IMPACT OF DIRECTIVE 76/464/EEC AND ITS DAUGHTER DIRECTIVES ON THE MOST IMPORTANT SURFACE WATERS IN THE COMMUNITY

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Document

Impact of Directive 76/464/EEC and its "daughter" directives on the most important surface waters in the Community

Volume 1: Main Report

M.T. Villars

G. Broseliske

J-P.R.A. Sweerts

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Preface

The Framework Directive 76/464/EEC (4 May 1976; source: EC001[1]) and its daughter Directives are meant to control pollution caused by discharges of certain dangerous substances into the aquatic environment of the Community. The Directives have had to be transposed by the Member States into their national legislation within the time limits given by the Directives. The effect of implementation of the Directives on the quality of EC surface waters, however, had not yet been inventoried in a comprehensive way at Community level.

The purpose of this project is to provide an evaluation of the impact of Directive 76/464/EEC on the quality of the main surface waters within the Community during the last 10 - 12 years. An analysis of changes in discharges and water quality for List I substances accompanied by an in-depth analysis regarding national and regional strategies and sanitation of industries, has been conducted for the main EC surface waters. The three new countries to join the EC (Austria, Finland and Sweden) have not been included as part of this study.

The present study was commissioned by DGXI/C/5 in February 1994 to a Joint Venture comprising DELFT HYDRAULICS and the Institute for Inland Water Management and Waste Water Treatment (RIZA) the Netherlands (Contract B4-3040/93/001169/LP/A3). The study was supervised by Mrs. J. Vennekens, Mr. A.C. Marcolino and Ms. E. McDonnell of the European Commission (DGXI-C.5). The data acquisition and the interpretation of the data have been carried out in association with the National Experts of the Member States. The cooperation of the National Experts and their colleagues in providing necessary information has been critical for conducting this study and is gratefully acknowledged.

1 References throughout the text are given by a country/location code followed by a 3-4 digit number (e.g. EC001). This non-standard manner of giving references has been chosen in order to allow references to be easily incorporated within the water quality data tables (Appendix E, Volume II). Full references per country are given in Chapter 8.

Executive Summary

Introduction

The framework Directive 76/464/EEC (4 May 1976; source: EC001) on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community and its daughter Directives have had to be incorporated by the Member States into their national legislation within the time limits given by the Directives. The effect of implementation of the Directives on the quality of EC surface waters, however, had not yet been inventoried in a comprehensive way at Community Level.

Objective of the study

The objective of this project is to provide an evaluation of the impact of Directive 76/464/EEC on the quality of the main surface waters within the Community during the period 1980-1993. An analysis has been made of changes in discharges and water quality for List I substances (note: a separate complementary review of List II substances is also being made). The analysis is coupled with a compilation and review of transposition of the Directive and its "daughters" in the national legislation of all Member States. This includes an indepth analysis regarding national and regional strategies and sanitation of industries.

More specific objectives of this of the study are:

- to make an overview of the transposition and implementation of Directive 76/464/EEC and daughter Directives in all Member States;
- to collect discharge and water quality data for the selected substances and surface waters, in as much detail as possible;
- to make an analysis on the basis of the gathered data, of the relationship between the transposition of Directive 76/464/EEC, the changes in industrial loads, and the water quality of the surface waters.

Selection of substances and main surface waters

During the inception phase of the project, a selection was made together with an EC representative for a limited number of substances and main surface waters. For detailed analysis, the following List I substances for which limit values are adopted in daughter Directives were selected: mercury, cadmium, hexachlorocyclohexane, tetrachloromethane, DDT, pentachlorophenol, drins, hexachlorobenzene, hexachlorobutadiene, chloroform, 1,2-dichloroethane, trichloroethene, tetrachloroethane, and trichlorobenzene. Dissolved oxygen and BOD were included as extra general parameters.

To obtain a representative picture for the main surface waters in the community, the following 16 surface water systems were chosen:

national rivers:	UK	Thames, Mersey, Trent
	France	Seine, Loire, Rhone
	Italy	Po
	Greece	Axios
	Portugal	Sado
	Spain	Ebro
	Ireland	Slaney
	Luxembourg	Moselle (tributary of the Rhine)
international rivers:	Rhine (covering parts of Germany, France, the Netherlands, Luxembourg)	
	Meuse and Scheldt (covering parts of France, Belgium and the Netherlands)	
	Tagus (covering parts of Spain and Portugal)	

Collection of information

Once the set of substances and selected surface waters was chosen, all relevant information was collected, specifically:

- information on the transposition and implementation of Directive 76/464/EEC and daughter Directives in all Member States;
- data on industrial dischargers and actual waste load discharges within each selected river basin;
- water quality data for the selected substances and surface waters (as yearly averaged concentrations);
- information on the characteristics of List I substances including chemical and environmental characteristics, the most important production processes and monitoring requirements.

In general, the main sources for information have been the National Experts on the implementation of Directive 76/464/EEC, i.e representatives of the member states to the European Commission. In some cases this information was supplemented by data from international literature and personal contact of RIZA and DELFT HYDRAULICS with experts in the Member States. Additional water quality data was obtained from the international GEMS database.

Assessment of Directive 76/464/EEC

The methodology for the assessment of Directive 76/464/EEC has been to analyze the data and information described for trends in discharges and surface water quality. These trends over the years 1980-1993 have been compared with the dates of the implementation of Directive 76/464/EEC and its daughter Directives in the Member States. Furthermore, other factors that may have contributed to changes in discharges and water quality have also been considered (i.e. driving forces such as international conventions or treaties). Finally, these comparisons have been discussed with the representatives of (some of) the Member States to put the trends into a historical perspective containing an overview of other developments that may have contributed to the character of the trends.

Thus, a comparison was made of monitoring data with developments (including the implementation of Directive 76/464/EEC) which may have had an impact on the waste loads and water quality. In this way, the effectiveness of Directive 76/464/EEC for the considered water systems and substances has been evaluated.

Conclusions

Bearing in mind that the Directive gives an either/or option for Member States to implement limit values for emissions or surface water quality objectives, there are three rivers for which extensive information exists regarding transposition, water quality *and* discharges. These are the Rhine, Scheldt and Mersey Rivers. For other rivers, there is either:

- extensive water quality data and limited discharge information,
- limited water quality data and extensive discharge information, or
- limited water quality data and limited discharge information.

In all cases, conclusions about the impact of Directive 76/464/EEC are based upon the available data.

Overall conclusions for the Rhine:

- the transposition of Directive 76/464/EEC and daughter Directives for List I substances is complete;
- a permit system was operating for most List I substances before 1976;
- the water quality for all List I substances improved in the period 1980-1992;
- the industrial and municipal discharges of List I substances were strongly reduced in the period 1985-1992; the discharge of DDT and HCH is expected to be reduced;
- Directive 76/464/EEC (including daughter Directives) is an important driving force leading to significant water quality improvement. Another important driving force is the Chemical Treaty for the Rhine of 1976.

Overall conclusions for the Scheldt and Mersey:

- the transposition of Directive 76/464/EEC and daughter Directives for List I substances is completed;
- a permit system was not operating for most List I substances before 1976;
- the water quality for cadmium in the Scheldt improved in the period 1980-1992;
- considering direct and indirect riverine inputs, the water quality for mercury has improved in the Mersey;
- the industrial and municipal discharges of cadmium and mercury in the Scheldt and Mersey, respectively, were reduced for the period 1985-1992; for the discharge of other List I substances, there was not sufficient information available to draw conclusions;
- Directive 76/464/EEC (including daughter Directives) is one of the key driving forces leading to significant water quality improvement for cadmium and mercury, respectively.

Overall conclusions for remaining rivers:

- the transposition of Directive 76/464/EEC and daughter Directives for List I substances is completed;
- a permit system was not operating for most List I substances before 1976;
- the availability of water quality data ranges from non-available to available;
- the water quality is sometimes improving, sometimes remaining constant, or fluctuating with no clear trend;
- the information on industrial and municipal discharges also ranges from not available to available. The type of information available includes discharges from individual industries, aggregated discharges (groups of substances), and the sum of riverine plus industrial discharges (river discharges to sea);
- in general, there is less information available for discharges than for water quality.
- Directive 76/464/EEC (including daughter Directives) is often the most important driving force with regard to management actions to implement a permit system, to reduce discharges and improve water quality.

General Conclusion

It is concluded that Directive 76/464/EEC is one of the important factors that have contributed to the improvement of water quality in the main surface waters of the European Community in the period 1980 - 1993. Its impact on water pollution control practices varies per country (and thus per river), depending on the National legislations and other international agreements which are also in effect. In many countries, a permit system was not operating for most List I substances before 1976, thus Directive 76/464/EEC was the driving force for National legislation.

Also, in many countries monitoring programs for List I substances started only in the last years. Therefore, trend analysis is not possible. However, because most countries do have an monitoring program for List I substances in the main surface waters, trend analysis will be possible in the future.

Uitgebreide samenvatting

Inleiding

De Raamwerk richtlijn 76/464/EEG (4 mei 1976; bron: EC001) en de dochter Richtlijnen van de Europese Gemeenschap over vervuiling veroorzaakt door bepaalde gevaarlijke stoffen geloosd in het aquatisch milieu, moeten door de lid staten zijn opgenomen in de nationale wetgeving binnen de tijd limieten van de Richtlijnen. Het effect van de implementatie van de Richtlijnen op de kwaliteit van het oppervlaktewater in de EG, is tot nu toe echter niet nauwkeurig in de Europese Gemeenschap onderzocht.

Doel van de Studie

Het doel van dit project is om een evaluatie te geven van de invloed van Richtlijn 76/464/E-EG op de kwaliteit van de belangrijkste oppervlakte wateren in de Europese Gemeenschap gedurende de periode 1980-1993. Er is een analyse gemaakt van de veranderingen in lozingen en waterkwaliteit voor Lijst I stoffen (opmerking: een separaat aanvullend onderzoek is in uitvoering voor Lijst II stoffen). De analyse gaat samen met een verzameling en beoordeling van de wettelijke implementatie van de Richtlijn en de dochter Richtlijnen in de nationale wetgeving van de lid staten. Een analyse van de nationale en regionale strategieën en sanering door industrieën vormt hier een onderdeel van.

Meer specifieke doelen van de studie zijn:

- het maken van een overzicht van de wettelijke en technische implementatie van de Richtlijn 76/464/EEG en dochter Richtlijnen in de lid staten;
- het verzamelen van lozings en waterkwaliteitgegevens voor een geselecteerd aantal stoffen en oppervlakte wateren;
- het maken van een analyse op basis van de verzamelde gegevens van de relatie tussen de wettelijke implementatie van Richtlijn 76/464/EEG, de veranderingen in industriële lozingen, en de kwaliteit van het oppervlaktewater.

Selectie van stoffen en oppervlakte wateren

Gedurende de inceptie fase van het project is een selectie gemaakt samen met een vertegenwoordiger van de Europese Commissie voor een beperkt aantal stoffen en oppervlakte wateren. Voor een gedetailleerde analyse zijn de volgende Lijst I stoffen, waarvoor grenswaarden zijn opgenomen in de dochter Richtlijnen, geselecteerd: kwik, cadmium, hexachloorhexaan, tetrachloormethaan, DDT, pentachloorfenol, drins, hexachloorbenzeen, hexachloorbutadieen, chloroform, 1,2-dichloorethaan, trichlooretheen, tetrachloorethaan en trichloorbenzeen. Opgelost zuurstof en Biologisch Zuurstof Gebruik (BOD) zijn als extra parameters toegevoegd.

Om een representatief beeld van de belangrijkste oppervlakte wateren in de Europese gemeenschap te krijgen, zijn de volgende 16 water systemen gekozen:

nationale rivieren:

Verenigd Koninkrijk	Thames, Mersey, Trent
Frankrijk	Seine, Loire, Rhone
Italie	Po
Griekenland	Axios
Portugal	Sado
Spanje	Ebro
Ierland	Slaney
Luxemburg	Moezel (zijrivier van de Rijn)

internationale rivieren:

Rijn (Duitsland, Frankrijk, Nederland en Luxemburg)
Maas en Schelde (Frankrijk, belgië en Nederland)
Taag (Spanje en Portugal)

Verzameling van informatie

Na de selectie van de stoffen en oppervlakte wateren werd alle relevante informatie verzameld, met name:

- informatie over de wettelijke en technische implementatie van Richtlijn 76/464/EEG en de dochter Richtlijnen in de lid staten;
- gegevens over industriële lozers en de lozingen in elk van de stroomgebieden;
- waterkwaliteitgegevens van de geselecteerde stoffen voor de geselecteerde oppervlakte wateren (als jaar gemiddelde concentratie);
- informatie van de eigenschappen van Lijst I stoffen waaronder de chemische en milieu eigenschappen, de belangrijkste produktie processen en monitoring verplichtingen.

In zijn algemeenheid zijn de Nationale Experts voor de implementatie van Richtlijn 76/464/EEG de voornaamste bron geweest voor de verzamelde informatie. In enkele gevallen is de informatie aangevuld met gegevens uit de internationale literatuur en persoonlijke contacten met experts in de lidstaten van RIZA en het Waterloopkundig Laboratorium. Aanvullende waterkwaliteitgegevens zijn gehaald uit de internationale GEMS gegevensbank.

Beoordeling van Richtlijn 76/464/EEG

De methodologie voor de beoordeling van Richtlijn 76/464/EEG hield de analyse in van de gegevens en informatie van trends in lozingen en oppervlakte waterkwaliteit. Deze trends voor de periode 1980-1993 zijn vergeleken met de tijdstippen van implementatie van Richtlijn 76/464/EEG en de dochter Richtlijnen in de lidstaten. Daarnaast zijn ook de invloeden van andere factoren die hebben bijgedragen aan veranderingen in lozingen en waterkwaliteit bekeken (bijvoorbeeld drijvende krachten zoals internationale conventies). Tenslotte zijn deze vergelijkingen en bevindingen besproken met de vertegenwoordigers van de lidstaten om de trends in een historisch perspectief te plaatsen waarbij ook andere ontwikkelingen die kunnen hebben bijgedragen aan veranderingen in ogenschouw zijn genomen.

Zodoende is een vergelijking gemaakt tussen gemeten gegevens en ontwikkelingen (waaronder de implementatie van Richtlijn 76/464/EEG) welke een invloed gehad kunnen hebben op de lozingen en de waterkwaliteit. Op deze manier is de effectiviteit van Richtlijn 76/464/EEG voor de in ogenschouw genomen oppervlakte wateren geëvalueerd.

Conclusies

De Richtlijn 76/464/EEG geeft de mogelijkheid aan de lidstaten om grens waarden voor lozingen en/of waterkwaliteit doelstellingen te implementeren. Van drie rivieren is er uitgebreide informatie over wettelijke implementatie, waterkwaliteit en lozingen: de rivieren de Rijn, de Schelde en de Mersey. Voor de andere rivieren zijn er of:

- uitgebreide waterkwaliteitgegevens en weinig lozingen gegevens;
- weinig waterkwaliteitsgegevens en uitgebreide lozingen gegevens;
- weinig waterkwaliteitsgegevens en weinig lozingen gegevens.

Op de bovenstaande gegevens zijn de conclusies over de invloed van Richtlijn 76/464/EEG gebaseerd.

Conclusies voor de Rijn

- de wettelijke implementatie van Richtlijn 76/464/EEG en de dochter richtlijnen voor Lijst I stoffen is afgerond;
- een vergunningen systeem was reeds operationeel voor de meeste Lijst I stoffen voor 1976;
- de waterkwaliteit voor alle Lijst I stoffen is verbeterd in de periode 1980-1992;
- de industriële en kommunale lozingen van Lijst I stoffen is sterk verminderd in de periode 1985-1992; de lozingen van DDT en HCH zijn waarschijnlijk verminderd;
- Richtlijn 76/464/EEG (met inbegrip van de dochter Richtlijnen) is een van de belangrijkste drijvende krachten die hebben geleid tot belangrijke verbeteringen van de waterkwaliteit. Een andere belangrijke drijvende kracht is het Rijnchemie verdrag van 1976.

Conclusies voor de Schelde en de Mersey

- de wettelijke implementatie van Richtlijn 76/464/EEG en de dochter richtlijnen voor Lijst I stoffen is afgerond;
- een vergunningen systeem was niet operationeel voor de meeste Lijst I stoffen voor 1976;
- de waterkwaliteit voor cadmium in de Schelde is verbeterd in de periode 1980-1992;
- de waterkwaliteit voor kwik in de Mersey is verbeterd in de periode 1980-1992;
- de industriële en kommunale lozingen van respectievelijk cadmium in de Schelde en kwik in de Mersey is sterk verminderd in de periode 1985-1992; voor een oordeel over de lozingen van andere Lijst I stoffen was niet voldoende informatie beschikbaar om conclusies te trekken;
- Richtlijn 76/464/EEG (met inbegrip van de dochter Richtlijnen) is één van de belangrijkste drijvende krachten die hebben geleid tot belangrijke verbeteringen van de waterkwaliteit met betrekking tot cadmium en kwik.

Conclusies voor de andere rivieren

- de wettelijke implementatie van Richtlijn 76/464/EEG en de dochter richtlijnen voor Lijst I stoffen is afgerond;
- een vergunningen systeem was niet operationeel voor de meeste Lijst I stoffen voor 1976;
- de beschikbaarheid van waterkwaliteit gegevens varieert van niet beschikbaar tot beschikbaar;
- de waterkwaliteit is in sommige gevallen verbeterd, in andere gevallen is zij constant gebleven en in de overige gevallen fluctueert zij zonder duidelijke trend;
- de beschikbaarheid van informatie van industriële en kommunale lozingen varieert eveneens van niet beschikbaar tot beschikbaar. Het type informatie dat beschikbaar is omvat lozingen door individuele industrieën, geaggregeerde lozingsgegevens (voor groepen van stoffen) en informatie over de som van de afvoer van stoffen via rivieren en de industriële lozingen in het betreffende deltagebied;
- in het algemeen is er minder informatie beschikbaar van lozingen dan van waterkwaliteit van oppervlakte water;
- Richtlijn 76/464/EEG (met inbegrip van de dochter Richtlijnen) is een vaak de belangrijkste drijvende kracht met betrekking tot de invoering van een (lozings) vergunningsysteem teneinde de lozingen te verminderen en de waterkwaliteit te verbeteren.

Algemene conclusie

Richtlijn 76/464/EEG kan worden beschouwd als een van de belangrijke factoren die hebben bijgedragen tot de verbetering in de waterkwalitieit van de belangrijkste oppervlakte wateren in de lidstaten van de Europese Gemeenschap in de periode 1980-1993. De invloed op de maatregelen om de water verontreiniging te controleren varieert per land en daarmee per rivier en wordt bepaald door de nationale wetgeving en andere internationale overeenkomsten. In veel landen was er voor 1976 <u>geen</u> vergunningen stelsel voor lozingen van Lijst I stoffen zodat kan worden gesteld dat in die gevallen Richtlijn 76/464/EEG de drijvende kracht was voor de nationale wetgeving.

In meerdere EC landen zijn pas de laatste jaren monitoring programma's gestart. Daarom is voor de rivieren in deze landen een trend analyse niet mogelijk. Bijna alle EG landen hebben nu echter een monitoring programma voor Lijst I stoffen waardoor het in de toekomst mogelijk is om trend analyses te maken voor vrijwel alle belangrijke rivieren in de Europese Gemeenschap.

Zusammenfassung

Einführung

Die Rahmenrichtlinie 76/464/EWG (4. Mai 1976; Quelle: EC001) betreffend die Verschmutzung infolge der Ableitung bestimmter gefährlicher Stoffe in die Gewässer der Europäischen Gemeinschaft und ihre Tochterrichtlinien sollten innerhalb der in den Richtlinien festgelegten Fristen von den Mitgliedstaaten in ihre nationale Gesetzgebung aufgenommen sein. Die Auswirkung der Implementierung dieser Richtlinien auf die Qualität der EG-Oberflächengewässer ist jedoch auf Gemeinschaftsebene noch nicht umfassend inventarisiert worden.

Ziel der Studie

Ziel dieses Projektes ist es eine Bewertung des Einflusses der Richtlinie 76/464/EWG auf die Qualität der wichtigsten Oberflächengewässer in der EG über die Zeitspanne 1980-1993 zu liefern. Eine Analyse der Veränderungen der Einleitungen und der Wasserqualität für Stoffe der Liste I wurde durchgeführt (Anm.: Eine getrennte ergänzende Übersicht der Stoffe der Liste II wird ebenfalls erstellt). Die Analyse wurde mit einer Zusammenstellung und Beschreibung der Umsetzung der Richtlinie und ihrer "Töchter" in die nationale Gesetzgebung aller Mitgliedstaaten gekoppelt. Dies schließt eine gründliche Analyse der nationalen und regionalen Strategien sowie die Sanierung der Industrie mit ein.

Spezifischere Ziele dieser Studie sind:

- Erstellung einer Übersicht über die gesetzliche Umsetzung und Implementierung der Richtlinie 76/464/EWG und ihrer Tochterrichtlinien in allen Mitgliedstaaten;
- Sammlung von Einleitungs- und Wasserqualitätsdaten für die ausgewählten Stoffe sowie die Oberflächengewässer, so detailliert wie möglich;
- Auf der Grundlage der gesammelten Daten, Analyse des Zusammenhanges zwischen der gesetzlichen Umsetzung der Richtlinie 76/464/EWG, den Änderungen bei den industriellen Frachten und der Wasserqualität der Oberflächengewässer.

Auswahl von Stoffen und wichtigster Oberflächengewässer

In der Anfangsphase des Projektes wurde, zusammen mit einem Vertreter der Europäischen Kommission, eine begrenzte Zahl Stoffe und wichtige Oberflächengewässer ausgewählt. Für eine detaillierte Analyse wurden die folgenden Stoffe der Liste I, für die in den Tochterrichtlinien Grenzwerte festgelegt worden sind, ausgewählt: Quecksilber, Cadmium, Hexachlorcyclohexan, Tetrachlormethan, DDT, Pentachlorphenol, Drine, Hexachlorbenzol, Hexachlorbutadien, Chloroform, 1,2-Dichlorethan, Trichlorethen, Tetrachlorethan und Trichlorbenzol. Gelöster Sauerstoff und BSB wurden als zusätzliche allgemeine Parameter einbezogen.

Um ein repräsentatives Bild über die wichtigsten Oberflächengewässer in der EG zu erhalten, sind die nachfolgenden 16 Oberflächengewässersysteme ausgewählt worden:

nationale Flüsse:	Großbritannien	Themse, Mersey, Trent
	Frankreich	Seine, Loire, Rhone
	Italien	Po
	Griechenland	Axios
	Portugal	Sado
	Spanien	Ebro
	Irland	Slaney
	Luxemburg	Mosel (Nebenfluß des Rheines)

internationale Flüsse: Rhein (bedeckt Teile Deutschlands, Frankreichs, der Niederlande, Luxemburgs)
Maas und Schelde (bedeckt Teile Frankreichs, Belgiens und der Niederlande)
Tejo (bedeckt Teile Spaniens und Portugals)

Sammlung der Informationen

Nachdem sowohl die Stoffe als auch die ausgewählten Oberflächengewässer festgelegt worden waren, wurden alle relevanten Informationen gesammelt, insbesondere:

- Informationen über die gesetzliche Umsetzung und Implementierung der Richtlinie 76/464/EWG und ihrer Tochterrichtlinien in allen Mitgliedstaaten;
- Daten über industrielle Ableitungen und aktuelle Schadstoffemissionen für jedes ausgewählte Einzugsgebiet;
- Wasserqualitätsdaten für alle ausgewählten Stoffe und Oberflächengewässer (als Jahresmittelwerte der Konzentrationen);
- Informationen über die Charakteristika der Stoffe der Liste I, einschließlich chemischer und umwelthygienischer Eigenschaften, wichtigster Produktionsverfahren und Überwachungsanforderungen.

Im allgemeinen waren die nationalen Experten für die Implementierung der Richtlinie 76/464/EWG, d.h. die Vertreter der Mitgliedstaaten in der Europäischen Kommission, die wichtigsten Informationsquellen. In einigen Fällen wurde diese Informationen durch Daten aus der internationalen Literatur und persönliche Kontakte von RIZA und DELFT HYDRAULICS mit Sachverständigen in den Mitgliedstaaten ergänzt. Zusätzliche Wasserqualitätsdaten wurden der internationalen GEMS-Datenbank entnommen.

Beurteilung der Richtlinie 76/464/EWG

Zur Beurteilung der Effektivität der Richtlinie 76/464/EWG wurden Trendanalysen mit den vorliegenden Daten und Informationen zu Einleitungen und zur Wasserqualität durchgeführt. Diese Trends in der Periode 1980-1983 wurden mit Daten über die Implementierung der Richtlinie 76/464/EWG und ihrer Tochterrichtlinien in den Mitgliedstaaten verglichen. Daneben sind weitere Faktoren, die möglicherweise zu Veränderungen der Einleitungen und der Wasserqualität beigetragen haben, berücksichtigt worden (z.B. treibende Kräfte, wie internationale Vereinbarungen oder Verträge). Schließlich ist dieser Vergleich mit Vertretern aus einigen Mitgliedstaaten durchgesprochen worden, um die Trends unter einem historischen Blickwinkel zu betrachten, der auch andere Entwicklungen, die zum Charakter der Trends beigetragen haben können, einzubeziehen.

So wurde ein Vergleich zwischen Meßdaten und Entwicklungen (einschließlich der Implementierung der Richtlinie 76/464/EWG), die die Schadstoffmengen und Wasserqualität beeinflußt haben könnten, durchgeführt. Auf diese Weise ist die Effektivität der Richtlinie 76/464/EWG für die betrachteten Wassersysteme und Stoffe geprüft worden.

Schlußfolgerungen

Mit dem Gedanken, daß die Richtlinie für die Mitgliedstaaten eine Entweder/Oder-Möglichkeit enthält, also entweder Emissionsgrenzwerte oder Qualitätsziele für die Oberflächenwasserqualität zu implementieren, gibt es drei Flüsse, für die ausführliche Informationen über gesetzliche Umsetzung, Wasserqualität und Einleitungen vorliegen. Dies sind Rhein, Schelde und Mersey. Für andere Flüsse gibt es entweder:

- umfangreiche Wasserqualitätsdaten und wenige Einleitungsdaten,
- wenige Wasserqualitätsdaten und umfangreiche Einleitungsdaten, oder
- wenige Wasserqualitätsdaten und wenige Einleitungsdaten.

In allen Fällen stützen sich die Schlußfolgerungen über die Effektivität der Richtlinie 76/464/EWG auf die verfügbaren Daten.

Fazit für den Rhein:

- die gesetzliche Umsetzung der Richtlinie 76/464/EWG und ihrer Tochterrichtlinien für Stoffe der Liste I ist abgeschlossen;
- vor 1976 gab es für die meisten Stoffe der Liste I ein Genehmigungsverfahren;
- in der Periode 1980-1992 hat sich die Wasserqualität für alle Stoffe der Liste I verbessert;
- die industriellen und kommunalen Ableitungen der Stoffe der Liste I sind in der Periode 1985-1992 stark zurückgegangen; für DDT und HCH wird angenommen, daß die Ableitung reduziert wurde;
- Richtlinie 76/464/EWG (einschließlich Tochterrichtlinien) ist eine wichtige treibende Kraft, die zu einer signifikanten Verbesserung der Wasserqualität führt. Eine weitere treibende Kraft ist der Chemievertrag für den Rhein aus dem Jahre 1976.

Fazit für die Schelde und die Mersey

- die gesetzliche Umsetzung der Richtlinie 76/464/EWG und ihrer Tochterrichtlinien für Stoffe der Liste I ist vollständig;
- vor 1976 gab es für die meisten Stoffe der Liste I keine Genehmigungsverfahren;
- in der Periode 1980-1992 hat sich die Wasserqualität für Cadmium in der Schelde verbessert;
- bei Betrachtung direkter und indirekter Einleitungen in Flüsse und Flußmündungen hat sich die Wasserqualität für Quecksilber in der Mersey verbessert;
- die industriellen und kommunalen Ableitungen von Cadmium und Quecksilber in die Schelde bzw. die Mersey sind in der Periode 1985-1992 zurückgegangen; für die Ableitung anderer Stoffe der Liste I lagen unzureichende Informationen vor, um Schlußfolgerungen ziehen zu können;
- Richtlinie 76/464/EWG (einschließlich Tochterrichtlinien) ist eine der wichtigen treibenden Kräfte, die zu einer signifikanten Verbesserung der Wasserqualität für Cadmium bzw. Quecksilber geführt hat.

Fazit für die übrigen Flüsse:

- die gesetzliche Umsetzung der Richtlinie 76/464/EWG und ihrer Tochterrichtlinien für Stoffe der Liste I ist abgeschlossen;
- vor 1976 gab es für die meisten Stoffe der Liste I keine Genehmigungsverfahren;
- die Verfügbarkeit von Wasserqualitätsdaten variiert von nicht-verfügbar bis verfügbar;
- die Wasserqualität hat sich in einigen Fällen verbessert, ist in anderen unverändert geblieben oder schwankt ohne deutlichen Trend;
- die Informationen über industrielle und kommunale Ableitungen variieren ebenfalls von nicht-verfügbar bis verfügbar. Es liegen Informationen über Ableitungen von einzelnen Industrien, zusammengefaßten Ableitungen (Stoffgruppen), sowie die Summe von Einträgen über Flüsse und industrielle Ableitungen im Flußmündungsgebiet vor;
- im allgemeinen liegen weniger Daten über Ableitungen als über Wasserqualität vor;
- Richtlinie 76/464/EWG (einschließlich Tochterrichtlinien) ist in den meisten Fällen die wichtigste treibende Kraft in bezug auf die Verwirklichung von behördlichen Genehmigungsverfahren zur Verringerung der Ableitungen und Verbesserung der Wasserqualität.

Allgemeine Schlußfolgerung

Die Richtlinie 76/464/EWG muß als einer der wichtigen Faktoren, die zur Verbesserung der Wasserqualität von wichtigen Oberflächengewässern in der Europäischen Gemeinschaft in der Periode 1980-1993 beigetragen haben, betrachtet werden. Ihre Auswirkung auf die staatliche Überwachung der Wasserqualität variiert pro Land (und demzufolge pro Fluß), abhängig von den nationalen Gesetzgebungen und anderen internationalen Verträgen, die ebenfalls in Kraft sind. In vielen Ländern gab es vor 1976 für die meisten Stoffe der Liste I keine Genehmigungsverfahren, so daß die Richtlinie 76/464/EWG in diesen Fällen den Anstoß für die nationale Gesetzgebung war. In vielen Ländern hat man erst in den letzten Jahren Meßprogramme für Stoffe der Liste I eingeführt. Demzufolge ist eine Trendanalyse noch nicht möglich. Da die meisten Ländern jetzt über ein Meßprogramm für Stoffe der Liste I in den wichtigen Oberflächengewässern verfügen, wird eine Trendanalyse jedoch künftig möglich sein.

1 Introduction

1.1 General Introduction

The EC Framework Directive 76/464/EEC (4 May 1976) and its "daughter" Directives are meant to control pollution caused by discharges of certain dangerous substances into the aquatic environment of the Community. Specifically, the Directive requires the Member States of the EC to take all adequate measures to eliminate water pollution by the black list substances (i.e. List I). The directive lays down that all discharges containing List I substances require a licence, in which discharge standards are defined.

Institutional arrangements for the enforcement of pollution include national and local authorities. The national authorities generally set policies, objectives, standards and basic procedures. Compliance monitoring is conducted by either national or local authorities. Enforcement is predominantly the role of the local authorities. The main surface water systems (i.e. river basins) are often used as the geographical unit for water management and pollution control. This system however is usually difficult to implement in international contexts. Differences in legal and governmental structures may mean that, for the same measures, different implementation incentive systems will be relevant in different countries.

The Framework Directive and daughter Directives have had to be transposed by the Member States into their national legislation within the time limits given by the Directives. The effect of implementation of the Directives on the quality of EC surface waters, however, has not yet been inventoried in a comprehensive way.

1.2 Scope and Objectives of the study

The purpose of this project is to provide an evaluation of the impact of Directive 76/464/EEC on the quality of the main surface waters in the Community during the last 10 - 12 years. An analysis of changes in discharges and water quality for List I substances accompanied by an in-depth analysis regarding national and regional strategies, international driving forces, sanitation of industries, installation of waste water treatment plants and all available future plans and programmes, has been conducted for the main EC surface waters.

Directive 76/464/EEC deals with industrial waste loads, thus communal and diffuse loads are in principle not evaluated. Exceptions are made when data are available and necessary for the analysis of the evolution of the industrial discharges.

Directive 76/464/EEC (including Directive 86/280/EEC) comprise a number of key items:

- requirement for prior authorizations, including emission standards for List I/II substances;
- laying down limit values for discharges of List I substances at Community level;
- laying down quality objectives at Community level (alternative for limit values);
- authorizations shall be reviewed at least every four years;
- requirement to establish programmes with quality objectives for List II substances;
- requirement for inventories of discharges of List I substances;
- monitoring of discharges and surface waters for List I/II substances;
- reporting obligation for Member States on request by the Commission concerning authorizations, inventories, monitoring data etc. (now incorporated in Directive 91/692/EEC);
- drawing up specific programmes concerning List I substances to avoid or eliminate pollution from significant sources (including multiple and diffuse sources).

The scope of the project is to provide an evaluation of the impact entailed by the implementation of Directive 76/464/EEC for List I substances on the quality of the main surface waters in the Community in the period 1980 - 1993. It was agreed with the European Commission to assess the effectiveness of Directive 76/464/EEC by considering 4 aspects:

1. transposition of Directive 76/464/EEC and daughter Directives;
2. the trends in the water quality in selected main surface waters in the Community;
3. the trends in discharges of List I substances by industrial point sources;
4. other driving forces (than Directive 76/464/EEC) also leading to water quality improvements in the Community.

The results of the findings are reported using a specific format as given in figure 1.2.

1.3 Approach

1.3.1 Framework for analysis

The approach used in this study has been based on a Framework for Analysis, which is a structured sequence of steps to follow, in order to carry out the most optimal in-depth analysis. Within the Framework for Analysis three phases are identified:

phase 1:	Inception phase: Establishing contacts with National Experts on the implementation of Directive 76/464/EEC, and selecting water systems for the study;
phase 2:	Preparation phase: Data collection, preliminary analysis of all collected information and an identification of gaps in knowledge;
phase 3:	Analysis phase: Final data collection and contact with National Experts on the implementation of Directive 76/464/EEC to fill gaps in knowledge; and in-depth analysis of water quality in the main EC surface waters integrated with knowledge of emissions and driving forces (legislation).

1.3.2 Selection of substances and surface waters

Before actual data collection began, there was a selection of river basins and List I substances for evaluation of the Directive 76/464/EEC (phase 1). The purpose of the selection was to limit the study to be manageable but meaningful in scope. The selection of substances and surface waters was made in consultation with the representative of the European Commission.

The folowing List I substances for which limit values and water quality objectives are set by the EC, were selected: mercury, cadmium, hexachlorocyclohexane, tetrachloromethane, DDT, pentachlorophenol, drins, hexachlorobenzene, hexachlorobutadiene, chloroform, 1,2-dichloroethane, trichloroethene, tetrachloroethane, and trichlorobenzene. Dissolved oxygen and BOD were included as extra general parameters.

To obtain a representative picture for the main surface waters in the community, the following surface water systems were chosen:

national rivers:	UK	Thames, Mersey, Trent
	France	Seine, Loire, Rhone
	Italy	Po
	Greece	Axios
	Portugal	Sado
	Spain	Ebro
	Ireland	Slaney
	Luxembourg	Moselle (tributary of the Rhine)

international rivers: Rhine (covering parts of Germany, France, the Netherlands, Luxembourg)
Meuse and Scheldt (covering parts of France, Belgium and the Netherlands)
Tagus (covering parts of Spain and Portugal)

A summary of the selected substances and river basins included in this study is given in Table 1.1. A map showing the Member States and all the selected rivers in given in Figure 1.1.

The selection of monitoring points for water quality data in each river were chosen in consultation with the National Experts of each country. In general, one monitoring station per river is used. The selection in many cases was based on the availability of data. If data from more than one station were available, then typically the most downstream station was selected (i.e. representing a larger catchment area). An attempt was made to have only freshwater monitoring stations, though for some of the rivers (e.g. Scheldt) the monitoring stations are in an estuary (brackish water).

For the international rivers, data from more than one water quality monitoring station was collected (e.g. Rhine, Scheldt, Meuse, Tagus). These stations are from the different countries through which the river flows. Also for the Axios river in Greece, data from more than one station was collected.

For the international rivers (Rhine, Scheldt, Meuse, and Tagus), although water quality and loads data have been collected from different countries, the analysis of Directive 76/464/EEC is made for each river basin as a whole. No surface waters in Denmark were selected as water quality data from the National Expert on the implementation of Directive 76/464/EEC was not made available in time for inclusion. The new Member States of the Community (Austria, Finland and Sweden) were not included as part of this study.

In the preparation phase (phase 2), most of the necessary information was collected via the National Experts from each country. An interim report presenting the available data and identification of gaps in knowledge was prepared. All information presented in the interim report is included here in the final project report.

1.3.3 Analysis methodology

In the final or analysis phase (phase 3), an analysis has been made per river basin, of the impact of Directive 76/464/EEC on the quality of the main rivers of the Community. This report is the final report corresponding to the completion of phase 3.

A common methodology consisting of four components has been carried out for each river basin:

1) Transposition of Directive 76/464/EEC: Information from each Member State was collected to see how and when the Framework directive and daughter Directives were transposed and implemented.
2) Water Quality: All available water quality data for the selected substances was collected for the period 1980-1993 (as yearly average concentrations) for each river.
3) Emissions: All available data on industrial discharges within the river basin was collected.
4) Driving Forces: The implementation of Directive 76/464/EEC is also seen in relation to other national and international developments (e.g. International Rhine Commission and other international conventions and agreements) which have contributed to the regulation of discharges. All the "driving forces" which are relevant for each river basin have been summarized.

The 4 components of the analysis are illustrated schematically in Figure 1.2.: Transposition of Directive 76/464/EEC → other driving forces → waste loads discharge (emissions) → water quality. It is important that all substances are evaluated in the perspective of all important related developments in the river basin (i.e. all relevant driving forces).

The water quality data are reported as yearly average concentrations. This was chosen to represent concentrations instead of riverine load values (i.e. Q x C), as the goal of the study is to review the change over the years in water quality, which can best be seen as concentrations. Furthermore, within Directive 76/464/EEC, water quality standards (e.g. water quality objectives) are given as receiving water concentrations.

The water quality data (presented in Appendix E, Volume II) were for the most part provided in the data by the National Experts on the implementation of Directive 76/464/EEC. The method used for calculating the yearly average was not always given. Several databases stated explicitly that for individual measurements below the detection limit, the yearly average values were calculated by setting the value to half the detection limit. In some cases, the National Experts provided only data of daily or monthly concentrations. In this event, the yearly average concentrations were calculated by setting values less than detection to half the detection limit. Flow weighting of concentrations was not used. It is clear that not all data collected by all institutes were made available for this study. Within the time limits of the project, by using only data controlled by the National Experts, a best effort has been made.

In all cases, (total) pollutant concentrations in water have been reported [μg/l]. It can be argued that concentrations of some pollutants (e.g. organic micropollutants) should be reported as particulate concentrations (e.g. [μg/kg], μg pollutant per kg suspended sediment). However, the majority of the data available consisted of water concentrations, and for the sake of consistency, only these values have been reported.

In the final analysis, the data described above have been analyzed for changes in discharges (emissions) and surface water quality over time (no statistical 'trend analysis' has been performed). This analysis is made difficult by substance concentrations below the limit of detection, and changes in the detection limit over time. However, as best as possible, the observable changes or trends have been compared with the required dates of compliance of Directive 76/464/EEC and its daughter Directives as well as other relevant driving forces for pollution control in the country and/or river basin. Furthermore, these comparisons have been discussed with the representatives of the Member States to put the trends in a historical perspective containing an overview of other developments that may have contributed to the character of the trends.

Thus, an evaluation of monitoring data is made in relation with developments (including the implementation of Directive 76/464/EEC) which may have had in impact on the waste loads and water quality. In this way, the effectiveness of Directive 76/464/EEC for the considered water systems and substances is evaluated.

Table 1.1 Selected surface waters and substances for impact Analysis of Directive 76/464/EEC

EC List I (black list)		
substance		*unit*
flow		m3/s
Dissolved Oxygen		mg/l
BOD5		mg/l
total Hg		µg/l
total Cd		µg/l
Pentachlorophenol	PCP	µg/l
Trichlorobenzene	TCB	µg/l
1,2-Dichloroethane	EDC	µg/l
Tetrachloromethane	Tetra	µg/l
Chloroform	Trichloromethane	µg/l
Tetrachloroethene (..ethylene)	PER	µg/l
Trichloroethene (..ethylene)	TRI	µg/l
Hexachlorocyclohexane	Lindane or HCH(Y)	µg/l
Hexachlorobutadiene	HCBD	µg/l
Hexachlorobenzene	HCB	µg/l
Aldrin		µg/l
Dieldrin		µg/l
Isodrin		µg/l
Total Drins	DRINS	µg/l
o,p-DDT	2,4-DDT	µg/l
p,p'-DDT	4,4-DDT	µg/l
DDT (total)	DDT	µg/l

River	Monitoring station	Country
Axios	*Axioupolis*	Greece
	Prochoma/Koufalia	Greece
	Chalastra	Greece
Ebro	*Asco*	Spain
Loire	*Ste Luce*	France
Mersey	*Howley Weir*	United Kingdom
Meuse	*Tailfer*	Belgium
	Eijsden	Netherland
	Keizersveer	Netherland
Moselle	*Palzem*	Luxembourg
	Grevenmacher	Luxembourg
Po	*Pontelaguscuro*	Italy
Rhine	*Koblenz*	Germany
	Bimmen-Lobith	Germany / Netherland
	Lobith	Netherland
	Maassluis	Netherland
Rhone	*Arles*	France
Sado		Portugal
Scheldt	*Doel*	Belgium
	Schaar van Ouden Doel	Netherland
Seine	*Paris*	France
Slaney	*Enniscorth*	Ireland
Tagus	*Talavera*	Spain
	Santerem	Portugal
Thames	*Teddington Weir*	United Kingdom
Trent	*Dunham*	United Kingdom
	Keadby	United Kingdom

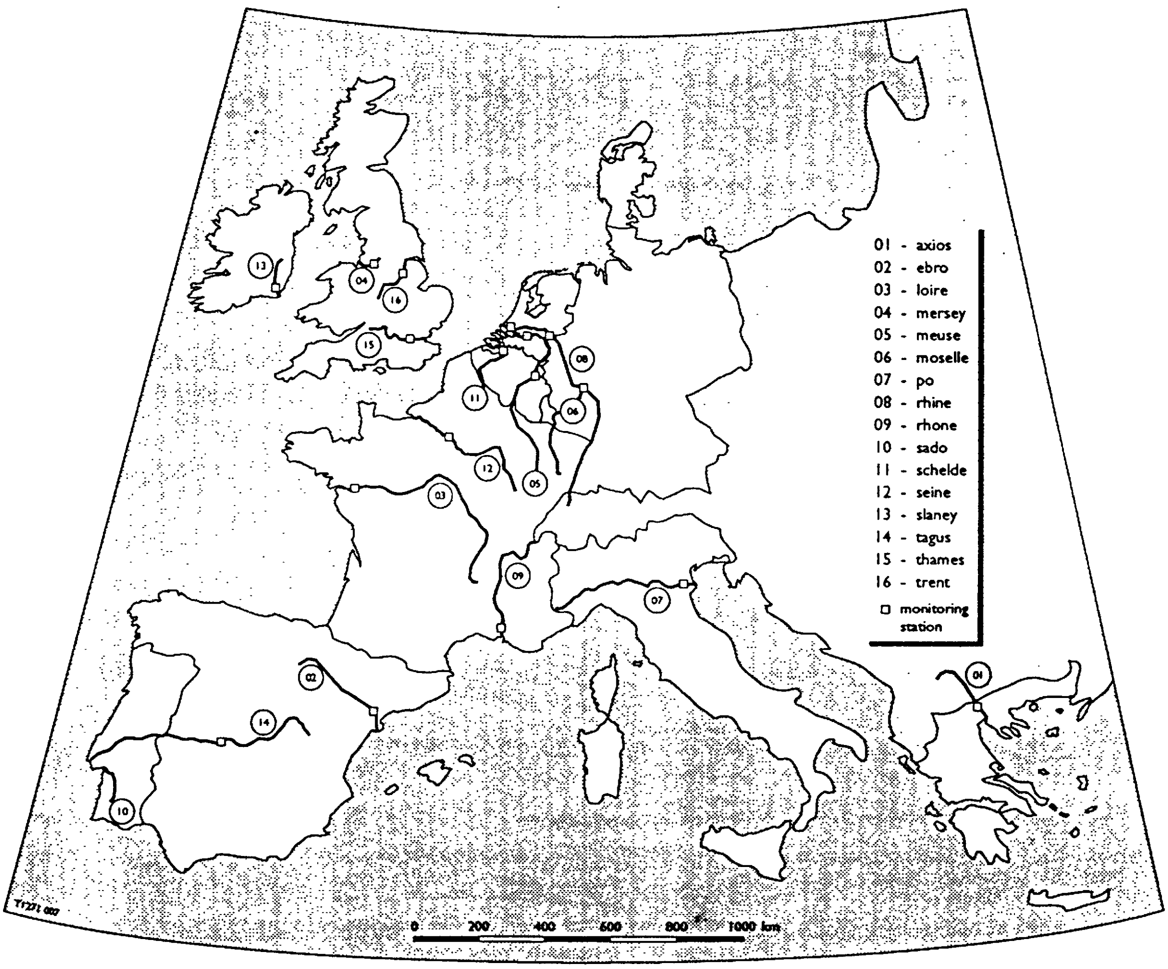

Figure 1.1 EC Member States and selected surface waters for analysis

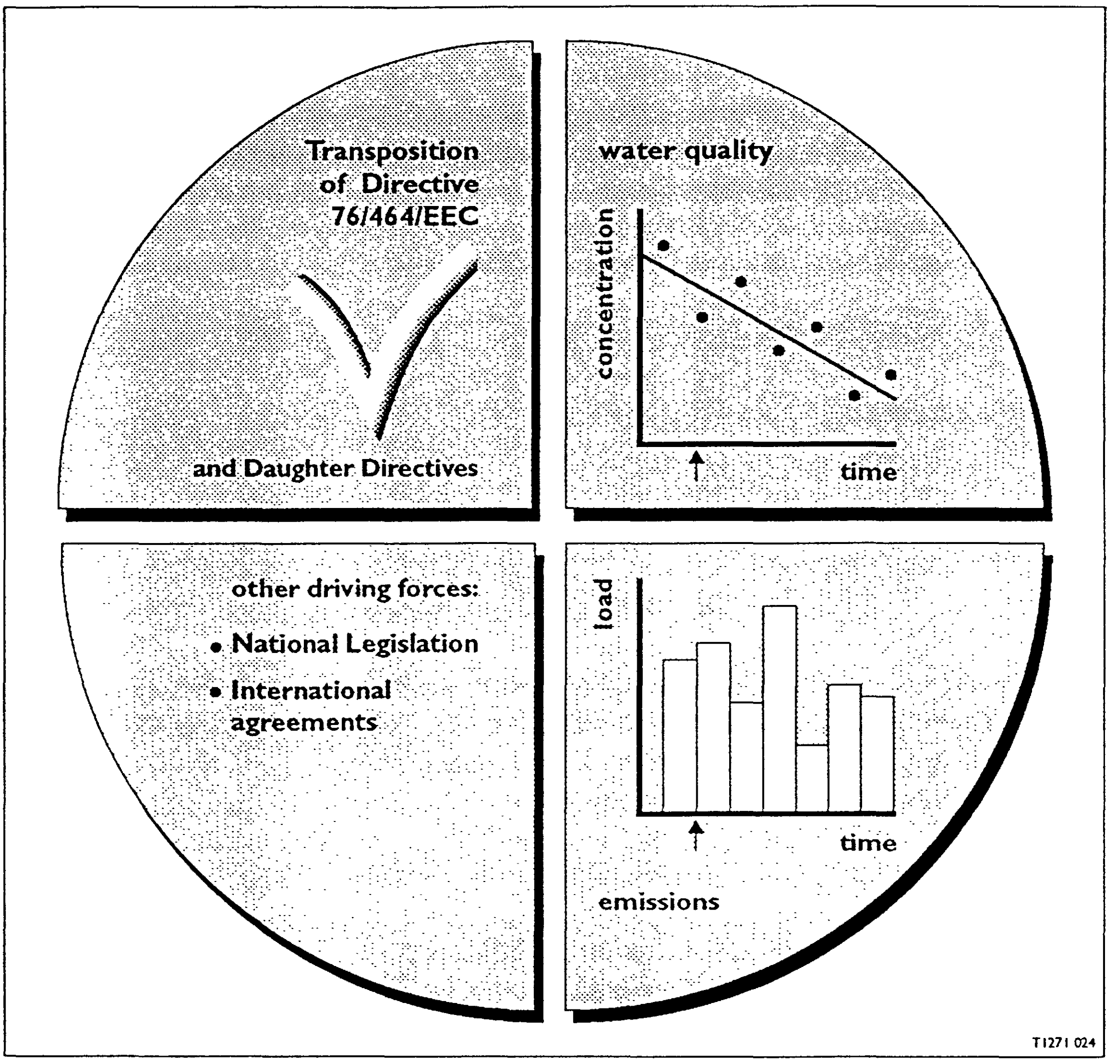

Figure 1.2 Impact of Directive 76/464/EEC regarding List I substances on the quality of a selected water system

1.4 Sources of Information

In general, the main sources for information were the representatives of the Member States to the European Commission (i.e. the National Experts). In some cases this information was supplemented by data from international literature and personal direct contact of RIZA and DELFT HYDRAULICS with experts in the Member States. Full references are given in chapter 8 of this report. Additional water quality data was obtained from the international GEMS database (GEN003, GEN023).

1.5 Outline of the project report

This report is presented in two volumes as follows:

- Volume I: Main report plus Appendices A, B, C.
- Volume II: Supplementary Appendices (D - H)

The report gives an overview of:

- the List I substances including general chemical characteristics, important production processes and monitoring requirements;
- the data gathered for the selected substances and surface waters with respect to waste loads and water quality;
- the information gathered concerning the transposition of Directive 76/464/EEC in the Member States including dates of implementation of the daughter Directives.

A description of Framework Directive 76/464/EEC and daughter Directives is given in Chapter 2. Characteristics of List I substances are given in Chapter 3. An overview of the available discharge and water quality data is given in Chapter 4. Chapter 5 gives an analysis of the 16 selected surface waters in the Community. The conclusions over the impact of Directive 76/464/EEC on the surface waters of the Community are given in Chapter 6. Acknowledgements and Bibliography are in Chapters 7 and 8.

The text of Council Directive 76/464/EEC is given in Appendix A. Full details of the 'Water Management Profiles' for each Member State are given in Appendix B. Appendix C gives an extended analysis of the Rhine river as an illustration of the type of analysis that can be made if very complete information on waste loads, water quality and driving forces is known.

The full databases for discharges and water quality for the selected rivers are given in Appendices D and E (Volume II). Also in Volume II are an evaluation of the impact of Directive 76/464/EEC on the Tagus River, Spain (Appendix F), a summary of UK water pollution control (Appendix G), and a summary of all daughter Directives and overview of List I substances (Appendix H).

1.6 Execution of the contracted research

The present study was commissioned by DGXI/C/5 in February 1994, to a Joint Venture comprising DELFT HYDRAULICS and the Institute for Inland Water Management and Waste Water Treatment (RIZA) the Netherlands. The data acquisition and the interpretation of the data are carried out in association with the National Experts involved in the implementation of Directive 76/464/EEC. The cooperation of the National Experts and their colleagues in providing necessary information has been critical for conducting this study and is gratefully acknowledged.

The study was carried out by a multi-disciplinary project team of the following persons:

Function	Name
Team leader and project leader DH	J-P.R.A. Sweerts (DH)
Water Quality specialist	M.T. Villars (DH)
Project leader RIZA, emission specialist	G.H. Broseliske (RIZA)
Policy analysis and emission specialist	J.A.W. De Wit (RIZA)
Project assistant	F. de Graaf (DH)
Project assistant	R. Wunderink (RIZA)

The study was supervised by Mrs. J. Vennekens, Mr. A.C. Marcolino and Ms. E. McDonnell of the European Commission (DG XI-C.5).

2 Directive 76/464/EEC

2.1 Framework Directive 76/464/EEC

During the summit in November 1972 of the heads of state of the European Community, the importance of having an environmental policy at Community level was stressed. Considering article 2 of the Treaty establishing the European Economic Community, promoting a continuous and well balanced development of economic activities within the whole of the Community, it was recognized that this aim could not be reached without an effective combat of pollution and nuisance, nor without an improvement of the quality of life and protection of the environment.

European institutions were invited to propare a first environmental action programme to be completed by the end of July 1973. This first environmental action program, as adopted in July 1973, comprises a chapter on specific actions for certain industrial sectors including the production of energy. First of all, measures aiming at the reduction of emissions had to be developed by the European Commission for the paper and pulp industry, the iron and steel industry and the titanium dioxide industry.

The history of Directive 76/464/EEC actually goes back to the paper and pulp proposals of 1973-1975. It turned out that there was insufficient support to adopt measures for this industrial branch. Consequently, the paper and pulp proposals were blocked in 1975. But, the situation urgently required a general and simultaneous action by the Member States to protect the aquatic environment of the Community from pollution, particularly that caused by certain persistent, toxic and bioaccumulable substances.

Several conventions or draft conventions such as for the prevention of marine pollution from land-based sources and the draft convention for the protection of the Rhine against chemical pollution, were designed to protect international water courses and the marine environment from pollution. Within the European Community it was considered to be important to ensure the coordinated implementation of these conventions. These aspects were major driving forces leading to the adoption of Council Directive 76/464/EEC on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community, as adopted on the 4th of May 1976. The full text of the Directive is given in Appendix A. This Directive aims at a general and simultaneous action by Member States of the European Union to protect the aquatic environment of the Community from pollution, particularly that caused by certain persistent, toxic and bioaccumulable substances.

To ensure an effective protection of the aquatic environment of the Community, a first list (List I) of certain individual substances was selected on the basis of their environmental toxicity, persistence and bioaccumulation, with the exception of those which are biologically harmless or which are rapidly converted into substances which are biologically harmless. In principle, the directive states that pollution through the discharge of List I substances must be eliminated. For this purpose, the Council has adopted specific discharge limit values and receiving water quality objectives and has implemented time limits based on proposals by the Commission. Requirements (emission standards) set by Member States in discharge authorizations, must at least meet the Council's time limits and limit values except in cases where they employ the Council's quality objectives.

Additonally, a second list of dangerous substances was established (List II). The List II (grey list) substances, are those which have a deleterious effect on the aquatic environment, which can, however, be confined to a given area and which depend on the characteristics and location of the water into which they are discharged. Any discharge of these substances should be subject to prior authorization which specifies emission standards. These emission standards are required to be based on quality objectives.

Considering the fact, that, from a technical point of view, part of List I has an "open-ended" character (e.g. "organohalogen compounds and substances which may form such components in the aquatic environment") this induced the question of which specific substances were meant, and in order to expedite the formulation of limit values and quality objectives for specific List I substances, the Council adopted on the 7th of February 1983 a Resolution, containing a list of 129 priority pollutants (later on this list was expanded to 132 substances). This list of 129 substances represents a priority working list for both the Commission and the Member States.

In order to optimize the formulation of limit values and quality objectives for specific List I substances (triggered by the list of 129 substances), the Council adopted on the 12th of June 1986 Directive 86/280/EEC, providing among others, a framework for fixing limit values and quality objectives for List I substances of the Annex to Directive 76/464/EEC. Council Directives on limit values and quality objectives for (the discharge of specific) List I substances are also referred to as "daughter Directives" of 76/464/EEC.

For this project, only List I substances are evaluated.

2.2 Daughter Directives for List I substances

In the period 1976-1990, the Council adopted limit values and quality objectives for 17 List I substances. These limits are given in the so-called daughter Directives of 76/464/EEC. Table H.1 (Appendix H, Volume II) gives a summary of daughter Directives including the relevant implementation dates. Considering Table H.1, one can see that the technical implementation of the necessary abatement measures has taken place at different paces (adoption dates of the daughter Directives range from 1982 (mercury) to 1990 (1,2-dichloroethane)).

Appendix B gives an overview of the water management structure and the implementation of Directive 76/464/EEC (including Directive 86/280/EEC) and daughter Directives in the Member States (sources are given in the text of Appendix B).

A general conclusion on water management (source: D110) is that the number of administrative tiers involved in the Member States ranges from 2 (State to local authority) to 5 (State, federal State, region, subregion and municipal), each having its characteristic transposition and implementation routings for Directives.

ERM (sources: EC002 and EC003) found, that the transposition of the Directives (i.e. embedding Directives in acts and orders in council) into Member State legislation is largely complete but the implementation (fixation of limit values in discharge permits and the technical realisation of abatement measures) of the Directives is in many cases still ongoing and in one or two cases at a very early stage or is evolving due to changes in administrative responsibility.

ERM (sources: EC002 and EC003) concluded that a very wide range in the rate and level of implementation of the Directives exists in the EU. This reflects widely differing background conditions in Member States in terms of administrative and legal systems and resources.

3 Characteristics of List I substances

3.1 Chemical and environmental characteristics

All substances for which limit values and quality objectives are adopted by the Council via daughter Directives to 76/464/EEC are considered to be toxic to aquatic organisms, to be persistent in the aquatic environment, or to give rise to bioaccumulation. Table H.2 (Appendix H) gives a broad overview of the chemical and environmental characteristics of these substances.

3.2 Most important production and application processes

The most important production and application processes leading to the discharge of substances for which daughter Directives are adopted, are given in Table H.3. This table also includes so-called "miscellaneous applications" (sources: GEN022 and EC008). This information gives insight in a broader (sometimes more diffuse scale) of application (and possible discharge) of the substance.

One must keep in mind that in a few cases, the specific substance is produced and discharged indirectly because it is formed as a by-product of a main production process (e.g. hexachlorobutadiene is formed during the production of tetrachloroethylene (PER) and carbon tetrachloride via perchlorination).

Appendix D (Volume II) gives a complete overview of (mostly industrial) dischargers (e.g. specific industries) of List I substances of Directive 76/464/EEC. Available information regarding the discharge of List I substances (e.g. actual emissions) is also included in Appendix D.

3.3 Monitoring Requirements for List I substances

In general, monitoring takes place for several reasons. First of all it helps to identify the presence of certain substances in waste and surface waters. It also helps to control the discharge of waste water and it helps to control the quality of the receiving waters. Finally its an assisting tool to reveal developments and trends in both discharges and surface water quality. Water management (including the abstraction of surface water for the production of drinking water in the Member States) has given rise to a diversity of surface and waste water monitoring programmes.

For the surface waters in the European Community, several international monitoring programmes for waste waters have been developed (e.g. Rhine Action Program and North Sea Action Program). Priority pollutants and 76/464/EEC List I substances also play an important role in the choice of the parameters to be monitored.

Distinctions can be made between waste water monitoring and surface water monitoring. The formal basis for waste water monitoring (limit value approach) and surface water monitoring (quality objective approach) for List I substances is triggered by article 13 of Directive 76/464/EEC and article 6 of Directive 86/280/EEC. According to these articles, Member States shall supply the Commission, at its request, a variety of information including monitoring data of discharges and surface waters.

In addition to the monitoring requirements of Directive 76/464/EEC, other Directives and Decisions have surface water monitoring requirements, such as:

- required surface water quality for the abstraction of drinking water;
- bathing (surface) water quality;
- establishing a common procedure for the exchange of information on the quality of surface fresh water;
- the quality of fresh waters needing protection or improvement in order to support fish life;
- methods of measurement and frequencies of sampling and analysis of surface water intended for the abstraction of drinking water;
- the required quality of shellfish (coastal and brackish) waters;
- the urban waste water treatment (UWWT) Directive.

Table 3.1 gives an overview of specific "surface water Directives" and related "76/464/EEC-List I" parameters that must be monitored by Member States. A general conclusion is, that for surface waters, designated by Member States to have specific functions according to the mentioned Directives, data on mercury, cadmium and two pesticides (HCH and dieldrin) might be feasible for the purpose of this project.

Finally it is worth while mentioning, that a Commission Decision of 27 July 1992 concerning questionnaires for the water Directives gives a structured format for the information to be supplied regarding monitoring data. Monitoring data on bathing water quality and on quality of surface fresh waters are absorbed by the CORINE information system, as previously maintained by the European Environment Agency Task Force within Directorate General XI of the European Commission. This is now the responsibility of the European Environment Agency (Council Regulation 90/1210/EEC of May 7, 1990 on the establishment of the EEA and the European Information and Observation Network OJL 120 11.5.90 p.1.).

Table 3.1 Overview of specific "surface water Directives" (and Council Decisions) and related "76/464/EEC-List I parameters" that must be monitored by Member States for designated surface waters

Number and date of Council Directive / Council Decision	**Scope of Council Directive / Council Decision**	**List I substances of Directive 76/464/EEC, that are included in the "surface water Directive/Decision", for which surface water monitoring must take place**
Council Directive 75/440/EEC of 16 June 1975 (also see 79/869/EEC)	required surface water quality for the abstraction of drinking water in the Member States	* mercury * cadmium * pesticides (sum of parathion, HCH and dieldrin; remark: parathion is not a List I substance)
Council Directive 76/160/EEC of 8 December 1975	bathing (surface) water quality in the Community	* mercury * cadmium * pesticides (sum of parathion, HCH and dieldrin; remark: parathion is not a List I substance)
Council Decision 77/795/EEC of December 1977	establishing a common procedure for the exchange of information on the quality of surface fresh water in the Community. A list of sampling and measuring stations are included in the Directive.	* cadmium (total) * mercury
Council Directive 78/659/EEC of July 1978	the quality of fresh waters needing protection or improvement in order to support fish life. Member States must designate the waters to which they will apply the requirement of this Directive.	no specific 76/464/EEC List I substances
Council Directive 79/869/EEC of 9 October 1979 (also see 75/440/EEC)	methods of measurement and frequencies of sampling and analysis of surface water intended for the abstraction of drinking water in the Member States.	* mercury * cadmium * pesticides (sum of parathion, HCH and dieldrin; remark: parathion is not a List I substance)
Council Directive 79/923/EEC of 30 October 1979	the required quality of shellfish waters (coastal and brackish waters designated by Member States as needing protection or improvement in order to support shellfish)	* mercury * cadmium * organohalogenated substances

4 Overview of the available data

4.1 Summary of data availability

Following the selection of representative rivers basins and List I substances (see Chapter 1), National Authorities were contacted and information on water quality management, industrial discharges, and water quality was requested. The National Authorities contacted are listed in Chapter 7. All information received was given a reference number, and is presented in the reference section (Chapter 8).

The full data obtained for the study are presented in the Appendices:

Appendix B (Volume I):	Water Quality Management Profiles for all Member States
Appendix D (Volume II)	Industrial Dischargers of List I Substances
Appendix E (Volume II):	Water Quality of List I Substances in Selected Main Waters

The availability of data is summarized in the following two tables for industrial discharges and water quality data. Gaps in the data tables indicate that little or no data were available for the given substance in the specific river basin. The data gaps can be due to a variety of reasons, including: no monitoring program (i.e. no data collection), no known sources of pollutant, or no centralized data collection point (data collected locally, but not readily available at the national level). More details per river basin are given in Chapter 5.

Industrial Discharge Data

Table 4.1 Availability of industrial discharge data

substances / rivers	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Rhine	++	++	+	++	+	++	++	++	++	++	++	++	++	++
Meuse	+	+		+		+				+				
Scheldt	+	++												
Tagus)[1]	+	+	+											
Thames														
Mersey)[1]	++													
Trent														
Seine	+	+												
Loire		+												
Rhone	+	+												
Po														
Ebro														
Axios														
Slaney)[2]		+												
Moselle		+												
Sado														

++ data available for statement on trends

)[1] riverine plus direct input data
)[2] riverine input data

\+ data available, however insufficient for statement on trends

"blank" limited or no data available

1 mercury
2 cadmium
3 hexachlorocyclohexane
4 tetrachloromethane
5 DDT
6 pentachlorophenol
7 drins
8 hexachlorobenzene
9 hexachlorobutadiene
10 chloroform
11 1,2-dichloroethane
12 trichloroethene
13 tetrachloroethane
14 trichlorobenzene

This table gives an overview of the available waste load data:

- Data are within the category '++' if there are data from different years such that a trend can be seen.
- Data are in the category '+' if data are available, but not enough for statements on trends.
- Data are in the category "blank" if there are limited or no data.

Water Quality Data

Table 4.2 Availability of water quality data

substances / rivers	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Rhine)[1] (Lobith)	++	++	++	++	+	++	+	++		++	++	+	+	
Meuse)[2] (Eijsden)	++	++	++	++	+	++	+	+		++	++	++	++	
Scheldt)[3] (Schaar v. Oud. Doel)	++	++	++	++	++	++	++	++	++	++	++	++	++	++
Tagus)[4] (Talavera)	++	++												
Thames	++	++	++		++	++	++	+	+	+	+	+	+	+
Mersey	++	++	++		++	+	++	+	+	+				
Trent	++	++	++		++	+	++	+	+	+	+	+	+	+
Seine	++	++												
Loire			+			+								
Rhone	+	+	+		+	+		+		+	+	+	+	
Po														
Ebro	++	++												
Axios)[5] (Axioupolis)	++	++												
Slaney														
Moselle		++												
Sado														

++ data available for statement on trends
+ data available, however insufficient for statement on trends (at least 2 years of data)
"blank" limited or no data available

1 mercury
2 cadmium
3 hexachlorocyclohexane
4 tetrachloromethane
5 DDT
6 pentachlorophenol
7 drins
8 hexachlorobenzene
9 hexachlorobutadiene
10 chloroform
11 1,2-dichloroethane
12 trichloroethene
13 tetrachloroethane
14 trichlorobenzene

Notes:

)[1] Rhine river data includes 4 monitoring station: Koblenz (G), Bimmen-Lobith (NL/G), Lobith (NL), and Maasluis (NL). Station Lobith has the most water quality data.

)[2] Meuse river data includes 3 monitoring stations: Tailfer (B), Eijsden (NL), and Kaisersveer (NL). Station Eijsden has the most water quality data.

)[3] Scheldt river data includes 2 monitoring stations: Doel (B), and Schaar van Ouden Doel (NL). Station Schaar van Ouden Doel has the most water quality data.

)[4] Tagus river data includes 2 monitoring stations: Talavara (SP) and Santerem (P). Station Talavara has the most water quality data.

)[5] Axios river data includes 3 monitoring stations in Greece: Axioupolis, 1020_02, and 1020_03. Station Axioupolis has the most data for List I substances.

4.2 Information on driving forces

In the beginning of the sixties, European industries were growing fast and the standard of living of the European society was improving. The dark side of these developments was an increased discharge of polluting substances, resulting in a deterioration of the quality of most European surface waters. The major issues of concern were the high concentrations of BOD, oxygen depletion and to a certain extent the presence of mercury and cadmium.

Later on, with increasing growth, urbanization, industrialization, and knowledge, the substances of environmental concern expanded to include pesticides, nutrients, other heavy metals (in addition to mercury and cadmium) and specific organic substances. Part of these developments were also triggered by the fact that more analytical methods were made available to quantify the presence of these substances and their effects in surface water. Public environmental awareness, triggered in part by the debate over DDT and the book 'The Silent Spring', also focused considerable attention on environmental conditions.

Pollution control measures, leading to the realization of municipal and industrial waste water treatment plants, were initiated, first of all at the national level, but also on an international level. A well known international framework for the conservation of surface water quality is the Convention for the protection of the Rhine against pollution (Bern, 1963). This convention was expanded in 1976 with the Rhine Chemical Treaty.

On a larger scale the EC adopted a number of Directives, having a positive impact on the surface water quality in the Community. Examples are the surface water Directives as mentioned in Table 3.1. Although these Directives did not primarily aim at water quality improvement, they had a positive impact on it.

An important EC Directive having a direct impact on the discharge of substances was adopted in 1976 (76/464/EEC). As well as the Rhine Chemical Treaty, Directive 76/464/EEC focused on the pollution caused by certain substances discharged to the aquatic environment. History showed that there was an intensive exchange of information between the International Rhine Commission (coordination of the execution of the Rhine Chemical Treaty) and the European Commission (coordination of the execution of Directive 76/464/EEC). In many cases, the International Rhine Commission took the lead in the technical specification of specific limit values for List I substances (e.g. mercury and cadmium), giving a positive impact on specifying the limit values for the daughters of Directive 76/464/EEC.

Taking another look at "environmental history", one can see that actions against pollution or against unacceptable environmental impacts receive strong political support when the environmental situation, or an event affecting the environment is considered unacceptable by the general public. An example is the fire at an industrial site in Switzerland in 1986 which lead to massive toxification of the river Rhine. This accident lead to the adoption of the Rhine Action Programm by the riparian states of the Rhine aiming at an accelerated restoration of this river. Another example is the accident at Seveso in Italy, which resulted in a massive discharge of dioxin into the environment. This event initiated the adoption of EU-Directive 82/501/EEC of 1982, leading to safer situations for specific industrial operations.

Many environmental problems however, are not geographically restricted to individual Member States. Transboundary surface waters allow pollution to be transported from one country to another. Special sea areas are polluted by riparian countries via national and international rivers.

In the beginning of the seventies, the situation in Europe was ready for international cooperation in the field of combatting water pollution. Furthermore, there was a need to harmonize countermeasures in order to minimize "unintended" competition among industries, caused by a high diversity of environmental requirements.

Beginning in 1963 and continuing to the present, many international treaties, conventions, and other forms of international cooperation concerning the protection of the aquatic environment have been signed. Table 4.3 gives an overview, including the participating Member States. This table shows that all EC Member States are involved in one or more international agreements. The EC is represented in these agreements by the European its Commission.

The term 'driving forces' is used for all major developments which have been and/or still are of influence on industrial discharges. Directive 76/464/EEC is the driving force for the control of industrial discharges of major imterest for this study. Complete information on the transposition and implementation of the Directive in each of the Member States has been collected. This includes the names and dates of specific national legislation which transpose the intent of the Directives, as well as the national organization regarding water management including issuing of permits, and monitoring of effluents and ambient water. This information is presented in full in Appendix B "Water Management Profiles".

Other driving forces can be important for pollution control, such as international commitments and treaties. Examples are the Paris Commission (PARCOM) for control of discharges to the North Sea from land based sources, International Rhine Commission (IRC) for improvement of the water quality of the Rhine River, Barcelona Convention for protection of the Mediterranean Sea, etc. Correspondence with the National Experts have helped to identify the relevant driving forces in each Member State. The information on relevant driving forces is presented with the river summaries in Chapter 5.

Table 4.3 Treaty/convention matrix for EC Member States

Member State	EU	PARCOM	RHINE	NSMC's	HELCOM	BARCELONA
Austria	#					
Belgium	#	#		#		
Denmark	#	#		#	#	
Finland	#			attended 1 or more meetings	#	
France	#	#	#	#		#
Germany	#	#	#	#	#	
Greece	#					#
Ireland	#	#		attended 1 or more meetings		
Italy	#					#
Luxembourg	#		#			
Netherlands	#	#	#	#		
Portugal	#	#		attended 1 or more meetings		
Spain	#	#		attended 1 or more meetings		#
Sweden	#	#		#	#	
United Kingdom	#	#		#		
European Community		#	#	#	#	#

Key for Table 4.3:

PARCOM	Convention for the prevention of marine pollution from land-based sources (1974) This so called Paris Convention is merged with the Olso Convention giving the OSPAR Convention (Convention for the protection of the marine environment in the north east part of the Atlantic Ocean; Paris, 1992)
RHINE	Convention for the protection of the Rhine against pollution (1963); Rhine Chemical Treaty (1976); Rhine Action Programme (1987)
NSMC's	Ministerial Declarations on the protection the North Sea against pollution (1984, 1987, 1990, 1995)
HELCOM	Baltic Sea Convention to protect the Baltic Sea against pollution (1974)
BARCELONA	Convention for the protection of the Mediterranean against pollution (1976) and its Protocols

5 Analysis of the selected surface waters in the Community

A summary analysis of the impact of Directive 76/464/EEC is presented for each of the selected surface waters in the Community. The analysis focuses on the following collected information:

- transposition of the Directive by the relevant Member States;
- discharges of the selected substances within the river basin area;
- water quality of the river (annual average concentrations) over the past 10-13 years;
- other driving forces for changes in emissions and water quality (e.g. national and international policies). Driving forces per river basin are listed chronologically. Dates of implementation of the National Legislation as compared to Directive 76/464/EEC and daughter Directives can give an indication of the influence of the Directives on the National Legislation.

Each analysis also includes a figure summarizing all available information regarding the substances Mercury and 1,2-dichloroethane (EDC). These two substances have been selected to illustrate the impacts of the Directive on heavy metals and organochlorinated micropollutants since they correspond to the first and last of the daughter Directives (1982/84 and 1990, respectively). The dates for compliance with the Directives are shown in the graphics with a small arrow (↑ or ↓).

The figures for each river summarize the 4 components of the study: Transposition of Directive 76/464/EEC → other driving forces → waste load discharges → water quality.

In general:

Water Quality: A large number of measurements is available for mercury as this is a parameter that has historically been measured along with basic water quality parameters. Thus, if water quality data are at all available, mercury concentrations are in most cases also available. In contrast, very few time series measurements of EDC are available (only for the Rhine, Scheldt, and Meuse rivers). This is typical of all the organo chlorinated substances.

Discharges: For the Rhine river, a comprehensive survey of all industrial and municipal discharges for the years 1985 and 1992 is available.

For other river basins, such complete information is not available. Either there is discharge data for only a small number of years, so that it is not possible to distinguish any trends, and/or there is not enough information to make a complete summary of discharges in the catchment. The loads summary gives the status of the available data.

The rivers are presented in alphabetical order in the following sections. The complete data bases for each river are given in Appendix D (Industrial dischargers) and Appendix E (water quality data), both in Volume II.

5.1 Axios River

Country:	Greece
Water Quality Data:	Some water quality data for cadmium and mercury have been sent from the National Expert for the years 1980-1988. Some additional information on dissolved oxygen is available.
Industrial Loads:	A limited number of manufacturing and discharging industries in the Axios river basin has been identified, but no data on actual discharges are available.
Transposition of 76/464/EEC and daughter Directives:	Detailed information regarding the transposition of Directives is only partly available. However, it is reported that the process of transposition seems to be complete, but full-scale implementation is still in progress [sources: EG002, EG003].
Driving Forces:	• 76/464/EEC (Brussels, 1976) • Barcelona Convention (Barcelona, 1976) and its protocols • National Legislation (Basic Law on the Environment N 1650 of 1986)

Overall Summary:

Given the available information, an evaluation of the impact of Directive 76/464/EEC on the quality of the Axios River cannot be made.

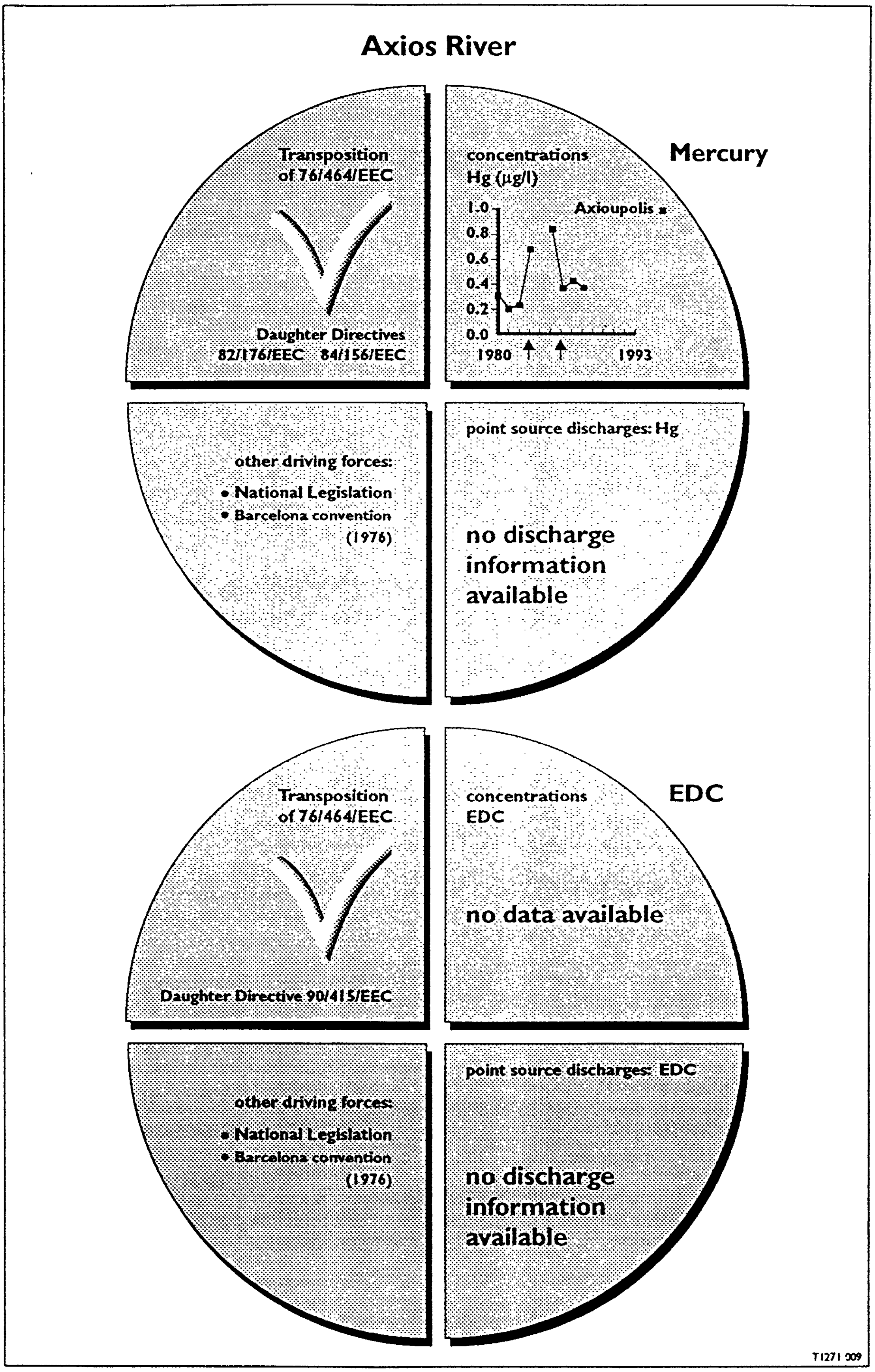

Figure 5.1 Summary of impact analysis of Directive 76/464/EEC for the Axios River

5.2 Ebro River

Country:	Spain
Water Quality Data:	Data concerning Hg, Cd, BOD and oxygen are available for the Ebro for the period 1981-1993. All data for Hg are below the detection limit of 1 ug/l, thus no trends over time are visible.
Industrial Loads:	For the Ebro river catchment, a number of manufacturing and discharging industries have been identified, but no data on actual discharges are available yet.
Transposition of 76/464/EEC and daughter Directives:	Information on the transposition of Directive 76/464/EEC and daughter Directives is available. Transposition is complete.
Driving Forces:	• 76/464/EEC (Brussels, 1976) • Barcelona Convention (Barcelona, 1976) and its protocols • National Legislation (Water Act of 1985)

Overall Summary:

Given the available information, an evaluation of the impact of Directive 76/464/EEC on the quality of the Ebro River cannot be made.

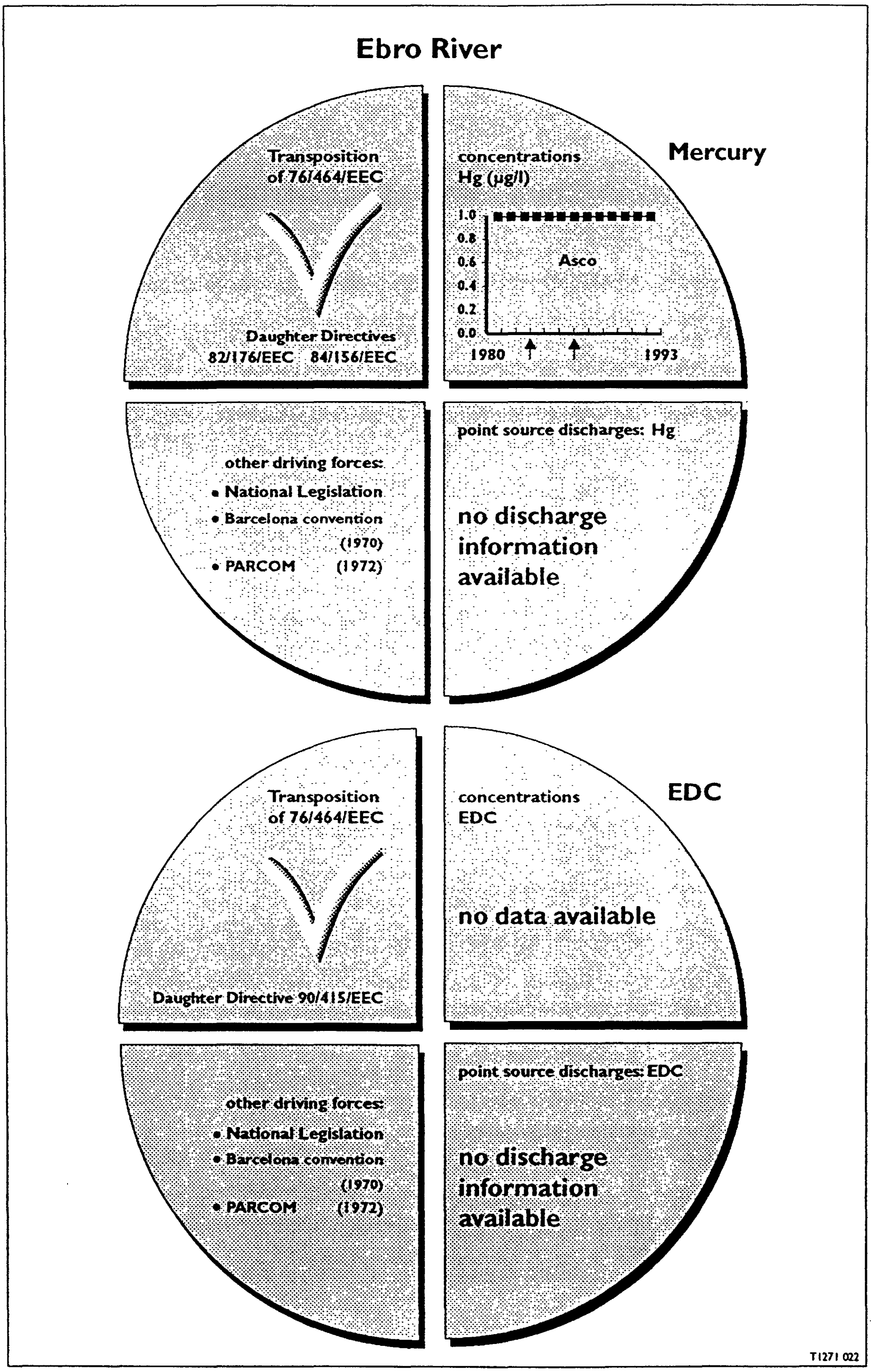

Figure 5.2 Summary of impact analysis of Directive 76/464/EEC for the Ebro River

5.3 Loire River

Country:	France
Water Quality Data:	Water quality data for the Loire are complete for oxygen and BOD, but is scarce for other substances. No water quality data are available for the heavy metals, mercury and cadmium. For organic micropollutants, data are available for pentachlorophenol and HCH for the years 1991-1993.
Industrial Loads:	In general, there are a lot of data available concerning manufacturing and discharging industries and actual industrial discharges in the River Loire catchment. However, no data are available for cadmium, mercury, and EDC (see Figure 5.3). For other substances for which data are available, there is no clear trend in the changes in discharges over the period 1980-1992. In a number of cases, the loads increase, and in other cases, they decrease or remain constant. For many identified industries, there is no specific data on discharges.
Transposition of 76/464/EEC and daughter Directives":	Information on the transposition of Directive 76/464/EEC and daughter Directives is available. Transposition is complete.
Driving Forces:	• PARCOM (Paris, 1974) • 76/464/EEC (Brussels, 1976) • National Legislation (Act of July 1976 on classified installations).

Overall Summary:

Systematic monitoring of French surface water concerning List I substances started only recently (1991). This is also true for the monitoring of discharges.
However, for a number of heavy metals (not including mercury), effluent monitoring includes 6 years (1986-1992) of data.
At present, it is not possible to make an evaluation of the impact of Directive 76/464/EEC on the quality of the River Loire. With continuation of the present monitoring system, there will be sufficient data to make a better analysis in several years time.

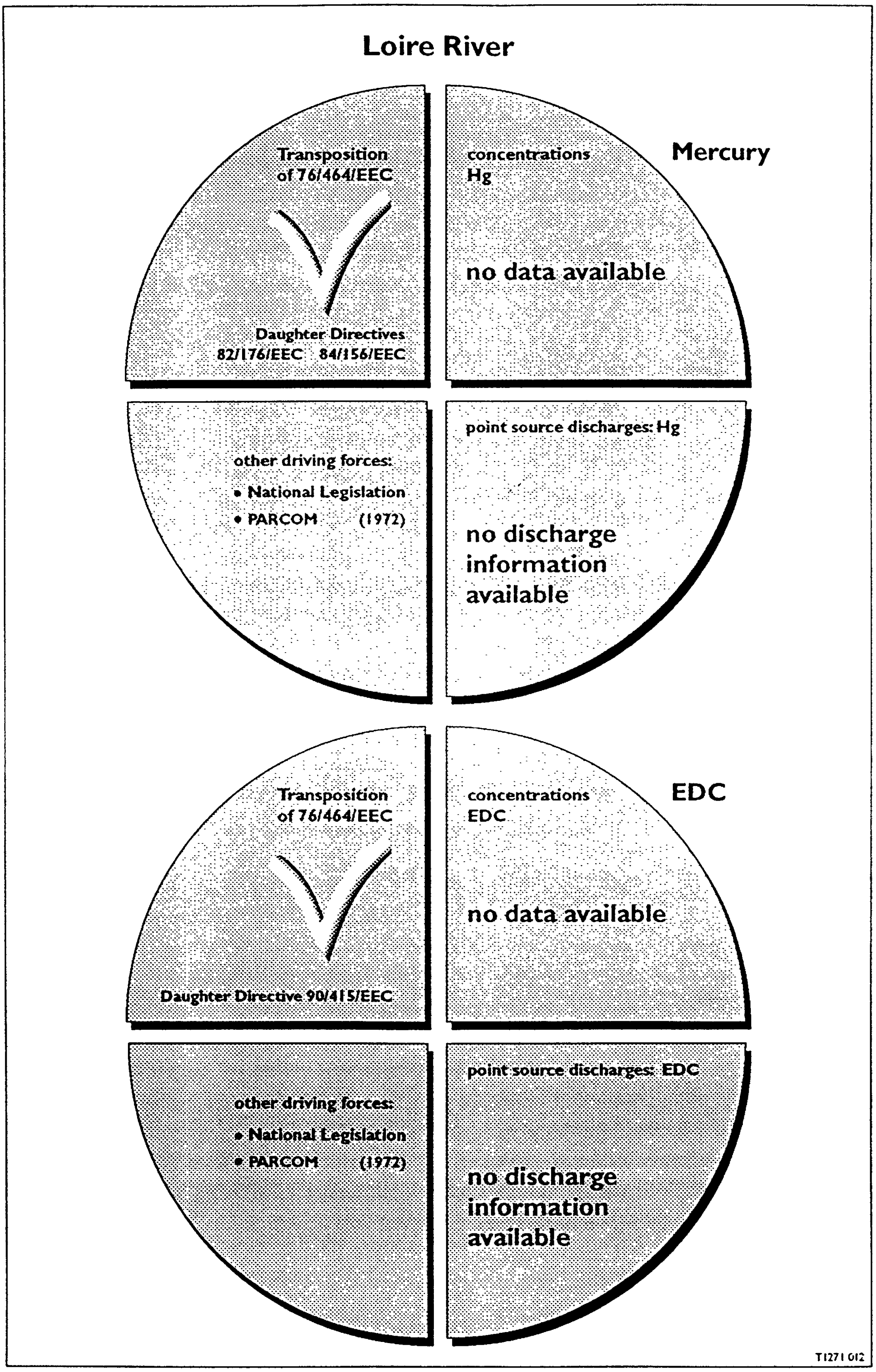

Figure 5.3 Summary of impact analysis of Directive 76/464/EEC for the Loire River

5.4 Mersey River

Country:	UK
Water Quality Data:	Data for many substances over a long time period have been provided by the National Expert. Specifically, data for dissolved oxygen, BOD, Hg and Cd are available for the years 1980-1993. Data for HCH, drins, and DDT are available for the years 1987-1993. One or two years of data are available for most other organic substances.
Industrial Loads:	No detailed information on actual industrial loads from individual dischargers is available. A summary of potential dischargers to the Mersey River based on EC studies by EURECO and WRC is available. However, there is no information on actual discharges. There are data on direct and riverine inputs (see Appendix D-2).
Transposition of 76/464/EEC and daughter Directives:	Information on the transposition of Directive 76/464/EEC and daughter Directives is available. Transposition is complete.
Driving Forces:	• PARCOM (Paris, 1974) • 76/464/EEC (Brussels, 1976) • National Legislation (Environmental Protection Act, 1990; Water Resources Act, 1991; Water Industry Act, 1991).

Overall Summary:

The water quality at the chosen station shows a trend of decreasing cadmium, HCH, drins, and p,p'-DDT concentrations. The riverine plus industrial inputs in the estuary of the Mersey do decrease visibly over the years 1985-1993. In addition, the information reported to the Oslo and Paris Commissions for the catchment of the Irish Sea (which includes the Mersey) shows a decrease in direct plus riverine loads for the years 1987-1992 for the substances cadmium, mercury and γ-HCH. A comparison of the water quality data with water quality objectives (given in Table 2.1) shows that for all substances (with the exception of endrin in 1988), water quality objectives are met.

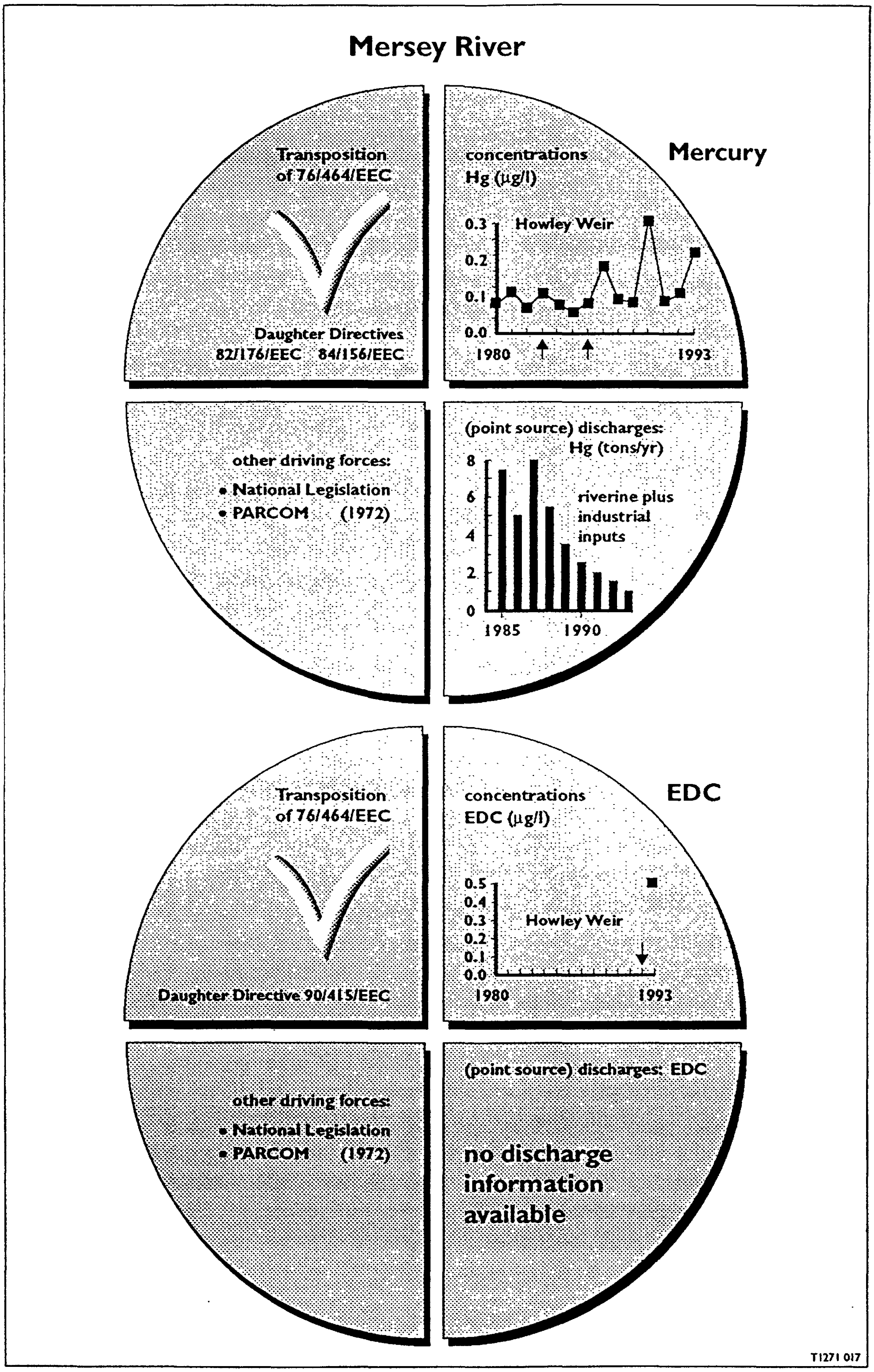

Figure 5.4 Summary of impact analysis of Directive 76/464/EEC for the Mersey River

5.5 Meuse River

Countries:	France, Belgium, The Netherlands
Water Quality Data:	Sufficient data for many substances over a long time period are available. Water quality data from three monitoring stations are presented: Tailfer (Belgium (○)), Eijsden (NL at the NL/Belgium border (■)), and Keisersveer (NL (▵)). The most complete data are from station Eijsden, (i.e. many substances including several organic micropollutants over the period 1980-1992).
Industrial Loads:	Discharge information is partly available. No conclusion on trends is possible.
Transposition of 76/464/EEC and daughter Directives:	Information on the transposition of Directive 76/464/EEC and daughter Directives is available. Transposition is complete.
Driving Forces:	• National legislation (France: Act of July 1976 on classified installations, 1976; Belgium: legislation for the protection of surface waters, 1971; Netherlands: Pollution of Surface Waters Act, 1970; • PARCOM (Paris, 1974)) • 76/464/EEC (Brussels, 1976) • Ministerial Declarations on the protection of the North Sea (1984, 1987, 1990, 1995)

Overall Summary:

Of the three stations selected for water quality measurements, the most water quality data is available at station Eijsden. At this station, there is a visible trend in decreasing water quality concentration for many substances. Less data is available, and no clear trends are visible at the other water quality monitoring stations. Also from the information available on industrial loads, no conclusions on trends are possible. Thus overall, it is not possible to make a conclusion on the impact of Directive 76/464/EEC on the water quality of the Meuse river.

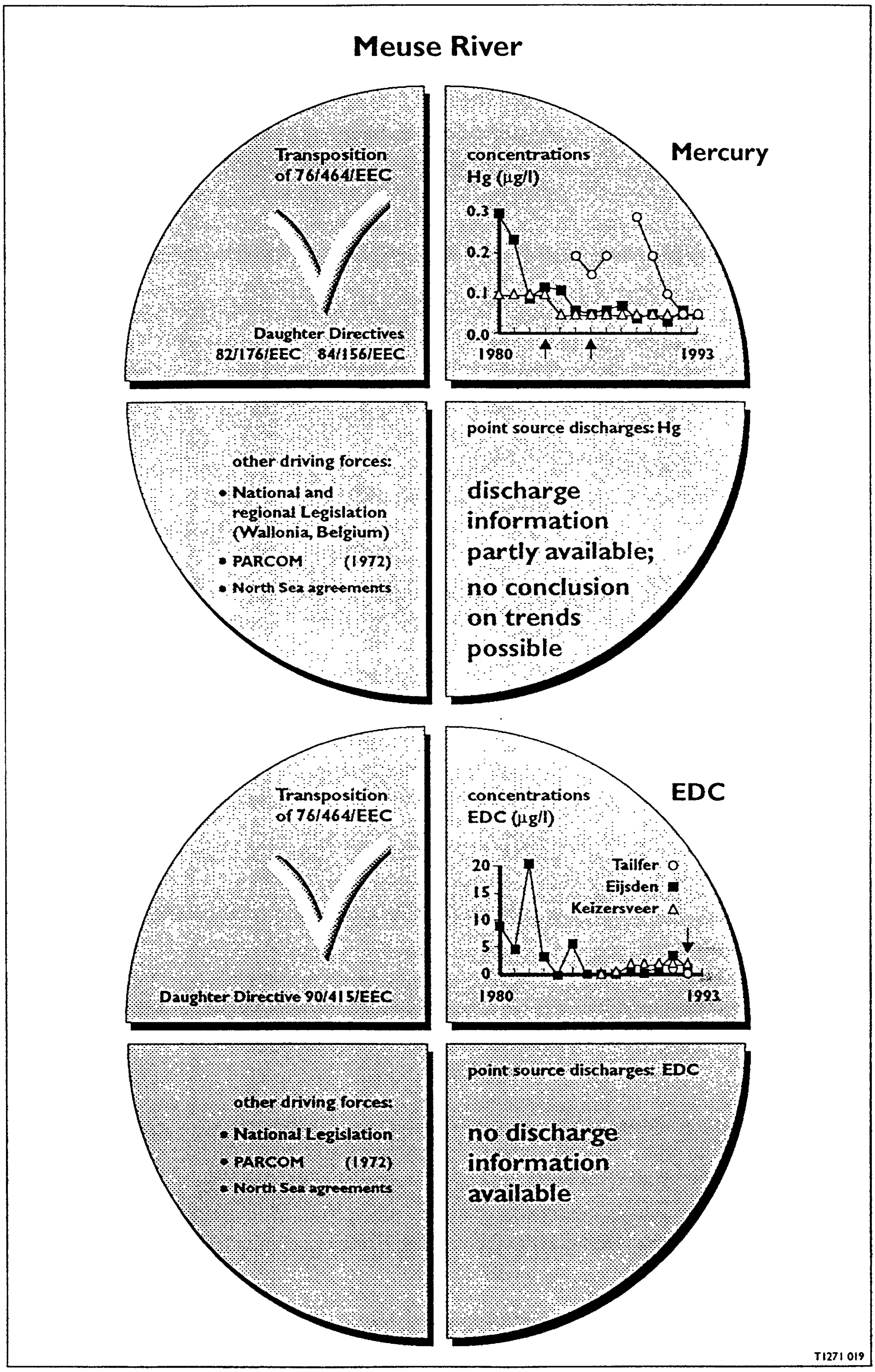

Figure 5.5 Summary of impact analysis of Directive 76/464/EEC for the Meuse River

5.6 Moselle River

Country:	Luxembourg (Note: The Moselle is a tributary of the Rhine River, which is discussed in Section 5.8).
Water Quality Data:	Water quality data for dissolved oxygen and BOD are available for the years 1982-1992. Data for Cd are available for the period 1982-1991 (dissolved oxygen, BOD and Cd are from station Grevenmacher). Data on several organic substances are available for the year 1992 (from station Palzem).
Industrial Loads:	Based on information from the National Expert of Luxembourg, there are currently no industrial discharges of List I substances in Luxembourg (source: L400).
Transposition of 76/464/EEC and daughter Directives:	Information on the transposition of Directive 76/464/EEC and daughter Directives is available. Transposition is complete.
Driving Forces:	• IRC (Bern, 1963) • National legislation (frame work regulation of 1971) • 76/464/EEC (Brussels, 1976) • IRC (Rhine Chemical Treaty; Bonn, 1976) • RAP (Strassbourg, 1987)

Overall Summary:

The water quality data shows no clear trends over the years. Based on the available information on discharges in Luxembourg (i.e. currently no industrial discharges of List I substances), it is difficult to make an analysis of the effectiveness of Directive 76/464/EEC on the quality of the surface waters in Luxembourg in general, and the Moselle in particular.

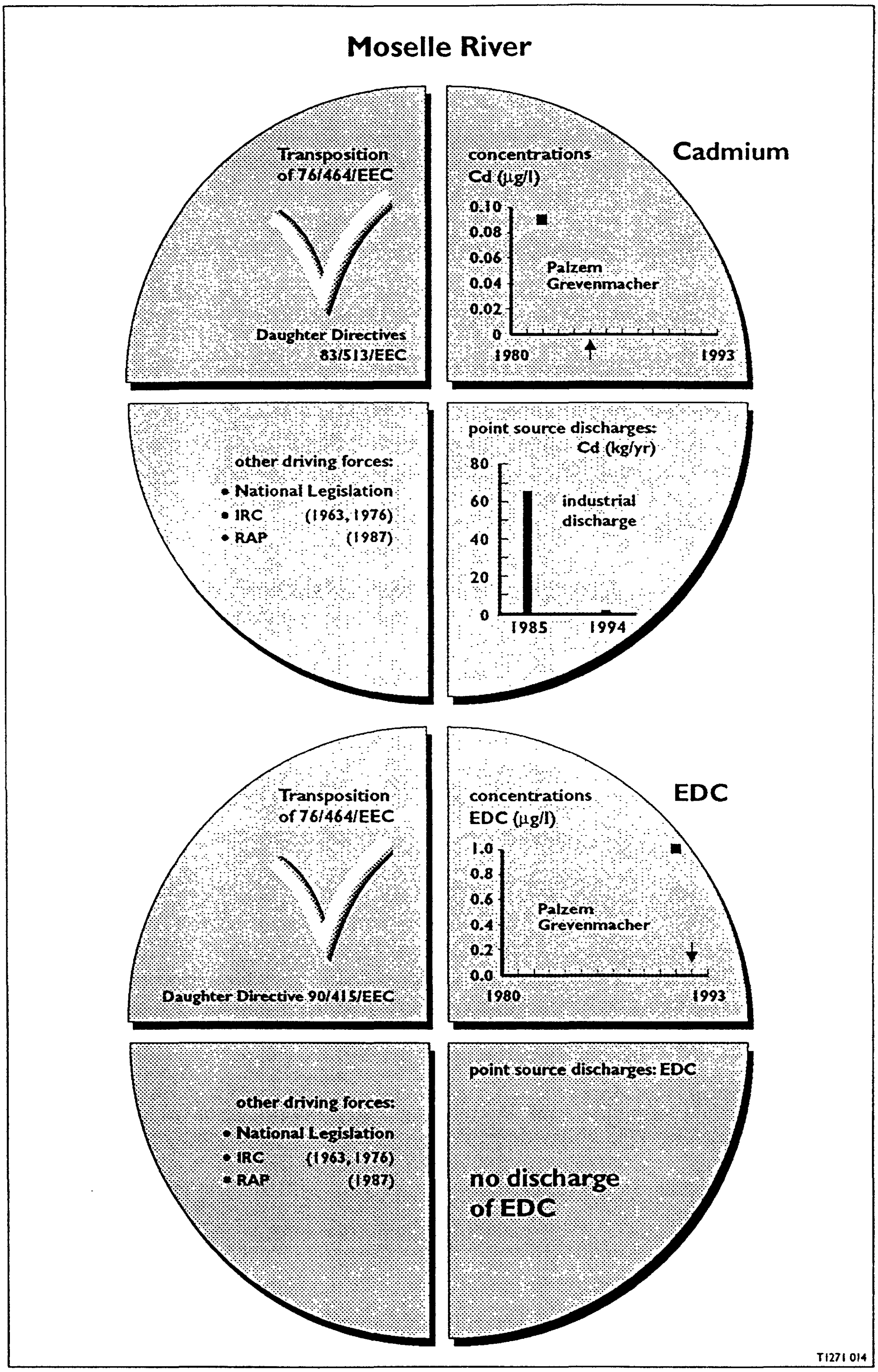

Figure 5.6 Summary of impact analysis of Directive 76/464/EEC for the Moselle River

5.7 Po River

Country:	Italy
Selected River Catchment:	Po
Water Quality Data:	Only limited water quality data were received from the National Expert (i.e. Hg and Cd for 1990).
Industrial Loads:	A limited number of manufacturing and discharging industries in the Po river basin has been identified, but no data on actual discharges are available.
Transposition of 76/464/EEC and daughter Directives:	Information on the transposition of Directive 76/464/EEC and daughter Directives is available. Transposition is complete.
Driving Forces:	• National legislation (Law no 319 of 1976) • 76/464/EEC (Brussels, 1976) • Barcelona Convention (Barcelona, 1976) and its protocols

Overall Summary:

Given the available information, an evaluation of the impact of Directive 76/464/EEC on the quality of the Po River cannot be made.

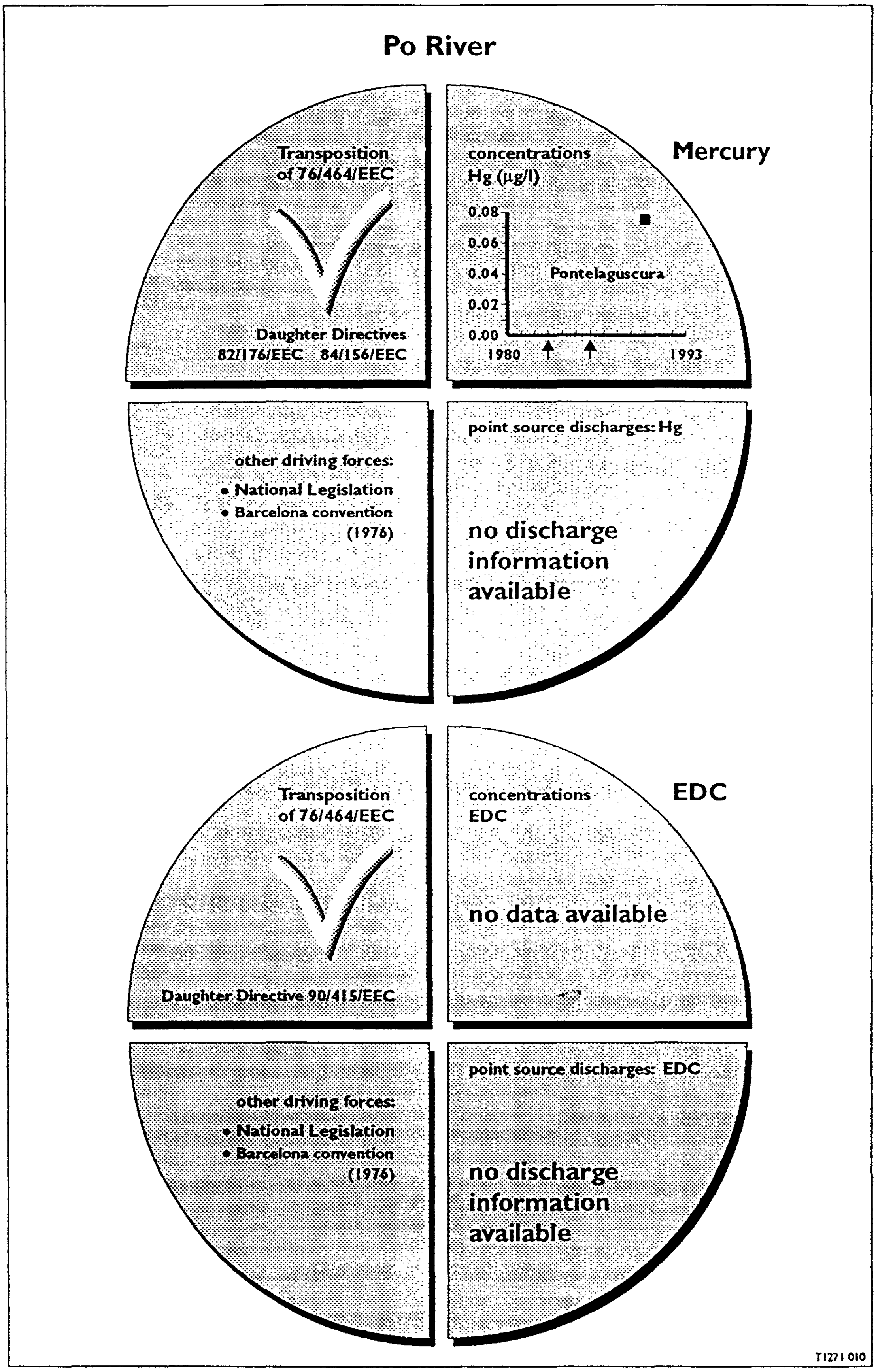

Figure 5.8 Summary of impact analysis of Directive 76/464/EEC for the Po River

5.8 Rhine River

Countries:	Germany, Netherlands, Luxembourg (Moselle), France (Moselle). Note 1: the Moselle River is also presented separately in section 5.6. Note 2: Switzerland is a riparian state of the Rhine, but is not an EU Member State.
Water Quality Data:	Sufficient data for many substances over long time period are available.
Industrial Loads:	Sufficient data for all substances over long time period are available.
Transposition of 76/464/EEC and daughter Directives:	Information on the transposition of Directive 76/464/EEC and daughter Directives is available. Transposition is complete.

Driving Forces:

- IRC (Bern, 1963)
- National Legislation:
  (France: Act of July 1976 on classified installations, 1976;
  Germany: Federal Water Management Law (1986)
  Luxembourg: frame work regulation of 1971
  Netherlands: Pollution of Surface Waters Act, 1970;
- PARCOM (Paris, 1974)
- 76/464/EEC (Brussels, 1976)
- IRC (Rhine Chemical Treaty; Bonn, 1976)
- RAP (Strassbourg, 1987)
- Ministerial Declarations on the protection of the North Sea (1984, 1987, 1990, 1995)

Overall Summary:

A review of the available information on industrial loads shows a general decrease in discharges. A review of water quality shows an improvement in water quality. Directive 76/464/EEC is one of the factors contributing to the improvement of water quality. Specific analysis can be made for certain chemical substances such as mercury and 1,2 dichloroethelyne as presented in Figure 5.9. An extensive review of the Rhine River is given in Appendix C, which illustrates the type of analysis that can be made when complete information is available.

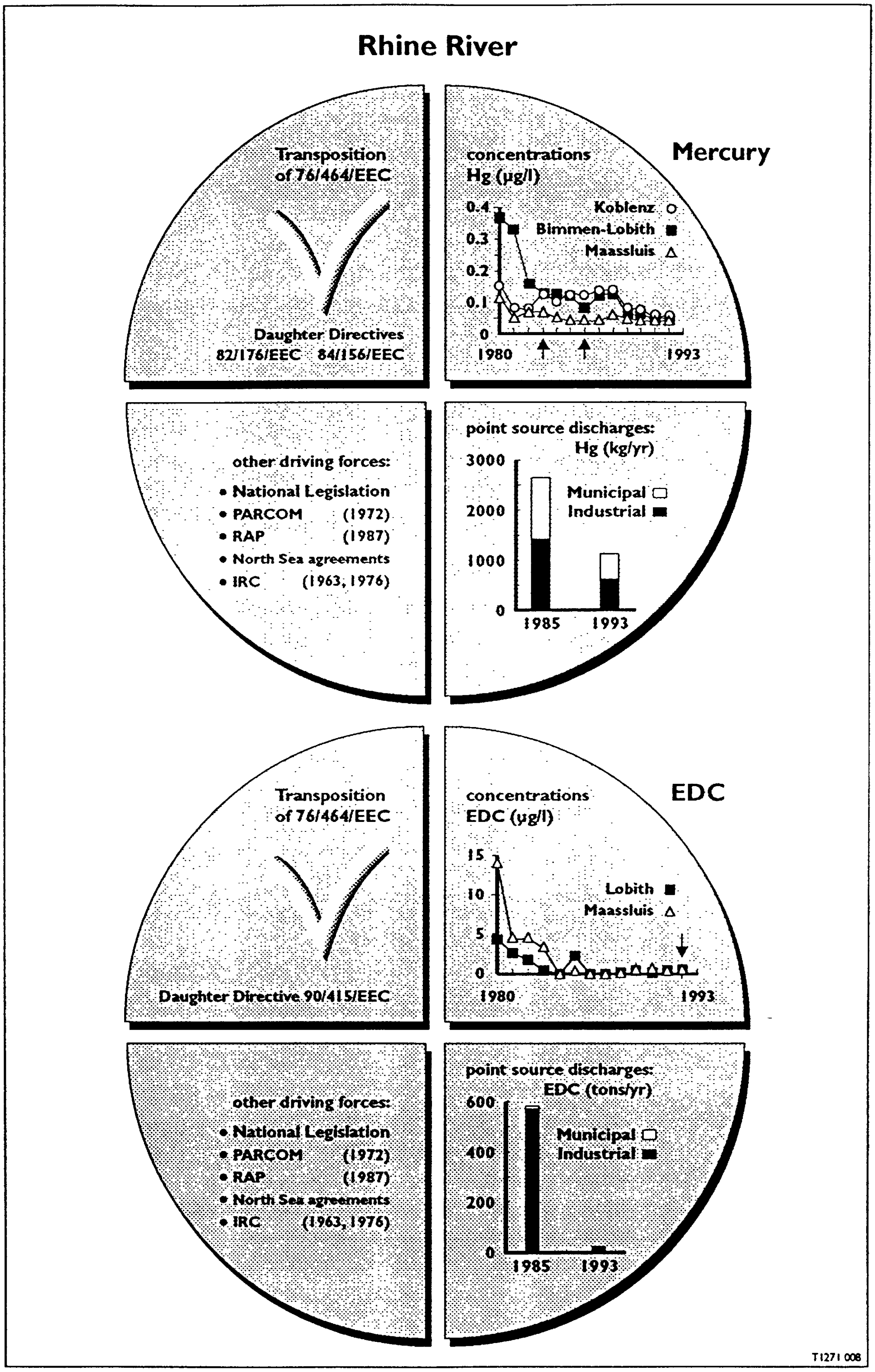

Figure 5.9 Summary of impact analysis of Directive 76/464/EEC for the Rhine River

5.9 Rhône River

Country: France

Water Quality Data: Water quality data for the Rhone is reasonably complete for oxygen and BOD (1987-1993), and comprises 2 years of data (1991-92) for several other substances.

Industrial Loads: In general, there is a lot of data available concerning industrial discharges in France. For the Rhone, there is a lot of information on manufacturing and discharging industries. However, the available data show no clear trend in the changes in discharges over the period 1980-1992. In a number of cases, the discharges increase, and in other cases, they decrease or remain constant. For many identified industries, there is no specific data on discharges.

Transposition of 76/464/EEC and daughter Directives: Information on the transposition of Directive 76/464/EEC and daughter Directives is available. Transposition is complete.

Driving Forces:

- 76/464/EEC (Brussels, 1976)
- National Legislation (Act of 19 July 1976 on classified installations)
- Barcelona convention (Barcelona, 1976) and its protocols

Overall Summary:

Systematic monitoring of French surface water concerning List I substances started only recently (1991). This is also true for the monitoring of discharges. However, for heavy metals, effluent monitoring includes 6 years (1986-1992). At present, it is not possible to make an evaluation of the impact of Directive 76/464/EEC on the quality of the Rhone River. With continuation of the present monitoring system, there will be sufficient data to make a better analysis in several years time.

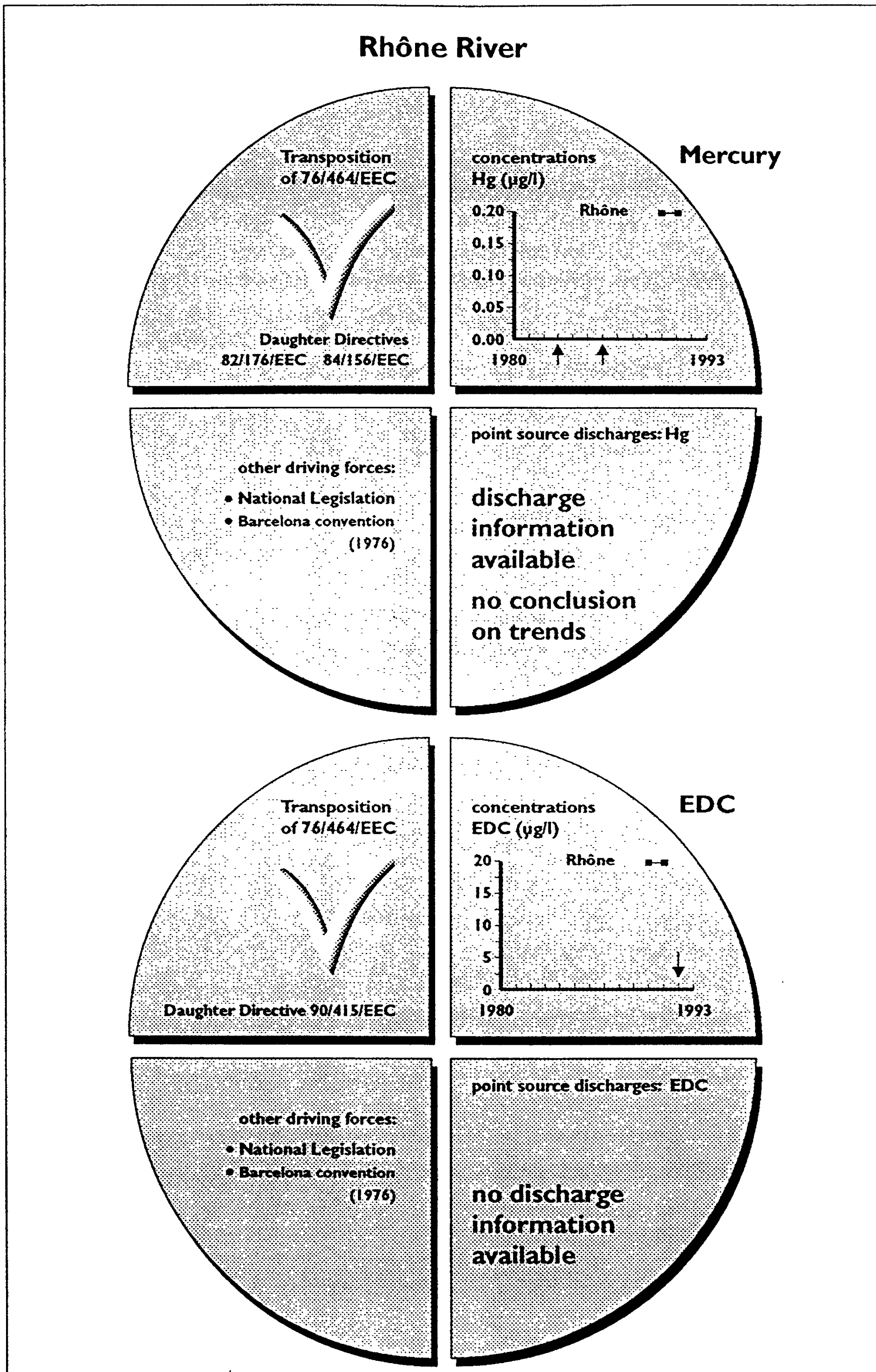

Figure 5.9 Summary of impact analysis of Directive 76/464/EEC for the Rhône River

5.10 Sado River

Country: Portugal

Water Quality Data: Water quality data for dissolved oxygen, BOD, mercury, cadmium, drins and DDT was received from the National Expert for the years 1989-1993. The data for the pollutants cadmium, drins and DDT indicate no trend as most values are below the detection limit. Values for mercury also show no clear trend, and the detection limit seems to increase in the years 1992-93 (<0.5 ug/l) in comparison to previous years.

Industrial Loads: A limited number of manufacturing and discharging industries in the Sado river basin have been identified, but no data on actual discharges are available.

Transposition of 76/464/EEC and daughter Directives: Information on the transposition of Directive 76/464/EEC and daughter Directives is available. Transposition is complete.

Driving Forces:

- PARCOM (Paris, 1974)
- 76/464/EEC (Brussels, 1976)
- National legislation (The Environmental Law of 1987)

Overall Summary:

Given the available information, an evaluation of the impact of Directive 76/464/EEC on the quality of the Sado River cannot be made.

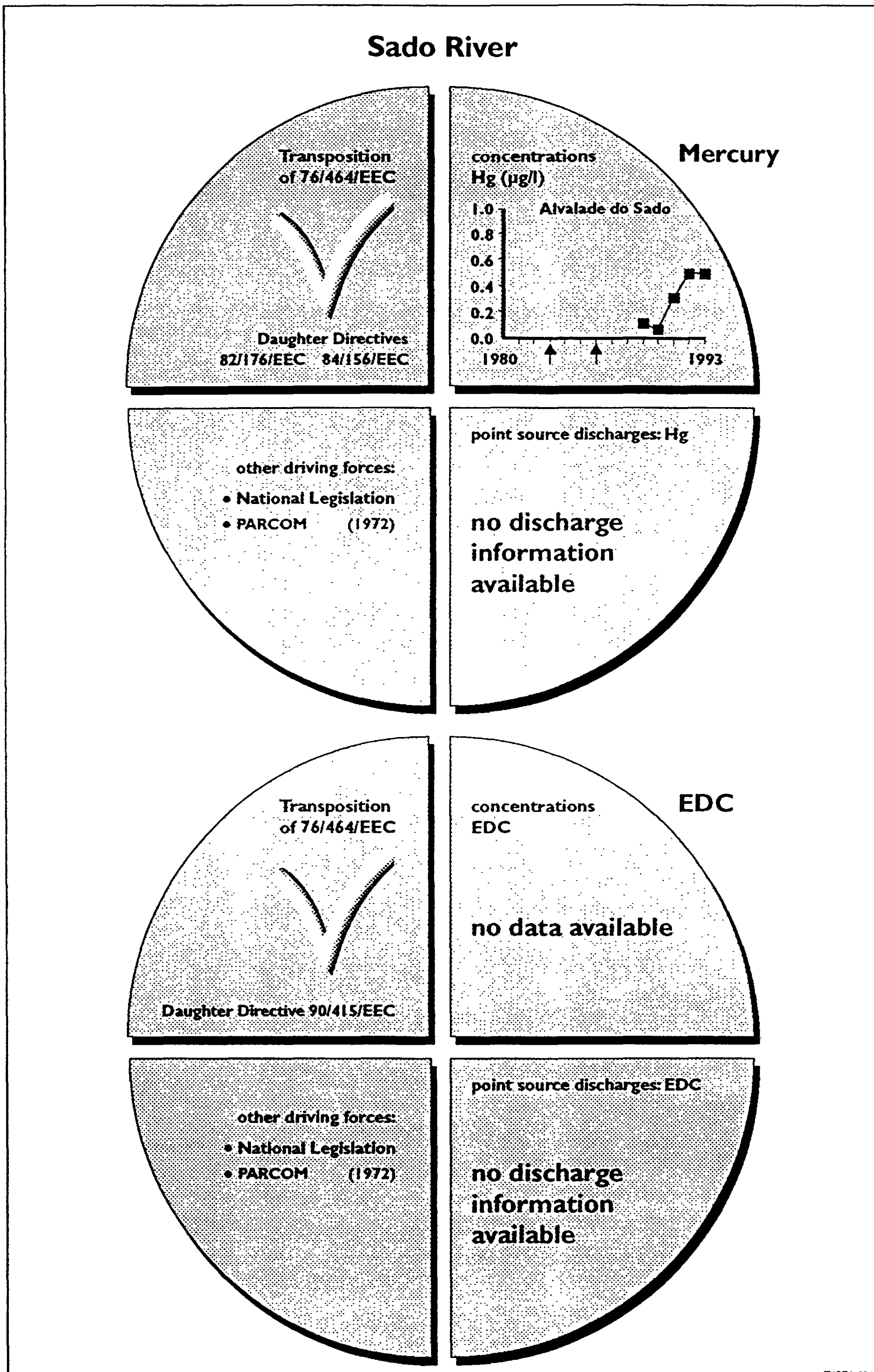

Figure 5.10 Summary of impact analysis of Directive 76/464/EEC for the Sado River

5.11 Scheldt River

Countries:	France, Belgium, The Netherlands
Water Quality Data:	Water quality data are available for the two station Schaar van Ouden Doel (NL) and Doel (Belgium). Especially for the monitoring station Schaar van Ouden Doel, sufficient data for many substances over a long time period are available.
Industrial Loads:	Sufficient data for a number of substances over a long time period are available.
Transposition of 76/464/EEC and daughter Directives:	Information on the transposition of Directive 76/464/EEC and daughter Directives is available. Transposition is complete.
Driving Forces:	• National legislation (France: Act of July 1976 on classified installations, 1976; Belgium: legislation for the protection of surface waters, 1971; Netherlands: Pollution of Surface Waters Act, 1970; • PARCOM (Paris, 1974)) • 76/464/EEC (Brussels, 1976) • Ministerial Declarations on the protection of the North Sea (1984, 1987, 1990, 1995)

Overall Summary:

For the Scheldt, there is a visible decreasing trend in Cd and Hg levels over time as it enters the Netherlands (both monitoring stations are at the Belgium-Netherlands border). No conclusions about the change in water quality in the Netherlands can be made. There has been no monitoring station in the Scheldt estuary chosen for this study, due to difficulties in comparing brackish and fresh water quality .

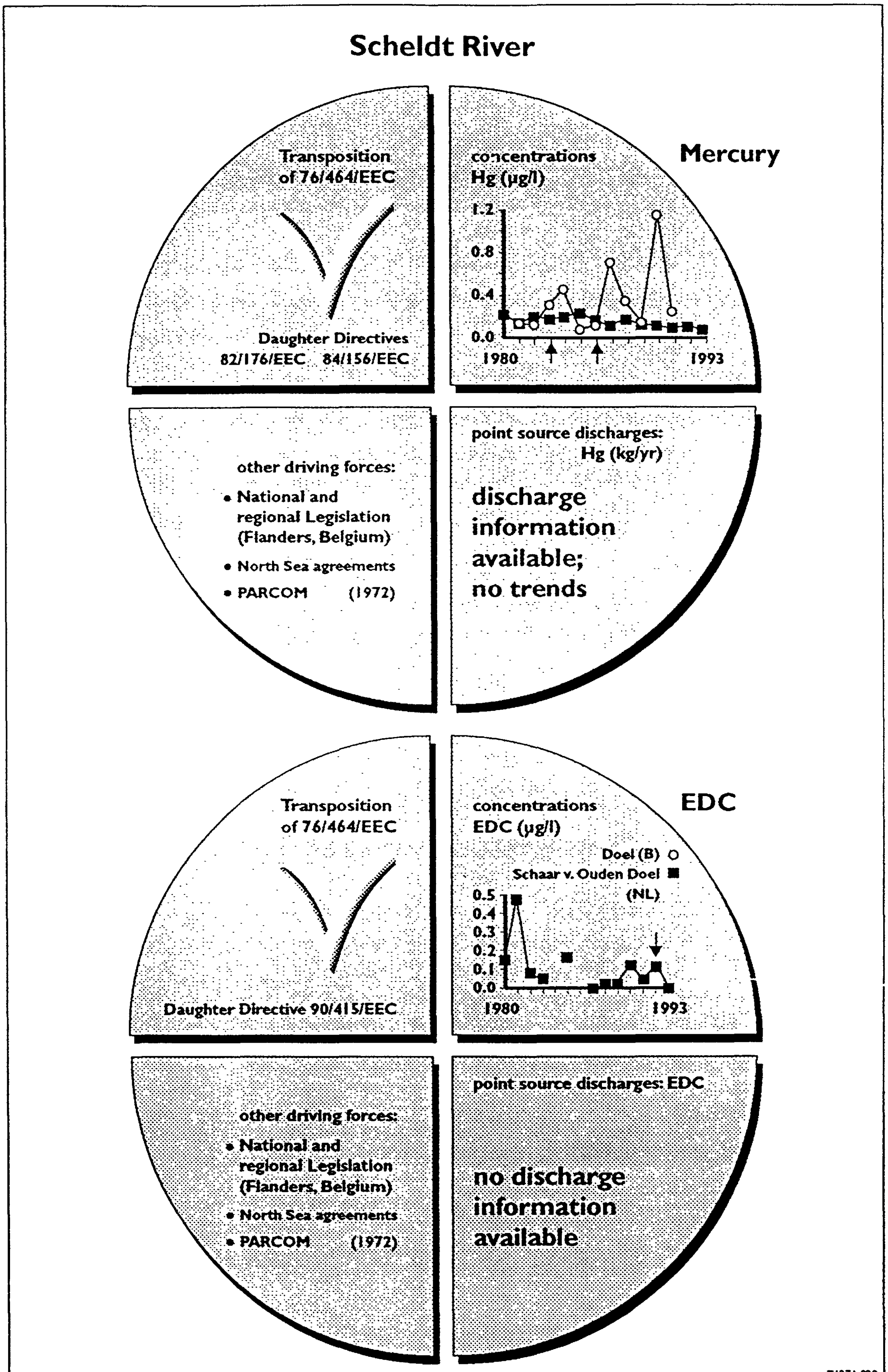

Figure 5.11 Summary of impact analysis of Directive 76/464/EEC for the Scheldt River

5.12 Seine River

Country:	France
Water Quality Data:	Water quality data for the Seine are available for dissolved oxygen, BOD5, Hg and Cd for the years 1980-1987, and 1989-1991.
Industrial Loads:	There are a lot of data available for industrial discharges in France; for the Seine river catchment, there is a lot of information on manufacturing and discharging industries. However, there is no clear trend in the changes in loads over the period 1980-1992. In a number of cases, the loads increase, and in other cases, they decrease or remain constant. For many identified industries there is no specific data on discharges.
Transposition of 76/464/EEC and daughter Directives:	Information on the transposition of Directive 76/464/EEC and daughter Directives is available. Transposition is complete.
Driving Forces:	• PARCOM (Paris, 1974) • 76/464/EEC (Brussels, 1976) • National Legislation (Act of July 1976 on classified installations).

Overall Summary:

Systematic monitoring of French surface water concerning List I substances started only recently (1991). This is also true for the monitoring of discharges. For heavy metals, effluent monitoring includes 6 years (1986-1992) of data. No conclusions on trends, however are possible.

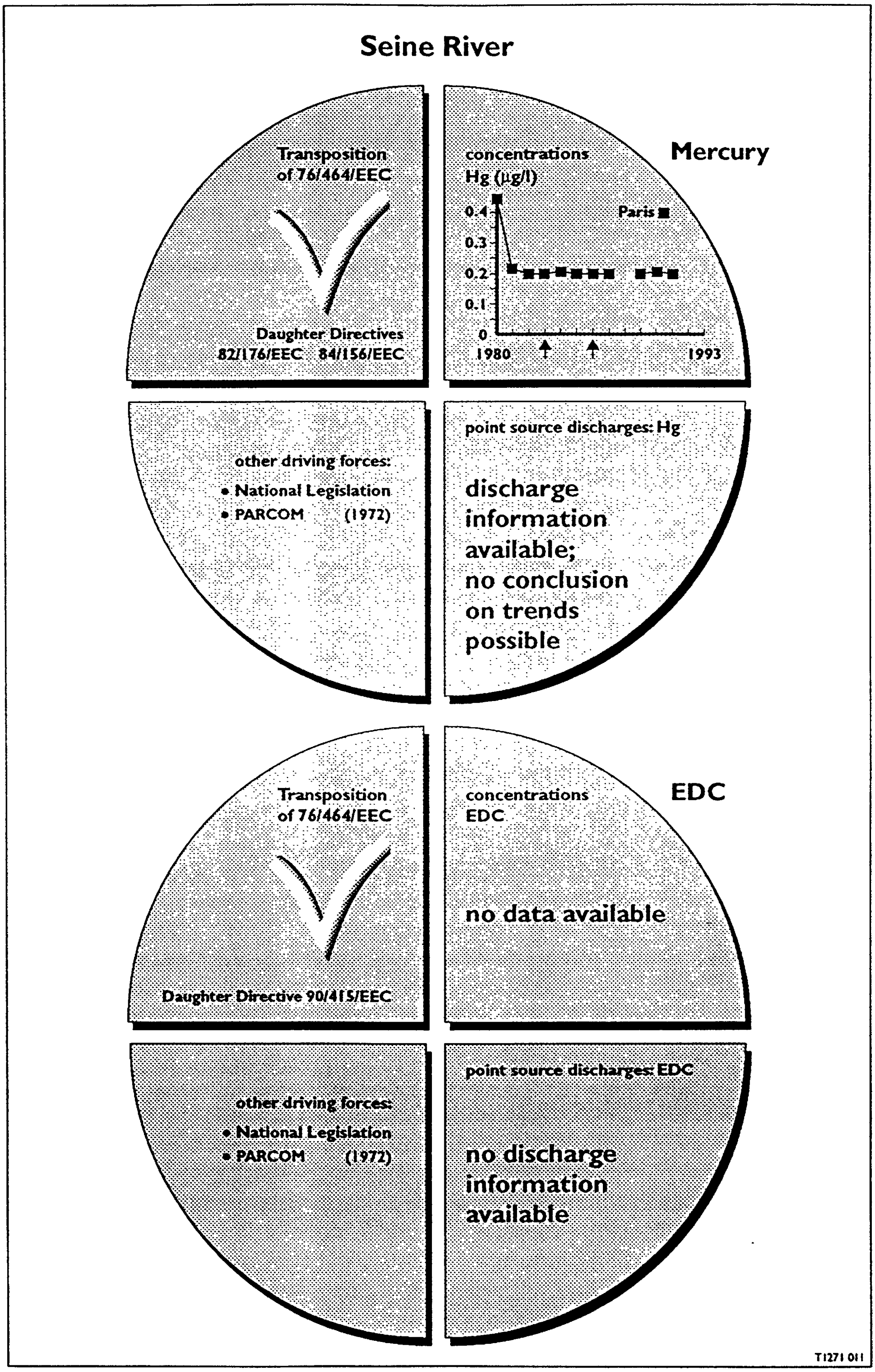

Figure 5.12 Summary of impact analysis of Directive 76/464/EEC for the Seine River

5.13 Slaney River

Country:	Ireland
Water Quality Data:	Water quality data for the Slaney River has been sent by the national representative. Monitoring data is focused primarily on BOD, and dissolved oxygen as there is little industrial activity in the catchment. These data are available for the years 1980-1993.
Industrial Loads:	Some general information primarily on BOD loads has been sent by the national representative. Riverine inputs on cadmium are also available.
Transposition of 76/464/EEC and daughter Directives:	Information on the transposition of Directive 76/464/EEC and daughter Directives is available. Transposition is complete.
Driving Forces:	• PARCOM (Paris, 1974) • 76/464/EEC (Brussels, 1976) • National Legislation (Local Government (Water Pollution) Act, 1977)

Overall Summary:

We have received a considerable amount of information from the national representative of Ireland. It seems that there are little or no industrial discharges of dangerous substances. Thus, it is difficult to make an assessment of the effectiveness or relevance of 76/464/EEC to the quality of surface waters in Ireland. From personal communications, it became clear that other EC Directives have had an impact on industrial waste production in Ireland.

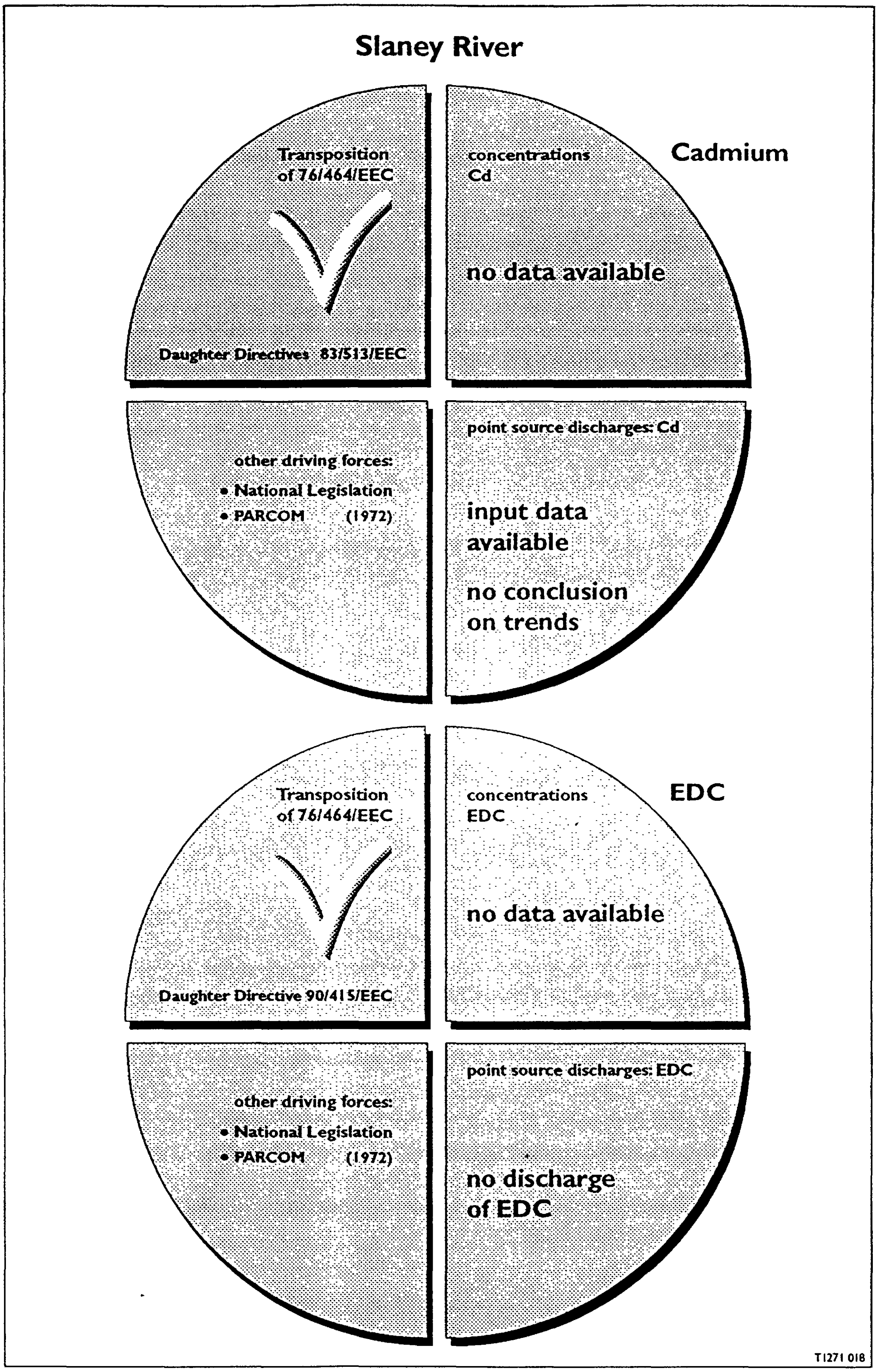

Figure 5.13 Summary of impact analysis of Directive 76/464/EEC for the Slaney River

5.14 Tagus River

Countries: Spain and Portugal

Water Quality Data: For the Tagus river in Spain, water quality data are available for dissolved oxygen and BOD for the years 1981-1993. For Cd, data are available for the years 1983-1993, and for Hg, data are available for the years 1985-1993. No data on organic substances are available. Some additional information is presented in Appendix F.

In Portugal, water quality data for dissolved oxygen and BOD are available for the years 1980-1993. For Cd and Hg, data are available for the years 1989-1993.

Industrial Loads: For the Tagus river in Spain, a limited number of manufacturing and discharging industries in the Tagus river basin have been identified, but no data on actual discharges are available yet.

In Portugal, data on riverine inputs to the sea for a number of substances are available.

Transposition of 76/464/EEC and daughter Directives: Information on the transposition of Directive 76/464/EEC and daughter Directives is available. Transposition is complete.

Driving Forces:

- PARCOM (Paris, 1974)
- 76/464/EEC (Brussels, 1976)
- National legislation:
  (Spain: Water Act of 1985
  Portugal: The Environmental Law of 1987)

Overall Summary:

Given the available information, an evaluation of the impact of Directive 76/464/EEC on the quality of the Tagus River cannot be made.

A translation of a document provided by the National Expert (lit E1100) providing an overview of the impact of Directive 76/464/EEC on the Tagus River in Spain is given in Appendix F.

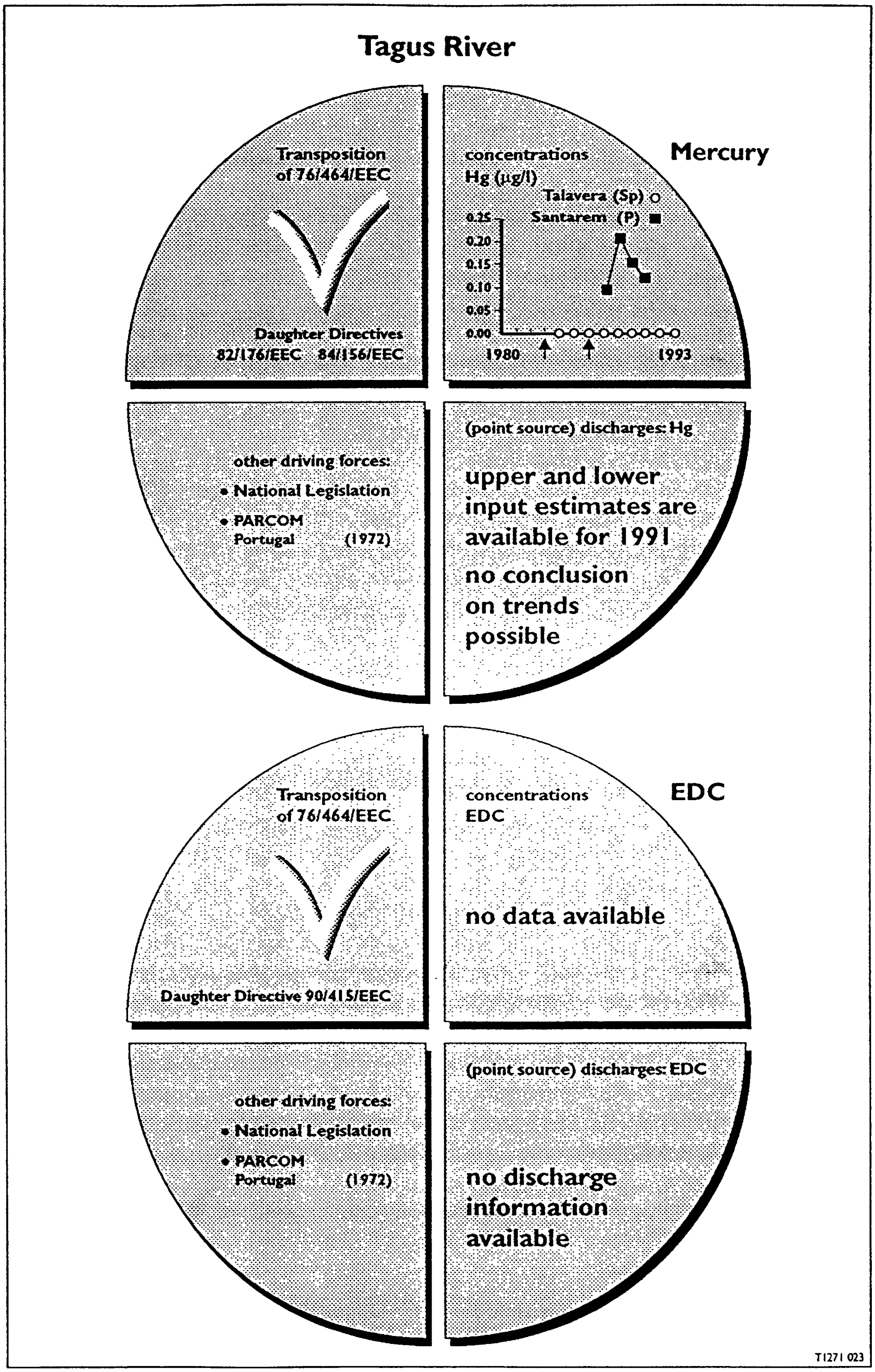

Figure 5.14 Summary of impact analysis of Directive 76/464/EEC for the Tagus River

5.15 Thames River

Country:	UK
Water Quality Data:	Data for many substances over a long time period have been provided by the National Expert. Specifically, data for dissolved oxygen, BOD, Hg and Cd are available for the years 1980-1993. Data for PCP, HCH, drins, and DDT are available for at least 6 years. One or two years of data are available for most other organic substances.
Industrial Loads:	No detailed information on actual industrial loads from individual dischargers is available.
Transposition of 76/464/EEC and daughter Directives:	Information on the transposition of Directive 76/464/EEC and daughter Directives is available. Transposition is complete.
Driving Forces:	• PARCOM (Paris, 1974) • 76/464/EEC (Brussels, 1976) • National legislation (Environmental Protection Act, 1990; Water Resources Act, 1991, Water Industry Act, 1991) • Ministerial Declarations on the protection of the North Sea (1984, 1987, 1990, 1995)

Overall Summary:

The water quality data at the chosen station shows decreasing concentrations of mercury, cadmium, PCP, aldrin, endrin and p,p'-DDT over time. No clear trend is visible for the other measured substances. Further analysis of the mercury data shows a change in the limit of detection (LOD) for mercury in 1986, from 0.5 to 0.1 μg/l. As most of the analyses are below the LOD, the yearly averages are seen as 0.25 (before 1986) and 0.05 (after 1986); yearly averages are calculated by setting concentrations less than LOD to one half LOD. Thus, this is not a real trend.

The information reported to the Oslo and Paris Commissions for the catchment of the North Sea (which includes the Thames) shows a decrease in direct plus riverine inputs for the years 1987-1992 for the substances cadmium, mercury and γ-HCH. A comparison of the water quality data with water quality objectives (given in Table 2.1) shows that for most substances, water quality objectives are met. The only exceptions are PCP in 1986 and 1990 with concentrations of 11.0 μg/l and 6.5 μg/l respectively (the standard is 2 μg/l) and endrin in 1988 and 1989 with concentrations of 0.01 and 0.009 μg/l (the standard is 0.005 μg/l).

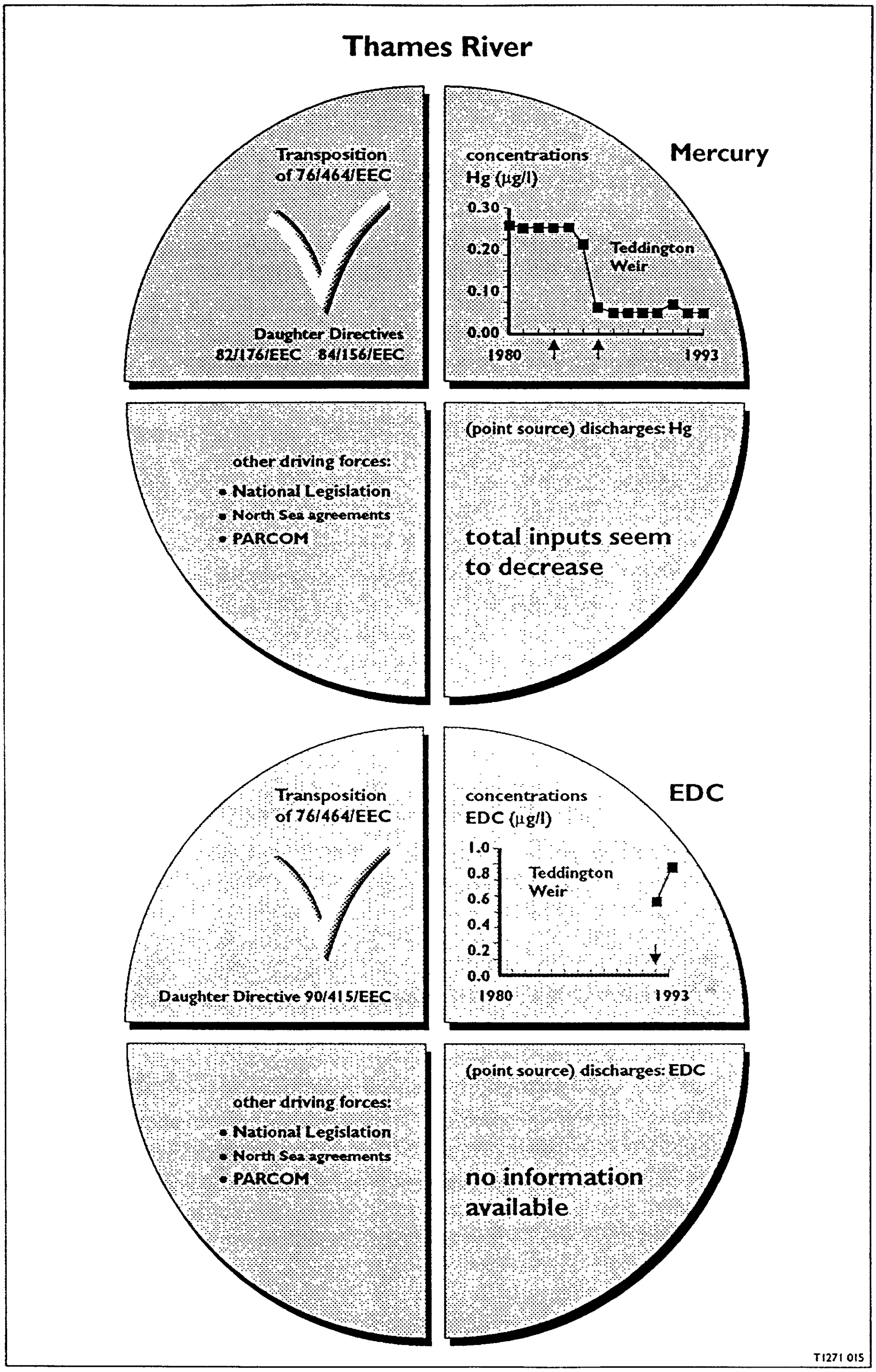

Figure 5.15 Summary of impact analysis of Directive 76/464/EEC for the Thames River

5.16 Trent River

Country: UK

Water Quality Data: Data for many substances over a long time period have been provided by the National Expert. Specifically, data for dissolved oxygen, BOD, Hg and Cd are available for the years 1980-1993. Data for HCH, drins and DDT are available for the years 1980-1983 and 1989-1993. Data for two or three years are available for several other organic substances.

Industrial Loads: No detailed information on actual industrial loads from individual dischargers is available.

Transposition of 76/464/EEC and "Daughter Directives": Information on the transposition of Directive 76/464/EEC and daughter Directives is available. Transposition is complete.

Driving Forces:

- PARCOM (Paris, 1974)
- 76/464/EEC (Brussels, 1976)
- National legislation (Environmental Protection Act, 1990; Water Resources Act, 1991, Water Industry Act, 1991)
- Ministerial Declaration on the protection of the North Sea (1984, 1987, 1990, 1995)

Overall Summary:

The water quality at the chosen station shows a trend of decreasing cadmium, HCH, drins and p,p'-DDT concentrations over time. No clear trend is visible for the other measured substances. Information reported to the Oslo and Paris Commissions for the catchment of the North Sea (which includes the Trent) shows a decrease in direct plus riverine inputs for the years 1987-1992 for the substances cadmium, mercury and γ-HCH. A comparison of the water quality data with water quality objectives (given in Table 2.1) shows that for all substances (except endrin in the years 1981-1983), water quality objectives are met.

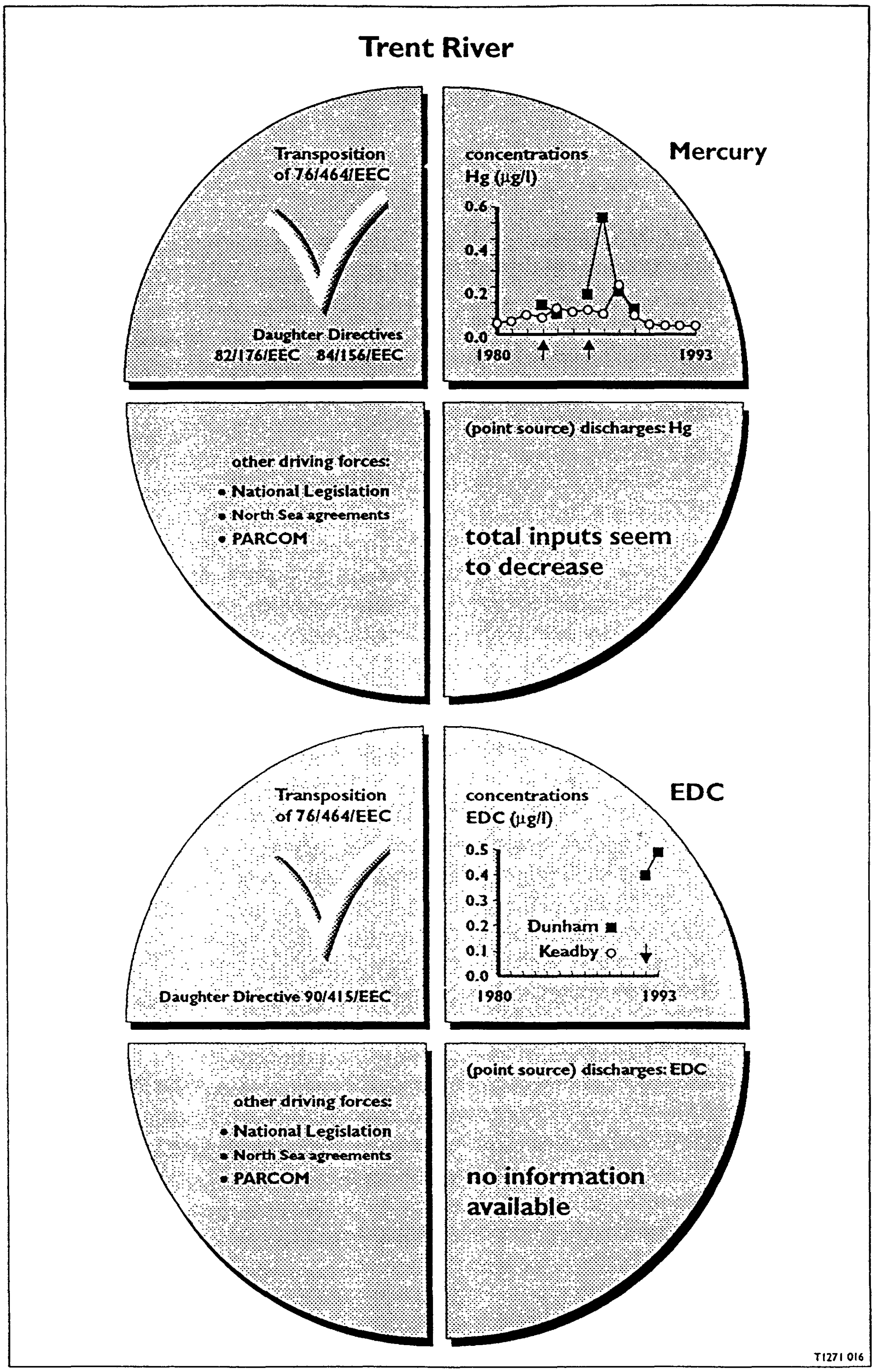

Figure 5.16 Summary of impact analysis of Directive 76/464/EEC for the Trent River

5.17 Denmark

Country:	Denmark
Selected River Catchment:	None selected
Water quality data:	No water quality information has been sent from the national representative. Time series for several years of water quality data for List I substances were not available at the Danish EPA (J.B. Jensen, Danish EPA, personal communication). However, data reports are produced by the Danish EPA: Since 1989, reports for the whole country are produced about general water quality parameters, oxygen and nutrients [source: DK1006]. It is expected that in the future further monitoring of an expanded list of substances will take place. At present, all the waterboards produce reports themselves and the information is not assembled for the whole country.
Industrial Loads:	Information about industrial loads has been received from the national representative [sources: DK1001 and DK1004]. The following conclusions can be made: • (Aggregated) information on groups of substances is available (not individual substances); • The available information shows a clearly decreasing trend for discharges.
Transposition of 76/464/EEC and daughter Directives:	Information on the transposition of Directive 76/464/EEC and daughter Directives is available. Transposition is complete.
Driving Forces:	• PARCOM (Paris, 1974) • Baltic Sea Convention (Helsinki 1974) • 76/464/EEC (Brussels, 1976) • Ministerial Declaration on the protection of the North Sea (1984, 1987, 1990, 1995) • National Legislation (last revision in 1995) The description of the driving forces and the order of impact of the driving forces were discussed at the Danish EPA with the National Expert.

Overall Summary:

Aggregated information on loads shows a clear trend, but it is not possible to distinguish trends for individual substances. Also, without any water quality data, it is not possible to evaluate the impact of Directive 76/464/EEC on the quality of surface waters in Denmark.

6 Overall analysis of the impact of Directive 76/464/EEC on the surface waters of the Community

Transposition

The transposition of Framework Directive 76/464/EEC and its daughter Directives is almost fully complete in all Member States. In a few Member States the transposition is not totally complete and this is currently under investigation by the European Community.

Driving Forces

A review of all relevant driving forces and discussion with National Authorities leads to the conclusion that Directive 76/464/EEC, including the daughter Directives, is one of the important factors that have contributed to the improvement in water quality of a number of main surface waters in the past 10-12 years.

More specifically, the National Legislation in most Member States is primarily based on both the National Legislation before 1976 as well as Directive 76/464/EEC and the daughter Directives. This is especially true in Denmark, Greece, Italy, Luxembourg, Portugal, Spain, the United Kingdom and Ireland, where a permit system for most List I substances became part of the National Legislation after the release in 1976 of Directive 76/464/EEC (Appendix B).

In the other countries (i.e. the Netherlands, Germany, France, and Belgium) a permit system for many List I substances already existed before Directive 76/464/EEC. National legislation in many cases was adapted after 1976 to meet the conditions in the Directive. For these countries, it is also possible that the international discussions leading to the Directive may have played an important role in setting the national legislation. The influence of a pending Directive can be seen in the example of significant reductions of 1,2-EDC in the Rhine river, even before the date of daughter Directive 90/415/EEC (see also Appendix C).

Thus it can be stated that in all countries the daughter Directives have lead to either the introduction or the tightening of emission standards and/or surface water quality standards for several List I substances.

Reduction of discharges and improvements of water quality have also been influenced by other driving forces from the EC (e.g. Council Directive 75/440/EEC, Required Surface Water Quality for Abstraction of Drinking Water), other international conventions and agreements (e.g. PARCOM, Baltic Sea Convention), economic developments and developments in industrial activities and production processes.

Quantification or ranking of the relative contributions of these developments to the improvement of water quality is not possible to make based on the information collected in this study. Developments at national and international levels were often occuring simultaneously, and influencing each other. However, it can be stated that Directive 76/464/EEC has had a direct or indirect effect on the permit system and setting of standards for discharges and water quality in most Member Sates for several List I substances. Consequently, the Directive contributes to the improvement of the water quality as seen for many substances in various rivers. In some instances, the positive effects of Directive 76/464/EEC may be counterbalanced by other developments such as economical growth and increased industrial activities.

Industrial and Municipal Loads

Only for the Rhine River, was sufficient information on the discharge of List I substances over the years available. For the river Scheldt, sufficient discharge information was made available only for cadmium. For the Mersey, direct plus riverine input data were made available for cadmium, mercury and HCH. For the rivers in France (Loire, Rhône and Seine), a substantial amount of information on discharges was available.

Water Quality

Yearly average water quality data have been collected for 16 rivers in the European Union. In general, historical data for most of the List I substances were available only for a few rivers.

For six of the rivers (Meuse, Trent, Thames, Mersey, Scheldt and Rhine), an extensive amount of data for general water quality parameters and List I substances was collected from the National Experts. In general, where such complete data is available, a trend of improving water quality (i.e. decreasing concentrations) can be seen. In general, water quality data is more available for the metals (i.e. cadmium and mercury) than for the chorinated organic substances (e.g. EDC).

For the rivers Axios, Ebro, Seine and Tagus, data were available for many years for the general water quality parameters, and mercury and cadmium. No data for the List I organic substances were available.

For the Moselle and the Slaney rivers, general water quality data were available, but there were little or no data on List I substances. The National Experts from Luxembourg and Ireland respectively reported that there were essentially no discharge of List I substances in their countries.

For some rivers (i.e. Loire and Rhone), general water quality data and limited data for List I substances from recent years were available.

For the Rivers Sado and Po, little or no water quality data were available.

Monitoring

Considering the monitoring of water flows and water quality data in the Community, some general conclusions can be drawn:

- monitoring of surface waters is, in general, performed by the competent authorities at different levels (e.g. national, provincial or local). In a number of cases, surface water monitoring is also carried out by non-governmental organisations, such as drinking water production companies;
- at the beginning of the 1980's, it was common practice to monitor surface waters for the water flow and general water quality parameters such as dissolved oxygen. The List I heavy metals, cadmium and mercury, were also routinely monitored;
- at a later stage, the monitoring was expanded with the analysis of some (List I) organic substances (e.g. aldrin, dieldrin, endrin, isodrin, 1,2-dichloroethane, etc.).
- in some river catchments (e.g. the Rhine, Scheldt, and Humber), a more extended group of the above mentioned parameters has been analyzed over a longer period of time;
- for a number of substances, the concentrations are below the limit of detection. Furthermore, this detection limit is changing with time;
- for several rivers, annual average concentrations are calculated and reported by setting any values below the detection limit to half the detection value. This calculation method was also used in cases where only daily concentration data were reported. For other rivers, annual average concentrations are reported with no indication of how any data below the detection limit were handled.

Considering the monitoring of waste water discharge, the following conclusions can be drawn:

- in the majority of the Member States, self monitoring of waste water discharges seems to be common practice; enforcement of the terms and standards set in the permits (on spot check basis) is carried out by the competent authorities;
- a number of Member States made actual discharge information available for individual industries (i.e. this information came from the central level). In a number of Member States, the information on industry discharges is decentralized. This decentralized information could not be made available by the National Expert. All discharge data used in this report are from publically available literature (see References);
- some Member States aggregated discharge information at a central level; this information is sometimes aggregated per river catchment (direct and indirect riverine input data);
- the procedures for discharge monitoring and reporting of discharges data at a central level seem to be less developed than for surface water monitoring.

Overall

The initial goal of this study was to draw conclusions as to the effectiveness of Directive 76/464/EEC based on an analysis of three connected components, namely: transposition and legislation, pollutant discharges, and water quality. Bearing in mind that the Directive gives an either/or option for Member Sates to implement limit values for emissions or surface water quality objectives: there are three rivers for which extensive information exists regarding transposition, water quality *and* discharges. These are the Rhine, Scheldt and Mersey Rivers. For other rivers, there is either:

- extensive water quality data and limited discharge information,
- limited water quality data and extensive discharge information, or
- limited water quality data and limited discharge information,

upon which to base a conclusion about the impact of Directive 76/464/EEC.

Overall conclusions for the Rhine (see also Appendix C)

- the transposition of Directive 76/464/EEC and daughter Directives for List I substances is complete;
- a permit system was operating for most List I substances before 1976;
- the water quality for all List I substances improved in the period 1980-1992;
- the industrial and municipal discharges of List I substances were strongly reduced in the period 1985-1992; the discharge of DDT and HCH is expected to be reduced;
- Directive 76/464/EEC (including daughter Directives) is one of the main driving forces leading to significant water quality improvement. Another important driving force is the Chemical Treaty for the Rhine of 1976.

Overall conclusions for the Scheldt and Mersey:

- the transposition of Directive 76/464/EEC and daughter Directives for List I substances is complete;
- a permit system was not operating for most List I substances before 1976;
- the water quality for cadmium in the Scheldt improved in the period 1980-1992;
- considering direct and indirect riverine inputs, the water quality for mercury has improved in the Mersey;
- the industrial and municipal discharges of these List I substances (Cd and Hg) were reduced in the period 1985-1992; for the discharge of other List I substances, there was not sufficient information available to draw conclusions;
- Directive 76/464/EEC (including daughter Directives) is one of the key driving forces leading to significant water quality improvement for cadmium and mercury, respectively.

Overall conclusions for remaining rivers:

- the transposition of Directive 76/464/EEC and daughter Directives for List I substances is complete;
- a permit system was not operating for most List I substances before 1976;
- the availability of water quality data ranges from not-available to available;
- the water quality is sometimes improving, sometimes remaining constant, or fluctuating with no clear trend;
- the information on industrial and municipal discharges also ranges from not available to available. The type of information available includes discharges from individual industries, aggregated discharges (groups of substances), and the sum of riverine plus industrial discharges (river discharges to sea);
- in general, there is less information available for discharges than for water quality.
- Directive 76/464/EEC (including daughter Directives) is often the most important driving force with regard to management actions to implement a permit system, to reduce discharges and improve water quality.

General Conclusions:

It is concluded that Directive 76/464/EEC has been one of the important factors leading to improvements in water quality of main European surface water over the period 1980-1993. Its impact on water pollution control practices varies per country (and thus per river), depending on the National legislation and other international agreements which are also in effect.

Discussions were held with many of the National Experts as to the relative importance of different driving forces. Among the National Experts there were various perceptions as to the most important driving forces within their own countries. It is clear that some Member States had pollution control legislation in place before 1976, including the obligation for dischargers to have a permit in which limit values are set by the competent authority. However, in the majority of Member States, this type of legislation was enacted only after Directive 76/464/EEC.

7 Acknowledgements

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Ireland:	D. Moore
Netherlands:	R. Goud
Portugal:	Mrs. M. Barros
United Kingdom:	I. MacDonald P. Bird
Luxembourg:	P. Hansen
Greece:	Mrs. Mourmouris
Italy:	F. Gigliani Mrs. L. Pierantoneli

8 References

EC	= European Community
GEN	= General information ; not received from EC
D	= Germany
F	= France
B	= Belgium
L	= Luxembourg
NL	= Netherlands
IRL	= Ireland
I	= Italy
UK	= United Kingdom
DK	= Denmark
GR	= Greece
E	= Spain
P	= Portugal

Note: References throughout the text are given by a country/location code followed by a 3-4 digit number (e.g. EC001). This non-standard manner of giving references has been chosen in order to allow references to be easily incorporated within the water quality data tables (Appendix E, Volume II).

EC = European Community

EC001: Council directive of 4 May 1976 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community. OJL 129, 18.5.1976, p.23.
: European Community, May 1976.

EC002: Administrative Structures and Implementation of the Community Directives on the Dangerous Substances Discharged into the Aquatic Environment.
Ref. No. B4-3040/015406/92
: Environmental Resources Management, Final Report, Sept. 1994.

EC003: Administrative Structures and Implementation of the Community Directives on the Dangerous Substances Discharged into the Aquatic Environment: Country Annexes.
Ref. No. B4-3040/015406/92
: Environmental Resources Management, Final Report, Sept. 1994.

EC004: Kwaliteit van zoet oppervlaktewater. Gemeenschappelijke procedure voor de uitwisseling van informatie: 1982-1986. Samenvattend verslag Comm. v/d Europese Gemeensch.
: Dir. Gen. Milieubescherming, Nucleaire Veiligheid en Burgerbescherming.

EC005: Identification and brief description of the emissions (water, air & wastes) from the different sectors of the Organic Chemical Industry. Final Report January 1992.
: Comm. of the European Communities. Dir. General for the environment.

EC006: Study Contract B 6612-90-007819. Application of directive 76/464/EEC
Dangerous substances in the aquatic environment. Final Report. XI/15/92-EN
: EXCOSER

EC007: The economic effects of pollution control. Measures on defined industrial sectors. Mercury discharging industries. Draft report.
: Commission of the European Communities

EC008: Technical data sheets on substances, candidates for List I, Directive 76/464/EEC. Final Report, 1990. EURECO.
: Commission of the European Communities

EC009: Identification and brief description of emissions (water, air, wastes) from different sectors of the manufacture of basic inorganic chemicals and non-metallic mineral products.
: Environmental Resources Management, Final Report.

EC010: The importance of diffuse pollution sources and their consequences to the aquatic environment of the community. Final Report.
: WRc Environment Medmenham Laboratory, Medmenham, UK.

EC011: Council Directive of 12 June 1986 on limit values and quality objectives for discharges of certain dangerous substances included in List I of the Annex to Directive 76/464/EEC. OJL 181, 4.7.1986, p.16.
: European Community, June 1986.

EC012: National reports of Member States concerning implementation of Directive 76/464/EEC

EC013: European Rivers and Lakes. Assessment of their Environmental State
Prepared by Danish Ministry of Environment and Energy
: European Environment Agency

EC014 Techno-economic Aspects of Measures to Reduce Water Pollution in Small and Medium Sized Enterprises on the Basis of an Industry and Market Driven Approach.
European Commission, Contract no. B4-3040/93/001170
: Krüger Consult, Final Report, February 1995

EC015: Council Directive of 16 June 1975 concerning the required quality of surface water that is destined for production of drinking water in the Member States. Directive 75/440/EEC. OJL 194, 25.7.75, p.34.
: European Community, July 1975.

EC016: Council Directive of 8 December 1975 concerning the quality of swimming water. Directive 76/160/EEC. OJL 31, 5.2.76, p.1.
: European Community, February 1976.

EC017: Council Directive of 12 December 1977 on the establishment of a communal procedure for exchange of information over the quality of fresh surface waters in the Community. Directive 77/795/EEC. OJL 334, 24.12.1979, p.29.
: European Community, December 1977.

EC018: Council Directive of 18 July 1978 concerning the quality of fresh water for the protection of of fish life.
Directive 78/659/EEC. OJL 222, 14.8.1978, p.1.
: European Community, August 1978.

EC019: Council Directive of 9 October 1979 concerning the methods of analysis and the the frequency of sampling and analysis of surface waters destined for production of drinking water in the Member States.
Directive 79/869/EEC.
: European Community, 1979.

EC020: Council Directive of 30 October 1979 concerning the required water quality for shellfish.
Directive 79/923/EEC. OJL 281, 10.11.1979, p.47.
: European Community, November 1979.

EC021: Council Directive of 17 December 1979 on protection of groundwater from pollution caused by discharges of certain dangereous substances.
Directive 80/68/EEC. OJL 20, 26.1.1980, p.43.
: European Community, January 1980.

EC022: Council Directive of 16 June 1975 concerning the required quality of surface water that is destined for production of drinking water in the Member States. Directive 75/440/EEC. OJL 158, 25.6.88, p.36.
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GEN = General information ; not received from EC

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+ diskette with data. Obtained via J.v.Gils, Delft Hydraulics.
: Ministry of Environment, Greece

GR901: Some data of Axios river.
Cadmium and Mercury (1980 - 1988)
: EC counsellor for Greece, Brussels

GR902: Policy Plan for the management of inland water quality in Greece
Draft, Athens, July, 1994
: Ministry of Env. Phys. Planning and Public Works

GR903: Axios River Basin Water Quality Management
v. Gils (Delft Hydraulics) and Argiropoulos (Min. for the Environment, Greece)
: Water Resources Management 5: 271-280, 1991

GR904: Programmes to reduce water pollution from the toxic substances featuring in List II of Directive 76/464/EEC;
Letter + Annex 1 + Annex 2 from Kh. Zerefos to DGXI, 8 December 1989,
:Greek Ministry of the Environment, Regional Planning and Public Works

E = Spain

E1100: Impacto de la Directiva 76/464 en el Rio Tajo , Żone Espanola
: Direccion General de Calidad de las Aquas, Madrid, Spain

E1101: Aplicacion de la directiva sobre substancas peligrosas en el medio acuatico (76/464/EEC)
: M.O.P.U. Direccion General de Obras Hidraulicas

E1102: Analisis de calidad de aguas 1989 - 1990
Summary of Ebro data - Station 027 (Tortosa) and Station 163 (Asco)
: Ministerio de Obras Publicas y Transportes Julio 1991

E1103: Analisis de calidad de aguas 1989 - 1990
Summary of Tajo data - Station 019 (Alcantara) and Station 015 (Talavera)
: Ministerio de Obras Publicas y Transportes Julio 1991

E1104: Localizacion de Substancias Microcontaminantes en Aguas Superficiales
:March 1995

E1105: Water Surveillance from on high by Marta Ruiz
Information about SAICA (Sistema Automatico de Informacion de Calidad de las Aguas
: Ministerio de Obras Publicas, Transportes y Medio Ambiente

E1106: La vigilancia de la contaminacion fluvial
: M.O.P.U. Direccion General de Obras Hidraulicas, Junio 1983

E1107: Information for Impact Study of Directive 76/464/EEC
March 1995
: Ministerio de Obras Publicas, Transportes y Medio Ambiente

P = Portugal

P1201: Plano Nacional da Politica de Ambiente
: Versao preliminar para discussao publica

P1202: Plano Nacional da Politica de Ambiente
: Versao preliminar para discussao publica, Anexos

P1203: Uma Estrategia para a Resolucao dos Problemas de Poluicao Hidrica em Portugal
Lisboa - Decembro de 1992
: Associacao Portuguesa dos Recursos Hidricos

P1204: Comments to Annex 1 (letter from M.C. Barros to G.H. Broseliske)
: Instituto da Agua, Lisboa , Portugal

P1205: OECD Environmental Reviews, Portugal
:OECD, Paris, 1993

P1206: Data from M.C. Barros sent to G.H. Broseliske
: Instituto da Agua, Lisboa , Portugal

APPENDICES

Appendix A: Council Directive 76/464/EEC

COUNCIL DIRECTIVE

of 4 May 1976

on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community

(76/464/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Articles 100 and 235 thereof,

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Parliament (1),

Having regard to the opinion of the Economic and Social Committee (2),

Whereas there is an urgent need for general and simultaneous action by the Member States to protect the aquatic environment of the Community from pollution, particularly that caused by certain persistent, toxic and bioaccumulable substances;

Whereas several conventions or draft conventions, including the Convention for the prevention of marine pollution from land-based sources, the draft Convention for the protection of the Rhine against chemical pollution and the draft European Convention for the protection of international watercourses against pollution, are designed to protect international watercourses and the marine environment from pollution; whereas it is important to ensure the coordinated implementation of these conventions;

(1) OJ No C 5, 8. 1. 1975, p. 62.
(2) OJ No C 108, 15. 5. 1975, p. 76.

Whereas any disparity between the provisions on the discharge of certain dangerous substances into the aquatic environment already applicable or in preparation in the various Member States may create unequal conditions of competition and thus directly affect the functioning of the common market; whereas it is therefore necessary to approximate laws in this field, as provided for in Article 100 of the Treaty;

Whereas it seems necessary for this approximation of laws to be accompanied by Community action so that one of the aims of the Community in the sphere of protection of the environment and improvement of the quality of life can be achieved by more extensive rules; whereas certain specific provisions to this effect should therefore be laid down; whereas Article 235 of the Treaty should be invoked as the powers required for this purpose have not been provided for by the Treaty;

Whereas the programme of action of the Europea Communities on the environment (3), provides for number of measures to protect fresh water and se water from certain pollutants;

Whereas in order to ensure effective protection of th aquatic environment of the Community, it is necessary to establish a first list, called List I, of certain individual substances selected mainly on the basis of their toxicity, persistence, and bioaccumulation, with the exception of those which are biologically harmless or

(3) OJ No C 112, 20. 12. 1973, p. 1.

which are rapidly converted into substances which are biologically harmless, and a second list, called List II, containing substances which have a deleterious effect on the aquatic environment, which can, however, be confined to a given area and which depend on the characteristics and location of the water into which they are discharged; whereas any discharge of these substances should be subject to prior authorization which specifies emission standards;

Whereas pollution through the discharge of the various dangerous substances within List I must be eliminated; whereas the Council should, within specific time limits and on a proposal from the Commission, adopt limit values which the emission standards should not exceed, methods of measurement, and the time limits with which existing dischargers should comply;

Whereas the Member States should apply these limit values, except where a Member State can prove to the Commission, in accordance with a monitoring procedure set up by the Council, that the quality objectives established by the Council, on a proposal from the Commission, are being met and continuously maintained throughout the area which might be affected by the discharges because of the action taken, among others, by that Member State;

Whereas it is necessary to reduce water pollution caused by the substances within List II; whereas to this end the Member States should establish programmes which incorporate quality objectives for water drawn up in compliance with Council Directives where they exist; whereas the emission standards applicable to such substances should be calculated in terms of these quality objectives;

Whereas, subject to certain exceptions and modifications, this Directive should be applied to discharges into ground water pending the adoption of specific Community rules in the matter;

Whereas one or more Member States may be able, individually or jointly, to take more stringent measures than those provided for under this Directive;

Whereas an inventory of discharges of certain particularly dangerous substances into the aquatic environment of the Community should be drawn up in order to know where they originated;

Whereas it may be necessary to revise and, where required, supplement Lists I and II on the basis of experience, if appropriate, by transferring certain substances from List II to List I,

HAS ADOPTED THIS DIRECTIVE:

Article 1

1. Subject to Article 8, this Directive shall apply to:

— inland surface water,

— territorial waters,

— internal coastal waters,

— ground water.

2. For the purposes of this Directive:

(a) 'inland surface water' means all static or flowing fresh surface water situated in the territory of one or more Member States;

(b) 'internal coastal waters' means waters on the landward side of the base line from which the breadth of territorial waters is measured, extending, in the case of watercourses, up to the fresh-water limit;

(c) 'fresh-water limit' means the place in the watercourse where, at low tide and in a period of low fresh-water flow, there is an appreciable increase in salinity due to the presence of sea-water;

(d) 'discharge' means the introduction into the waters referred to in paragraph 1 of any substances in List I or List II of the Annex, with the exception of:

— discharges of dredgings,

— operational discharges from ships in territorial waters,

— dumping from ships in territorial waters;

(e) 'pollution' means the discharge by man, directly or indirectly, of substances or energy into the aquatic environment, the results of which are such as to cause hazards to human health, harm to living resources and to aquatic ecosystems, damage to amenities or interference with other legitimate uses of water.

Article 2

Member States shall take the appropriate steps to eliminate pollution of the waters referred to in Article 1 by the dangerous substances in the families and groups of substances in List I of the Annex and to reduce pollution of the said waters by the dangerous substances in the families and groups of substances in List II of the Annex, in accordance with this Directive, the provisions of which represent only a first step towards this goal.

Article 3

With regard to the substances belonging to the families and groups of substances in List I, hereinafter called 'substances within List I':

1. all discharges into the waters referred to in Article 1 which are liable to contain any such substance shall require prior authorization by the competent authority of the Member State concerned;
2. the authorization shall lay down emission standards with regard to discharges of any such substance into the waters referred to in Article 1 and, where this is necessary for the implementation of this Directive, to discharges of any such substance into sewers;
3. in the case of existing discharges of any such substance into the waters referred to in Article 1, the dischargers must comply with the conditions laid down in the authorization within the period stipulated therein. This period may not exceed the limits laid down in accordance with Article 6 (4);
4. authorizations may be granted for a limited period only. They may be renewed, taking into account any changes in the limit values referred to in Article 6.

Article 4

1. Member States shall apply a system of zero-emission to discharges into ground water of substances within List I.

2. Member States shall apply to ground water the provisions of this Directive relating to the substances belonging to the families and groups of substances in List II, hereinafter called 'substances within List II'.

3. Paragraphs 1 and 2 shall apply neither to domestic effluents nor to discharges injected into deep, saline and unusable strata.

4. The provisions of this Directive relating to ground water shall no longer apply upon the implementation of a separate Directive on ground water.

Article 5

1. The emission standards laid down in the authorizations granted pursuant to Article 3 shall determine:

(a) the maximum concentration of a substance permissible in a discharge. In the case of dilution the limit value provided for in Article 6 (1) (a) shall be divided by the dilution factor;

(b) the maximum quantity of a substance permissible in a discharge during one or more specified periods of time. This quantity may, if necessary, also be expressed as a unit of weight of the pollutant per unit of the characteristic element of the polluting activity (e.g. unit of weight per unit of raw material or per product unit).

2. For each authorization, the competent authority of the Member State concerned may, if necessary, impose more stringent emission standards than those resulting from the application of the limit values laid down by the Council pursuant to Article 6, taking into account in particular the toxicity, persistence, and bioaccumulation of the substance concerned in the environment into which it is discharged.

3. If the discharger states that he is unable to comply with the required emission standards, or if this situation is evident to the competent authority in the Member State concerned, authorization shall be refused.

4. Should the emission standards not be complied with, the competent authority in the Member State concerned shall take all appropriate steps to ensure that the conditions of authorization are fulfilled and, if necessary, that the discharge is prohibited.

Article 6

1. The Council, acting on a proposal from the Commission, shall lay down the limit values which the emission standards must not exceed for the various dangerous substances included in the families and groups of substances within List I. These limit values shall be determined by:

(a) the maximum concentration of a substance permissible in a discharge, and

(b) where appropriate, the maximum quantity of such a substance expressed as a unit of weight of the pollutant per unit of the characteristic element of the polluting activity (e.g. unit of weight per unit of raw material or per product unit).

Where appropriate, limit values applicable to industrial effluents shall be established according to sector and type of product.

The limit values applicable to the substances within List I shall be laid down mainly on the basis of:

— toxicity,

— persistence,

— bioaccumulation,

taking into account the best technical means available.

2. The Council, acting on a proposal from the Commission, shall lay down quality objectives for the substances within List I.

These objectives shall be laid down principally on the basis of the toxicity, persistence and accumulation of the said substances in living organisms and in sediment, as indicated by the latest conclusive scientific data, taking into account the difference in characteristics between salt-water and fresh water.

3. The limit values established in accordance with paragraph 1 shall apply except in the cases where a Member State can prove to the Commission, in accordance with a monitoring procedure set up by the Council on a proposal from the Commission, that the quality objectives established in accordance with paragraph 2, or more severe Community quality objectives, are being met and continuously maintained throughout the area which might be affected by the discharges because of the action taken, among others, by that Member State.

The Commission shall report to the Council the instances where it has had recourse to the quality objectives method. Every five years the Council shall review, on the basis of a Commission proposal and in accordance with Article 148 of the Treaty, the instances where the said method has been applied.

4. For those substances included in the families and groups of substances referred to in paragraph 1, the deadlines referred to in point 3 of Article 3 shall be laid down by the Council in accordance with Article 12, taking into account the features of the industrial sectors concerned and, where appropriate, the types of products.

Article 7

1. In order to reduce pollution of the waters referred to in Article 1 by the substances within List II, Member States shall establish programmes in the implementation of which they shall apply in particular the methods referred to in paragraphs 2 and 3.

2. All discharges into the waters referred to in Article 1 which are liable to contain any of the substances within List II shall require prior authorization by the competent authority in the Member State concerned, in which emission standards shall be laid down. Such standards shall be based on the quality objectives, which shall be fixed as provided for in paragraph 3.

3. The programmes referred to in paragraph 1 shall include quality objectives for water; these shall be laid down in accordance with Council Directives, where they exist.

4. The programmes may also include specific provisions governing the composition and use of substances or groups of substances and products and shall take into account the latest economically feasible technical developments.

5. The programmes shall set deadlines for their implementation.

6. Summaries of the programmes and the results of their implementation shall be communicated to the Commission.

7. The Commission, together with the Member States, shall arrange for regular comparisons of the programmes in order to ensure sufficient coordination in their implementation. If it sees fit, it shall submit relevant proposals to the Council to this end.

Article 8

Member States shall take all appropriate steps to implement measures adopted by them pursuant to this Directive in such a way as not to increase the pollution of waters to which Article 1 does not apply. They shall in addition prohibit all acts which intentionally or unintentionally circumvent the provisions of this Directive.

Article 9

The application of the measures taken pursuant to this Directive may on no account lead, either directly or indirectly, to increased pollution of the waters referred to in Article 1.

Article 10

Where appropriate, one or more Member States may individually or jointly take more stringent measures than those provided for under this Directive.

Article 11

The competent authority shall draw up an inventory of the discharges into the waters referred to in Article 1 which may contain substances within List I to which emission standards are applicable.

Article 12

1. The Council, acting unanimously, shall take a decision within nine months on any Commission proposal made pursuant to Article 6 and on the proposals concerning the methods of measurement applicable.

Proposals concerning an initial series of substances as well as the methods of measurement applicable and the deadlines referred to in Article 6 (4) shall be submitted by the Commission within a maximum period of two years following notification of this Directive.

2. The Commission shall, where possible within 27 months following notification of this Directive, forward the first proposals made pursuant to Article 7 (7). The Council, acting unanimously, shall take a decision within nine months.

Article 13

1. For the purposes of this Directive, Member States shall supply the Commission, at its request to be submitted in each case, with all the necessary information, and in particular:

— details of authorizations granted pursuant to Article 3 and Article 7 (2),

— the results of the inventory provided for in Article 11,

— the results of monitoring by the national network,

— additional information on the programmes referred to in Article 7.

2. Information acquired as a result of the application of this Article shall be used only for the purpose for which it was requested.

3. The Commission and the competent authorities of the Member States, their officials and other servants shall not disclose information acquired by them pursuant to this Directive and of a kind covered by the obligation of professional secrecy.

4. The provisions of paragraphs 2 and 3 shall not prevent publication of general information or surveys which do not contain information relating to particular undertakings or associations of undertakings.

Article 14

The Council, acting on a proposal from the Commission, which shall act on its own initiative or at the request of a Member State, shall revise and, where necessary, supplement Lists I and II on the basis of experience, if appropriate, by transferring certain substances from List II to List I.

Article 15

This Directive is addressed to the Member States.

Done at Brusssels, 4 May 1976.

For the Council

The President

G. THORN

ANNEX

List I of families and groups of substances

List I contains certain individual substances which belong to the following families and groups of substances, selected mainly on the basis of their toxicity, persistence and bioaccumulation, with the exception of those which are biologically harmless or which are rapidly converted into substances which are biologically harmless:

1. organohalogen compounds and substances which may form such compounds in the aquatic environment,

2. organophosphorus compounds,

3. organotin compounds,

4. substances in respect of which it has been proved that they possess carcinogenic properties in or via the aquatic environment (1),

5. mercury and its compounds,

6. cadmium and its compounds,

7. persistent mineral oils and hydrocarbons of petroleum origin,

and for the purposes of implementing Articles 2, 8, 9 and 14 of this Directive

8. persistent synthetic substances which may float, remain in suspension or sink and which may interfere with any use of the waters.

List II of families and groups of substances

List II contains:

— substances belonging to the families and groups of substances in List I for which the limit values referred to in Article 6 of the Directive have not been determined,

— certain individual substances and categories of substances belonging to the families and groups of substances listed below,

and which have a deleterious effect on the aquatic environment, which can, however, be confined to a given area and which depend on the characteristics and location of the water into which they are discharged.

Families and groups of substances referred to in the second indent

1. The following metalloids and metals and their compounds:

1. zinc	6. selenium	11. tin	16. vanadium
2. copper	7. arsenic	12. barium	17. cobalt
3. nickel	8. antimony	13. beryllium	18. thalium
4. chromium	9. molybdenum	14. boron	19. tellurium
5. lead	10. titanium	15. uranium	20. silver

2. Biocides and their derivatives not appearing in List I.

3. Substances which have a deleterious effect on the taste and/or smell of the products for human consumption derived from the aquatic environment,

   and compounds liable to give rise to such substances in water.

4. Toxic or persistent organic compounds of silicon, and substances which may give rise to such compounds in water, excluding those which are biologically harmless or are rapidly converted in water into harmless substances.

(1) Where certain substances in List II are carcinogens, they are included in category 4 of this list.

5. Inorganic compounds of phosphorus and elemental phosphorus.

6. Non persistent mineral oils and hydrocarbons of petroleum origin.

7. Cyanides, fluorides.

8. Substances which have an adverse effect on the oxygen balance, particularly: ammonia, nitrites.

Statement on Article 8

With regard to the discharge of waste water into the open sea by means of pipelines, Member States undertake to lay down requirements which shall be not less stringent than those imposed by this Directive.

Appendix B: Water Management Profiles for EC Member States)[1]

(Comprising key issues of organisation, legislation, transposition of Directive 76/464/EEC (for List I substances), permitting, enforcement and monitoring)

)[1] New Member States (Sweden, Finland and Austria) are not included, as a description of the water management in these new Member States was beyond the scope of this project.

BELGIUM

Brussels region

(sources: EC002, EC003, EC012, D110)

1 Organization

The competent authority in Brussels is the Brussels Institute for Environmental Management (IBGE-BIM). IBGE publishes reports on the state of the environment in Brussels based on data, primarily collected by the national authorities.

2 Framework legislation

The framework legislation for protection of surface water was adopted in 1971 (Loi du 26 mars 1971 portant sur la protection des eaux de surface contre la pollution). Directive 76/464/EEC and its daughter Directives are applicable in the Brussels region through a mix of royal decrees (national level) and regional decrees setting limit values for List I substances.

3 Transposition

An overview of the transposition of Directive 76/464/EEC and its daughters is given in table 1.

Table 1

EC-Directive	national transposition (acts/royal and regional decrees)
- 76/464/EEC	Royal Decree of 03-08-1976
- 82/176/EEC	Royal Decree of 12-09-1985
- 83/513/EEC	Royal Decree of 18-03-1987
- 84/156/EEC	Royal Decree of 30-03-1987
- 84/491/EEC	Royal Decree of 07-10-1986
- 86/280/EEC	Royal Decrees of 17 & 22-2-1988
- 88/347/EEC	Regional Decrees of 21-05-1992
- 90/415/EEC	Regional Decrees of 21-05-1992

Quality objectives of the directives have not been transposed as such into regional regulations. However, some List I substances are covered in this perspective by a royal decree of 1987 (Arrêté Royal du 4 novembre 1987 fixant des normes de qualité de base pour les eaux du réseau hydrographique public).
There is no programme for List II substances, except that their discharge is forbidden unless it is specially authorised in the discharge permit.

4 Permitting and enforcement

Currently the industrial waste water emissions are covered by a separate permit system. A new permit system will be adopted soon. New permits will be valid for 10 years, renewable twice during this period of 10 years.

5 Monitoring

a. Waste water monitoring

Monitoring of waste water discharges is carried out by the Environmental Inspectorate. There are currently no specific provisions at regional level for self-monitoring.

b. Surface water monitoring

The monitoring of the quality of surface waters is carried out by the authorities.

Flemish region

(sources: EC002, EC003, EC012, D110, B325)

1 Organization

The Administration for Environment, Nature, Land and Water Management called AMINAL (Administratie Milieu, Natuur-, Land en Waterbeheer), is a subdivision of the Department of the Environment and Infrastructure (Departement Leefmilieu en Infrastructuur) belonging to the Administration of the Flemish Government.
The Flemish Environmental Agency (VMM = Vlaamse Milieu Maatschappij) is an official organisation responsible for planning (sewage infrastructure and sewage treatment plants and environmental policy), monitoring, control and collecting levies on waste water discharges.

2 Framework legislation

Regulation of (point source) discharges in Flanders is primarily based on the Act of 26 March 1971 concerning the protection of surface waters against pollution (Wet van 26 maart 1971 op de bescherming van de oppervlaktewateren tegen verontreiniging).
This Act was regularly amended and supplemented 10 times (period 1979 - 1992).
A new framework legislation for the protection of the aquatic environment in the Flemish Region is in the preparatory phase.

3 Transposition

All directives have been transposed into national and regional law. Directive 76/464/EEC has first been transposed into a Royal Decree of 03. August 1976 (Koninklijk Besluit van 03 augustus 1976 houdende algemeen reglement voor het lozen van afvalwater in de gewone oppervlaktewateren). One has to keep in mind that environmental legislation became progressively a regional matter from 01 January 1989 onwards; product norms are still a federal matter).

Two major pieces of legislation have recently been adopted:

VLAREM 1 : General rules and permit procedures (Besluit van de Vlaamse Executieve van 6 februari 1991 houdende vaststelling van het Vlaams Regelement betreffende de Milieuvergunning, gewijzigd bij besluiten van de Vlaamse Executieve van 27 februari 1992 en van 28 oktober 1992)

VLAREM 2 : Specific rules for the different environmental compartments (air, water, soil, noise) and industrial sectors (nuisance causing installations) (Besluit van de Vlaamse Executieve van 7 january 1992 houdende vaststelling van het Vlaams Regelement inzake milieuvoorwaarden voor hinderlijke inrichtingen, gewijzigd bij besluit van de Vlaamse Executieve van 31 juli 1992).

An overview of the transposition of Directive 76/464/EEC and its daughters is given in table 1.

Table 1

EC-Directive	national transposition (acts/administrative orders/decrees)	
Limit values (industrial sectors):		
- 76/464/EEC	Royal decree of 03-08-1976	& VLAREM II
- 82/176/EEC	Royal Decree of 12-09-1985	& VLAREM II
- 83/513/EEC	Royal Decree of 18-03-1987	& VLAREM II
- 84/156/EEC	Royal Decree of 30-03-1987	& VLAREM II
- 84/491/EEC	Royal Decree of 07-10-1986	& VLAREM II
- 86/280/EEC	Royal Decrees of 17 & 22-02-1988	& VLAREM II
- 88/347/EEC		VLAREM II
- 90/415/EEC		VLAREM II
Water Quality Objectives:		
- 82/176/EEC	Royal decree of 04 November 1987, Decision of Flemish Executive of 21 October 1987 & VLAREM II	
- 83/513/EEC		
- 84/156/EEC		
- 84/491/EEC		
- 86/280/EEC		
- 88/347/EEC	VLAREM II	
- 90/415/EEC	VLAREM II	

4 Permitting and enforcement

Since 1992 all issued discharge permits are based on VLAREM I and II. These regulations were established to integrate all previous fragmentary environmental legislation into one updated coordinated Flemish environmental legislation. All EC Directives are put into force in VLAREM.

Discharges from installations classified as first or second class need a discharge permit. An application for a permit has to be made at the province for nuisance causing installations in the private sector (industry) and the region for installations under control of official bodies. The applications are judged by provincial and regional commissions. AMINAL/Division of permits (AMINAL/AMV of Afdeling Milieuvergunningen) co-ordinates the permit procedure and exercises, together with VMM in an advisory role, on water discharges and emissions into air.

Permits delivered or requested before September 1991 are valid for a maximum period of 20 years or the period as mentioned in the permit if less.

Permits for discharges containing List I (and/or List II) substances have to be evaluated at least each four years and renewed or adapted considering progress of best available techniques and water quality objectives.

Enforcement of the terms and standards set in the permits is carried out by AMINAL/Division of environmental Inspection (AMINAL/AMI = Afdeling Milieu Inspectie)

5 Monitoring

a. Waste water monitoring

Self-monitoring by industries discharging List I substances exceeding specific discharge volumes is done on a mandatory basis.

Monitoring of waste water discharges is conducted by the Flemish Environmental Agency (VMM); the List I substances mercury and cadmium are systematically monitored by VVM.

b. Surface water monitoring

The Flemish Environmental Agency (VMM) runs the measuring network for the control of the quality of surface waters. VMM also publishes various annual reports on waste water emissions.

Walloon region

(sources: EC002, EC003, EC012, EC014, D110)

1 Organization

The competent body in the Walloon region is the General Directorate for Natural Resources and the Environment (DGNRE). Two divisions of the DGNRE are involved in areas covered by the directives:

- Division of Surface Waters (Divisions des eaux de surface), whose competencies include waste water discharge permits.

- Division of industrial Pollution (Divisions de pollutions industrielles, DPI). This division is in charge of monitoring all industrial emissions and immissions.

2 Framework legislation

The framework legislation (at national level) for protection of surface water was adopted in 1971 (Loi du 26 mars 1971 portant sur la protection des eaux de surface contre la pollution). Degree of 07 October 1985 sets a framework legislation on the protection of surface water in the Wallone region.

3 Transposition

An overview of the transposition of Directive 76/464/EEC and its daughters is given in table 1.

Table 1

EC-Directive	national transposition (act/royal and regional decrees)
- 76/464/EEC	Royal Decree of 03 August 1983
- 82/176/EEC	*)
- 83/513/EEC	Royal Decree of 30-03-1987
- 84/156/EEC	Royal Decree of 30-03-1987
- 84/491/EEC	Royal Decree of 07-10-1986
- 86/280/EEC	Regional Decrees of 11-02-1993
- 88/347/EEC	Regional Decrees of 11-02-1993
- 90/415/EEC	Regional Decrees of 11-02-1993

*) Although Directive 82/176/EEC had been implemented by two specific Royal Decrees (of 12-9-1985 and 3-2-1988), Environmental Resources Management (sources: EC002 and EC003) reports that it seems that the provisions of the Walloon General Decree do not apply in this case.

The quality objectives of the directives have not been transposed as such into the regional regulation. However, some List I substances are covered by a royal decree of 1987. There is at the moment no programme covering List II substances.

4 Permitting and enforcement

A system of permits for industrial waste water is organized by Regional Decrees of 1985 and 1989. Discharge permits must be renewed every four years. Permits set limit values based on continuous measurements or daily averages.

The enforcement of waste water discharges does not systematically take place.

5 Monitoring

a. Waste water monitoring
Monitoring in the framework of maintenance and compliance with permit conditions is a responsibility of the Division of Surface Water.

Results from discharge monitoring are not published but can be obtained from the authorities upon request.

Wallonia adopted a general decree in February 1993 for the discharge of List I hazardous substances to surface water and sewers. This decree includes a number of requirements applicable to self-monitoring, sampling, measurements and reporting. Self-monitoring requirements are also laid down in permits on a case-by-case basis.

b. Surface water monitoring
Surface water quality is monitored systematically by the authorities.

The Walloon Region publishes an annual report on surface water quality.

DENMARK

(sources: EC002, EC003, EC012, DK1003)

1 Organization

In Denmark, the county and municipal authorities are in principle responsible for the control of waste water discharges. This control is part of their overall environmental responsibility.

2 Framework legislation

The Environmental Protection Act (Lov om Miljϕbeskyttelse, 1974; last revision 1995) introduced comprehensive environmental legislation and was enacted before Denmark became a member of the EC.

3 Transposition

Existing legislation effectively covered some of the measures spelled out by the Directives. In order to formally comply with the Directives, specific implementing legislation was adopted.

An overview of the transposition of Directive 76/464/EEC and its daughters is given in table 1.

Table 1

EC-Directive	national transposition (acts/administrative orders/decrees)
- 76/464/EEC	Covered by the Environmental Protection Act
- 82/176/EEC	Statutory order no 736 of 27-10-1986
- 83/513/EEC	Statutory order no 181 of 25-03-1986
- 84/156/EEC	Statutory order no 736 of 27-10-1986
- 84/491/EEC	Statutory order no 520 of 08-08-1986
- 86/280/EEC	Statutory order no 75 of 30-01-1992
- 88/347/EEC	Statutory order no 75 of 30-01-1992
- 90/415/EEC	Statutory order no 75 of 30-01-1992

A permit to discharge List II substances is issued on the basis of a combination of the principle of best available technology and the principle of compliance with the fixed environmental quality of the receiving water.

4 Permitting and enforcement

In Denmark the county (for direct discharges) and municipal authorities (for indirect discharges) are in principle responsible for the control of waste water discharges.
County and municipal authorities each have officials with authority to check compliance with permits which have been granted by them.
The Environmental Protection Agency (Miljϕ Styrelsen) is generally not involved in compliance checking and enforcement, but where the local authority fails to act, it can initiate legal action against an operator.

5 Monitoring

a. Waste water monitoring
Self-monitoring is required for all installations that need a permit to operate. Monitoring methods and frequencies are specified in the permits, in accordance with national guidelines.

The national authorities have published data on site-specific industrial waste water discharges. Of particular interest in this respect was the Environment Project, that covered eight industry sectors, focusing primarily on large installations discharging hazardous substances.
In addition annual inventories are made of the effluents from industrial activity to lakes, rivers and the sea.

b. Surface water monitoring
The Danish government carried out research projects concerning surface water quality in particular "hot spots" areas.

FRANCE

(sources: EC002, EC003, EC012, F213, F214, F217, D110, NL537, GEN018)

1 Organization

The key organisations in charge of water management in France include the Ministry of Environment, Regional Directorates and Water Agencies. The Ministry of Environment is competent for regulatory aspects. The quality of the aquatic environment is the responsibility of 22 Regional Directorates of Environment (Directions Régionales de l'Environnement; DIREN). These Regional Directorates are managed by the Ministry of Environment.
The Classified Installations Inspectorate is responsible for coordinating permitting and monitoring activities of classified installations. The Inspectorate is organized at regional level, located within 22 Directorates of Industry, Research and Environment (Directions Régionales de l'Índustries, de la Recherche et de l'Environnement; DRIRE). These DRIRE-organizations are managed by both the Ministry of Environment and the Ministry of Industry.
The 6 Water Agencies (Agences de l'Eau) collect data on water consumption and waste water discharges for taxation purposes. The Water Agencies are mainly planning and fund-raising agencies. The raised money will be reallocated to the dischargers as financial support in order to encourage discharge reductions. Construction of sewer systems or sewage treatment plants e.g. is done by the municipalities.
Under the auspices of the Minister of the Environment, the prefects of the 100 departments have a key role in water control. National river quality and the setting of river quality objectives is the responsibility of the prefect. Moreover the prefect has to assure compliance with the standards via inspection and prosecution. For this purpose the Service for technical Assistance to Treatment Plants (Service d'Assistance Technique aux Stations d'Epurations; SATESE) operates under the supervision of the departments.

2 Framework legislation

In France the Act of 19 July 1976 on classified installations (Loi 76-663 du 19 juillet relative aux installations classées pour la protection de l'environnement) is the framework legislation.

3 Transposition

Directive 76/464 and its daughter Directives have been transposed into French legislation by a number of ministerial decrees (MD) and circulars (CI) adopted in the framework of the law of 19 July 1976 on classified installations:

An overview of the transposition of Directive 76/464/EEC and its daughters is given in table 1.

Table 1

EC-Directive	national transposition (acts/ministerial decrees/circulars)
- 76/464/EEC	Covered by the Act of 19 July 1976
- 82/176/EEC	MD of 21-11-1991
	CI of 13-12-1983 (cancelled)
- 83/513/EEC	MD of 26-09-1985 (two separate decrees, cancelled progressively)
	CI of 06-12-1985 (cancelled)
	MD of 23-01-1991
- 84/156/EEC	CI of 04-11-1985 (cancelled)
	MD of 23-01-1991
- 84/491/EEC	CI of 06-03-1986
- 86/280/EEC	MD of 12-10-1987
- 88/347/EEC	MD of 27-09-1989
- 90/415/EEC	MD of 02-10-1991

In 1993 France adopted a general decree applicable to class A installations. This general decree contains limit values for List I substances of the directives. It also incorporates some limit values for List II substances.

Article 22 of the General Decree stipulates that quality objectives of receiving watercourses must be considered when setting limit values for discharges. It was reported that concentration values under List I - Heading B have generally not been transposed into departmental objectives (sources: EC002, EC003).

4 Permitting and enforcement

Industrial waste water discharges are covered by environmental permits coordinated at regional level by the Inspectorate of Classified Installations and issued by the prefectorial authorities. Permit conditions are granted on the basis of circulars and ministerial decrees covering specific aspects of industrial activities.

The prefect has to assure compliance with the standards via inspection and prosecution. For this purpose the Service for Technical Assistance to Treatment Plants (Service d'Assistance Technique a l'exploitation des Stations d'Epurations; SATESE) operates under the supervision of the departments.

5 Monitoring

a. Waste water monitoring

The General Decree of 01. March 1993 requires classified installations to (self)monitor emissions of List I and II substances on a daily basis when discharged quantities exceed certain limits. Classified installations mainly comprise industrial installations.

SATESE executes the monitoring of discharges mainly originating from municipal waste water treatment plants.

b. Surface water monitoring

The General Decree of 01. March 1993 also stipulates discharge rates of COD, hydrocarbons and heavy metals beyond which classified installations must monitor the quality of the receiving watercourses.

In general, the quality of the aquatic environment is monitored by the DIREN and the 6 Water Agencies.

At national level results are centralised by the Ministry of Environment; at regional level monitoring data is centralised and published by the DIREN and the 6 Water Agencies.

GERMANY

(sources: EC002, EC003, EC012, D109, D110, GEN018)

1 Organization

The federal government passes framework acts which contain the basic provisions on water management measures. Implementation of the water legislation is the responsibility of the "Länder" and the municipal authorities which both implement the permitting procedures and grant permits.

Specific provisions such as discharge standards are provided by the Administrative Framework Ordinance (Rahmen-Abwasserverwaltungsvorschrift). The Länder are required to incorporate these requirements and are entitled to be more stringent if necessary. The ordinance covers direct discharges into surface waters.

The Ministry of Environment, Nature Conservation and Reactor Safety (Bundesministerium für Umweltschutz, Naturschutz und Reaktorsicherheit) and other ministries are responsible for the preparation of legislation rather than the implementation.
The implementation of the legislation is the responsibility of the "Länder". Generally there are three levels of authority involved in surface water management:

- The competent "Länder" ministry, p.e. in Rheinland-Pfalz the Ministry of Environment (Ministerium für Umwelt).

- Regional authorities, generally responsible for permitting and monitoring.

- Local authorities, generally responsible for permitting and monitoring.

2 Framework legislation

The Federal Water Management Law (Gesetz zur Ordnung des Wasserhaushalts, WHG) of 23 September 1986 represents the legislative framework for the control of hazardous discharges. Most of its general provisions are interdependent with Länder legislation.

All the Länder have implemented federal water legislation by establishing their own water statutes.

3 Transposition

Directive 76/464/EEC and its daughter Directives have been transposed into German law by the following legislation:

- Federal Water Management Law (Gesetz zur Ordnung des Wasserhaushalts - WHG) of 23-9-1986 (amended 27-6-1994);
- Ordinance on Waste Water origins (Abwasserherkunftsverordnung - AbwHerkV) of 3-7-1987 (amended 27-5 1991);
- General Administrative Rules on Water Polluting Substances (Katalog Wassergefährdender Stoffe) of 9-3-1990;
- General Administrative Ordinance on Minimal Requirements relating to Waste Water Discharges (Rahmen-Abwasser Verwaltungsvorschrift - Rahmen Abwasser VwV) of 29-10-1992;
- Waste Water Charge Act (Abwasserabgabengesetz - AbwAG) of 6-11-1990 (amended 5-7-1994).

An more detailed overview of the transposition of Directive 76/464/EEC and its daughters is given in table 1.

Table 1

EC-Directive	national transposition (acts/administrative orders)
- 76/464/EEC	- WHG (updated version of 1976 / source: D110); WHG (updated version of 1986 / source: EC003);
- 82/176/EEC	- Zweiundvierzigste Allgemeine Verwaltungsvorschrift über Mindestanforderungen an das Einleiten von Abwasser in Gewässer (Alkalichlorid nach dem Amalgamverfahren; 05-09-1984);
- 83/513/EEC	- Achtundvierzigste Allgemeine Verwaltungsvorschrift über Mindestanforderungen an das Einleiten von Abwasser in Gewässer (Verwendung bestimmter gefährlicher Stoffe))[1];
- 84/156/EEC	- Anhang 22 der Rahmen-VwV (Mischabwasser))[2];
- 84/491/EEC	- Achtundvierzigste Allgemeine Verwaltungsvorschrift über Mindestanforderungen an das Einleiten von Abwasser in Gewässer (Verwendung bestimmter gefährliger Stoffe))[1];
- 86/280/EEC	- Achtundvierzigste Allgemeine Verwaltungsvorschrift über Mindestanforderungen an das Einleiten von Abwasser in Gewässer (Verwendung bestimmter gefährliger Stoffe))[1]; - Anhang 22 der Rahmen-VwV (Mischabwasser))[2];
- 88/347/EEC	- Achtundvierzigste Allgemeine Verwaltungsvorschrift über Mindestanforderungen an das Einleiten von Abwasser in Gewässer (Verwendung bestimmter gefährliger Stoffe))[1]; - Anhang 22 der Rahmen-VwV (Mischabwasser))[2];
- 90/415/EEC	- AchtundvierzigsteAllgemeineVerwaltungsvorschriftüberMindestanforderungen an das Einleiten von Abwasser in Gewässer (Verwendung bestimmter gefährliger Stoffe))[1]; - Anhang 22 der Rahmen-VwV (Mischabwasser))[2];

)[1] transposition in the period 09-01-89 untill 04-03-1992
)[2] transposition date: 27-08-1991

These pieces of legislation are "Verwaltungsvorschriften des Bundes" (administration regulations at federal level). There are also administrative regulations at "Länder-level" which implement parts of the Directives. The Bundesrat has in March 1995 decided about an amendment of the WHG. This amendment should give the federal government the legal basis to implement EC-directives by ordinances instead of administrative regulations. The Bundesstag has now to decide about the amendment that is forced by a decision of the European court. The Länders will amend their legislation in the same way.

Difficulties arise in translating EC Directives into national law both because of the federal structure of Germany in which enforcement of water laws is the responsibility of the Länder and because of different interpretations of the requirements set in the EC Directives. The principal difference between the German approach of controlling hazardous discharges and that in Directive 76/464/EEC is that German legislation is applied to industrial sectors rather than individual substances. In federal "Verwaltungsvorschriften" a Best Available Technology (BAT) is defined for about 60 industrial sectors. Among these there are sectors discharging hazardous substances (such as heavy metals and AOX substances) to surface waters. German legislation is based on emission limits rather than quality objectives.

In the absence of environmental quality criteria, the Federal Government and the Federal States reached agreement in 1993 on a "Concept for the derivation of quality guide values for the protection of inland surface waters against pollution". Based on current scientific knowledge it lays down, on a trial basis, separate, legally non-binding quality objectives (quality guide values) for various water uses meriting protection (e.g. aquatic communities, drinking water supply, professional and sports fishing). Quality guide values are also given for suspended particulate matter and sediments, to ensure that a hazard to the respective uses worthy of protection need not be feared.

The quality guide values set are concentration values for hazardous substances in the water compartment which should not be exceeded, if at all possible (orientation values rather than normative limit values). In using the quality guide values, the enforcement authorities are free to decide in each case which uses worthy of protection to take into account, whether to set intermediate values and, if so, what time targets to allocate to the various intermediate values. Initially, compliance with the quality guide values will be monitored on the basis of water quality data. A second step envisaged is to search for the causes of pollution in cases where water pollution exceeds the quality guide values.

On that basis, sources of pollution and the effectiveness of cleanup measures can be better determined, and measures designed to reduce water pollution, e.g. drawing up of effective cleanup programmes can be proposed. The concept (which follows the environmental pollution control ('immission') approach) therefore constitutes an ideal complement to the well-tried emission approach (reduction or prevention of pollutant inputs at source).

In addition to improving the quality of water, the water system as a whole, including banks and their respective environment must be so conserved or reshaped that a sound species variety can develop in an ecological system. This must be as close to nature as possible.

The limit values of the Directives are "Anforderungen" in German legislation. In these "Anforderungen" the limit values are implemented as loads and/or concentrations. The EC-limit values correspond with the "Anforderungen" according to best available technology set in the "Verwaltungsvorschriften". In many cases, the German "Verwaltungsvorschriften" contain just loads, although the Directives contain loads as well as concentrations (source: D110, EURECO, pag. 74).

In the Chemicals Act, there is a possibility to forbid or to decrease the production, the application or putting on the market of certain hazardous substances with reference to human and environmental conditions.

Germany has a ministerial decree to control the application of PCB and PCB-substitutes. By 1999, the application of PCB and its hazardous substitutes must be put to an end by applying a step by step programme, and the substances have to be destroyed in an environmentally correct way.

German legislation does not distinguish between List I and II substances. It is sector-specific. Hazardous discharges must be treated according to the "state of art" and less hazardous discharges must comply with the less stringent "generally acknowledged rules of technology".

4 Permitting and enforcement

The requirements for the discharge of waste water into surface waters are defined in the WHG. In principle, every discharge of water and every waste water treatment installation requires a permit from the competent authority.

The implementation of water resources management regulations is exclusively a matter of the Federal States and the municipalities. The water management administrations of the Federal States are predominantly integrated in the respective general Federal State administrations; in the new states, partly special environmental administrations have been introduced.

In most Federal States, water resources management is carried out on three levels just as general administration . However, the assignment of tasks differs from state to state:

<u>Supreme authority:</u>
(Ministry with a water resources department; predominantly ministry for the environment).
Functions: water management control and superior administrative procedures.

<u>Intermediate-level authority:</u>
District government, offices of the presidents of the governments, Federal State authorities.
Functions: regional water resources management planning, important procedures under the water acts, administrative procedures.

<u>Lower Authority:</u>
Lower water authorities (districts or towns not belonging to a country) as well as technical authorities (e.g. water resources authorities).
Functions: procedures under the water acts as well as technical advice, monitoring of waters and waste water discharges.

An exception are some smaller states which have a two-level administration (i.e. no intermediate-level authority) as well as city states with only one level of water resources management.

For the comprehensive technical functions of water resources management, most Federal States dispose, apart from water resources authorities, of central state authorities having different designations (Federal State authorities of environmental protection, for water resources management, for water waste etc.). The technical function of these Federal State authorities in the sectors water science, water resources management planning, official technical advice, preparation of technical guidelines, and education and training, differ from state to state. The said authorities are responsible to the supreme authorities. Partly the Federal State authorities are also in charge of enforcement functions (e.g. flood warning services, monitoring of waters and discharges, waste water charges).

For the purposes of coordinating common problems and handling legislative instruments under the water acts, the supreme Federal State authorities working in the field of water resources management have pooled together to form the Joint Water Commission of the Federal States (LAWA).

Waste waster containing hazardous (groups of) substances must meet the discharge standards laid down in accordance with the state of technology (Stand der Technik; also referred to as Best Available Technology)

As far as permit granting is concerned, the competent authority can restrict the period of validity of a permit. (source: D110, EURECO 2.1.4). A four yearly evaluation of the permit is neither set in the national legislation nor is it a permit condition. Competent authorities however, have the right to evaluate and to revise permits at any time (source: D110, EURECO pg. 77, 2.1.4).

Enforcing compliance of terms as set in permits is in particular a responsibility of the Länder and the lower environmental administrations.

5 Monitoring

a. Waste water monitoring

In principle, the enforcement by the competent authority is regulated in the water statutes of the Länder. Supplementary to this kind of enforcement on these statutes (water acts, ordinances, administrative regulations) a system of so-called self-enforcement by the discharges is also regulated. This system includes the control of the quality of the waste water by the discharger himself.

In the WHG, it is determined that users of water who are permitted to discharge more than 750 m^3 of waste water on one day shall appoint one or more water pollution control officers. In case the waste water discharge does not exceed 750 m^3/day, the competent authority may direct the discharger to appoint pollution control officers.

Analysis methods are specified in the Administrative Framework Ordinance (Rahmen-Abwasser Verwaltungsvorschrift) and in the individual plant operation permits (self-monitoring).

The national authorities draw up inventories for the EC as part of their general reporting duties. These inventories are compiled by the Länder authorities.

b. Surface water monitoring

Surface waters in Germany are subject to regular monitoring. Water quality monitoring is to safeguard natural waters as ecological systems, and also for their many diverse uses. Water quality monitoring goals include:

- documenting the long-term developments and present state of water pollution,
- assessing the impacts of anthropogenic substances on aquatic ecosystems,
- preventing potential danger to human health (especially by early recording of short-term changes)
- showing the effectiveness of water protection measures (limitation of emissions) and the needs for further action by means of water quality (immission) values.

As written in section 4, surface water monitoring is also a matter of the Federal States. According to the three levels of administration, different agencies realize surface water monitoring on the basis of state water laws and supplementary regulations. Generally the agency at the highest administration levels is responsible for data collection and reporting. Data reports to the EC are coordinates by the LAWA and/or the Federal Environmental Agency.

GREECE

(sources: EC002, EC003, EC012, EC014, GR902)

1 Organization

At central level, waste water discharges are (primarily) the responsibility of both the Ministry of Environment and the Ministry of Health. However, day to day control lies with the prefectural authorities.
The role of the prefectures is very important as far as discharge permitting is concerned. In the case of major or Class A installations the central ministries will also be involved in reviewing the permit. Compliance with waste water permits is supervised by the Ministry of Health.

2 Framework legislation

The permitting of industrial installations and hence of their discharges is controlled under the terms of the Basic Law on the Environment N 1650 of 1986.

3 Transposition

The process of transposition is essentially complete, but full-scale implementation of the Directives and their requirements is still in progress.
Transposition of the Directives have been carried out by following legislative instruments:

- Presidential Decree No 1180 of 1981
- Health Decree Elb-221-1965; remains in force until full implementation of Law No 1650 of 1986 (below)
- Act on the Protection of the Environment No 1650 of 1986
- Ministerial Decision No 144 of 1987
- Ministerial Decision No 18186/271 of 1988

An overview of the transposition of Directive 76/464/EEC and its daughters is given in table 1.

Table 1

EC-Directive	national transposition (acts/administrative orders/decrees)
- 76/464/EEC	Health Decree Elb-221-1965, and Act on the Protection of the Environment No 1650 of 1986
- 82/176/EEC	Ministerial decree no. 144 of 1987
- 83/513/EEC	Ministerial decree no. 144 of 1987
- 84/156/EEC	Ministerial decree no. 144 of 1987
- 84/491/EEC	Ministerial decree no. 144 of 1987
- 86/280/EEC	
- 88/347/EEC	
- 90/415/EEC	

4 Permitting and enforcement

The permitting of industrial installations and hence of their discharges is controlled under the terms of the Basic Law on the Environment of 1986. Standards to be used in permits are drawn up by the Ministry of Health, advised by the Ministry of Environment. These standards reflect the limit values and quality objectives of the Directives. Permits tend to be renewed every 3 - 5 years and are changed when standards or processes change.

Enforcement of the terms and standards set in the permits is mainly the responsibility of the Ministry of Health and the Prefectures (source: GR902).

5. Monitoring

a. Waste water monitoring

Most discharges are subject to self-monitoring by operators. Otherwise monitoring tends to be on the basis of complaints or incidents.

Environmental Resources Management (sources: EC002 and EC003) reports that the official reporting of monitoring or discharge surveys does not appear to be well developed in Greece at the present.

b. Surface water monitoring

Sources EC002 and EC003 report that no specific programmes on the monitoring of List I and II substances in Greece exist. Source GR902 however, reports that the Water Department of the Ministry of the Environment has planned the start of a surface water monitoring program for toxic substances of both List I and List II substances of Directive 76/464/EEC.

IRELAND

(sources: EC002, EC003, IRL603, IRL604, IRL605, IRL606, IRL607, IRL613)

1 Organization

The development and implementation of policy and legislation related to the protection of the aquatic environment is the responsibility of the Department of the Environment. This department is responsible for the implementation of Directive 76/464 and its daughter Directives. Specific aspects of the Directives are implemented by the following:

- The Environmental Protection Agency (EPA);

- The 33 local authorities are responsible for licensing discharges of trade and sewage effluent, and for monitoring of compliance with discharge conditions;

- The 87 sanitary authorities are responsible for licensing discharges to sewer and for monitoring of compliance with discharge conditions.

2 Framework legislation

The framework legislation for water pollution control is the Local Government (Water Pollution) Act of 1977, the Local Government (Water Pollution) (Amendment) Act of 1990 and the Environmental Protection Agency Act of 1992.

3 Transposition

Acts relevant to the transposition of the Directives are
- Local Government (water Pollution) Act, 1977 (Control of Cadmium Discharges) Regulations 1985
- Local Government (Water Pollution) Act, 1977 (Control of HCH and Mercury Discharges) Regulations, 1986
- Local Government (Water Pollution) Act, 1977 and 1990 (control of Aldrin, Dieldrin, Endrin, Isodrin, HCB, HCBD and $CHCL_3$ Discharges) Regulations
- Local Government (Water Pollution) Act, 1977 and 1990 (control of Carbon Tetrachloride, DDT and Pentachlorophenol Discharges) Regulations, 1994

An overview of the transposition of Directive 76/464/EEC and its daughters is given in table 1.

Table 1

EC-Directive	national transposition (acts/administrative orders/decrees)
- 76/464/EEC	Local Government (Water Pollution) Acts, 1977 and 1990
- 82/176/EEC	Local Government (Water Pollution) Act, 1977 (Control of HCH and Mercury Discharges) Regulations; Statutory instrument no. 55 of 1986; Ministerial Monitoring Directions;
- 83/513/EEC	Local Government (Water Pollution) Act, 1977 (Control of Cadmium Discharges) Regulations; Statutory instrument no. 294 of 1985; Ministerial Monitoring Directions;
- 84/156/EEC	Local Government (Water Pollution) Act, 1977 (Control of HCH and Mercury Discharges) Regulations; Statutory instrument no. 55 of 1986; Ministerial Monitoring Directions;
- 84/491/EEC	Local Government (Water Pollution) Act, 1977 (Control of HCH and Mercury Discharges) Regulations; Statutory instrument no. 55 of 1986; Ministerial Monitoring Directions;
- 86/280/EEC	Local Government (Water Pollution) Act, 1977 and 1990 (Control of Carbon Tetrachloride, DDT and Pentachlorophenol Discharges) Regulations; Statutory instrument no. 43 of 1994; Ministerial Monitoring Directions;
- 88/347/EEC	Local Government (Water Pollution) Act, 1977 and 1990 (Control of Aldrin, Dieldrin, Endrin, Isodrin, HCB, HCBD and $CHCL_3$ Discharges) Regulations; Statutory instrument no. 348 of 1993; Ministerial Monitoring Directions;
- 90/415/EEC	Local Government (Water Pollution) Acts, 1977 and 1990 (Control of EDC, TRI, PER and TCB discharges) Regulations; Statutory instrument no. 245 of 1994; Ministerial Monitoring Directions.

4 Permitting and enforcement

The entry of polluting matter into surface waters is prohibited and the discharge of trade or sewage effluent to waters and the discharge of trade effluent to sewer must be licensed. Licenses are issued by the local authority.
Licenses are reviewable at least every 3 years but may be reviewed earlier.

A distinction between scheduled and non-scheduled industries has to be made. The Environmental Protection Agency (EPA) licenses the discharges of all scheduled industries (these are the potentially more polluting industries) both to surface waters and to the sewerage. Discharges of non-scheduled industries are licensed by regional and local authorities. The county councils license the non-scheduled industrial discharges to surface waters whereas the municipal authorities license the non-scheduled industrial discharges to sewerage.

Statutory emission standards are imposed as conditions in licenses for List I substances whereas quality objectives are used as a basis for setting limits as conditions of licenses for List II substances.

Compliance checking with regard to discharge licenses is undertaken by local authorities.

5 Monitoring

a. Waste water monitoring
Monitoring of discharges is carried out by the operator (based on terms in the discharge permit).

In addition, local authorities exercise compliance checking by spot check discharge monitoring.

b. Surface water monitoring
Monitoring of surface waters is conducted by EPA and local authorities. Quality control and data reporting is coordinated by the EPA.

ITALY

(sources: EC002, EC003)

1 Organization

One of the major concerns of the national authorities in implementing directive 76/464/EEC and it daughters was the need to overhaul the existing administrative system. The responsibilities of all tiers of government in Italy are currently in a state of flux. In general there is a move towards devolving authority to lower tiers of government.
The national authorities are responsible for policy development on the control of industrial discharges, overseeing the implementation of the decree, developing technical standards for sampling of discharges and receiving waters. They are also responsible for setting limit values for List I and II substances.
The regional authorities are responsible for the production of water quality plans and for data collecting relating to discharges and water quality within their regions.
The provincial authorities retain overall competence for the administration of the authorization and inspection system. In practice these activities are normally carried out by the municipal authorities (especially in case of discharges into the municipal sewer) and the local health authority respectively.

2 Framework legislation

Law no 319 of 1976 is the Italian framework legislation.

3 Transposition

Legislative Decree No 133 of 27 January 1992 transposed Directive 76/464 and its daughters into national law with the exception of Directive 86/280 which the authorities regard as being adopted within the existing framework legislation. This decree represents an attempt to resolve a number of problems on transposition of the Directives.

List II substances are still subject to the old limit values of the national legislation but discharges will have to respect List I values once the water quality plans have been introduced.

An overview of the transposition of Directive 76/464/EEC and its daughters is given in table 1.

Table 1

EC-Directive	national transposition (acts/administrative orders/decrees)
- 76/464/EEC	Legislative Decree No 133 of 27-01-1992
- 82/176/EEC	Legislative Decree No 133 of 27-01-1992
- 83/513/EEC	Legislative Decree No 133 of 27-01-1992
- 84/156/EEC	Legislative Decree No 133 of 27-01-1992
- 84/491/EEC	Legislative Decree No 133 of 27-01-1992
- 86/280/EEC	Law no 319 of 1976
- 88/347/EEC	Legislative Decree No 133 of 27-01-1992
- 90/415/EEC	Legislative Decree No 133 of 27-01-1992

4 Permitting and enforcement

Provincial and municipal authorities are the main agents involved in permitting. All permits are granted for four years with the request for renewal being presented one year before expiry of an existing permit. In the case of discharges containing List II, but not List I substances the duration of the permit is decided on the basis of regional water quality programmes.

Enforcement of the terms and standards set in the permits is carried out by the competent authority

5 Monitoring

a. Waste water monitoring
The frequency of monitoring and analysis to be carried out is fixed in the discharge permit and both activities are the responsibility of the operator.

b. Surface water monitoring
The monitoring to be carried out under the terms of decree 133 should produce useful data for both List I and II substances. Environmental Resources Management (sources: EC002, EC003) reports that at present no specific programmes of monitoring of discharges exist at a national level.

At present reporting and data availability varies widely between regions, premises and local health authorities. The investigation of pollution is largely based on complaints.

LUXEMBOURG

(sources: EC002, EC003)

1 Organization

The Ministry of Environment (Administration de l'Environnement) is competent for regulatory aspects and discharge permits, whereas its administration is in charge of monitoring industrial waste water and water quality.

2 Framework legislation

In 1971 a framework regulation was adopted for the transposition of EC Directives concerning e.g. agriculture. By extension this law has also been used for transposing EC Directives related to the environment but will be completed shortly by a framework law for the transposition of environmental Directives.

3 Transposition

Regulations adopting and implementing Directive 76/464 and its daughter Directives are:

Table 1

EC-Directive	national transposition (acts/Grand-Ducel regulations)
- 76/464/EEC	Transposed via above mentioned Framework legislation
- 82/176/EEC	Grand-Ducal Regulation of 17-04-1986
- 83/513/EEC	Grand-Ducal Regulation of 17-04-1986
- 84/156/EEC	Grand-Ducal Regulation of 17-04-1986
- 84/491/EEC	Grand-Ducal Regulation of 17-04-1986
- 86/280/EEC	Grand-Ducal Regulation of 07-09-1987
- 88/347/EEC	Grand-Ducal Regulation of 30-06-1989
- 90/415/EEC	Grand-Ducal Regulation of 14-04-1992

In most cases the Directives have been transposed as such. List II substances have generally not been addressed by regulation.

4 Permitting and enforcement

A permit is always required for the discharge of industrial waste water. Permits delivered before 1990 are valid for a period of 30 years. The validity of new permits is not limited but they can be revised at any time by the authorities. New permits refer to discharge limits included in the regulation, except for certain substances.

Enforcement of the terms and standards set in the permits is carried out by the competent authority.

5 Monitoring

a. Waste water monitoring

The administration conducts an average of four to six checks per company per year down to three checks for industries with minor discharges.
The administration centralises monitoring data for industrial discharges.

Measurements are also conducted by industries themselves, but the results collected have no legal status. The authorities are trying to define legal conditions that will apply to self-assessment.

b. Surface water monitoring

The Water Department of the Ministry of the Environment is responsible for the monitoring of surface and ground waters.

The quality of surface waters is assessed indirectly by measuring the concentration of heavy metals in algae after immersion in watercourses for a certain period of time.

The administration centralises monitoring data for surface water quality.

NETHERLANDS

(sources: EC002, EC003, EC012, D110, GEN018, NL535, NL538, NL539, NL540, NL541)

1 Organization

The Ministry of Transport, Public Works and Water Management (Ministerie van Verkeer en Waterstaat) is the competent authority for waste water discharge permitting in the case of discharges into state managed waters (in general the major surface waters having an interregional importance). The (twelve) provinces are the competent authority for the non-state managed waters (waters having more a regional importance). In practice, however, most provinces (the exceptions being Utrecht and Groningen), delegated their authority to (± thirty) local water boards ("Waterschappen").

There is a "National Policy Document on Water Management" presenting an integrated approach to water management, including aspects such as:

- pollution reduction
- hydraulic design
- use
- institutional arrangement
- international waters

The National Policy Document contains a list of environmental quality objectives, including most of the 76/464/EEC List I substances.
The provinces are required to make their own policy plans both to meet the targets specified in the National Policy Document and aspects which are of provincial interest. Orders in council specify some elements that must be included in provincial plans. These include requirements of EC Directives. The final level of planning is at water board level. The water boards are responsible for drawing up concrete management plans to implement the provincial plans.

2 Framework legislation

Regulation of (point source) discharges in the Netherlands is primarily based on the Pollution of Surface Waters Act (Wet verontreiniging oppervlaktewateren, Wvo; adopted in 1969; last revision 1994). The Wvo is a framework act.

3 Transposition

Directive 76/464/EEC and its daughter Directives have fully been transposed into Dutch legislation (via ministerial decrees under the Wvo); table 1 gives an overview of the transposition:

Table 1

EC-Directive	national transposition (acts/ministerial decrees)
- 76/464/EEC	Wvo
- 82/176/EEC	Ministerial Decree of 16-06-1983 for Mercury
- 83/513/EEC	Ministerial Decree of 02-08-1985 for Cadmium
- 84/156/EEC	Ministerial Decree of 25-04-1986 for Mercury
- 84/491/EEC	Ministerial Decree of 25-08-1986 for HCH
- 86/280/EEC	Ministerial Decree of 15-04-1992 for Carbon tetrachloride
	Ministerial Decree of 15-04-1992 for DDT
	Ministerial Decree of 15-04-1992 for PCP
- 88/347/EEC	Ministerial Decree of 15-04-1992 for HCBD
	Ministerial Decree of 15-04-1992 for DRINS
	Ministerial Decree of 15-04-1992 for HCB
	Ministerial Decree of 15-04-1992 for Chloroform
- 90/415/EEC	Ministerial Decree of 03-01-1992 for EDC
	Ministerial Decree of 03-01-1992 for TRI
	Ministerial Decree of 03-01-1992 for PER

In the Netherlands List I substances, candidate List I substances and some List II substances are dealt with by means of limit values. In the case of some List II substances a quality objectives approach is pursued.

4 Permitting and enforcement

Discharge permits may contain technical terms which the operator is required to meet. These conditions are based on best technical means (List I and List I candidate substances) and best practicable means (most of the List II substances), and on legal standards. The entity of best technical means and best practicable means are referred to as Best Available Technology.

Enforcement of the terms and standards set in the permits is carried out by the competent authority (the Ministry of Transport, Public Works and Water Management for the state managed waters and the provinces and local water boards for the non-state managed waters).

5 Monitoring

a. Waste water monitoring
Monitoring of discharges is carried out by the discharger (a self monitoring obligation laid down in articles in the discharge permits) and (with a lower frequency) by the competent authorities as a reflection of their water management task (including enforcement).
Water monitoring data are applied for regular national (and international) reporting on discharges.

b. Surface water monitoring
Surface water monitoring of the state managed waters is carried out and reported by RIZA (inland waters including part of the brackish waters) and RIKZ for remaining brackish waters and the (North) Sea). RIZA and RIKZ are technical institutes of the directorate "Rijkswaterstaat" of the Ministry of Transport, Public Works and Water Management. Non state managed waters are monitored by the provinces and local water boards. RIZA is responsible for reporting monitoring data (of both state and non-state managed waters) to the European Commission.

In this context it is worth while mentioning that water production companies are also monitoring surface waters (even in international cooperation frame works). The results are also periodically reported.

PORTUGAL

(sources EC002, EC003, EC012, P1204)

1 Organization

At central level, the Ministry of Environment and Natural Resources (Ministériodo Ambiente e Recursos Naturais, MARN) is the competent authority for water policy and water management in Portugal. The Directorate of the Environment of this Ministry (Direccao-Geral do Ambiente, DGA) is responsible for developing policies, legislations and programmes at national level.
Within the MARN, the Water Institute (Instituto da Agua) has the overall responsibility for water management but the Regional Directorates of the Environment and Natural Resources (Direccoes Regionais do Ambiente e Recursos Naturais, DRARN) are the executive and operational bodies. The Directorate of the Environment's role derives from its responsibilities concerning environmental policy (not just water), implementation and enforcement.

2 Framework legislation

The Environmental Law of 1987 (Lei de Bases do Ambiente) is a framework legislation demanding and permitting specific legislation and regulations. Regarding water management specific legislation on some important aspects has been published. The more important are:

- Decree-law 74/90, March 7 - Water quality standards are generic waste water discharge standards.
- Decree-law 45/94, February 22 - Planning of water resources management.
- Decree-law 46/94, February 22 - Permitting system for uses of water public domain.
- Decree-law 47/94, February 22 - Economical and financial regime of the use of water public domain.

3 Transposition

Environmental Resources Management (ERM) reports that the transposition of Directive 76/464/EEC and its daughters Directives into national legislation is essentially complete. It has been carried out by legislative Decree No 74 of 1990.

An overview of the transposition of Directive 76/464/EEC is given in table 1.

Table 1

EC-Directive	national transposition (acts/administrative orders/decrees)
- 76/464/EEC	Decree-law 74/90 of 07-03-1990
- 82/176/EEC	Regulation 1033/93 of 15-10-1993
- 83/513/EEC	Decree-law 74/90 of 07-03-1990 Regulation 1030/90 of 14-10-1990
- 84/156/EEC	Decree-law 74/90 of 07-03-1990
- 84/491/EEC	Decree-law 74/90 of 07-03-1990
- 86/280/EEC	Decree-law 74/90 of 07-03-1990
- 88/347/EEC	Decree-law 74/90 of 07-03-1990
- 90/415/EEC	Regulation 895/94 of 03-10-1994

4 Permitting and enforcement

Permitting and enforcement is carried out under the provisions of Decree-law 46/94 of 22 February, of Decree-law 74/90 of 7 March and of regulations concerning specific activities. The competent authorities are the Regional Directorates for Environment and natural Resources (there are 5 such Directorates). The Water Institute has a coordinating role, establishing criteria and issuing guidelines to guarantee an harmonized approach and the directorate of the Environment has a decisive role in the permitting where large and highly polluting industries or large urban waste water treatment plants are concerned.
Permits for waste water discharges may be granted for 10 years and the terms and the standards laid down in the permit may be altered under "good reason" or may be renewed.

Enforcement of the terms and standards set in the discharge permits is carried out primarily by the competent authority for the permitting, but the Directorate of the Environment may also carry out enforcement actions (and participate in the permitting) whenever it is considered necessary on a policy basis. enforcement actions should be carried out regarding each discharge, every six months.

5 Monitoring

a. Waste water monitoring
Self-monitoring of discharges is common. Dischargers (industries or municipalities) are required to collect and analyze samples of their effluents according to what is set out in the permit. It may be required that results of this self-monitoring activities are periodically sent to the permitting competent authority.
The data regarding discharge monitoring gathered either by the authorities or by the discharger are not widely reported at present.

b. Surface water monitoring
Monitoring of surface water quality is carried out at both national and regional level. A nationwide Water Quality Network is coordinated by the Water Institute with the participation (sampling and analysis) of the Regional Directorates and DGA. The results of such monitoring have been published. All the concerned authorities carry out surface and groundwater quality studies (monitoring or other types of studies) which may or may not be published. The objectives of the Water Quality Network are to collect data to assess water quality on a national basis to provide support to decision-making regarding planning and water management. In addition, monitoring of water with specific uses is carried out to comply with EU legislation. Since 1993 monthly publication of data (and its assessment) from selected sampling stations of the Water Quality Network is being done by the Water Institute in connection with the Regional Directorates and the DGA.

SPAIN

(sources: EC002, EC003, EC012, E1104, E1105, E1107)

1 Organization

The administrative hierarchy in Spain consists of a central government, regional authorities (Comunidas Autónomas), provinces and municipalities. Surface water quality management is the responsibility of the central government (Ministry of Public Works, Transport and Environment; Ministerio de Obras Públicas, Transportes y Medio Ambiente) except in the case of water basins which fall entirely within one administrative region. In that case water quality is controlled by the regional environmental agencies.
Besides this administrative structure Spain is split up in 10 continental regions based on hydrographical principals. The Canary Islands are considered separately. Each of these river basins have a Drainage Basin Authority (Organismo de Cuenca hidrográfica) which reports to the Directorate General for Water Quality (Direccion General de Calidad de las Aquas of Ministry of Public Works, Transport and Environment) but has considerable independence as far as day to day planning and management are concerned.

2 Framework legislation

Regulation of the water management in Spain is primarily based on the Water Act of 1985; Ley de Aguas 1985.

3. Transposition

ERM (EC002, EC003) reports that the transposition of Directive 76/464 and its daughter Directives into Spanish legislation is essentially complete. The relevant items of legislations are:

- Royal Decree No 849 of 1986 (Articles 245 to 274)
- Order of 12-11-1987
- Order of 28-6-1991

Implementation of the legislation is still in progress with major programmes of work still being developed or being carried out.

An overview of the transposition of Directive 76/464/EEC and its daughters is given in table 1.

Table 1

EC-Directive	national transposition (acts/administrative orders/decrees)
- 76/464/EEC	Royal Decree 849 of 11-04-1986
- 82/176/EEC	Ministerial order of 12-11-1987
- 83/513/EEC	Ministerial order of 12-11-1987
- 84/156/EEC	Ministerial order of 12-11-1987
- 84/491/EEC	Ministerial order of 12-11-1987
- 86/280/EEC	Ministerial order of 12-11-1987
- 88/347/EEC	Ministerial orders of 31-06-1989 (discharges from land into the sea) and 13-03-1989
- 90/415/EEC	Ministerial orders of 28-10-1992 (discharges from land into the sea) and 28-06-1991

4 Permitting and enforcement

Permitting is the responsibility of the 10 Drainage Basin Agencies. Discharge permits are normally valid for 4 to 5 years unless there is a significant variation in either the process being operated or characteristics of the discharge.
Permits for discharges to the sewer system are issued by municipalities.
Enforcement of the terms and standards set in the permits is carried out by the Drainage Basin Agencies.

5 Monitoring

a. Waste water monitoring

Monitoring of discharges is carried out by the discharger (a self monitoring obligation laid down in articles in the discharge permits) and by or on behalf of the Drainage Basin Agencies.
Water monitoring data are applied on an ad hoc basis for national (and international) reporting on discharges. At this moment Spain is preparing a national data system on discharges of List I substances, containing potential dischargers of List I substances; in the near future it is expected to include actual discharges of these substances in a systematic way.

b. Surface water monitoring

Surface water quality monitoring in Spain is controlled by the Ministry of Public Works, Transport and Environment through the water basin authorities. Monitoring is carried out for List I substances. There is a national monitoring network which has been operating for ten years. Monitoring data used to be published annually (until 1991). All data however, are put in a water quality data system, from which these data can easily be obtained.

UNITED KINGDOM

(sources: EC002, EC003, EC012, D110, UK800, UK803, UK806, UK808, NL536)

Although practical arrangement for the control of discharges of dangerous substances to water are similar in all parts of the United Kingdom, there are differences in legislation and organisations responsible for the control. This water management profile for the United Kingdom focuses on England and Wales. Key differences are indicated regarding Scotland and Northern Ireland.

1 Organization

Overall responsibility for protection of the aquatic environment from discharges of dangerous substances lies with the Department of Environment. Regulatory functions in England and Wales including the issuing of authorizations and consents, and compliance checking are undertaken by the following:

- Non-IPC discharge to water - National Rivers Authority (NRA)
- IPC discharge to water and sewer - Her Majesty's Inspectorate of pollution (HMIP)
- Non-IPC discharge to sewer - water companies and HMIP

In Scotland, the Water Purification Boards carry out equivalent functions to the NRA, and IPC regulation is the responsability of Her Majesty's Industrial Pollution Inspectorate (HMIPI). Discharge to sewers is controlled by local authorities. In Northern Ireland, discharge to water and sewer is controlled by the Department of the Environment for Northern Ireland.

2 Framework legislation

The framework legislation for the control of water pollution is as follows:

- Discharges to water:	Water Resources Act 1991
- Discharges to sewer:	Water Industry Act 1991
- Discharges to sewer and water from processes subject to Integrated Pollution Control (IPC):	Environmental Protection Act 1990

In Scotland, the frame work legislation controlling water pollution by dangerous substances is the Control of Pollution Act 1974. In Northern Ireland, discharges are controled under The Water Act (Northern Ireland) 1972. Integrated Pollution Control under the Environment Protection Act 1990 applies in Scotland but has yet to be introduced in Northern Ireland (source: EC003).

3 Transposition

The framework acts are implemented in relation to discharges of substances listed in the relevant Directives by a number of regulations:

- Surface Waters (Dangerous Substances) (Classification) Regulations 1989 SI 1989/286 - discharges to water
- Surface Waters (Dangerous Substances) (Classification) Regulations 1992 SI 1992/337 - discharges to water
- Trade Effluents (Prescribed Processes and Substances) Regulations 1989 SI 1989/1156 - discharges to sewer
- Trade Effluents (Prescribed Processes and Substances) Regulations 1992 SI 1992/339 - discharges to sewer
- Environmental Protection (Prescribed Processes and Substances) Regulations 1991 SI 1991/472 - IPC processes and substances
- Environmental Protection (Prescribed Processes and Substances) (Amendment) Regulations 1992 SI 1992/614 - IPC processes and substances.

An overview of the transposition of Directive 76/464/EEC and its daughters is given in table 1.

Table 1

EC-Directive	national transposition (acts/administrative orders/decrees)
- 76/464/EEC	Circular 18/85 and circular 7/89
- 82/176/EEC	S.I. 89/2286
- 83/513/EEC	S.I. 89/2286
- 84/156/EEC	S.I. 89/2286
- 84/491/EEC	S.I. 89/2286
- 86/280/EEC	S.I. 89/2286
- 88/347/EEC	S.I. 89/2286
- 90/415/EEC	S.I. 1992/337

4 Permitting and enforcement

The discharge of dangerous substances into surface waters is prohibited except when in accordance with a consent. Conditions may be attached to consents for discharge to water and sewer under the Environmental Protection Act 1990 (IPC processes) regarding inter alia Best Available Techniques Not Entailing Excessive Costs (BATNEEC) and the Best Practical Environmental Option (BPEO) in case of release to more than one environmental medium.

Limits set in consents and authorizations for the discharge of List I substances are established on the basis of water quality objectives. The consents and authorizations are valid indefinitely but are reviewed every 2 to 4 years, depending on the responsible authority.

Enforcement of the terms and standards set in the permits is carried out by the National Rivers Authority (source: UK800) in England and Wales and the Water Purification Boards in Scotland.

5 Monitoring

a. Waste water monitoring

Discharges into surface water from non-IPC processes are monitored by the licensing authority (National Rivers Authority, NRA in England and Wales and the Water Purification Boards in Scotland).

The monitoring of discharges is carried out by the operator for IPC processes and non-IPC discharges to sewer.

b. Surface water monitoring

Surface water monitoring is undertaken by the National Rivers Authority in England and Wales and the Water Purification Boards in Scotland.

Data from environmental monitoring are reported to the EC.

Appendix C Analysis of the Rhine River with respect to Directive 76/464/EEC

Introduction

The entire catchment area of the Rhine is located in 9 mid and western European countries. The major part of the catchment area is located in Switzerland, France, Germany, Luxembourg and the Netherlands and comprises approximately 185,000 km^2. The length of the river is more than 1000 km, measured from its major origin (Swiss Alps) to the Rhine estuary in the Netherlands, where it flows into the North Sea. More than 40 million people live within its catchment area. The river flow ranges from 1000 m^3/sec at the Swiss-German border to 2200 m^3/sec at the Dutch-German border. The catchment area is highly industrialised. In addition, the Rhine is one of the most intensively used rivers in the world for shipping, connecting the world's largest sea harbour (Rotterdam) with the world's largest inland harbour (Duisburg) in the heart of the Ruhr area.

The riparian states of the Rhine, (i.e. Switzerland, France, Germany, Luxembourg, and the Netherlands) and the European Community have signed several treaties in order to protect the river against pollution. Also, the riparian states and the EU are working together within the framework of the Rhine Action Program (RAP). This program aims both at the intensified protection of the Rhine against pollution, and at the ecological and morphological rehabilitation of the Rhine.

Finally, it is worthwhile mentioning that recently the IRC adopted guidelines for discharge-monitoring by point source dischargers (i.e. substance or group of substances to monitor, and frequency of monitoring). Guidelines are also given for the enforcement intensity to be employed by the competent authority.

The major part of the information presented in this appendix is based on information brought together by the riparian states of the Rhine within the framework of the Rhine treaties and the Rhine Action Program (results of monitoring data on both surface water, including suspended solids, and on industrial, municipal and diffuse discharges). Table C.1 gives an overview of monitoring activities in the riparian states of the Rhine (source: International Rhine Commission, GEN027).

Transposition of Directive 76/464/EEC in river basin legislation

Appendix B gives an overview of the implementation of Directive 76/464/EEC and its daughters in the riparian Rhine states of France, Luxembourg, Germany and the Netherlands. In general it can be concluded, that transposition of Directive 76/464/EEC and its daughters into national legislation is complete.

Waste loads (for each List I substance)

Within the framework of the Rhine Action Program, the International Rhine Commission adopted a number of reports giving a clear view of the discharge trends of priority pollutants in the catchment area of the Rhine for the period 1985 -1992. All 76/464/EEC List I substances are included in this list of priority substances.

The results as given in Table C.2, should be assessed considering the trends in the Rhine water quality as given in chapter 5. To obtain a good balance between discharge trends and water quality trends, the Swiss discharge data are included, in spite of the fact that Switzerland is not a EU-Member State. Discharge data for Luxembourg for 1992 (although of relatively minor importance) are not available.

For all substances which are considered within the framework of the Rhine Action Programme, the IRC adopted indicative water quality objectives (so called "Zielvorgaben"). All 76/464/EEC List I substances are included in this list of priority pollutants. Based on the monitored concentrations of the priority substances in the Rhine River at its international monitoring locations compared with the "Zielvorgaben", it was concluded that additional abatement measures should be considered (exceeding BAT and BEP) for a number of substances. Among these, five 76/464/EEC List I substances are included (mercury, cadmium, y-HCH, chloroform and hexachlorobenzene).

note: A direct comparison of the "Zielvorgaben" (defined as 90 percentile concentrations) and the quality objectives as set in the 76/464/EEC daughter Directives (concentrations given as an arithmetic mean over a year) is not possible. In addition, there is limited relevance to making such a comparison, because riparian Rhine states are implementing limit values rather than implementing quality objectives as set in the 76/464/EEC daughter Directives.

It is important to keep in mind that significant discharge reductions in industrial and municipal sources took place in the past 15 - 20 years. For this reason, the relative contribution of diffuse discharges of many priority substances is increasing, and in a number of cases they are even exceeding the discharge contribution of the point sources.

The IRC concluded that additional abatement measures for the priority substances not reaching the "Zielvorgaben" should be considered only after integral pathway studies and assessments were conducted, including diffuse sources in the catchment area of the Rhine. This work will be started in 1995.

Considering the results as listed in table C.2, a number of conclusions can be drawn. For some substances (e.g. trichlorobenzene, hexachlorobutadiene, hexachlorobenzene, DDT and the sum of Aldrin, Dieldrin, Endrin and Isodrin) the discharge via municipal waste water is absent or insignificant. For other substances (e.g. mercury, cadmium, tetrachloroethylene) discharges via industrial and municipal waste water are of the same order of magnitude. Finally there is a number of substances which are either primarily discharged via municipal waste water (e.g. pentachlorophenol) or via industrial waste water (e.g. 1,2-Dichloroethane).

It is important to realise that municipal waste water consists of waste water from households, contaminated rainwater (as far it is collected via the municipal sewerage system) and smaller industries connected to the municipal sewerage system. It is therefore in general not correct to presume that connected industries are primarily responsible for the discharge of List I substances via municipal waste water.

The reduction in total point-source discharge in the period 1985 - 1992 ranges in the order of approximately 60 % to more than 90 %, as shown in Figure C.2. Changes in discharges from individual industrial dischargers of List I substances (as given in Appendix B) vary widely in the same period of time, ranging from an increase of the discharge to an almost complete elimination of the discharge. It is important to bear in mind that for a number of substances, many abatement measures were already taken before 1985, explaining why some reduction percentages are relatively low (only 60% for mercury, compared to 90-100% for PCP). Mercury, for example, had been the target of discharge abatement practices for almost 3 decades.

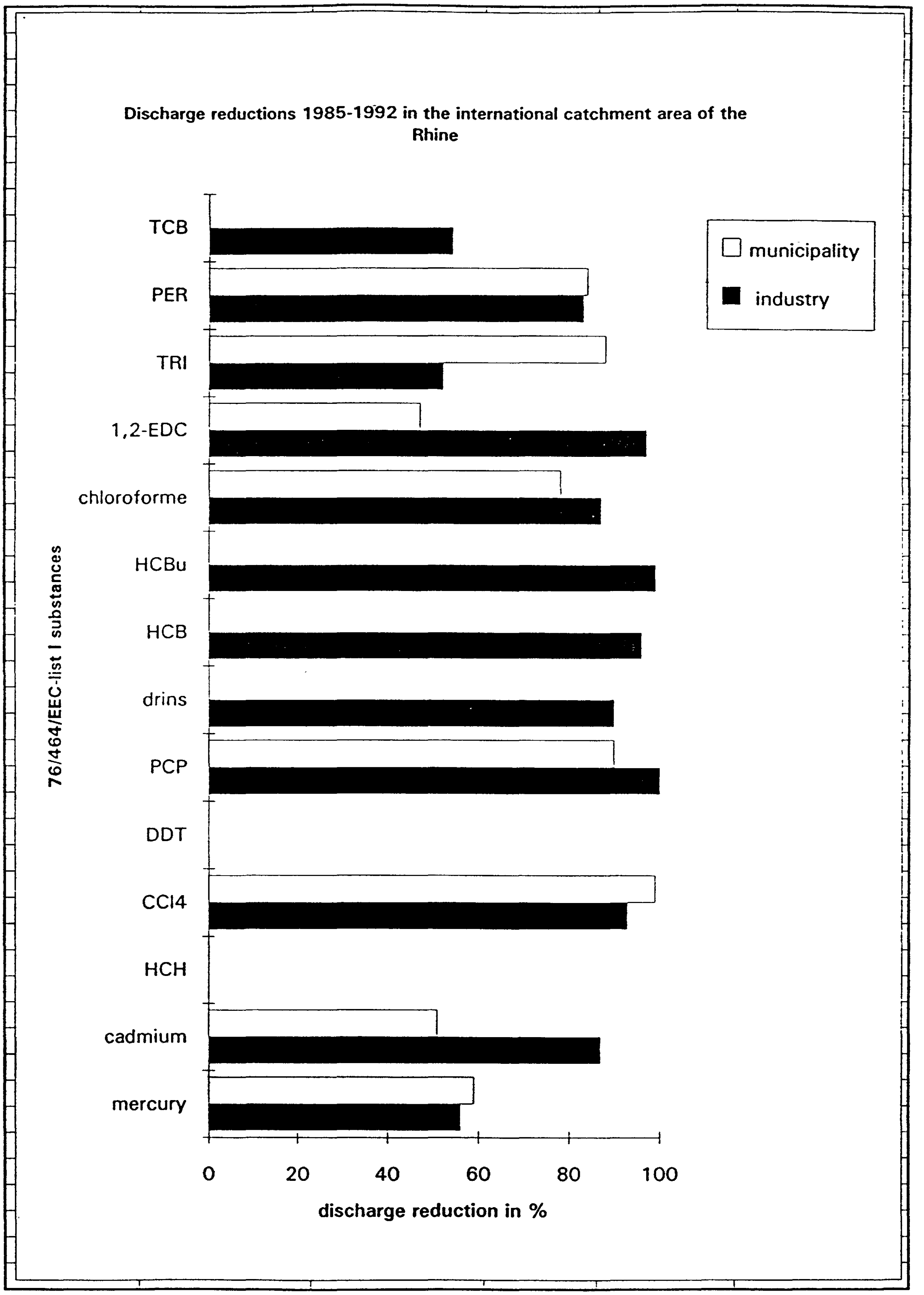

Figure C.1 Reduction in point source discharges to the Rhine river, 1985-1992

Table C.1 Overview of discharge and surface water monitoring activities in the riparian states of the Rhine (source: International Rhine Commission)

monitoring profile	monitoring within the limits of industrial or municipal site (battery limits)				monitoring in receiving surface water	
country	monitoring by discharger ("self-enforcement"))[1]	monitoring (enforcement) by or on behalf of competent authorities)[2]			surface water monitoring network	abstraction of surface water for the production of drinking water
		regular	periodically	unexpected		
France	I,V	L,O	A,L,O	A	A,L	A,L,D
Germany	I,V	A,O,L	A,O	A	A,O	A,D
Switzerland	I	A	A	A	A	A
Netherlands	V,I	O	A	A,O	A	D
Luxembourg	V, (I)	A,O,L	A	A	A	-

)[1] key: V = voluntary
I = imperative

)[2] key: A = competent authority
O = on behalf of a competent authority (governmental institutes etc.)
L = a certified and approved laboratory
D = drinking water production company

Table C.2 Discharges of 76/464/EEC List I substances in the catchment area of the Rhine
Discharges are given in Kg/year

substance	industrial discharge in 1985 (kg)	industrial discharge in 1992 (kg)	municipal discharge in 1985 (kg)	municipal discharge in 1992	relevance of diffuse discharge)[1]	industrial discharge reduction in 1985 - 1992 in %	municipal discharge reduction in 1985 - 1992 in %
Mercury	1442	<639	1258	< 506	=	56	59
Cadmium	17,805	<2284	3689	< 1811	=	87	51
Hexachlorocyclohexane		30		70			
Carbon tetrachloride	2370	155	3971	< 52	=	93	99
DDT		0		<			
Pentachloro-phenol	426	0.1	1930	200	+	100	90
Sum of Aldrin, Dieldrin, Endrin and Isodrin	32	3.5	0.4	0.4	+	90	0
Hexachlorobenzene	195	8	1	1		96	0
Hexachlorobutadiene	67	0,9	<	<		99	
Chloroform	81,780	< 10,859	10,034	< 2198	-	87	78
1,2-Dichloroethane	572,600	17,328	8500	4500	-	97	47
Trichloroethylene (TRI)	3111	1494	11,356	< 1330	=	52	88
Tetrachloroethylene (PER)	7288	1241	11,103	< 1763	=	83	84
Trichlorobenzene (TCB)	2110	< 961	<	<		54	

)[1] - -> the known diffuse discharge is of minor importance in comparison to the point source discharges (sum of industrial and municipal wastewater)
= -> the known diffuse discharge is of the same order as the discharge via point source discharges
\+ -> the known diffuse discharge is more important than the discharge via point source discharges

Driving forces behind the observed changes in industrial waste loads

For the international catchment area of the Rhine there are a number of international driving forces leading to the reduction of discharges by industries and municipalities. The Rhine Convention (Bern 1963), The Rhine Chemical Treaty (Bonn, 1976), Directive 76/464/EEC and to a lesser extend the Rhine Chloride Treaty (Bonn 1976) play an important role as far as the quality improvement of the river Rhine via discharge reductions is concerned. In 1987, the Ministers of the riparian states of the Rhine and the European Community adopted the Rhine Action Programme, giving a political incentive to expedite the clean-up and ecological restoration of the river Rhine.

The Paris Convention, recently merged with the Oslo Convention giving the OSPAR Convention (protection of the marine environment in the north east part of the Atlantic Ocean) and the North Sea Ministers Conferences should be mentioned as well, because these also formulate Best Available Techniques and limit values for substances representative of specific industrial branches.

In addition, there are several surface water bound EC-Directives (including Directive 76/464/EEC) demanding a certain minimum water quality regarding specific functions of the surface waters (see Table 3.1 giving a spècific overview of surface water Directives in the Community).

It is worth while mentioning, that there was an intensive exchange of information between the International Rhine Commission (coordinating the execution of the Rhine Chemical Treaty) and the European Commission (coordinating the execution of Directive 76/464/EEC), considering the technical specification of limit values for List I substances.

It can be concluded that no one single convention, treaty or Directive is responsible for quality improvement of the river Rhine. Rather, it is a combination of conventions, treaties, Directives and action programmes applied in a coordinated fashion that lead to successful restoration and protection of the water quality of the Rhine.

Sometimes, even discussions leading to Directives may have had a positive impact on discharge reductions and therefore on the quality of a water system. For example, 1,2-dichloroethane (EDC) had a discharge reduction of more than 95 % in the period 1985 - 1992. However, daughter Directive 90/415/EEC, giving limit values for EDC, is dated July 1990, and demanded (formal compliance (transposition) by January 1992 and technical compliance by 1993 and 1995 (see Table H.1 for exact compliance dates). Thus, the majority of the discharge decrease was completed before the implementation of the Directive.

Besides formal (legal) incentives and political commitments, there are economic incentives. A well known economic incentive is the fact that dischargers in Germany, France and the Netherlands must pay levies for their discharges. Although the basis for the levy to be paid is a reflection of the organisation of the water management in these countries, the effect of paying a discharge levy is roughly comparable. The fact that money must be paid for a discharge could be an incentive to look for methods reducing the discharge.

Appendix D-1 Industrial and Municipal Dischargers of List I Substances:

Major point source dischargers in the European Union

Key to references:

W : WRC (The importance of diffuse pollution sources and their consequences to the aquatic environment of the Community. Source EC010. Final Report (LS 9480 SLG). This report gives an overview of industrial manufactures of 129 List I and potential List I substances.

E : EURECO (Technical data sheets on substances candidates for List I, Directive 76/464/EEC; Final report October 1990). Source: EC008.
This report gives an overview of industrial manufactures and data of environmental properties of 129 List I and potential List I substances.

D : National reports regarding Directive 76/464/EEC. These reports were given to the European Commission by Member States.

N : National reports on discharges)[1]. Sources: D105, D106, D115, F208-F212, B300, B301, NL531, NL535, NL538, NL541, P1206, UK801.

R : Information gathered by the International Rhine Commission (Bestandsaufnahme der puktuellen Einleitungen prioritärer Stoffe 1992; Synthesebericht; July 1994). Source: GEN017.

E1 : ERM (chlor-alkali) (The economic effects of pollution control measures on defined industrial sectors; mercury discharging industries; December 1977). Source: EC007.

<< : discharge is less than X (X = 1% of the sum of industrial and municipal discharge in 1992 into the international catchment area of the Rhine); this information is based on the report mentioned under R.

m/d m = substance is manufactured; it is expected that the substance is also discharged.
d = substance is not manufactured; it is or can be discharged because of use of the substance in the industrial process.

)[1] General remarks:

Belgian discharges are reported in grammes per day; the annual discharge is calculated presuming a discharge during 365 days per year.

French discharges are reported in kg/day (except the mercury discharges, which are reported in kg/year); the annual discharge is calculated presuming a discharge during 365 days per year.

List 1 substances.

The data are sorted as follows:

1. first on catchment area
   (the catchment areas are selected as described in the study contract)
2. second on country
   (every country (per catchment area) starts on a fresh page)
3. third on substance
   (list 1)
4. fourth on industry-name
5. fifth on site of the industry
6. sixth on year of discharge

RIZA, the Netherlands (view subst_g.qbe/subst_g.frm).

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
Catchment area: **Axios.**							
GRE	Ethyl Hellas Chemical Co SA	m	Thessalonica (Thessaloniki)	Gulf of Thessalonica	Aegian Sea.	E	-

1,2-Dichloroethane

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
GRE	Esso Papasm ??	d	Salonica (Thessaloniki)	Mediterranean	via Kokitos and Aegean Sea.	E1	

Mercury chloralkali

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			mercury process ?

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Ebro**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
SPA	Agrocos SA	m	Badalona (n.of Barcelona)	Mediterranean		W,D	

1,2,4-Trichlorobenzene

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
SPA	CROS (Sociedad Anonima CROS)	m	Flix (w of Barcelona)	Rio Ebro		W,E,E1	ERKIMA?

Carbontetrachloride

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
SPA	Agrocos SA	m	Badalona (n.of Barcelona)	Mediterranean		W,D	

Hexachlorobenzene

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
SPA	Inquinosa (i)	m	Sabinanigo (n/e of Spain)	Rio Ebro via Gallego	via Rio Callego	W,E	

Lindane

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
SPA	Química del Cinca SA	d	Aragón (area near Zaragossa)	Ebro (rio Cinca)		D	

Mercury

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
SPA	CROS SA	d	Tarragone (s. of Barcelona)	Mediterranean	via rio Ebro	E1,D	

Mercury chloralkali

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Ebro**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
SPA	CROS (Sociedad Anonima CROS)	d	Flix (w of Barcelona)	Rio Ebro		W,E,E1	ERKIMA?

Substance	Discharge	Unit	Year	Refer.	Other remarks
Mercury chloralkali	0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
SPA	Energia e Industrias Aragonesas	d	Tarragona (s. of Barcelona)	Mediterranean	via rio Ebro	E1,D	

Substance	Discharge	Unit	Year	Refer.	Other remarks
Mercury chloralkali	0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
SPA	CROS (Sociedad Anonima CROS)	m	Flix (w of Barcelona)	Rio Ebro		W,E,E1	ERKIMA?

Substance	Discharge	Unit	Year	Refer.	Other remarks
Tetrachloroethylene	0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
SPA	CROS (Sociedad Anonima CROS)	m	Flix (w of Barcelona)	Rio Ebro		W,E,E1	ERKIMA?

Substance	Discharge	Unit	Year	Refer.	Other remarks
Trichloroethylene	0,0	No Info. in			mercury process ?

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Loire**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Angers Nickel Chrome	d	Avrille	Loire		D	electroplating; 59/E3, near Nantes.

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	DEC	d	Cornemon	Loire		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
150,0	kg/y	in	1988	N	
75,0	kg/y	in	1990	N	
55,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	SRPI - Morin	d	Redon	Loire		D	electroplating

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Simmonds SA	d	St Cosme en Vairais	Sarthe		D	electroplating

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Souriau	d	La Ferte Bernard (n-w France)	Sarthe		N,D	electroplating

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
1680,0	kg/y	in	1990	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Loire**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	TSI	d	Florent sur Cher	Loire		N	m-France

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
365,0	kg/y	in	1986	N	
365,0	kg/y	in	1989	N	
180,0	kg/y	in	1990	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Thomson C.S.F.	d	Brest	Atlantic Ocean		D	electroplating

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Mersey.**

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
UK	ICI Mond division	m	Runcorn (s-e of Liverpool)	Mersey		W,E,N	Cheshire.

1,2-Dichloroethane

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
UK	ICI Mond division	m	Runcorn (s-e of Liverpool)	Mersey		W,E,N	Cheshire.

Carbontetrachloride

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
UK	ICI Mond division	m	Runcorn (s-e of Liverpool)	Mersey		W,E,N	Cheshire.

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
UK	Associated Octel Company (AOC)	m	Ellesmere Port (Cheshire area)	Manchester Ship Canal		E1,N	near Liverpool

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
300,0	kg/y	in	1991	N	approximately 0,3 tonnes/yr (UK 801).
0,0	No info.	in	1992	N	Switch from chloralkali process to mercury-free membrane technology (UK 801).

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
UK	BP Chemicals	d	Sandbach (s. of Manchester)	r. Weaver	via River Weaver	E1	

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Mersey**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
UK	ICI Mond division	d	Runcorn (s-e of Liverpool)	Mersey		W,E,N	Cheshire.

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
70000,0	kg/y	in	1975	N	In the mid-1970s, the load was estimated to be more than 70 te/yr (UK801).
1000,0	kg/y	in	1993	N	'less than 1,0 te/yr' (UK 801).

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
UK	ICI Mond division	m	Runcorn (s-e of Liverpool)	Mersey		W,E,N	Cheshire.

Tetrachloroethylene

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
UK	ICI Mond division	m	Runcorn (s-e of Liverpool)	Mersey		W,E,N	Cheshire.

Trichloroethylene

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Meuse**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References
BEL	Solvic	m	Jemeppe sur Sambre	Meuse	via Sambre	W

1,2-Dichloroethane

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References
BEL	Solvay and Cie SA	m	Jemeppe sur Sambre	Meuse	via Sambre	W,E

Carbontetrachloride

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References
BEL	Solvay and Cie SA	m	Jemeppe sur Sambre	Meuse	via Sambre	W,E

Chloroform

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in	1989		production stopped since 1989.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References
BEL	Solvay and Cie SA		Jemeppe sur Sambre	Meuse	via Sambre	W,E

Tetrachloroethylene

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Meuse**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Stolberg- Binsfeldhammer	d	Stolberg	Vicht - Rur		D	non ferrous metal industry

	Discharge	Unit	Year	Refer.	Other remarks
Cadmium	0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	William Prym-Werke	d	Stolberg (Harz)	Vichtbach - Rur		D	electroplating

	Discharge	Unit	Year	Refer.	Other remarks
Cadmium	0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Meuse**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Budelco BV	d	Budel-Dorplein	Meuse	Tungelroysche Beek -> Zuid-Willemsvaart -> Kanaal Wessem-Nederweert	D	zink production

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
12,0	kg/y	in	1990	D	Treshold for individual report (76/464/EEC) = 10 Cd kg/y.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Harcros Chemicals		Roermond	Meuse	via Maasnielderbeek	D	discharge via STP Roermond

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
17,0	kg/y	in	1989		

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Philips complex-R		Eindhoven	Dommel		D	discharge via STP Eindhoven

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
11,0	kg/y	in	1991		

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Akzo Chemie Nederland BV	d	Weert	Meuse	via Tungelroysche Beek-> Zuid Willemsvaart-> Kanaal Wessem-Nederweert	D,N	organic chemical industry

Carbontetrachloride

Discharge	Unit		Year	Refer.	Other remarks
120,0	kg/y	in	1989	D	
101,0	kg/y	in	1990	D	
135,0	kg/y	in	1991	D	
141,0	kg/y	in	1992	D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Meuse**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Akzo Chemie Nederland BV	d	Weert	Meuse	via Tungelroysche Beek-> Zuid Willemsvaart-> Kanaal Wessem-Nederweert	D,N	organic chemical industry

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
117,0	kg/y	in	1990	D	
131,0	kg/y	in	1991	D	
179,0	kg/y	in	1992	D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Natron Solvay Nederland Chemie	d	Linne Herten	Meuse		D,N	

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
35,0	kg/y	in	1989	D	
35,0	kg/y	in	1990	D	
24,0	kg/y	in	1991	D	
28,0	kg/y	in	1992	D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Scott Page	d	Gennep	Meuse		D	paper industry via STP Gennep

Pentachlorophenol

Discharge	Unit		Year	Refer.	Other remarks
2,5	kg/y	in	1992	D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Po.**

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
ITA	Enichem Sintesi SpA	m	Pieve Vergonte	Po	via Toce > Lago Maggiore > Ticino	E	

Carbontetrachloride

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
ITA	Enichem Sintesi SpA	m	Pieve Vergonte	Po	via Toce > Lago Maggiore > Ticino	E	

DDT

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
ITA	Enichem Sintesi SpA	m	Sesto San Giovanni (n. Milaan)	Po via Adda	via Lambro	W	

DDT

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
ITA	CAFFARO ??	d	Brescia	Mella - Oglio	via Me'la > Oglio	E1	

Mercury chloralkali

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			mercury process ?

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
ITA	Montedison ??	d	Mantua (Mantova)	Po via Mincio		E1	

Mercury chloralkali

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			mercury process ?

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Po.**

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
ITA	Rumianca	d	Pieve Vergonte	Po	via Toce > Lago Maggiore > Ticino	E1	

Mercury chloralkali

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
ITA	Sta Elet. Solf & Chloroderivati ??	d	Villovesco	Po	via Lambro	E1	

Mercury chloralkali

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			mercury process ?

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

FRA	Rhom & Haas	d	Lauterbourg	Rhine	via ...	R	

1,2-Dichloroethane

Discharge	Unit		Year	Refer.	Other remarks
500000,0	kg/y	in	1985	R	
3240,0	kg/y	in	1992	R	

FRA	Thann et Mulhouse	d	Alsace Lorraine area	Rhine	via ...	R,N	

1,2-Dichloroethane

Discharge	Unit		Year	Refer.	Other remarks
3500,0	kg/y	in	1985		
720,0	kg/y	in	1992		

FRA	MDPA (Mines de Potasse d'Alsace?)	d	Elsac Lorraine area	Rhine	via ...	R	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
200,0	kg/y	in	1985	R	
140,0	kg/y	in	1992	R	

FRA	Stracel	d	Strasbourg	Rhine	via ..	R	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
250,0	kg/y	in	1992	R	

FRA	Platforme de Carling	d	Strasbourg (region of)	Rhine	via...	R	(part of Rhône Poulenc industries).

Carbontetrachloride

Discharge	Unit		Year	Refer.	Other remarks
23,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Stracel	d	Strasbourg	Rhine	via ..	R	

Carbontetrachloride

Discharge	Unit		Year	Refer.	Other remarks
150,0	kg/y	in	1985	R	
6,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Thann et Mulhouse	d	Alsace Lorraine area	Rhine	via ...	R,N	

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
1350,0	kg/y	in	1985	R	
576,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Mines de Potasse d'Alsace (MDPA)	d	Mulhouse (n-e France)	Rhine	via ...	N	dep 68.

Mercury

Discharge	Unit		Year	Refer.	Other remarks
32,4	kg/y	in	1989		
31,7	kg/y	in	1990	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Stracel	d	Strasbourg	Rhine	via ..	R	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
20,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Thann et Mulhouse	d	Alsace Lorraine area	Rhine	via ...	R,N	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
65,0	kg/y	in	1985	R	
1,7	kg/y	in	1989	N	
25,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Potasse et Produits Chimiques (PPC)	m	Thann (s.e. of Mulhouse)	Rhine	via Thur?	E1,N	

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
33,0	kg/y	in	1986	N	
25,7	kg/y	in	1988	N	
25,7	kg/y	in	1989	N	
50,4	kg/y	in	1990	N	
32,3	kg/y	in	1991	N	
27,2	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	BASF AG	m	Ludwigshafen	Rhine		D,R,N	

1,2-Dichloroethane

Discharge	Unit		Year	Refer.	Other remarks
40000,0	kg/y	in	1985	R	
3900,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bayer AG		Dormagen (n. of Colone)	Rhine		N (R)	

1,2-Dichloroethane

Discharge	Unit		Year	Refer.	Other remarks
250,0	kg/y	in	1985	N/R	
218,0	kg/y	in	1992	N/R	<< 218; see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bayer AG Leverkusen	d	Leverkusen (n. of Colone)	Rhine		D,N	manufacture of pigments

1,2-Dichloroethane

Discharge	Unit		Year	Refer.	Other remarks
3000,0	kg/y	in	1985	R	
2400,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Chemische Werke Hüls (CWH)		Marl	Rhine	via Lippe	W, (R)	?

1,2-Dichloroethane

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Deutsche Solvay Werke	m	Rheinberg (near Duisburg?)	Rhine (?)		D,R (N)	not the Rheinberg near Regensburg (Donau catchment area).

1,2-Dichloroethane

Discharge	Unit		Year	Refer.	Other remarks
400,0	kg/y	in	1985	R	
218,0	kg/y	in	1992	N/R	<< 218; see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hoechst	m	Gendorf Hürth-Knapsack	Rhine?		W,E,N (R)	Hürth

1,2-Dichloroethane

Discharge	Unit		Year	Refer.	Other remarks
100,0	kg/y	in	1985	R	
218,0	kg/y	in	1992	N/R	<< 218, see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls AG	m	Marl (n. of Essen-Bochum)	Lippe		D,N,R,W	

1,2-Dichloroethane

Discharge	Unit		Year	Refer.	Other remarks
920,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Kläranlage Sesekemündung	d		Rhine		R	STP

1,2-Dichloroethane

Discharge	Unit		Year	Refer.	Other remarks
1700,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	BASF AG		Ludwigshafen	Rhine		D,R,N	

1,2,4-Trichlorobenzene

Discharge	Unit		Year	Refer.	Other remarks
900,0	kg/y	in	1985	R	see TCB.
350,0	kg/y	in	1992	N/R	< 350: less than 350/ see also TCB.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bayer AG Leverkusen	m	Leverkusen (n. of Colone)	Rhine		D,N	manufacture of pigments

1,2,4-Trichlorobenzene

Discharge	Unit		Year	Refer.	Other remarks
700,0	kg/y	in	1985	R	see TCB.
260,0	kg/y	in	1992	R	see TCB.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hoechst AG		Frankfurt	Rhine	via Main	W,E,N,D	

1,2,4-Trichlorobenzene

Discharge	Unit		Year	Refer.	Other remarks
0,0		in		N	see TCB, FRG Hoechst AG Frankfurt.
0,0		in		N	see TCB, FRG Hoechst AG Frankfurt.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls AG		Lülsdorf	Rhine	via ...	R	

1,2,4-Trichlorobenzene

Discharge	Unit		Year	Refer.	Other remarks
85,0	kg/y	in	1992	R	see TCB.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls- Troisdorf AG		Rheinfelden	Rhine	via ...	N,R,E1,D	(including Hüls AG Chemiebetrieb).

1,2,4-Trichlorobenzene

Discharge	Unit		Year	Refer.	Other remarks
150,0	kg/y	in	1985	R	see TCB.
10,0	kg/y	in	1992	N/R	<< 10, see note/ see also TCB.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	BASF AG	d	Ludwigshafen	Rhine		D,R,N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
235,0	kg/y	in	1985	R	
100,0	kg/y	in	1992	N/R	<< 100; see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	BASF Pigmentherstellung	d	Besigheim (w. of Münich)	Rhine	via Enz/Neckar	D,N (R)	manufacture of pigments

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
70,0	kg/y	in	1985	D/R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Discharge	Unit		Year	Refer.	Other remarks
41,0	kg/y	in	1992	N/R	<< 41 !: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bauer und Schourt Karcher GmbH	d	Saarlois	Rhine	via Schwarzbach/Saar	D	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	'other plant'.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bayer AG Leverkusen	d	Leverkusen (n. of Colone)	Rhine		D,N	manufacture of pigments

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
225,0	kg/y	in	1985	D/N	
41,0	kg/y	in	1992	N/R	<< 41; see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bayer Uerdingen AG	d	Krefeld	Rhine		D,N (R)	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
155,0	kg/y	in	1985	D/R	'other plant'
41,0	kg/y	in	1992	N/R	<< 41 !: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Berzelius Metallhütte	d	Duisburg	Rhine		D,R (N)	non ferrous metal industry

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
480,0	kg/y	in	1985	D/R	
82,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine.**

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Blei- und Silberhütte	d	Braubach	Rhine		D	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	'other plant'.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Chemische Fabrik Kalk GmbH	d	Colone	Rhine		D	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	'other plant'

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Degussa AG Marquart	d	Bonn	Rhine		D	manufacture of pigments

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Deutsche Solvay Werke	d	Rheinberg (near Duisburg?)	Rhine (?)		D,R (N)	not the Rheinberg near Regensburg (Donau catchment area).

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
130,0	kg/y	in	1985	D/R	'other plant'
59,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Fa. JTT Cannon Electric GmbH G.	d	7956 Weinstandt	Rhine	via Rems/Neckar	D	(Galvanotechnik); electroplating; discharge via STP

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Fa. Renz Galvanotechnik	d	Plochingen	Neckar		D	electroplating; discharge via STP

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	GBS (or GSB)	d	Idar Oberstein (Stadt)	Nahe		D	toxic waste treatment

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	'other plant'.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Haidl Papier GmbH	d	Duisburg	Rhine		D	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	'other plant'

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Holtzmann	d	Karlsruhe	Rhine		N (R)	pulp industry

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
35,0	kg/y	in	1985	R	
41,0	kg/y	in	1992	N/R	<< 41 !: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls AG	d	Marl (n. of Essen-Bochum)	Lippe		D,N,R,W	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
225,0	kg/y	in	1985	D/R	'other plant'
41,0	kg/y	in	1992	N/R	<< 41 !: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine.**

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Karcher Beckingen	d	Beckingen	Rhine	via Mühlenbach/Saar	D	

Cadmium

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in		D	'other plant'

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Karl Diehl, Mariahütte	d	Nonnweiler	Nahe	via Prims/Saar	D	

Cadmium

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in		D	'other plant'

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Kirsten	d	VG Langenlonsheim	Rhine	via Nahe	D	electroplating

Cadmium

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Matthes und Weber	d	Duisburg	Rhine		D,R,N	

Cadmium

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in		D	'other plant'

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Osram GmbH	d	Schwab Münich	Lech		D	

Cadmium

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in		D	'other plant'

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	PWA	d	Mannheim	Rhine		N (R)	pulp industry

Cadmium

Discharge	Unit	Year	Refer.	Other remarks
45,0	kg/y in	1985	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

41,0 kg/y in 1992 N/R << 41 !: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Pigment Chemie	d	Duisburg	Rhine		R,D,N	

Cadmium

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in		D	'other plant'

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Rentrop	d	Plettenburg	Lenne/Ruber (Oesterbach)		D	electroplating

Cadmium

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Retorte, U. Scharer GmbH	d	Rötenbach	Regnitz - Main		D	

Cadmium

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in		D	'other plant'

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Ruhr-Zink	m	Datteln (Near Marl)	Rhine?	via Lippe	E	

Cadmium

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Sachtleben	d	Duisburg	Rhine		D,N,R	

Cadmium

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in		D	'other plant'

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Sessler GmbH	d	Würtzburg	Main		D	electroplating; discharge via STP

Cadmium

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Siemens AG	d	Redwitz	Rhine	via Main	D	electroplating; discharge via STP

Cadmium

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Teves	d	VG Rheinböllen	Rhine		D	electroplating

Cadmium

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Varta	d	Krautscheid	Rhine		D	

Cadmium

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in		D	'other plant'

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Villeroy und Boch, Merzig	d	Merzig	Saar - Mozel	via Seffersbach	D	

Cadmium

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in		D	'other plant'

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site

Catchment area: **Rhine**.

FRG	W. Lemmer App.	d	Kreutzwertheim	Rhine	via Main	D	electroplating; discharge via STP

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

FRG	BASF AG	d	Ludwigshafen	Rhine		D,R,N	

Carbontetrachloride

Discharge	Unit		Year	Refer.	Other remarks
11300,0	kg/y	in	1985	R	
2,0	kg/y	in	1992	N/R	<< 2: less than 2 kg.

FRG	Bayer AG Leverkusen	d	Leverkusen (n. of Colone)	Rhine		D,N	manufacture of pigments

Carbontetrachloride

Discharge	Unit		Year	Refer.	Other remarks
33,0	kg/y	in	1985	R	
2,6	kg/y	in	1992	N/R	

FRG	Hoechst AG	m	Frankfurt	Rhine	via Main	W,E,N,D	

Carbontetrachloride

Discharge	Unit		Year	Refer.	Other remarks
1400,0	kg/y	in	1985	D/R/N	methane chlorination; production chlorofluorocarbons
35,0	kg/y	in	1992	R	

FRG	Hüls AG	d	Marl (n. of Essen-Bochum)	Lippe		D,N,R,W	

Carbontetrachloride

Discharge	Unit		Year	Refer.	Other remarks
500,0	kg/y	in	1985	R	CCl4 production via perchlorination
4,2	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Kernforschungszentrum Karlsruhe	d	Karlsruhe	Rhine		R,N	

Carbontetrachloride

Discharge	Unit		Year	Refer.	Other remarks
5,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	BASF AG	d	Ludwigshafen	Rhine		D,R,N	

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
11300,0	kg/y	in	1985	N/R	28.000 is 'old' figure for 1985.
6600,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bayer AG	d	Elberfeld	Rhine		R	

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
540,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bayer AG	d	Uerdingen	Rhine		R	

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
146,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bayer AG Leverkusen	d	Leverkusen (n. of Colone)	Rhine		D,N	manufacture of pigments

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
400,0	kg/y	in	1985	R	
380,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bellino & Cie GmbH	d		Rhine		R	

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
300,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Boeringer	d	Ingelheim	Rhine		R	

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
175,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hoechst AG	m	Frankfurt	Rhine	via Main	W,E,N,D	

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
1800,0	kg/y	in	1985	R	
300,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hoffmann La Roche	d	Grenzach	Rhine		R (N) E1	

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
800,0	kg/y	in	1985	R	
170,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Holtzmann		Karlsruhe	Rhine		N (R)	pulp industry

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
18600,0	kg/y	in	1985	R	
131,0	kg/y	in	1992	N/R	<< 131: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine.**

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls AG	m	Marl (n. of Essen-Bochum)	Lippe		D,N,R,W	

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	PWA	d	Mannheim	Rhine		N (R)	pulp industry

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
32400,0	kg/y	in	1985	N	
131,0	kg/y	in	1992	N	<< 131: see note

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	PWA		Stockstadt	Rhine		N (R)	pulp industry

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
5500,0	kg/y	in	1985	N	
131,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Alu- Suisse	d	Rheinfelden	Rhine		N (R)	

Hexachlorobenzene

Discharge	Unit		Year	Refer.	Other remarks
30,0	kg/y	in	1985	N	
0,0	No Info.	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bayer AG Leverkusen	m	Leverkusen (n. of Colone)	Rhine		D,N	manufacture of pigments

Hexachlorobenzene

Discharge	Unit		Year	Refer.	Other remarks
60,0	kg/y	in	1985	N	
0,0	No Info.	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

FRG	Hüls AG	m	Marl (n. of Essen-Bochum)	Lippe		D,N,R,W	

Hexachlorobenzene

Discharge	Unit		Year	Refer.	Other remarks
60,0	kg/y	in	1985	N	
0,0	kg/y	in	1992	N	no discharge of HCB.

FRG	Hüls- Troisdorf AG	d	Rheinfelden	Rhine	via ...	N,R,E1,D	(including Hüls AG Chemiebetrieb).

Hexachlorobenzene

Discharge	Unit		Year	Refer.	Other remarks
30,0	kg/y	in	1985	N	
7,0	kg/y	in	1992	N	

FRG	Bayer AG Leverkusen		Leverkusen (n. of Colone)	Rhine		D,N	manufacture of pigments

Hexachlorobutadiene

Discharge	Unit		Year	Refer.	Other remarks
40,0	kg/y	in	1985	N	
0,0	No Info.	in	1992	N	

FRG	Hüls AG	m	Marl (n. of Essen-Bochum)	Lippe		D,N,R,W	

Hexachlorobutadiene

Discharge	Unit		Year	Refer.	Other remarks
40,0	kg/y	in	1985	N	1985= estimated; co-product PER.
0,4	kg/y	in	1992	N	

FRG	Celamerck GmbH (1)	m	Ingelheim (near Mainz)	Rhine		W	

Lindane

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	E. Merk	d	Gernsheim	Rhine		R	

Lindane

Discharge	Unit		Year	Refer.	Other remarks
24,0	kg/y	in	1992		

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bayer AG Leverkusen	d	Leverkusen (n. of Colone)	Rhine		D,N	manufacture of pigments

Mercury

Discharge	Unit		Year	Refer.	Other remarks
95,0	kg/y	in	1985	R	mercury catalyst in other than VC-production; discharge of 95 kg/y also originates from chloralkali plant.
31,0	kg/y	in	1992	R	discharge of 31 kg/y also originates from chloralkali plant.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Berzelius Metallhütte	d	Duisburg	Rhine		D,R (N)	non ferrous metal industry

Mercury

Discharge	Unit		Year	Refer.	Other remarks
60,0	kg/y	in	1985	D/R	non-ferrous metal industry
17,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Deutsche Solvay Werke	d	Rheinberg (near Duisburg?)	Rhine (?)		D,R (N)	not the Rheinberg near Regensburg (Donau catchment area).

Mercury

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	mercury catalyst in VC-production

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	E. Merck	m	Darmstadt	Rhine	via Schwarzbach	D	production mercury compounds

Mercury

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine.**

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Fa. Varta AG	d	Ellwangen	Jagst		D	production primary batteries

Mercury

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	GBS (or GSB)	d	Idar Oberstein (Stadt)	Nahe		D	toxic waste treatment

Mercury

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Großkraftwerk Franken II	d	Erlangen	Regnits - Main		D	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	other productions

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls AG	d	Marl (n. of Essen-Bochum)	Lippe		D,N,R,W	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
127,0	kg/y	in	1985	R	Hg catalyst in VC-production; Hg discharge due to both application of Hg catalyst and chlorine production.
19,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls AG	d	Troisdorf	Rhine	via ...	N (R)	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
70,0	kg/y	in	1985	N	
11,0	kg/y	in	1992	N/R	<< 11: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine.**

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls- Troisdorf AG	d	Rheinfelden	Rhine	via ...	N,R,E1,D	(including Hüls AG Chemiebetrieb).

Mercury

Discharge	Unit		Year	Refer.	Other remarks
8,0	kg/y	in	1985	N	
11,0	kg/y	in	1992	N/R	<< 11: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Kirsten	d	VG Langenlonsheim	Rhine	via Nahe	D	electroplating

Mercury

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	other productions

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Müllverbrennungsanlage Wuppertal	d	Wuppertal	Rhine	via Wupper	D	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	other productions

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Müll- und Klärschlammverbr. anlage	d	Bamberg	Regnitz - Main		D	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	other productions

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	PWA	d	Mannheim	Rhine		N (R)	pulp industry

Mercury

Discharge	Unit		Year	Refer.	Other remarks
12,0	kg/y	in	1985	N	
11,0	kg/y	in	1992	N/R	<< 11: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine.**

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	PWA	d	Stockstadt	Rhine		N (R)	pulp industry

Mercury

Discharge	Unit		Year	Refer.	Other remarks
10,0	kg/y	in	1985	N	
11,0	kg/y	in	1992	N/R	<< 11: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Pigment Chemie	d	Duisburg	Rhine		R,D,N	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
47,0	kg/y	in	1985	R/D	other productions
11,0	kg/y	in	1992	N/D	<< 11: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	BASF AG	d	Ludwigshafen	Rhine		D,R,N	

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
57,0	kg/y	in	1985	R/D	
37,0	kg/y	in	1992	R/N	<< 37 kg/y, see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bayer AG	d	Dormagen (n. of Colone)	Rhine		N (R)	

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bayer AG Leverkusen	d	Leverkusen (n. of Colone)	Rhine		D,N	manufacture of pigments

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
95,0	kg/y	in	1985	R	discharge of 95 kg/y also originates from application of mercury catalist.
31,0	kg/y	in	1992	R	discharge of 31 kg/y also originates from application of mercury catalist.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bayer Uerdingen AG	d	Krefeld	Rhine		D,N (R)	

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
90,0	kg/y	in	1985	D/R	
11,0	kg/y	in	1992	R/N	<< 11: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Dynamit Nobel	d	Lûlsdorf ?	Rhine		E1	

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	not reported in 1990 as a 464-plant by FRG

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Dynamit Nobel	d	Rheinfelden (n-e. of Basle)	Rhine		E1	

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	not reported in 1990 as a 464-plant by FRG

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hoechst AG	d	Frankfurt	Rhine	via Main	W,E,N,D	

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
50,0	kg/y	in	1985	D/R	
16,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hoechst AG, Werk Knapsack	d	Hürth	Rhine	via Düffelsbach	E1,D	

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hoffmann La Roche	d	Grenzach	Rhine		R (N) E1	

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	not reported in 1990 as a 464-plant by FRG.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls AG	d	Marl (n. of Essen-Bochum)	Lippe		D,N,R,W	

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
127,0	kg/y	in	1985	R/D	Hg discharge due to both application of Hg catalyst and chlorine production.
19,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls AG Werk Lülsdorf		Niederkassel	Rhine		E1,D	

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls- Troisdorf AG		Rheinfelden	Rhine	via ...	N,R,E1,D	(including Hüls AG Chemiebetrieb).

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bayer AG Leverkusen	m	Leverkusen (n. of Colone)	Rhine		D,N	manufacture of pigments

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Pentachlorophenol

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Dynamit Nobel	m	Rheinfelden (n-e. of Basle)	Rhine		E1	

Pentachlorophenol

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hoechst AG		Frankfurt	Rhine	via Main	W,E,N,D	

Pentachlorophenol

Discharge	Unit		Year	Refer.	Other remarks
200,0	kg/y	in	1985	N	Production of organic intermediates
2,0	kg/y	in	1992	N/R	<< 2: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hûls- Troisdorf AG		Rheinfelden	Rhine	via ...	N,R,E1,D	(including Hûls AG Chemiebetrieb).

Pentachlorophenol

Discharge	Unit		Year	Refer.	Other remarks
220,0	kg/y	in	1985	N	
2,0	kg/y	in	1992	N/R	<< 2: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	BASF AG	d	Ludwigshafen	Rhine		D,R,N	

Tetrachloroethylene

Discharge	Unit		Year	Refer.	Other remarks
400,0	kg/y	in	1985	R	
113,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bayer AG Leverkusen		Leverkusen (n. of Colone)	Rhine		D,N	manufacture of pigments

Tetrachloroethylene

Discharge	Unit		Year	Refer.	Other remarks
120,0	kg/y	in	1985		
30,0	kg/y	in	1992		<< 30: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hoechst AG		Frankfurt	Rhine	via Main	W,E,N,D	

Tetrachloroethylene

Discharge	Unit		Year	Refer.	Other remarks
300,0	kg/y	in	1985		Production of chlorofluorocarbons
30,0	kg/y	in	1992		<< 30: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls AG	d	Lülsdorf	Rhine	via ...	R	

Tetrachloroethylene

Discharge	Unit		Year	Refer.	Other remarks
118,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls AG	m	Marl (n. of Essen-Bochum)	Lippe		D,N,R,W	

Tetrachloroethylene

Discharge	Unit		Year	Refer.	Other remarks
780,0	kg/y	in	1985	N	
30,0	kg/y	in	1992	N/R	<< 30: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls- Troisdorf AG	d	Rheinfelden	Rhine	via ...	N,R,E1,D	(including Hüls AG Chemiebetrieb).

Tetrachloroethylene

Discharge	Unit		Year	Refer.	Other remarks
500,0	kg/y	in	1985		
30,0	kg/y	in	1992		<< 30: see note.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	BASF AG	d	Ludwigshafen	Rhine		D,R,N	

Trichlorobenzene

Discharge	Unit		Year	Refer.	Other remarks

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Discharge	Unit		Year	Refer.	Other remarks
900,0	kg/y	in	1985	R	see 1,2,4-TCB.
350,0	kg/y	in	1992	R	< 350: less than 350 kg/ see 1,2,4-TCB.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Bayer AG Leverkusen	m	Leverkusen (n. of Colone)	Rhine		D,N	manufacture of pigments

Trichlorobenzene

Discharge	Unit		Year	Refer.	Other remarks
700,0	kg/y	in	1985	R	see 1,2,4-TCB.
260,0	kg/y	in	1992	R	see 1,2,4-TCB.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hoechst AG	m	Frankfurt	Rhine	via Main	W,E,N,D	

Trichlorobenzene

Discharge	Unit		Year	Refer.	Other remarks
195,0	kg/y	in	1985	R/N	see 1,2,4-TCB; Production of organic intermediates
240,0	kg/y	in	1992	R/N	see 1,2,4-TCB.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls AG	d	Lülsdorf	Rhine	via ...	R	

Trichlorobenzene

Discharge	Unit		Year	Refer.	Other remarks
85,0	kg/y	in	1992	R	see 1,2,4-TCB.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls- Troisdorf AG	m	Rheinfelden	Rhine	via ...	N,R,E1,D	(including Hüls AG Chemiebetrieb).

Trichlorobenzene

Discharge	Unit		Year	Refer.	Other remarks
150,0	kg/y	in	1985	N	see 1,2,4-TCB.
10,0	kg/y	in	1992	N/R	<< 10, see note/ see 1,2,4-TCB.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	BASF AG	d	Ludwigshafen	Rhine		D,R,N	

Trichloroethylene

Discharge	Unit		Year	Refer.	Other remarks
900,0	kg/y	in	1985	R	
174,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls AG	m	Marl (n. of Essen-Bochum)	Lippe		D,N,R,W	

Trichloroethylene

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRG	Hüls- Troisdorf AG	d	Rheinfelden	Rhine	via ...	N,R,E1,D	(including Hüls AG Chemiebetrieb).

Trichloroethylene

Discharge	Unit		Year	Refer.	Other remarks
500,0	kg/y	in	1985	N	
28,0	kg/y	in	1992	R/N	<< 28: see note.

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site

Catchment area: **Rhine**.

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
NL	Akzo Chemicals Botlek BV	m	Rotterdam	Botlek	(Botlek Harbour)	W,E,N(R)	Rovin (Akzo Chemicals Botlek B.V.)

1,2-Dichloroethane

Discharge	Unit		Year	Refer.	Other remarks
19550,0	kg/y	in	1985	R	
4600,0	kg/y	in	1992	R	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
NL	Pakhoed Chemicals BV (Botlek)	d	Rotterdam/ Botlek	Botlek - Scheur		R	tank storage (ex Paktank Botlek)

1,2-Dichloroethane

Discharge	Unit		Year	Refer.	Other remarks
2200,0	kg/y	in	1985	R	
320,0	kg/y	in	1992	R	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
NL	Van Ommeren Botlek BV	d	Rotterdam	Botlek - Scheur		R	

1,2-Dichloroethane

Discharge	Unit		Year	Refer.	Other remarks
700,0	kg/y	in	1992	R	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
NL	Afvalverwerking Regio Nijmegen	d	Nijmegen	Waal	via STP	D	discharge via STP Nijmegen

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
12,0	kg/y	in	1990	D	Treshold for individual report (76/464/EEC) = 10 kg Cd/y.

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
NL	Afvalverwerking Rijnmond BV/NV?		Rotterdam/ Botlek	Nieuw Waterweg	Scheur	D	municipal and industrial waste incenerator

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
92,0	kg/y	in	1989	D	Treshold for individuel report (76/464/EEG) = 10 kg Cd/y.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Gevudo	d	Dordrecht	Rhine / Beneden Merwede		D,N	discharge via STP Dordrecht; waste incinerator

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
1580,0	kg/y	in	1989	D	
12,3	kg/y	in	1992	D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	HMI Billiton BV	d	Arnhem	Rhine	Nederrijn	D,N	non ferro industry

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
38,4	kg/y	in	1992	D	Treshold for individual report (76/464/EEC) = 10 kg Cd/y.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Hydro Agri Rotterdam BV	d	Vlaardingen	Rhine	Nieuwe Maas	D,N,R	phosphate fertilizer plant

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
12000,0	kg/y	in	1985	D/R	
2010,0	kg/y	in	1989	D	
1987,0	kg/y	in	1990	D	
1504,0	kg/y	in	1991	D	
600,0	kg/y	in	1992	D/R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Kemira Pernis BV	d	Rotterdam/ Pernis	Nieuwe Maas		D,N,R	phosphate fertiliser plant

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
2400,0	kg/y	in	1985	D/R	
1520,0	kg/y	in	1989	D	Treshold for individuel report (76/464/EEG) = 10 kg Cd/y.
1229,0	kg/y	in	1990	D	
838,0	kg/y	in	1991	D	
480,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Kemira Pigments BV	d	Rotterdam/ Roozenburg	Scheur		D,N,R	titanium dioxide plant (ex Tiofine)

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
10,0	kg/y	in	1990	D	Treshold for individual report (76/464/EEC) = 10 kg Cd/y.
12,0	kg/y	in	1992	D	12, of 15 kg!

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Dow Chemical Benelux BV	d	Rotterdam/ Botlek	Oude Maas	via 3th Petroleum harbour/ Scheur	D,N,R	tank storage

Carbontetrachloride

Discharge	Unit		Year	Refer.	Other remarks
6,0	kg/y	in	1985	R	
36,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Nederlandse Benzol Mij		Rotterdam	Botlek - Scheur		R	tank storage

Carbontetrachloride

Discharge	Unit		Year	Refer.	Other remarks
39,0	kg/y	in	1985	R	
8,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Pakhoed Chemicals BV (Botlek)		Rotterdam/ Botlek	Botlek - Scheur		R	tank storage (ex Paktank Botlek)

Carbontetrachloride

Discharge	Unit		Year	Refer.	Other remarks
13,0	kg/y	in	1985	R	
6,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Dow Chemical Benelux BV	d	Rotterdam/ Botlek	Oude Maas	via 3th Petroleum harbour/ Scheur	D,N,R	tank storage

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
51,0	kg/y	in	1991	D	
33,0	kg/y	in	1992	D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Dupont de Nemours	d	Dordrecht	Rhine / Beneden Merwede		D,N	organic chemical industry

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
87,0	kg/y	in	1990	D	
399,0	kg/y	in	1991	D	
43,0	kg/y	in	1992	D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Luxan	d	Elst	Linge	tributary of Rhine	D	discharge via STP Nieuwgraaf

DDT

Discharge	Unit		Year	Refer.	Other remarks
52,0	g/y	in	1992	D	(0,052 kg/y).

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Shell Nederland Chemie BV	m	Rotterdam	Rhine - Nieuwe Maas	1e petroleumharbour	W,E,D,N	organic chemical industry

Drins

Discharge	Unit		Year	Refer.	Other remarks
32,0	kg/year	in	1985	D	calculation method: drins= {aldrin, dieldrin, endrin, isodrin}
7,4	kg/year	in	1989	D	
8,6	kg/year	in	1990	D	
5,2	kg/y	in	1991	D	
3,3	kg/y	in	1992	D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Shell Nederland Chemie BV	d	Rotterdam	Rhine - Nieuwe Maas	1e petroleumharbour	W,E,D,N	organic chemical industry

Hexachlorobenzene

Discharge	Unit		Year	Refer.	Other remarks
7,0	kg/y	in	1990	D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Discharge	Unit		Year	Refer.	Other remarks
1,2	kg/y	in	1991	D	
1,4	kg/y	in	1992	D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Shell Nederland Chemie BV	d	Rotterdam	Rhine - Nieuwe Maas	1e petroleumharbour	W,E,D,N	organic chemical industry

Hexachlorobutadiene

Discharge	Unit		Year	Refer.	Other remarks
0,4	g/y	in	1992		'other production'.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Luxan		Elst	Linge	tributary of Rhine	D	discharge via STP Nieuwgraaf

Lindane

Discharge	Unit		Year	Refer.	Other remarks
0,1	g/y	in	1992		

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Afvalverwerking Regio Nijmegen	d	Nijmegen	Waal	via STP	D	discharge via STP Nijmegen

Mercury

Discharge	Unit		Year	Refer.	Other remarks
19,0	kg/y	in	1989	D	Treshold for individual report (76/464/EEC) = 7,5 kg Hg/y.
48,0	kg/y	in	1990	D	
29,0	kg/y	in	1991	D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Afvalverwerking Rijnmond BV/NV?	d	Rotterdam/ Botlek	Nieuw Waterweg	Scheur	D	municipal and industrial waste incenerator

Mercury

Discharge	Unit		Year	Refer.	Other remarks
5,0	kg/y	in	1985	D	
12,0	kg/y	in	1989	D	Treshold for individuel report (76/464/EEG) = 7,5 kg Hg/y.
39,0	kg/y	in	1992	D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Hydro Agri Rotterdam BV	d	Vlaardingen	Rhine	Nieuwe Maas	D,N,R	phosphate fertilizer plant

Mercury

Discharge	Unit		Year	Refer.	Other remarks
270,0	kg/y	in	1985	R/D	
266,0	kg/y	in	1989	D	Treshold for individuel report (76/464/EEG) = 7,5 kg Hg/y.
237,0	kg/y	in	1990	D	
248,0	kg/y	in	1991	D	
196,0	kg/y	in	1992	R/D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Kemira Pernis BV	d	Rotterdam/ Pernis	Nieuwe Maas		D,N,R	phosphate fertiliser plant

Mercury

Discharge	Unit		Year	Refer.	Other remarks
100,0	kg/y	in	1985	R/D	
23,0	kg/y	in	1989	D	
55,0	kg/y	in	1990	D	
64,0	kg/y	in	1991	D	
42,0	kg/y	in	1992	R/D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Kemira Pigments BV	d	Rotterdam/ Roozenburg	Scheur		D,N,R	titanium dioxide plant (ex Tiofine)

Mercury

Discharge	Unit		Year	Refer.	Other remarks
46,0	kg/y	in	1985	R/D	
11,0	kg/y	in	1989	D	
19,0	kg/y	in	1990	D	
14,0	kg/y	in	1992	R/D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Shell Nederland Raffinaderij BV	d	Rotterdam/ Pernis	Rhine - Nieuwe Maas		D,N,R	Oil refinery, discharging in an industrial harbour connected with the Rhine

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site

Mercury

Discharge	Unit		Year	Refer.	Other remarks
39,0	kg/y	in	1985	R/D	
39,0	kg/y	in	1989	D	
39,0	kg/y	in	1990	D	
50,0	kg/y	in	1991	D	
48,0	kg/y	in	1992	R/D	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
NL	Akzo Chemicals Botlek BV	d	Rotterdam	Botlek	(Botlek Harbour)	W,E,N(R)	Rovin (Akzo Chemicals Botlek B.V.)

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
37,0	kg/y	in	1985	N	plant closed per 85?
0,1	kg/y	in	1992	N	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
NL	Shell Nederland Chemie BV	d	Rotterdam	Rhine - Nieuwe Maas	1e petroleumharbour	W,E,D,N	organic chemical industry

Pentachlorophenol

Discharge	Unit		Year	Refer.	Other remarks
0,1	kg/y	in	1992	N	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
NL	Dow Chemical Benelux BV	d	Rotterdam/ Botlek	Oude Maas	via 3th Petroleum harbour/ Scheur	D,N,R	tank storage

Tetrachloroethylene

Discharge	Unit		Year	Refer.	Other remarks
3190,0	kg/y	in	1985	R	
230,0	kg/y	in	1992	R	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
NL	Nederlandse Benzol Mij	d	Rotterdam	Botlek - Scheur		R	tank storage

Tetrachloroethylene

Discharge	Unit		Year	Refer.	Other remarks
60,0	kg/y	in	1985	R	
38,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Pakhoed Chemicals BV (Botlek)	d	Rotterdam/ Botlek	Botlek - Scheur		R	tank storage (ex Paktank Botlek)

Tetrachloroethylene

Discharge	Unit		Year	Refer.	Other remarks
900,0	kg/y	in	1985	R	
540,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Dow Chemical Benelux BV	d	Rotterdam/ Botlek	Oude Maas	via 3th Petroleum harbour/ Scheur	D,N,R	tank storage

Trichloroethylene

Discharge	Unit		Year	Refer.	Other remarks
224,0	kg/y	in	1985	R	
140,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
NL	Pakhoed Chemicals BV (Botlek)	d	Rotterdam/ Botlek	Botlek - Scheur		R	tank storage (ex Paktank Botlek)

Trichloroethylene

Discharge	Unit		Year	Refer.	Other remarks
250,0	kg/y	in	1985	R	
650,0	kg/y	in	1992	R	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhône**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Soc. du Chlor. de Vinyle de Fos (?)	m	Fos sur Mer (w. of Marseille)	Mediterranean (Golfe de Fos)		W,E	

1,2-Dichloroethane

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Solvay and Cie SA	m	Tavaux (s-e Dijon)	Rhône	via Doubs -> Saône	N,W	Rhône Alps

1,2-Dichloroethane

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Rhône Poulenc (1)	m	Le Pont de Claix (n. Grenoble)	Isère		W,E	

1,2,4-Trichlorobenzene

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Dassault	d	Argonay	Rhône		D	electroplating

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Elf ATOCHEM	d	Pierre Benite (m-e France)	Rhône		N	dep 69.

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
657,0	kg/y	in	1991	N	
365,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhône**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Galvanoplast	d	Les Aynans (n-e France)	Rhône	via	N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
440,0	kg/y	in	1986	N	
255,0	kg/y	in	1989	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Marquet	d	Cluses	Rhône		D,N	electroplating; DEP 74

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Nicoud	d	Cluses	Rhône		D	electroplating

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Rhône Poulenc	d	Roches de Condrieu	Rhône		N	m-e France

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
730,0	kg/y	in	1986	N	
2373,0	kg/y	in	1988	N	
1860,0	kg/y	in	1989	N	
1825,0	kg/y	in	1990	N	
4125,0	kg/y	in	1991	N	
1250,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	SAM	m	Lyon	Rhône/Saône		E	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhône**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Saint - Dupont	d	Faverges	Rhône		D	electroplating

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Soc. Soufre et Micron Couleurs	d	Narbonne (Langedoc)	Rhône		D,N	Manufacture of pigments

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
365,0	kg/y	in	1986	N,D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Tefal	d	Rumilly	Rhône		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
30,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Tredi	d	St Vulbas (m-e France)	Rhône		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
73,0	kg/y	in	1991	N	
65,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Elf ATOCHEM	d	Pierre Benite (m-e France)	Rhône		N	dep 69.

Carbontetrachloride

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Elf ATOCHEM SA	m	Lavera (Martigues)	Mediterranean		D,N	dep 13.

Carbontetrachloride

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site

Catchment area: **Rhône**.

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
FRA	Elf ATOCHEM SA	m	Le Pont de Claix (n. Grenoble)	Rhône	via Isére	W	

Carbontetrachloride

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
FRA	Elf ATOCHEM SA	m	L'Estaque (w. of Marseille)	Mediterranean		W	

Carbontetrachloride

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
FRA	Elf ATOCHEM Saint Auban	m	Saint Auban (w. of Nice)	Mediterranean	via Esceron -> Tineé.	W,D	dep 4.

Carbontetrachloride

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in		D	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
FRA	Solvay and Cie SA	m	Tavaux (s-e Dijon)	Rhône	via Doubs -> Saône	N,W	Rhône Alps

Carbontetrachloride

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in		D	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
FRA	Elf ATOCHEM SA	m	L'Estaque (w. of Marseille)	Mediterranean		W	

Chloroform

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhône**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Solvay and Cie SA	m	Tavaux (s-e Dijon)	Rhône	via Doubs -> Saône	N,W	Rhône Alps

Chloroform

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Elf ATOCHEM Saint Auban		Saint Auban (w. of Nice)	Mediterranean	via Esceron -> Tineé.	W,D	dep 4.

Lindane

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Rhône Poulenc Agrochem. SA (i)	m	Saint Auban (w.of Nice)	Mediterranean	via Esceron -> Tineé	W,E	

Lindane

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Rhône Poulenc (1)	m	Le Pont de Claix (n. Grenoble)	Isère		W,E	

Lindane

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Elf ATOCHEM	d	Pierre Benite (m-e France)	Rhône		N	dep 69.

Mercury

Discharge	Unit		Year	Refer.	Other remarks
50,0	kg/y	in	1991	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Elf ATOCHEM SA	d	Lavera (Martigues)	Mediterranean		D,N	dep 13.

Mercury

Discharge	Unit		Year	Refer.	Other remarks
16,0	kg/y	in	1986	N	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site

Catchment area: **Rhône.**

Discharge	Unit		Year	Refer.	Other remarks
16,5	kg/y	in	1988	N	
16,0	kg/y	in	1989	N	
26,6	kg/y	in	1990	N	
47,0	kg/y	in	1991	N	
32,5	kg/y	in	1992	N	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
FRA	Elf ATOCHEM Saint Auban	d	Saint Auban (w. of Nice)	Mediterranean	via Esceron -> Tineé.	W,D	dep 4.

Mercury

Discharge	Unit		Year	Refer.	Other remarks
198,0	kg/y	in	1986	N	
121,0	kg/y	in	1988	N	
110,0	kg/y	in	1989	N	
46,0	kg/y	in	1991	N	
39,0	kg/y	in	1992	N	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
FRA	Soc. Cogema	d	Miramas Istres (n-w Marseille)	(Golfe de Fos?)		D,N	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
2,3	kg/y	in	1992	D,N	"other plant"

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
FRA	Soc. Prodica à Marseille	d	Marseille Saint Marcel	Rhône		D	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	"other plant"

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
FRA	Soc. Soufre et Micron Couleurs	d	Narbonne (Langedoc)	Rhône		D,N	Manufacture of pigments

Mercury

Discharge	Unit		Year	Refer.	Other remarks
2,5	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Rhône**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Produits Chimiques Ugine Kuhlmann	d	Jarrie (near La Rochelle)	Atlantic Ocean	Pertuis d'Antioche.	E1	Rhône Alps

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Rhône Poulenc Agrochem. SA (i)	m	Saint Auban (w.of Nice)	Mediterranean	via Esceron -> Tineé	W,E	

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Rhône Poulenc Industries	m	Lavera	Mediterranean		E1	

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Solvay and Cie SA	m	Tavaux (s-e Dijon)	Rhône	via Doubs -> Saône	N,W	Rhône Alps

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
69,0	kg/y	in	1986	N	
80,0	kg/y	in	1988	N	
50,0	kg/y	in	1989	N	
26,0	kg/y	in	1990	N	
31,0	kg/y	in	1991	N	
25,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Elf ATOCHEM Saint Auban	m	Saint Auban (w. of Nice)	Mediterranean	via Esceron -> Tineé.	W,D	dep 4.

Tetrachloroethylene

Discharge	Unit		Year	Refer.	Other remarks

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
			0,0 No Info. in				
FRA	Progelec	m	Le Pont de Claix (n. Grenoble)	Rhône	via Isére	W,E	

Tetrachloroethylene

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Solvay and Cie SA	m	Tavaux (s-e Dijon)	Rhône	via Doubs -> Saône	N,W	Rhône Alps

Tetrachloroethylene

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Elf ATOCHEM Saint Auban	m	Saint Auban (w. of Nice)	Mediterranean	via Esceron -> Tineé.	W,D	dep 4.

Trichloroethylene

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Solvay and Cie SA	m	Tavaux (s-e Dijon)	Rhône	via Doubs -> Saône	N,W	Rhône Alps

Trichloroethylene

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Sado**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
POR	Companhia Nacional de Petroquimica	m	Sines (s of Lisbon)	Atlantic Ocean		E,N	s.w. of Portugal; s. of Sado-river.

1,2-Dichloroethane

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Scheldt.**

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	BASF NV	m	Antwerpen	Zeeschelde- lower		W,E1	linkeroever

Substance	Discharge	Unit		Year	Refer.	Other remarks
1,2-Dichloroethane	0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	LVM	m	Tessenderlo	Scheldt	via Grote Beek > Demer Albert Canal?	W,E	waste water pipeline -> Scheldt?

Substance	Discharge	Unit		Year	Refer.	Other remarks
1,2-Dichloroethane	0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Artmeto-Eltroga BVBA	d	Menen	Leie		N	

Substance	Discharge	Unit		Year	Refer.	Other remarks
Cadmium	1,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Associated Weavers	d	Ronse	Bovenschelde		N	

Substance	Discharge	Unit		Year	Refer.	Other remarks
Cadmium	18,1	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Bekaert-Pelzen	d	Oudenaarde	Bovenschelde		N	

Substance	Discharge	Unit		Year	Refer.	Other remarks
Cadmium	1,1	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Belteinka PVBA	d	Oudenaarde	Bovenschelde		N	

Substance	Discharge	Unit		Year	Refer.	Other remarks
Cadmium	3,8	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Scheldt**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Boucher NV	d	Ertvelde	Kanaal Gent-Terneuzen		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
1,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Cambier Firma NV	d	Ronse	Bovenschelde		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
9,6	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Colle Gebroeders NV	d	Deinze	Leie		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
6,4	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	De Waele NV	d	Kluisbergen	Bovenschelde		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
6,2	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Dow Benelux SA	d	Tessenderlo	Beneden Demer		N	discharge via STP Tessendelo

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
11,5	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Scheldt.**

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Eurantex BV	d	Oudenaarde	Bovenschelde		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
4,4	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Eurocompound Belgium BV	?	Oudenaarde	Bovenschelde		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
1,2	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Friswit	d	Hoogstraten	Mark en Kleine Aa		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
1,4	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Gevaco	d	Oudenaarde	Bovenschelde		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
1,4	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	IVOO C.V.	?	Oostende	'Zeebrugge'		N	discharge via STP Oostende

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
5,2	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Intercom Miwa	?	Sint Niklaas	Kanaal Gent-Terneuzen		N	discharge via STP Sint-Niklaas

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
1,4	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Scheldt.**

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Jacky NV	d	Baasrode	Zeeschelde- middle		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
20,7	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Kempense Steenkoolmijn	d	Zolder	Grote Nete/ Boven Demer		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
21,1	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Metallurgie Hoboken	?	Hoboken	Zeeschelde- lower		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
25,3	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	NMBS (LP 2)	?	Mechelen	Beneden Dijle		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
2,5	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Rûtgers VFT NV	d	Zelzate	Kanaal Gent- Terneuzen		N	ex Sopar Chemie

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
6,5	kg/y	in	1992	N	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site

Catchment area: **Scheldt**.

BEL STP Balen — d — Balen — Grote Nete — N

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
11,8	kg/y	in	1992	N	

BEL STP Ninove — d — Ninove — Dender — N

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
15,2	kg/y	in	1992	N	

BEL STP Sint-Niklaas — d — Sint Niklaas — Kanaal Gent-Terneuzen — N

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
67,6	kg/y	in	1992	N	

BEL Sabena Techn. Directie — d — Zaventem — Beneden Dijle — N

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
1,3	kg/y	in	1992	N	

BEL Samsonite NV — d — Oudenaarde — Bovenschelde — N

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
2,5	kg/y	in	1992	N	

BEL Sofinal Cotesa NV — d — Nokere Kruishoutem — Leie — N

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
3,4	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Scheldt**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Tessenderlo Chemie (TCH)	d	Ham	Grote Nete		N	sampling point no. 39453.

Substance	Discharge	Unit		Year	Refer.	Other remarks
Cadmium	222,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Tessenderlo Chemie (TCH)	d	Ham	Beneden Demer		N	sampling point no. 39454.

Substance	Discharge	Unit		Year	Refer.	Other remarks
Cadmium	222,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Tessenderlo Chemie (TCH)	d	Tessenderlo	Grote Nete		N	sampling point no. 398014.

Substance	Discharge	Unit		Year	Refer.	Other remarks
Cadmium	70,2	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	UCB Chemie BV	d	Gent	Kanaal Gent-Terneuzen		N	

Substance	Discharge	Unit		Year	Refer.	Other remarks
Cadmium	32,9	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	UCB FTAL NV	d	Schoonaarde	Zeeschelde		N	linkeroever

Substance	Discharge	Unit		Year	Refer.	Other remarks
Cadmium	22,2	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Scheldt**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Utexbel NV	d	Oudenaarde	Bovenschelde		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
6,8	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Vamo-Mills NV	d	Gent	Kanaal Gent-Terneuzen		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
3,8	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Verenigde Weverijen Leon	d	Deinze	Leie		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
7,1	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Vieille Montagne	m	Overpelt	Dommel/ Kempisch Canal	via Kempensch Kanaal -> Albert Kanaal -> Scheldt	E,N	south of Eindhoven

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
394,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Vuylsteke NV	d	Roeselare	Leie		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
9,5	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Scheldt**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Wasserij St. Joris	d	Gingelom	Gete		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
1,2	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	ARCO Chemical Products	d	Gent	Kanaal Gent-Terneuzen		N	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
11,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Amylum NV		Aalst	Dender		N	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
20,9	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	BASF NV	d	Antwerpen	Zeeschelde- lower		W,E1	linkeroever

Mercury

Discharge	Unit		Year	Refer.	Other remarks
48,0	kg/y	in	1992	N	discharge via gipsum; also see under C12-production

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Bekaert NV	d	Aalter	Kanaal Gent-Oostende		N	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
1,5	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Belgian Shell	d	Gent	Kanaal Gent-Terneuzen		N	

Mercury

Discharge	Unit		Year	Refer.	Other remarks

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
			8,5 kg/y in 1992 N				
BEL	Centrawas bvba	d	Gullegem	Leie		N	
	Mercury		Discharge / Unit / Year / Refer. / Other remarks: 1,0 kg/y in 1992 N				
BEL	IVBO S.V.	d	Brugge	polders bij Zeebrugge		N	
	Mercury		Discharge / Unit / Year / Refer. / Other remarks: 76,0 kg/y in 1992 N				
BEL	IVOO C.V.	d	Oostende	'Zeebrugge'		N	discharge via STP Oostende
	Mercury		Discharge / Unit / Year / Refer. / Other remarks: 15,3 kg/y in 1992 N				
BEL	LYS Yarns	d	Zulle	Leie		N	
	Mercury		Discharge / Unit / Year / Refer. / Other remarks: 1,2 kg/y in 1992 N				
BEL	STP Dendermonde	d	Dendermonde	Zeeschelde-middle		N	
	Mercury		Discharge / Unit / Year / Refer. / Other remarks: 5,7 kg/y in 1992 N				

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Scheldt.**

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	STP Koersel	d	Koersel	Beneden- Demer		N	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
1,2	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	STP Langemark	d	Langemark	IJzer: Blankaart		N	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
6,2	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	STP Leuven	d	Kessel Lo	Boven- Dijle		N	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
2,5	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	STP Woumen	d	Woumen	IJzer: Blankaart		N	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
3,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Vieille Montagne	d	Overpelt	Dommel/ Kempisch Canal	via Kempensch Kanaal -> Albert Kanaal -> Scheldt	E,N	south of Eindhoven

Mercury

Discharge	Unit		Year	Refer.	Other remarks
9,1	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	BASF NV	d	Antwerpen	Zeeschelde- lower		W,E1	linkeroever

Mercury chloralkali

Discharge	Unit	Year	Refer.	Other remarks

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
			0,0 No Info. in				
BEL	Solvay & Chemie	d	Antwerp	Zeeschelde- lower		E1	

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
1,4	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
BEL	Tessenderlo Chemie (TCH)	d	Tessenderlo	Grote Beek - Demer	via Grote Beek > Demer (Albert Canal)	E1	waste water pipeline -> Scheldt?

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Scheldt**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Metaleurop (ex Pennarroya)	d	Noyelles Godault (n-w France)	Haute Deule		D,N	non-ferrous/ production primary batteries

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
35400,0	kg/y	in	1986	N	
27000,0	kg/y	in	1988	N	
2040,0	kg/y	in	1989	N/D	
1640,0	kg/y	in	1990	N	
2263,0	kg/y	in	1991	N	
1970,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Union miniere (ex Vieille Montagne)	d	Auby (n-w France)	Scarpe	Scheldt?	D,N	non-ferrous/production primary batteries; ex Vieille Montagne þ 1992.

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
4380,0	kg/y	in	1988	N/D	
440,0	kg/y	in	1990	N	
438,0	kg/y	in	1991	N	
440,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Metaleurop (ex Pennarroya)	d	Noyelles Godault (n-w France)	Haute Deule		D,N	non-ferrous/ production primary batteries

Mercury

Discharge	Unit		Year	Refer.	Other remarks
192,0	kg/y	in	1988	N/D	'other plant'
14,2	kg/y	in	1989	N	
13,5	kg/y	in	1990	N	
10,9	kg/y	in	1991	N	
19,5	kg/y	in	1992	N	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site

Catchment area: **Scheldt**.

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
FRA	Sollac	d	Dunkerque (n-w France)	Atlantic Ocean		N	

Mercury

Discharge	Unit		Year	Refer.	Other remarks
72,0	kg/y	in	1991	N	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
FRA	Union miniere (ex Vieille Montagne)	d	Calais (n-w France)	Atlantic Ocean		N	ex Vieille Montagne, þ 1992.

Mercury

Discharge	Unit		Year	Refer.	Other remarks
99,0	kg/y	in	1990	N	
54,7	kg/y	in	1991	N	
2,7	kg/y	in	1992	N	Decline in discharge caused by treatment measures.

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
FRA	Produits Chimiques Ugine Kuhlmann	d	Loos (near Lille)	La Deûle		E1,N	

Mercury chloralkali

Discharge	Unit		Year	Refer.	Other remarks
22,6	kg/y	in	1986	N	
16,2	kg/y	in	1988	N	
13,1	kg/y	in	1989	N	
13,9	kg/y	in	1990	N	
10,9	kg/y	in	1991	N	
13,5	kg/y	in	1992	N	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site

Catchment area: **Scheldt**.

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
NL	Hoechst Holland NV	d	Vlissingen-Oost	Westerscheldt		D,N	Phosphoric acid production (via electrolysis proces)

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
121,0	kg/y	in	1989	D	
109,0	kg/y	in	1990	D	
95,0	kg/y	in	1991	D	
47,0	kg/y	in	1992	D	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
NL	Pechiney BV	d	Vlissingen-Oost	Westerscheldt		D,N	aluminium production including production of carbon anodes

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
84,0	kg/y	in	1989	D	
92,0	kg/y	in	1990	D	
72,0	kg/y	in	1991	D	
35,0	kg/y	in	1992	D	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
NL	Zuid Chemie BV	d	Sas van Gent	Westerscheldt	via Kanaal Sas van Gent-Terneuzen	D,N	fertiliser plant

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
49,0	kg/y	in	1989	D	
61,0	kg/y	in	1990	D	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
NL	Afvalstoffen Terminal Moerdijk	d	Moerdijk	Westerscheldt		D	chemical waste treatment facility; discharge via STP Bath.

Mercury

Discharge	Unit		Year	Refer.	Other remarks
8,5	kg/y	in	1992	D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Seine.**

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Aterc	m	Nogent l'Arthaux	Seine ?	via Marne	E	(Nogent-L'Artaud)

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	CDF Chimie AZF	d	Grand Couronne (n-w France)	Seine		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
760,0	kg/y	in	1986	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Comptoir Lyon Alemand Louyot	d	Noisy le Sec	Seine?	indirect discharge via POTW	N	dep 93 !?

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
2200,0	kg/y	in	1986	N	
75,0	kg/y	in	1990	N	
40,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Elf ATOCHEM	d	Serquigny	Seine		N	dep 27.

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
30,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Forges de Boulogne	d	Boulogne	Marne		D	electroplating

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site

Catchment area: **Seine.**

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
FRA	Hydro Agri Fr. (SNA, ex Norsk H.Az)	d	Le Havre	Seine		N	dep 76; ex Norsk Hydro Azote, þ 1992 (?).

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
8250,0	kg/y	in	1986	N	
8760,0	kg/y	in	1988	N	
7665,0	kg/y	in	1989	N	
7670,0	kg/y	in	1990	N	
6753,0	kg/y	in	1991	N	
6000,0	kg/y	in	1992	N	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
FRA	Perrien	d	Montreuil	Seine		D	electroplating

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
FRA	Pont a Mousson SA	d	Bayard (n-e France)	Seine		N	DEP 52

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
365,0	kg/y	in	1986	N	
365,0	kg/y	in	1988	N	
365,0	kg/y	in	1989	N	
75,0	kg/y	in	1992	N	

Coun-try	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	Refe-rences	Remarks concerning the site
FRA	SC Grande Paroisse (SCGP)	d	Grand Quevilly	Seine		N	dep 76.

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
290,0	kg/y	in	1990	N	
172,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Seine**.

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	SEP	d	St Ouen l'Aumone	Seine - Oise		D	electroplating

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Soc. Parisienne de Cadmiage	d	Montreuil	Seine		D	electroplating

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Thann et Mulhouse	d	Le Havre (n-w France)	Seine		N	

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
4015,0	kg/y	in	1986	N	
256,0	kg/y	in	1991	N	
51,0	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Villard S.A.	d	Montereau Fault Yonne	Seine - Marne		D,N	electroplating

Cadmium

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Cipel	d	Caudebec les Elbeuf	?		D	manufacture of primary batteries

Mercury

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Crompton & Knowles (ICI Francolor)	d	Oissel (n-w France)	Seine ?		D,N	ex ICI Francolor þ 1992, dep 76.

Mercury

Discharge	Unit		Year	Refer.	Other remarks
25,5	kg/y	in	1986	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Seine.**

Discharge	Unit		Year	Refer.	Other remarks
29,0	kg/y	in	1989	N	
11,7	kg/y	in	1990	N	
12,4	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Hydro Agri Fr. (SNA, ex Norsk H.Az)	d	Le Havre	Seine		N	dep 76; ex Norsk Hydro Azote, þ 1992 (?).

Mercury

Discharge	Unit		Year	Refer.	Other remarks
21,0	kg/y	in	1988	N	
18,0	kg/y	in	1989	N	
19,3	kg/y	in	1990	N	
45,9	kg/y	in	1991	N	
19,2	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	SC Grande Paroisse (SCGP)	d	Grand Quevilly	Seine		N	dep 76.

Mercury

Discharge	Unit		Year	Refer.	Other remarks
2,1	kg/y	in	1992	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	SC Grande Paroisse (SCGP)	d	Rouen	Seine		N	dep 76.

Mercury

Discharge	Unit		Year	Refer.	Other remarks
20,4	kg/y	in	1990	N	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Seraf	d	Tourville la Rivière	?		D	toxic waste treatment

Mercury

Discharge	Unit		Year	Refer.	Other remarks
0,0	No Info.	in		D	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Produits Chimiques Ugine Kuhlmann	d	Villers St Paul (n. of Paris)	Seine	via Oise	E1	

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Mercury chloralkali

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site
FRA	Soc. des Produits Chimiques	m	Harbonnières (n. of Paris)	Somme		E1	

Mercury chloralkali

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

Catchment area: **Tagus**.

POR	Solvay Portugal	d	Póvoa de Santo Iria (Lisbon)	Atlantic Ocean	via Tagus Estuary	E1,N	

Mercury chloralkali

Discharge	Unit	Year	Refer.	Other remarks
0,0	No Info. in			mercury process

Country	Manufacturer, or Discharger	m/d	Site	Near by surface water	via..	References	Remarks concerning the site

end of report

Appendix D-2 Industrial and Municipal Dischargers of List I Substances:

Supplemental information on discharges, direct and riverine inputs

Slaney river (Ireland)

For this project, the catchment of the Slaney river was chosen in accordance with the Irish national representative. In source IRL613, it is stated that there are few, if any, of the candidate List I substances produced, generated, used or discharged in Ireland in general and in the Slaney catchment in particular.

For the Slaney River, annual loads (inputs) are reported among which is the List I substance cadmium (source: IRL611 concerning "PARCOM Pilot and Comprehensive Studies"). The results for cadmium are given in Table 1.

Table 1 : PARCOM: annual loads (tonnes cadmium / year)

1986	:	0.32
1987	:	0.2
1990	:	0.09
1992	:	0.13
1993	:	0,09

There is no evidence of any trend in cadmium loads (data for 1986-1987 are based on analysis results having higher detection limits than for 1990-1993). The data is not linked to individual dischargers.

DENMARK

In sources DK1001 and DK1004, Denmark reported on the discharge via industrial waste water of many polluting (List I and List II) substances. Source DK1001 does not make a distinction in individual List I substances. The overall results are given below in table 2.

Table 2 Discharge via industrial waste water in Denmark in tonnes or kg / year

group of substances	discharge in 1985	discharge in 1988/1989	discharge in 1993
heavy metals	20 tonnes	11 tonnes	5 tonnes
chlorinated aromatic hydrocarbons	52.750 kg	12.800 kg	
chlorinated aliphatic hydrocarbons	26.480 kg	17.400 kg	
adsorbable organo halogens	14.400 kg	3.950 kg	

More information concerning specific List I substances is given in source DK1004, and in Table 3 below.

Table 3 Total discharge in tonnes per year of organic substances in 1992/1993 from industries in Denmark:

substance	discharge in tonnes / year
Pentachlorophenol	0
Hexachlorobenzene	0
Hexachlorobutadiene	-
Carbontetrachloride	-
Chloroform	-
Trichloroethylene	5
Tetrachloroethylene	5
Trichlorobenzene	-
1,2-Dichloroethane	$<<$ 1

Source DK1001 shows, that in Denmark industrial discharges in general take place to the sea or estuaries. The majority of the industries are located in or near major cities around the coast. Only a limited number of industries have an inland location discharging into a small river or canal.

Specific statements on discharge trends for List I substances can not be given based on the information given in sources DK1001 and DK1004.

Tagus and Sado river (Portugal)

As far as environmental planning is concerned, Portugal adopted a national environmental policy plan considering all environmental compartments (sources: P1201 and P1202). A National water policy plan is being developed. Based on this latter, the river basins will have to develop water management plans including such aspects as making inventories of discharges, etc.

In the framework of the Oslo and Paris Convention, Portugal prepared a data report on riverine and direct inputs of contaminants to the maritime area of the Paris Convention in 1991 (source: GEN021).

For the Tagus River, input data for 3 List I substances is collected (cadmium, mercury and γ-HCH). These data are given in Table 4.

Table 4: Direct and riverine inputs to the maritime area of the Paris Convention in 1991 by Portugal (Tagus river)

substance	sewage effluents)1	industrial effluents)1	riverine inputs)2	tributary rivers)3	total inputs
cadmium (ton)	n.i.	n.i.	0 30	0 3	0 33
mercury (ton)	n.i.	n.i.	1.5 1.6	0.2 0.2	1.7 1.8
y-HCH (kg)	n.i.	n.i.	0 9.5	0,4 0,9	0.4 10.4

key

n.i.	:	no information
inputs	:	first figure is lower estimate; second figure is upper estimate.
)1 sewage effluents industrial effluents	:	direct discharges into Tagus estuary
)2 riverine input	:	discharge via Tagus river before entering the estuary
)3 tributary rivers	:	discharge via Sorraia river into Tagus estuary

Specific statements on discharge trends for List I substances can not be given based on the information given in source GEN021. For the Sado River, no discharge information was made available.

Furthermore, one must keep in mind that the Tagus river is a transboundary surface water, also carrying Spanish discharges of List I substances before entering the Atlantic Ocean via Portuguese territory.

Tagus and Ebro river (Spain)

Spain developed a data system including all names of direct and indirect potential dischargers of List I (and potential List I) substances (source: E1104). Potential in this context means, that the industrial activity gives rise to the possible discharge of a List I substance. In time, actual discharges of List I substances will be included in the data system, representing an effective tool to control discharges of List I substances.

Specific statements on discharge trends for List I substances can not be given, considering the fact that the above mentioned data system does not (yet) contain information on actual discharges of List I substances.

Scheldt (Belgium / Flemish and Brussels region)

The Flemish region started elaborated discharge inventories into the Scheldt river of a number of List I substances (mercury and cadmium: sources: B300 and B301). For these substances sufficient discharge information is available for 1991 and 1992; this period of time however, is to short to give specific statements on discharge trends for these substances. For the other List I substances no discharge information was made available.

No discharge information was made available by the Brussels region.

Meuse (Belgium / Walloon region).

No discharge information was made available by the Walloon region.

Trent, Mersey and Thames (United Kingdom)

General

The UK provided a comprehensive list of dischargers including consent details on List I substances (source: UK801). These data give a clear view of which discharger is consented to discharge which List I substances and to what extent. This information however, does not give an insight into what is actually discharged by these point-sources. General statements on discharge trends for List I substances can not be given.

Specific

In addition, the UK gave an overview of reductions of input loads of mercury to the Mersey estuary for the period 1985 - 1993 (source: UK801). Tighter controls and improved effluent treatment processes by the largest producer of chlorine to reduce the quantity of mercury discharged in waste brine and a change to the (mercury free) membrane process by another producer have brought about a dramatic reduction in the amount of mercury discharged over the past 15 years. The results are given in table 5.

For inputs of mercury to the Mersey Estuary (mainly originating from chlorine production via the chlor alkali process), a clear "discharge trend" is given.

Table 5 Inputs of mercury to the Mersey Estuary (rounded data).

year	industrial inputs (tonnes/year)	riverine inputs (tonnes/year)	total inputs (tonnes/year)
1985	6	1.5	7.5
1986	4.5	0.5	5
1987	6.5	1.5	8
1988	4	1.5	5.5
1989	2.5	1	3.5
1990	2	0.5	2.5
1991	1.5	0.5	2
1992	1	0.5	1.5
1993	0.5	0.5	1

Additionally, the UK reported on direct and riverine discharges via the Oslo and Paris Commissions (sources: GEN025 and GEN026). The results for the catchment areas "Irish Sea" (Mersey is included) and North Sea (Thames and Trent are included) are given in Tables 6 and 7.

Table 6 Direct and riverine inputs to Paris Convention Waters by UK rivers into Irish Sea (river Mersey included)

	cadmium (tonnes/year)		mercury (tonnes/year)		y-HCH (kg/year)	
1987)1	35		13		900	
1988)1	35		13		900	
1990)2	25	31	3.9	5.2	2.7	63
1992)2	10.6	14.1	2.4	3.4	96	129.1

)1 1984 data (Irish Sea: only direct input data based on 1984)
)2 first figure = lower estimate
second figure = upper estimate

Table 7 Direct and riverine inputs to Paris Convention Waters by UK rivers into the North Sea (rivers Thames and Trent included).

	cadmium (tonnes/year)		mercury (tonnes/year)		y-HCH (kg/year)	
1987)1	31		6.6		500	
1988)1	31		6.6		500	
1990)2	6.4	15.3	1.8	4.5	297	386
1992)2	7.6	17.7	1	3.8	196	217

)1 1986 data
)2 first figure = lower estimate
second figure = upper estimate

Po (Italy)

No discharge information was made available.

Axios (Greece)

No discharge information was made available.

Luxembourg

For the catchment area of the Rhine, Luxembourg provided information on discharges of two List I substances for the year 1985 (discharge into the Luxembourg part of the Moselle (source: GEN024). The data provided are given in Table 8.

Table 8 Discharge of mercury and cadmium in 1985 in the Luxembourg catchment area of the Moselle (a tributary of the Rhine):

substance	direct discharge via industrial waste water (kg/year)	direct discharge via municipal waste water (kg/year)	total discharge (kg/year)
mercury	0	10	10
cadmium	66	55	121

In 1994 Luxembourg reported that there are no industrial discharges of List I substances (source L405).

So far, a cadmium trend can be assumed (from 66 kg/year to 0 kg/year in the period 1985 -> 1994).

Appendix E Water Quality of List I Substances in Selected Main Waters

EC List 1 (black list) River 'Axios' Monitoring station 'Axioupolis'

Annual averages (< = below detection limit) Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980	171.4		GR901							0.33		GR901	0.48		GR901									
1981	201.9		GR901							0.21		GR901	0.65		GR901									
1982	173.8		GR901							0.24		GR901	0.10		GR901									
1983	98		GR901							0.68		GR901												
1984	175.6		GR901																					
1985	88.8		GR901							0.85		GR901												
1986	172.5		GR901							0.37		GR901	0.40		GR901									
1987	98.3		GR901							0.44		GR901	0.20		GR901									
1988	44.5		GR901							0.38		GR901	0.45		GR901									
1989																								
1990																								
1991																								
1992																								
1993																								

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993																								

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
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1989																								
1990																								
1991																								
1992																								
1993																								

EC List 1 (black list) River 'Axios' Monitoring station 'code 1020_02'

Annual averages (< = below detection limit) Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986	174		GR900	9.53	*	GR900																		
1987	98		GR900	10.10	*	GR900																		
1988	43		GR900	11.18	*	GR900																		
1989	72		GR900	11.38	*	GR900																		
1990	38		GR900	10.57	*	GR900																		
1991	113		GR900	11.40	*	GR900																		
1992				11.49	*	GR900																		
1993																								

* unreliable according the Ministry of Environment

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
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1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993																								

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
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1993																								

EC List 1 (black list) River 'Axios' Monitoring station 'code 1020_03'

Annual averages (< = below detection limit) Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986	171		GR900	9.68	*	GR900																		
1987	129		GR900	10.29	*	GR900																		
1988	35		GR900	10.77	*	GR900																		
1989	72		GR900	11.35	*	GR900																		
1990	38		GR900	10.80	*	GR900																		
1991	113		GR900	11.38	*	GR900																		
1992				11.37	*	GR900																		
1993																								

* unreliable according the Ministry of Environment

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
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1991																								
1992																								
1993																								

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
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1992																								
1993																								

EC List 1 (black list) River 'Ebro' Monitoring station 'Asco '

Annual averages (< = below detection limit)

Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980																								
1981	685		SP1102	8.7		SP1102	3.0		SP1102	1	<	SP1102	0.1	<	SP1102									
1982	543		SP1102	8.4		SP1102	3.3		SP1102	1	<	SP1102	0.1	<	SP1102									
1983				8.4		SP1102	2.9		SP1102	1	<	SP1102	0.1	<	SP1102									
1984				9.1		SP1102	3.1		SP1102	1	<	SP1102	0.1	<	SP1102									
1985	471		SP1102	7.6		SP1102	2.7		SP1102	1	<	SP1102	0.1	<	SP1102									
1986	460		SP1102	9.1		SP1102	3.7		SP1102	1	<	SP1102	0.1	<	SP1102									
1987	435		SP1102	9.3		SP1102	3.2		SP1102	1	<	SP1102	0.1		SP1102									
1988	458		SP1102	8.9		SP1102	2.9		SP1102	1	<	SP1102	0.1	<	SP1102									
1989	186		SP1102	9.5		SP1102	4.3		SP1102	1	<	SP1102	0.1	<	SP1102									
1990	207		SP1102	9.0		SP1102	4.2		SP1102	1	<	SP1102	0.1	<	SP1102									
1991	280		SP1102	9.5		SP1102	4.8		SP1102	1	<	SP1102	0.24		SP1102									
1992	403		SP1102	9.4		SP1102	5.9		SP1102	1	<	SP1102	0.30		SP1102									
1993	257		SP1102	8.8		SP1102	7.5		SP1102	1	<	SP1102	0.28		SP1102									

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
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1989																								
1990																								
1991																								
1992																								
1993																								

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993																								

EC List 1 (black list) River 'Loire' Monitoring station 137000 (Ste Luce)

Annual averages (< = below detection limit) Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980	1165.58		F202	11.81		F202	6.58		F202															
1981	1174.50		F202	10.93		F202	4.67		F202															
1982	1172.75		F202	12.02		F202	6.67		F202															
1983	1335.58		F202	9.93		F202	5.00		F202															
1984	987.67		F202	10.01		F202	5.08		F202															
1985	600.13		F202	12.11		F202	7.75		F202															
1986	967.42		F202	10.68		F202	6.43		F202															
1987	873.42		F202	11.70		F202	6.37		F202															
1988	1177.83		F202	10.58		F202	6.16		F202															
1989	375.83		F202	10.42		F202	6.58		F202															
1990	396.25		F202	9.77		F202	6.38		F202															
1991	488.08		F202	9.45		F202	5.73		F202							0.05	<	F203						
1992				10.82		F202	6.07		F202							0.05	<	F203						
1993																0.05	<	F201						

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																0.020		F203						
1992																0.0129		F203						
1993																0.0114		F201						

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993																								

EC List 1 (black list) River 'Mersey' Monitoring station ' Howley Weir '

Annual averages (< = below detection limit) Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980	57.6		UK801	6.1		UK801	5.1		UK801	0.086		UK801	0.48		UK801									
1981	51.4		UK801	6.2		UK801	5.0		UK801	0.121		UK801	0.63		UK801									
1982	40.8		UK801	6.0		UK801	5.6		UK801	0.074		UK801	1.21		UK801									
1983	57.2		UK801	6.1		UK801	6.2		UK801	0.119		UK801	0.83		UK801									
1984	48.5		UK801	5.6		UK801	6.5		UK801	0.084		UK801	0.23		UK801									
1985	37.4		UK801	6.2		UK801	5.0		UK801	0.062		UK801	0.18		UK801									
1986	35.1		UK801	6.8		UK801	5.5		UK801	0.091		UK801	0.29		UK801									
1987	33.4		UK801	7.3		UK801	4.7		UK801	0.197		UK801	0.21		UK801									
1988	34.1		UK801	7.7		UK801	4.8		UK801	0.098		UK801	0.23		UK801									
1989	20.9		UK801	7.5		UK801	5.6		UK801	0.091		UK801	0.19		UK801									
1990	34.9		UK801	6.0		UK801	4.3		UK801	0.329		UK801	0.29		UK801									
1991	21.7		UK801	6.8		UK801	3.7		UK801	0.092		UK801	0.30		UK801									
1992	39.4		UK801	7.2		UK801	3.5		UK801	0.114		UK801	0.28		UK801	0.1		UK801						
1993	29.5		UK801	6.4		UK801	3.6		UK801	0.237		UK801	0.10		UK801	0.06		UK801	0.5		UK801			

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																0.0222		UK801						
1988																0.0506		UK801						
1989																0.0540		UK801						
1990																0.0497		UK801						
1991																0.0393		UK801						
1992							0.5		UK801							0.0388		UK801	0.03		UK801	0.04		UK801
1993	0.5		UK801				0.66		UK801	0.5		UK801	0.7		UK801	0.0274		UK801	0.02		UK801	0.02		UK801

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987	0.0038		UK801	0.0065		UK801													0.0164		UK801			
1988	0.0045		UK801	0.0078		UK801	0.011		UK801										0.0194		UK801			
1989	0.0005		UK801	0.0010		UK801	0.001		UK801										0.0030		UK801			
1990	0.0041		UK801	0.0045		UK801	0.004		UK801										0.0061		UK801			
1991	0.0011		UK801	0.0013		UK801	0.003		UK801										0.0049		UK801			
1992	0.0065		UK801	0.0031		UK801							0.011		UK801				0.0110		UK801	0.011		UK801
1993	0.0008		UK801	0.0008		UK801	0.002		UK801				0.003		UK801				0.0010		UK801	0.004		UK801

EC List 1 (black list) — **River 'Meuse'** — **Monitoring station 'Tailfer'**

Annual averages (< = below detection limit) — Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980																								
1981																								
1982																								
1983	229		N516	10.8		N516							0.3		N516									
1984	212		N516	10.3		N516							0.2		N516									
1985	126		N517	10.4		N517				0.20	<	N517	0.1		N517									
1986	207		N517	10.6		N517				0.15		N517	0.2		N517									
1987	209		N518	10.9		N518				0.20	<	N518	0.2		N518									
1988	256		N518	11.0		N518				0.25		N518	0.2		N518									
1989	152		N530	11.0		N530				0.30		N530	0.1		N530	0.01		N530						
1990	150		N519	10.6		N519				0.20		N519	0.2		N519	0.01		N519						
1991	156		N520	10.7		N520				0.10		N520	0.1		N520	0.01		N520						
1992	165		N521	11.0		N521				0.05		N521	0.1		N521	0.01		N521						
1993	159		N534	12.1		N534				0.05	>	N534	0.1		N534	0.01		N534						

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986				1.90		N518	0.8		N518				0.40		N518									
1987				0.10	<	N518	0.2		N518	0.2		N518	0.10		N518									
1988										0.1	<	N518												
1989							0.1	<	N530	0.1		N530	0.10	<	N530									
1990							0.1	<	N530	0.4		N530				0.1	<	N530						
1991				0.10	<	N530	0.1	<	N530	0.1		N530	0.10	<	N530	0.01	<	N520						
1992	1.00	<	N521	0.01		N521	0.2		N521	0.1		N521	0.04		N521	0.01		N521				0.01	<	N521
1993	0.20		N534	0.01		N534	0.3		N534	0.1		N534	0.03		N534	0.01		N534				0.01	<	N534

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992	0.01	<	N521							0.01	<	N521	0.01	<	N521	0.01	<	N521	0.01	<	N521	0.01	<	N521
1993	0.01	<	N534	0.01	<	N534	0.01	<	N534							0.01	<	N534	0.01	<	N534			

EC List 1 (black list) River 'Meuse' Monitoring station 'Eijsden'

Annual averages (< = below detection limit) Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980	284		N505	9.7		N505				0.31		N505	3.42		N505									
1981	337		N505	9.6		N505				0.24		N505	2.15		N505									
1982	275		N505	8.5		N505				0.09		N505	0.86		N505	0.029		N505						
1983	285		N505	8.6		N505				0.12		N505	1.44		N505	0.064		N505						
1984	311		N505	8.9		N505				0.11		N505	0.85		N505	0.036		N505						
1985	182		N505	8.1		N505				0.06		N505	0.35		N505	0.025		N505						
1986	274		N505	9.0		N505				0.05		N505	0.43		N505	0.019		N505						
1987	314		N505	9.7		N505				0.06		N505	1.26		N505	0.012		N505						
1988	359		N505	8.8		N505				0.07		N505	2.23		N505	0.016		N505						
1989	203		N505	8.0		N505				0.04		N505	0.63		N505	0.017	<	N505						
1990	191		N505	8.2		N505				0.05		N505	0.53		N505	0.018	<	N505						
1991	184		N505	8.4		N505				0.03	<	N505	0.42		N505	0.015	<	N505						
1992	214		N505	9.0		N505				0.06		N505	0.32		N505	0.026	<	N505						
1993	249		N534	7.2		N534				0.05		N534	0.4		N534	0.02		N534						

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980	8.3		N505	1.75		N505	1.06		N505	1.64		N505	1.99		N505	0.03		N512				0.01	<	N512
1981	4.2		N505	3.99		N505	4.15		N505	2.52		N505	1.78		N505	0.02		N513				0.00		N513
1982	18.0		N505	0.35		N505	0.61		N505	1.06		N505	1.93		N505	0.03		N515				0.01	<	N515
1983	3.0		N505	0.28		N505	0.99		N505	0.49		N505	1.89		N505	0.02		N516				0.01	<	N516
1984							0.5		N516	0.60		N516	0.8		N516	0.02		N516				0.01	<	N516
1985	5.0		N505	0.32		N505	0.86		N505	1.20		N505	1.42		N505	0.03		N517				0.01	<	N517
1986	0.2		N517	0.30		N505	1.26		N505	0.38		N505	0.6		N505	0.02		N517				0.01		N517
1987	0.1		N505	1.10		N505	0.11		N505	0.31		N505	0.16		N505	0.02		N518				0.01	<	N518
1988	0.2		N505	0.16		N505	0.47		N505	0.34		N505	0.15		N505	0.02		N518				0.01		N518
1989	0.57	<	N505	0.01	<	N505	0.12	<	N505	0.15		N505	0.11		N505	0.01		N530				0.01	<	N530
1990	0.34	<	N505	0.03		N505	0.25	<	N505	0.38		N505	0.32		N505	0.02		N519				0.01	<	N519
1991	0.97	<	N505	0.03	<	N505	0.41	<	N505	0.27		N505	0.26		N505	0.04		N520				0.01	<	N520
1992	3.08	<	N505	0.05	<	N505	0.24	<	N505	0.42		N505	0.28	<	N505	0.01		N521				0.01	<	N521
1993	1.0		N534	0.07		N534	0.1		N534	0.3		N534	0.2		N534	0.01		N534				0.01	<	N534

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991	0.02		N520							0.02		N520	0.01	<	N520	0.01	<	N520	0.01	<	N520	0.01	<	N520
1992	0.01	<	N521							0.01	<	N521	0.01	<	N521	0.01	<	N521	0.01	<	N521	0.01	<	N521
1993	0.01	<	N534	0.01	<	N534	0.01	<	N534							0.01	<	N534	0.01	<	N534			

EC List 1 (black list) River 'Meuse' Monitoring station 'Keizersveer'

Annual averages (< = below detection limit) Annual averages calculated with values below detection limit set to half value

year	flow m3/s	<	source	diss. oxygen mg/l	<	source	BOD 5 mg/l	<	source	total Hg µg/l	<	source	total Cd µg/l	<	source	Pentachlorophenol µg/l	<	source	Trichlorobenzene µg/l	<	source
1980	390		N512	9.8		N512				0.1		N512	1.2		N512						
1981	462		N513	9.7		N513				0.1		N513	0.9		N513						
1982	359		N515	9.3		N515				0.1		N515	0.7		N515						
1983	384		N516	8.9		N516				0.1		N516	0.5		N516						
1984	404		N516	9.4		N516				0.05		N516	0.5		N516						
1985	259		N517	9.6		N517				0.05		N517	0.2		N517						
1986	346		N517	9.7		N517				0.05		N517	0.4		N517						
1987	404		N518	9.7		N518				0.05		N518	0.6		N518						
1988	444		N518	9.5		N518				0.05		N518	0.8		N518	0.03		N518			
1989	273		N530	9.0		N530				0.05		N530	0.3		N530	0.04		N530			
1990	224		N530	9.3		N530				0.05		N530	0.3		N530	0.02		N530			
1991	221		N530	9.9		N530				0.05		N530	0.5		N530	0.02		N530			
1992	270		N530	9.8		N530				0.05		N530	0.2		N530	0.03		N530			
1993	288		N534	9.5		N534				0.05		N534	0.3		N534	0.01		N534			

year	1,2-Dichloroethane µg/l	<	source	Tetrachloromethane µg/l	<	source	Chloroform µg/l	<	source	Tetrachloroethene µg/l	<	source	Trichloroethene µg/l	<	source	Hexachl.cyclohexane µg/l	<	source	Hexachlorobutadiene µg/l	<	source	Hexachlorobenzene µg/l	<	source
1980																0.03		N512				0.01	<	N512
1981																								
1982										0.3		N515	0.1	<	N515	0.03		N515				0.01	<	N515
1983																0.02		N516				0.01	<	N516
1984										0.2		N516	0.2		N516	0.02		N516				0.01	<	N516
1985										0.1		N517	0.1		N517	0.02		N517				0.01		N517
1986																0.02		N517				0.01	<	N517
1987	0.1	<	N518	0.1		N518	0.2		N518	0.2		N518	0.2		N518	0.02		N518				0.01	<	N518
1988	0.1	<	N518	0.1	<	N518	0.1		N518	0.1	<	N518	0.1		N518	0.02		N518				0.01	<	N518
1989	2.00	<	N530	0.04		N530	0.2		N530	0.08		N530	0.08		N530	0.02		N530				0.01		N530
1990	2.00	<	N530	0.1		N530	0.06		N530	0.1		N530	0.06		N530	0.02		N530				0.01	<	N530
1991	2.00	<	N530	0.04		N530				0.08		N530			N530	0.04		N530				0.01	<	N530
1992	2.00	<	N530	0.01		N530	0.07		N530	0.08		N530	0.09		N530	0.02		N530				0.01	<	N530
1993	2.00	<	N534	0.01		N534	0.05	<	N534	0.05		N534	0.04		N534	0.01		N534				0.01	<	N534

year	Aldrin µg/l	<	source	Dieldrin µg/l	<	source	Endrin µg/l	<	source	Isodrin µg/l	<	source	Total Drins µg/l	<	source	o,p-DDT µg/l	<	source	p,p'-DDT µg/l	<	source	DDT (total) µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991	0.01	<	N530	0.01	<	N530	0.01	<	N530							0.01	<	N530	0.01	<	N530			
1992	0.01	<	N530	0.01	<	N530	0.01	<	N530							0.01	<	N530	0.01	<	N530			
1993	0.01	<	N534	0.01	<	N534	0.01	<	N534							0.01	<	N534	0.01	<	N534			

EC List 1 (black list) River 'Moselle' Monitoring station 'Grevenmacher / Palzem'

Annual averages (< = below detection limit) Annual averages calculated with values below detection limit set to detection limit

	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980																								
1981																								
1982				10.0		L403	3.8		L403				1	<	L403									
1983				9.9		L403	3.7		L403	0.09	<	L403	0.3	<	L403									
1984	197.0		L403	9.7		L403	3.9		L403				0.3	<	L403									
1985	117.0		L403	9.7		L403	3.6		L403				2.8	<	L403									
1986	192.0		L403	9.0		L403	3.7		L403				0.3	<	L403									
1987	155.0		L403	9.7		L403	3.6		L403				0.1	<	L403									
1988	194.0		L403	9.4		L403	3.8		L403				0.1	<	L403									
1989	91.6		L403	9.1		L403	3.7		L403				1.3	<	L403									
1990	118.0		L403	9.2		L403	3.6		L403				0.1	<	L403									
1991	59.0		L403	9.3		L403	3.2		L403				0.1	<	L403									
1992	135.0		L403	7.8		L403	3.7		L403							0.05	<	L404 (*)						
1993																								

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992	1	<	L404 (*)	0.1	<	L404 (*)	0.1	<	L404 (*)	0.1	<	L404 (*)	0.1	<	L404 (*)				0.01	<	L404 (*)			
1993																								

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993																								

(*) Data from Reference L404 are from Monitoring station 'Palzem'

EC List 1 (black list) River 'Po' Monitoring station 'Pontelaguscuro'

Annual averages (< = below detection limit) Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990										0.0755		I 707	0.155		I 707									
1991																								
1992																								
1993																								

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993																								

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993																								

EC List 1 (black list) River 'Rhine' Monitoring station 'Koblenz'

Annual averages (< = below detection limit) Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980	1924		GEN012	8.1		GEN012				0.16		GEN012	0.30	<	GEN012									
1981	2204		GEN012	8.8		GEN012				0.08		GEN012	0.30	<	GEN012									
1982	2164		GEN012	8.8		GEN012				0.08		GEN012	0.30	<	GEN012									
1983	1981		GEN012	7.9		GEN012				0.13		GEN012	0.12		GEN012	0.106		GEN012						
1984	1762		GEN012	8.0		GEN012				0.10		GEN012	0.15		GEN012	0.116		GEN012						
1985	1484		GEN012	8.4		GEN012				0.13		GEN012	0.12		GEN012	0.068		GEN012						
1986	1865		GEN012	8.8		GEN012				0.12		GEN012	0.15		GEN012	0.044		GEN012						
1987	2191		GEN012	9.3		GEN012				0.14		GEN012	0.11		GEN012	0.026		GEN012						
1988	2217		GEN012	8.9		GEN012				0.14		GEN012	0.12		GEN012	0.030		GEN012						
1989	1424		GEN012	8.5		GEN012				0.08		GEN012	0.09		GEN012	0.022		GEN012						
1990	1470		GEN012	8.8		GEN012				0.08		GEN012	0.10		GEN012	0.021		GEN012						
1991	1353		GEN012	9.8		GEN012				0.05	<	GEN012	0.07		GEN012	0.019		GEN012						
1992	1623		GEN012	9.5		GEN012				0.05	<	GEN012				0.018		GEN012						
1993																								

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl. cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																0.01		GEN012						
1981																0.02		GEN012						
1982																0.026		GEN012						
1983																0.018		GEN012						
1984																0.02		GEN012						
1985																0.034		GEN012						
1986																0.034		GEN012						
1987																0.01	<	GEN012						
1988																0.007		GEN012						
1989																0.01	<	GEN012						
1990																0.007		GEN012						
1991				0.04		GEN012	1.14		GEN012	0.10		GEN012	0.2		GEN012	0.005		GEN012						
1992				0.01		GEN012	0.62		GEN012	0.14		GEN012	0.13		GEN012	0.005	<	GEN012						
1993																								

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993																								

River 'Rhine' Monitoring station 'Bimmen-Lobith'

Annual averages (< = below detection limit)

Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
																	B							
1980	2545		GEN012	8.4		GEN012				0.37		GEN012	1.30		GEN012									
1981	2990		GEN012	8.9		GEN012				0.33		GEN012	1.00		GEN012									
1982	2791		GEN012	9.1		GEN012				0.16		GEN012	0.80		GEN012	0.292		GEN012						
1983	2682		GEN012	9.1		GEN012				0.13		GEN012	0.40		GEN012	0.103		GEN012						
1984	2492		GEN012	9.3		GEN012				0.12		GEN012	0.30		GEN012	0.072		GEN012						
1985	1995		GEN012	9.0		GEN012				0.12		GEN012	0.20		GEN012	0.065		GEN012						
1986	2510		GEN012	9.3		GEN012				0.08		GEN012	0.20		GEN012	0.050	<	GEN012						
1987	2826		GEN012	9.6		GEN012				0.12		GEN012	0.21		GEN012	0.050		GEN012						
1988	2828		GEN012	9.7		GEN012				0.13		GEN012	0.21		GEN012	0.100	<	GEN012						
1989	1815		GEN012	9.4		GEN012				0.06		GEN012	0.11		GEN012									
1990	1886		GEN012	9.6		GEN012				0.06		GEN012	0.10		GEN012	0.100		GEN012						
1991	1751		GEN012	9.7		GEN012				0.05		GEN012	0.11		GEN012	0.129		GEN012						
1992	2019		GEN012	9.6		GEN012				0.06		GEN012	0.09		GEN012	0.018		GEN012						
1993																								

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl. cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
		B			B			B			B						B							
1980																								
1981																0.02		GEN012						
1982																0.015		GEN012						
1983																0.018		GEN012						
1984																0.02		GEN012						
1985																0.013		GEN012						
1986																0.01		GEN012						
1987																0.01		GEN012						
1988																0.01		GEN012						
1989																0.01	<	GEN012						
1990																0.05		GEN012						
1991	5.0	<	GEN012	0.05	<	GEN012	0.13		GEN012	0.07		GEN012	0.05	<	GEN012	0.05		GEN012						
1992	5.0	<	GEN012	0.05	<	GEN012	0.11		GEN012	0.05		GEN012	0.07		GEN012	0.05	<	GEN012						
1993																								

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
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1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993																								

B = only Bimmen

EC List 1 (black list) River 'Rhine' Monitoring station 'Lobith'
Annual averages (< = below detection limit) Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980	2547		N510	8.0		N510				0.18		N510	1.58		N510	0.39		N510						
1981	3001		N510	8.3		N510				0.13		N510	1.12		N510	0.13		N510						
1982	2801		N510	8.4		N510				0.12		N510	0.86		N510	0.08		N510						
1983	2652		N510	8.3		N510				0.11		N510	0.42		N510	0.07		N510						
1984	2520		N510	8.5		N510				0.07		N510	0.20		N510	0.05		N510						
1985	2010		N510	8.0		N510				0.07		N510	0.14		N510	0.03		N510						
1986	2462		N510	8.8		N510				0.06		N510	0.14		N510	0.03		N510						
1987	2861		N510	9.3		N510				0.06		N510	0.10		N510	0.02		N510						
1988	2832		N510	9.3		N510				0.05		N510	0.10		N510	0.03		N510						
1989	1821		N510	9.2		N510				0.06		N510	0.12		N510	0.02	<	N510						
1990	1856		N510	9.8		N510				0.05		N510	0.11		N510	0.02	<	N510						
1991	1754		N510	9.4		N510				0.05	<	N510	0.11	<	N510	0.02	<	N510						
1992	2010		N529	9.7		N529				0.05		N529	0.10		N529	0.02		N529						
1993	2014		N529	9.7		N529				0.05		N529	0.10		N529	0.01		N529						

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl. cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980	4.3		N510	2.51		N510	2.28		N510	0.83		N510	0.53		N510	0.03		N510				0.05		N510
1981	2.7		N510	3.31		N510	3.68		N510	0.50		N510	0.20		N510	0.03		N510				0.02		N510
1982	1.8		N510	0.23		N510	1.32		N510	0.58		N510	0.57		N510	0.02		N510				0.01		N510
1983	0.5		N510	0.33		N510	1.06		N510	0.48		N510	0.53		N510	0.019		N510				0.010		N510
1984							1.0		N523	0.50		N523	0.20		N523	0.019		N510				0.007		N510
1985	2.3		N510	0.05		N510	1.05		N510	0.26		N510	0.14		N510	0.016		N510				0.007		N510
1986				0.15		N510	1.52		N510	0.26		N510	0.14		N510	0.015		N510				0.002		N510
1987	0.0		N510	0.00		N510	0.7		N510	0.09		N510	0.00		N510	0.018		N510				0.002		N510
1988	0.1		N510	0.05		N510	0.49		N510	0.09		N510	0.14		N510	0.008		N510				0.002		N510
1989	0.5	<	N510	0.01	<	N510	0.15	<	N510	0.05		N510	0.09	<	N510	0.01		N525				0.01		N525
1990	0.2	<	N510	0.02		N510	0.17	<	N510	0.05		N510	0.09		N510	0.006		N510	0.002		GEN014	0.001	<	N510
1991	0.4	<	N510	0.02	<	N510	0.29	<	N510	0.06		N510	0.04	<	N510	0.002	<	N510	0.1	<	N526	0.001	<	N510
1992	0.60	<	N532	0.02	<	N532	0.08	<	N532	0.08	<	N532	0.04	<	N532	0.01		N529				0.01	<	N529
1993	0.09		N529	0.1	<	N529	0.1	<	N529	0.1	<	N529	0.1	<	N529	0.01		N529				0.01	<	N529

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
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1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992	0.01	<	N529	0.01	<	N529										0.01	<	N529	0.01	<	N529			
1993	0.01	<	N529	0.01	<	N529				0.01	<	N529	0.01	<	N529	0.01	<	N529	0.01	<	N529	0.01	<	N529

EC List 1 (black list) River 'Rhine' Monitoring station 'Maassluis'

Annual averages (< = below detection limit) Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene		
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980				8.1		N510				0.12		N510	0.86		N510						
1981				8.3		N510				0.05		N510	0.81		N510						
1982				8.7		N510				0.07		N510	0.50		N510	0.041		N510			
1983				8.7		N510				0.07		N510	0.54		N510	0.053		N510			
1984				9.1		N510				0.05		N510	0.19		N510	0.048		N510			
1985				9.3		N510				0.04		N510	0.26		N510	0.029		N510			
1986				9.2		N510				0.04		N510	0.22		N510	0.017		N510			
1987				9.6		N510				0.04		N510	0.10		N510	0.022		N510			
1988				9.5		N510				0.06		N510	0.29		N510	0.022		N510			
1989				9.2		N510				0.05		N510	0.16	<	N510	0.010	<	N510			
1990				9.1		N510				0.04		N510	0.11		N510	0.014	<	N510			
1991				9.4		N510				0.04	<	N510	0.10		N510	0.015	<	N510			
1992				9.8		N532				0.04		N532	0.08		N532	0.022	<	N532			
1993																					

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl. cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980	14.1		N510	1.65		N510	2.28		N510	1.25		N510	0.45		N510									
1981	4.7		N510	1.89		N510	1.14		N510	0.38		N510	0.14		N510									
1982	4.7		N510	0.18		N510	0.62		N510	0.49		N510	0.39		N510									
1983	3.4		N510	1.96		N510	0.60		N510	0.23		N510	0.31		N510									
1984																								
1985	0.4		N510	0.05		N510	0.41		N510	0.20		N510	0.11		N510									
1986				0.22		N510	0.12		N510	0.15		N510	0.07		N510									
1987	0.0		N510	0.30		N510	0.39		N510	0.12		N510	0.02		N510									
1988	0.1		N510	0.05		N510	0.38		N510	0.14		N510	0.07		N510									
1989	0.6	<	N510	0.01	<	N510	0.09	<	N510	0.02	<	N510	0.03	<	N510									
1990	0.7	<	N510	0.02	<	N510	0.09	<	N510	0.07		N510	0.08	<	N510									
1991	0.4	<	N510	0.02	<	N510	0.17	<	N510	0.02	<	N510	0.05	<	N510									
1992	0.60	<	N532	0.02	<	N532	0.07	<	N532	0.08	<	N532	0.09	<	N532									
1993																								

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
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1990																								
1991																								
1992																								
1993																								

EC List 1 (black list) River 'Rhone' Monitoring station ' Arles'

Annual averages (< = below detection limit) Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987	1690		F206	9.65		F206	2.44		F206															
1988	1703		F206	10.63		F206	2.48		F206															
1989	952		F206	9.18		F206	1.53		F206															
1990	1220		F206	9.50		F206	1.23		F206															
1991	1204		F206	9.73		F206	1.09		F206	0.200	<	F206	1.0	<	F206	2.0	<	F206						
1992	1698		F206	10.08		F206	1.42		F206	0.200	<	F206	1.0	<	F206	2.0	<	F206						
1993	1527		F206	10.43		F206	1.50		F206															

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991	20.0	<	F206				0.2	<	F206	0.1	<	F206	0.4	<	F206	0.015	<	F206				0.015	<	F206
1992	20.0	<	F206				0.2	<	F206	0.1	<	F206	0.4	<	F206	0.015	<	F206				0.015	<	F206
1993																								

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																						0.050	<	F206
1992																						0.050	<	F206
1993																								

EC List 1 (black list) River 'Sado' Monitoring station 'Alvalade de Sado'

Annual averages (< = below detection limit) Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene		
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																					
1981																					
1982																					
1983																					
1984																					
1985																					
1986																					
1987																					
1988																					
1989				7.8		P1206	1.8		P1206	0.11		P1206	4	<	P1206						
1990				8.1		P1206	0.5		P1206	0.05		P1206	4		P1206						
1991				6.7		P1206			P1206	0.30		P1206	4	<	P1206						
1992				8.1		P1206	11.0		P1206	0.5	<	P1206									
1993				8.3		P1206	2.3		P1206	0.5	<	P1206	5	<	P1206						

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993																								

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991	3	<	P1206	2	<	P1206	5	<	P1206										9	<	P1206			
1992	3	<	P1206	2	<	P1206	5	<	P1206										9	<	P1206			
1993	3	<	P1206	2	<	P1206	5	<	P1206										9	<	P1206			

EC List 1 (black list) River 'Scheldt' Monitoring station : Doel (B)

Annual averages (DL = Detection Limit) Annual averages calculated with values below detection limit set to zero

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980																								
1981				2.5		B324	9.2		B324	0.13		B324	2.4		B324									
1982				3.3		B324	4.2		B324	0.11		B324	1.6		B324									
1983				4.3		B324	4.8		B324	0.30		B324	0.5		B324									
1984				2.7		B324	3.9		B324	0.45		B324	1.01		B324									
1985				1.1		B324	2.8		B324	0.06		B324	1.36		B324									
1986				3.1		B324	2.8		B324	0.12		B324	0.66		B324									
1987				3.9		B324	3.0		B324	0.70		B324	1.20		B324									
1988	197		B321	4.1		B321	2.8		B321	0.33		B321	0.66		B321									
1989	123		B321	3.8		B321	2.3		B321	0.13		B321	1.09		B321									
1990	96		B321	3.6		B324	2.7		B324	1.15		B324	0.83		B324									
1991	105		B321	4.0		B324	2.3		B324	0.24		B324	0.71		B324									
1992				5.1		B321																		
1993				3.7		B321																		

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																0.060		B324						
1983																0.050		B324						
1984																0.028		B324						
1985																0.038		B324				DL		B324
1986																0.036		B324				0.001		B324
1987																0.025		B324				0.001		B324
1988																								
1989																								
1990																0.015		B324				0.001		B324
1991																0.018		B324				0.001		B324
1992																								
1993																								

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985	0.003		B324	0.001		B324	DL		B324	DL		B324										DL		B324
1986	0.001		B324	0.001		B324	DL		B324	DL		B324										DL		B324
1987	0.001		B324	0.001		B324	0.001		B324	DL		B324										0.001		B324
1988																								
1989																								
1990	0.001		B324	0.001		B324	DL		B324	0.001		B324				DL		B324						
1991	DL		B324	DL		B324	0.0009		B324	0.002		B324				DL		B324	DL		B324			
1992																								
1993																								

EC List 1 (black list) River 'Scheldt' Monitoring station 'Schaar van Ouden Doel'

Annual averages (< = below detection limit)

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980	134.6		N527				3.315		N527	0.244		N527	2.567		N527									
1981	157.8		N527				3.964		N527	0.123		N527	1.862		N527									
1982	124.6		N527				3.6		N527	0.176		N527	1.496		N527	0.043		N527						
1983	119.4		N527				3.107		N527	0.156		N527	1.116		N527	0.091		N527	0.119		N527			
1984	146.6		N527				3.68		N527	0.178		N527	1.288		N527	0.08		N527						
1985	120.2		N527				3.346		N527	0.224		N527	1.608		N527	0.063		N527	0.142		N527			
1986	126.9		N527				3.018		N527	0.148		N527	0.882		N527	0.059		N527	0.036		N527			
1987	172.6		N527				3.976		N527	0.102		N527	0.822		N527	0.032		N527	0.037		N527			
1988	201.9		N527				2.914		N527	0.159		N527	0.763		N527	0.071		N527	0.048		N527			
1989	123.1		N527				1.5		N527	0.111		N527	0.646		N527	0.053		N527						
1990	96.0		N527				1.077		N527	0.101		N527	0.474		N527	0.032		N527						
1991	110.1		N527				1.417		N527	0.078		N527	0.325		N527	0.025		N527						
1992	125.7		N527				1.385		N527	0.089		N527	0.409		N527	0.035		N527						
1993	146.7		N527							0.063		N527	0.359		N527	0.018		N527						

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980	1.019		N527	0.015		N527	0.603		N527	3.47		N527	0.876		N527	0.045		N527	0.016		N527	0.081		N527
1981	4.777		N527	0.376		N527	0.428		N527	1.658		N527	0.554		N527	0.037		N527	0.004		N527	0.002		N527
1982	0.769		N527	0.072		N527	0.462		N527	1.423		N527	1.204		N527	0.042		N527	0 (*)		N527	0.001		N527
1983	0.556		N527	1.892		N527	1.308		N527	1.188		N527	1.183		N527	0.035		N527	0 (*)		N527	0.001		N527
1984																0.042		N527	0 (*)		N527	0.001		N527
1985	1.667		N527	0.097		N527	0.791		N527	1.69		N527	0.549		N527	0.048		N527	0 (*)		N527	0.001		N527
1986				0.038		N527	0.117		N527	0.832		N527	0.504		N527	0.031		N527	0.001		N527	0.001		N527
1987	0 (*)		N527	0.013		N527	0.175		N527	0.897		N527	0.627		N527	0.034		N527	0 (*)		N527	0 (*)		N527
1988	0.169		N527	0.049		N527	0.694		N527	0.747		N527	0.239		N527	0.025		N527	0.001		N527	0 (*)		N527
1989	0.213		N527	0.054		N527	0.087		N527	0.512		N527	0.245		N527									
1990	1.267		N527	0.014		N527	0.106		N527	0.239		N527	0.181		N527									
1991	0.477		N527	0.02		N527	0.148		N527	0.278		N527	0.205		N527									
1992	1.15		N527	0.027		N527	0.098		N527	0.358		N527	0.313		N527									
1993	0.1		N527	0.024		N527	0.068		N527	0.304		N527	0.165		N527	0.012		N527	0.001		N527	0.001		N527

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980	0.078		N527	0.295		N527	0.216		N527							0.001		N527	0 (*)		N527			
1981	0.004		N527	0		N527	0.005		N527							0 (*)		N527	0 (*)		N527			
1982	0 (*)		N527	0.001		N527	0 (*)		N527							0 (*)		N527	0 (*)		N527			
1983	0 (*)		N527	0.001		N527	0 (*)		N527							0 (*)		N527	0 (*)		N527			
1984	0 (*)		N527	0.001		N527	0 (*)		N527							0 (*)		N527	0.001		N527			
1985	0 (*)		N527	0.002		N527	0 (*)		N527							0 (*)		N527	0 (*)		N527			
1986	0 (*)		N527	0.001		N527	0 (*)		N527							0 (*)		N527	0.001		N527			
1987	0 (*)		N527	0 (*)		N527	0 (*)		N527							0 (*)		N527	0 (*)		N527			
1988	0 (*)		N527	0 (*)		N527	0 (*)		N527							0 (*)		N527	0 (*)		N527			
1989																								
1990																								
1991																								
1992																								
1993	0.001		N527	0.001		N527	0.001		N527							0.001		N527	0.001		N527			

(*) below detection limit; detection limit not given.

EC List 1 (black list) River 'Seine' Monitoring station : Paris

Annual averages (< = below detection limit)

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980	345		GEN023	9.79		GEN023	4.79		GEN023	0.442		GEN023	1.0		GEN023									
1981	450		GEN023	10		GEN023	3.61		GEN023	0.217		GEN023	0.8		GEN023									
1982	367		GEN023	9.74		GEN023	4.7		GEN023	0.2		GEN023	0.5		GEN023									
1983	456		GEN023	9.48		GEN023	3.42		GEN023	0.2		GEN023	0.7		GEN023									
1984	300		GEN023	9.74		GEN023	4.57		GEN023	0.208		GEN023	0.8		GEN023									
1985	224		GEN023	9.65		GEN023	4.28		GEN023	0.2		GEN023	0.9		GEN023									
1986	277		GEN023	10.5		GEN023	6.08		GEN023	0.2		GEN023	1.0		GEN023									
1987	327		GEN023	9.36		GEN023	5.18		GEN023	0.2		GEN023	2.2		GEN023									
1988																								
1989	216		GEN023	9.22		GEN023	5.63		GEN023	0.2		GEN023	1.0		GEN023									
1990				8.63		GEN023	5.72		GEN023	0.206		GEN023	1.0		GEN023									
1991				8.33		GEN023	5.08		GEN023	0.2		GEN023	1.0		GEN023									
1992																								
1993																								

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993																								

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
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1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993																								

EC List 1 (black list) **River 'Slaney'** **Monitoring station ' Enniscorth '**

Annual averages (< = below detection limit)

Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen (*)			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980				10.92		IRL611	2.29		IRL611															
1981				11.11		IRL611	2.34		IRL611															
1982				10.86		IRL611	2.42		IRL611															
1983				11.17		IRL611	2.28		IRL611															
1984				10.69		IRL611	4.00		IRL611															
1985				11.25		IRL611	2.84		IRL611															
1986				11.17		IRL611	2.63		IRL611															
1987				11.28		IRL611	3.48		IRL611															
1988				11.22		IRL611	3.99		IRL611															
1989				10.91		IRL611	2.67		IRL611															
1990				10.87		IRL611	2.54		IRL611															
1991				11.03		IRL611	2.00		IRL611															
1992				11.27		IRL611	2.07		IRL611															
1993				12.10		IRL611	1.28		IRL611				0.175		IRL611									

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993																								

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993																								

(*) dissolved oxygen in mg/l ; calculated from DO%, saturation, Temp. and Cl.

EC List 1 (black list) River 'Tagus' Monitoring station 'Talavera (E)'

Annual averages (< = below detection limit) Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene		
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																					
1981	44		SP1103	4.9		SP1103	12.7		SP1103												
1982	52		SP1103	5.5		SP1103	10.8		SP1103												
1983	39		SP1103	4.6		SP1103	12.3		SP1103				1.2		SP1103						
1984	62		SP1103	5.3		SP1103	14.3		SP1103				0.1	<	SP1103						
1985	70		SP1103	6.3		SP1103	9.8		SP1103	1	<	SP1103	0.1	<	SP1103						
1986	54		SP1103	9.1		SP1103	9.0		SP1103	1	<	SP1103	0.1	<	SP1103						
1987	107		SP1103	8.8		SP1103	8.5		SP1103	1.3		SP1103	0.1	<	SP1103						
1988	97		SP1103	9.0		SP1103	6.4		SP1103	1	<	SP1103	0.1	<	SP1103						
1989	133		SP1103	9.5		SP1103	6.1		SP1103	1	<	SP1103	0.1	<	SP1103						
1990	24		SP1103	8.6		SP1103	4.8		SP1103	1	<	SP1103	0.1	<	SP1103						
1991				8.3		SP1103	10.2		SP1103	0.1	<	SP1103	0.1	<	SP1103						
1992				9.6		SP1103	6.8		SP1103	0.1	<	SP1103	0.1	<	SP1103						
1993				9.4		SP1103	8.2		SP1103	0.1	<	SP1103	0.1	<	SP1103						

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993																								

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993																								

EC List 1 (black list) River 'Tagus' Monitoring station 'Santarem (P)'

Annual averages (< = below detection limit)

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980	276		GEN023	9.06		GEN023	2.63		GEN023															
1981	110		GEN023	8.48		GEN023	3.38		GEN023															
1982	263		GEN023	8.85		GEN023	2.27		GEN023															
1983	176		GEN023	8.53		GEN023	1.72		GEN023															
1984	225		GEN023	9.03		GEN023	1.92		GEN023															
1985	441		GEN023	7.82		GEN023	1.73		GEN023															
1986	342		GEN023	8.55		GEN023	1.72		GEN023															
1987	226		GEN023	8.14		GEN023	1.32		GEN023															
1988	431		GEN023	8.59		GEN023	1.54		GEN023															
1989				8.47		GEN023	2.49		GEN023	0.096		GEN023	3.1		GEN023									
1990				8.69		GEN023	1.7		GEN023	0.214		GEN023	4.5		GEN023									
1991				7.19		GEN023	1.97		GEN023	0.159		GEN023	5.0		GEN023									
1992				7.59		GEN023	2.16		GEN023	0.124		GEN023	5.0		GEN023									
1993																								

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993																								

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980	0.05		GEN023	0.0625		GEN023													0.2		GEN023			
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988																								
1989																								
1990																								
1991																								
1992																								
1993	0.003		GEN023	0.002		GEN023																		

EC List 1 (black list)　　River 'Thames'　　Monitoring station ' Teddington Weir '

Annual averages (< = below detection limit)　　Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene		
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980	68.3		UK801	9.9		UK801	2.7		UK801	0.26		UK801	0.65		UK801						
1981	81.0		UK801	9.9		UK801	2.8		UK801	0.25		UK801	0.50		UK801						
1982	77.8		UK801	10.1		UK801	2.6		UK801	0.25		UK801	0.50		UK801						
1983	57.2		UK801	9.8		UK801	2 5		UK801	0.25		UK801	0.50		UK801						
1984	55.5		UK801	10.1		UK801	3.1		UK801	0.25		UK801	0.50		UK801						
1985	65.0		UK801	10.0		UK801	2.4		UK801	0.21		UK801	0.39		UK801						
1986	86.3		UK801	10.9		UK801	3.6		UK801	0.06		UK801	0.34		UK801	11.0		UK801			
1987	63.5		UK801	9.8		UK801	2.6		UK801	0.05		UK801	0.31		UK801						
1988	72.2		UK801	10.8		UK801	2.7		UK801	0.05		UK801	0.19		UK801						
1989				8.1		UK801	2.4		UK801	0.05		UK801	0.23		UK801	0.2		UK801			
1990	38.1		UK801	9.2		UK801	2.8		UK801	0.05		UK801	0.12		UK801	6.5		UK801			
1991	23.2		UK801	10.1		UK801	2.9		UK801	0.07		UK801	0.19		UK801	0.1		UK801			
1992				9.5		UK801	1.8		UK801	0.05		UK801	0.25		UK801	0.3		UK801	0.1362		UK801
1993	60.7		UK801	9.7		UK801	1.8		UK801	0.05		UK801	0 25		UK801	0.2		UK801	0.1111		UK801

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																0.01		UK807						
1981																								
1982																								
1983																								
1984																0.025		UK807						
1985																0.022		UK807						
1986																0.035		UK807						
1987																0.021		UK807						
1988																0.021		UK807						
1989																0.036		UK807						
1990																0.084		UK807						
1991																0.021		UK807						
1992	0.5731		UK801				0.5654		UK801	0.3308		UK801	0.7192		UK801	0.0252		UK807	0.025		UK801	0.0025		UK801
1993	0.85		UK801				0.65		UK801	0.5		UK801	1.4542		UK801	0.0224		UK807	0.0182		UK801	0.002		UK801

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988	0.0050		UK801	0.0026		UK801	0.010		UK801										0.0250		UK801			
1989	0.0044		UK801	0.0031		UK801	0.009		UK801										0.0251		UK801			
1990	0.0016		UK801	0.0032		UK801	0.002		UK801										0.0017		UK801			
1991	0.0031		UK801	0.0025		UK801	0.004		UK801										0.0039		UK801			
1992	0.0025		UK801	0.0025		UK801	0.003		UK801	0.0025		UK801	0.0108		UK801				0.0035		UK801	0.014		UK801
1993	0.0020		UK801	0.0021		UK801	0.002		UK801	0.002		UK801	0.008		UK801				0.0024		UK801	0.0085		UK801

EC List 1 (black list) River 'Trent ' (Humber) Monitoring station ' Dunham '

Annual averages (< = below detection limit) Annual averages calculated with values below detection limit set to half value

year	flow			diss. oxygen			BOD 5			total Hg			total Cd			Pentachlorophenol			Trichlorobenzene					
	m3/s	<	source	mg/l	<	source	mg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source			
1980	107.7		UK801	9.5		UK801	3.7		UK801	0.055		UK801	3.80		UK801									
1981	117.1		UK801	9.7		UK801	4.1		UK801	0.064		UK801	1.96		UK801									
1982	82.8		UK801	9.3		UK801	3.8		UK801	0.095		UK801	1.05		UK801									
1983	84.3		UK801	8.3		UK801	2.6		UK801	0.084		UK801	0.42		UK801									
1984	92.6		UK801	9.4		UK801	3.2		UK801	0.114		UK801	0.87		UK801									
1985	79.6		UK801	9.3		UK801	2.9		UK801	0.108		UK801	0.36		UK801									
1986	111.0		UK801	10.5		UK801	3.6		UK801	0.117		UK801	0.72		UK801									
1987	104.2		UK801	11.2		UK801	3.3		UK801	0.105		UK801	0.70		UK801									
1988	98.1		UK801	11.3		UK801	3.3		UK801	0.225		UK801	0.47		UK801									
1989	53.9		UK801	10.1		UK801	3.2		UK801	0.098		UK801	0.35		UK801									
1990	66.4		UK801	10.4		UK801	3.7		UK801	0.056		UK801	0.30		UK801									
1991	62.1		UK801	9.7		UK801	2.8		UK801	0.05		UK801	0.40		UK801	0.25		UK800						
1992	87.7		UK801	9.6		UK801	3.1		UK801	0.05		UK801	0.38		UK801	0.218		UK801	0.15		UK801			
1993				10.4		UK801	3.0		UK801	0.05		UK801	0.31		UK801	0.0824		UK801	0.141		UK801			

year	1,2-Dichloroethane			Tetrachloromethane			Chloroform			Tetrachloroethene			Trichloroethene			Hexachl.cyclohexane			Hexachlorobutadiene			Hexachlorobenzene		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980																0.0385		UK801						
1981																0.0317		UK801						
1982																0.0758		UK801						
1983																0.0357		UK801						
1984																								
1985																								
1986																								
1987																								
1988																								
1989																0.0325		UK801						
1990																0.0206		UK801						
1991																0.0179		UK801						
1992	0.4166		UK801				0.2917		UK801	0.101		UK801	0.14		UK801	0.0062		UK801	0.018		UK801	0.0025		UK801
1993	0.5		UK801				0.176		UK801	0.04		UK801	0.164		UK801	0.0123		UK801	0.025		UK801	0.0027		UK801

year	Aldrin			Dieldrin			Endrin			Isodrin			Total Drins			o,p-DDT			p,p'-DDT			DDT (total)		
	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source	µg/l	<	source
1980	0.0050		UK801	0.0125		UK801	0.005		UK801										0.005		UK801			
1981	0.0050		UK801	0.0129		UK801	0.018		UK801										0.0183		UK801			
1982	0.0050		UK801	0.0100		UK801	0.025		UK801										0.025		UK801			
1983	0.0041		UK801	0.0081		UK801	0.020		UK801										0.0201		UK801			
1984																								
1985																								
1986																								
1987																								
1988																								
1989	0.0044		UK801	0.0018		UK801	0.0015		UK801										0.0005		UK801			
1990	0.0056		UK801	0.0021		UK801	0.0029		UK801										0.0020		UK801			
1991	0.0044		UK801	0.0032		UK801	0.003		UK801				0.008		UK800				0.0032		UK801			
1992	0.0025		UK801	0.0025		UK801	0.0025		UK801	0.0025		UK801	0.0097		UK801				0.0026		UK801	0.0049		UK801
1993	0.0025		UK801	0.0026		UK801	0.0025		UK801	0.0025		UK801	0.009		UK801				0.0025		UK801	0.005		UK801

Appendix F Analysis of the Tagus River in Spain with respect to Directive 76/464/EEC

Note: This Appendix is a translation of the Document "Impacto de la Directiva 76/464 en el Rio Tajo, Zona Española" (source: E1100) provided by the National Expert

Impact of the Directive 76/464 on the Tajo River in Spain

1 Introduction

For the Direction General of Water Quality, a report has been prepared for the EU regarding the impact of the governing Directive 76/464 and daughter Directives on the water quality of the Tajo River in Spain during the past 10 to 15 years based on the transposition of Directive of the EU.

It is necessary to state that the application of the Directive (76/464) in Spain has only been effective since January 1 1986, the date that Spain joined the European Union.

It is important to note that since the year 1972, Spain has had a system of control of water quality, publicly known as RED COCA (RED = network; COCA = control of water quality; thus: water quality monitoring network).

The water quality monitoring network (RED COCA) is only concerned with part of the necessary reductions included in Directive 76/464, and focuses only on regular analysis of concentrations of cadmium and mercury.

2 Monitoring Stations in Spain

There are 56 monitoring stations in the Tajo river basin as part of the water quality monitoring network (RED COCA). The present configuration of monitoring stations was established in 1972, when there was a general (national) expansion of the initial monitoring network dating from 1962. The new water quality monitoring stations were situated at existing locations of the water discharge measuring stations.
Since the hydrologic year 1981-1982, the monitoring stations have been classified as Special (E), Preferential (P) and Normal (N). The classification determines the frequency of measurement of parameters, based on its importance and background (local) conditions.

2.1 Analytical Measurements and Periodicity of the Water Quality Monitoring Network

The parameters analyzed in the network can be classified in the 4 following groups:

Group A: Flow, temperature, dissolved oxygen, suspended solids, pH, conductivity, COD, BOD5 and coliforms.
Group B: Total Dissolved Solids (TDS), chloride, sulphates, calcium, magnesium, sodium, potassium, phosphates, nitrates, nitrites, ammonia, carbonates, bicarbonates, coliforms and detergents.
Group C: Silica, fats, cyanide, phenols, fluoride, cadmium, chrome VI, and mercury.
Group D: Arsenic, copper, iron, magnesium, lead, zinc, antimony, nickel and selenium.

The frequency of sampling is monthly for all points. The frequency of analyses are distinguished by groups of parameters (A,B,C,D) depending on the category (Special, Preferential or Normal) of each station as indicated in the table.

Measurement frequency by group of parameters and type of station in the Water Quality Monitoring Network

Type of Station	Group of Parameters			
	A	B	C	D
Normal	Monthly	Semestral (2x/yr)	Annual	Annual
Preferential	Monthly	Quarterly (4x/yr)	Quarterly (4x/yr)	Quarterly (4x/yr)
Special	Monthly	Monthly	Monthly	Monthly

2.2 Water Quality Monitoring Stations

The main monitoring stations of the official network for water quality control in the Tajo River are given in the following table.

Major water quality monitoring stations in the Tajo River

Number	River	Location	Type of station
001	Tajo	Peralejo de las Truchas	N
005	Tajo	Trillo	N
007	Tajo	Bolarque	N
011	Tajo	Aranjuez	P
014	Tajo	Toledo	E
015	Tajo	Talavera	E
019	Tajo	Alcantara (Embalse)	N
151	Tajo	Castrejon (Embalse)	P
152	Tajo	Valdecanas (Embalse)	N
239	Tajo	Puente de la Barca	E

3 Special Studies

The preoccupation for the condition of the water quality in the region of the Tajo river catchment leads to the realization of special studies over the existence of contaminants related to the Directive, motivated by the EEC. In the year 1990, the study 'Impact of the Directive 76/464 in the Tajo River in Spain' took place which gave information over the existing contamination in the catchment for practically all the substances included in the Directive. Accompanying are the results obtained at different points along the Tajo River.

There will be follow-up studies which have already begun, to study the production of substances of this type in the Tajo river catchment.

4 Conclusions

Attached in the annex (Summary of water quality data for the Tagus River -Spain) are graphical representations of (maximum) cadmium and mercury concentrations along the length of the Tajo River which were collected in the water quality monitoring network in the years 1983 and 1993.

The length of the river from the source to the downstream border with Portugal is represented on the x-axis; concentrations are in mg/l, including values for cadmium and mercury that are below detection limit.

The maximum values for cadmium ranged from 0.04 mg/l (40 μg/l) at Puento de la barca in 1983, to below detection limit.

In another section (separate graphs), the mean values for concentrations of BOD for the same years at the same locations are reported. One can see an increase in the BOD that is produced in the Tajo River as a consequence of the point discharges in the Jarama basin (tributary to the Tajo), and the decrease in concentrations in the year 1993 as a result of the construction of numerous sewage treatment plants (STPs) in this basin, especially the capitol of Madrid.

Also in the annex are water quality data at different locations along the Tajo River obtained as part of the (special) study mentioned above.

It is interesting to note that several current studies have shown that some industries whose effluents may contain dangerous substances referred to in the rules are presently taking appropriate measures so as to decrease the emission of these pollutants.

In any case, it is necessary to point out the low impact of these substances on the water quality of the Tajo River, especially with reference to the concentrations of cadmium and mercury.

Annex: Summary of Water Quality Data for the Tagus River (Spain)

Some water quality data for BOD, mercury and cadmium in the Tagus river in Spain has been provided by the National Authorities for the impact study for Directive 76/464/EEC. This summary is based on graphs of data in Annex 2 of the document *Impacto de la Directiva 76/464 en el Rio Tajo. Zona Española*. As this data is not available in the format of yearly average values for several years, it has not been entered into the standard table format used for other rivers of interest for the impact study. Instead, a general summary of the available data is made as follows:

Data for BOD are available for the years 1983 (an average figure for the period 10-1-1983 to 29-12-1983) and 1993 (an average figure for the period 11-1-1993 to 29-12-1993). Data for cadmium and mercury are available for the years 1983 (quoted as a maximum value for the period 10-1-1983 to 29-12-1983) and 1993 (quoted as a maximum for the period 11-1-1993 to 29-12-1993). Data are from 9-10 water quality monitoring stations, beginning at Peralejo de las Truchas at the upstream end, to Alcantara at the border with Portugal. These monitoring stations cover a distance of 750 km along the length of the river.

BOD:

In 1983, for the 4 upstream monitoring stations (Peralejo de las Truchas, Trillo, Bolarque and Aranjuaz) the BOD concentrations are approximately 2.5 mg/l. These stations are in the upper 250 km of the river. A large peak in concentration is seen at Puente de la barca, where the average concentration is approximately 45 mg/l. Downstream of Puente de la barca, concentrations are lower at Toledo (30 mg/l) and Talavara (13 mg/l). In the lower 200 km of the river, from Valdecanas to Alcantara, the concentrations are approximately 5 mg/l.

In 1993, there is a noticeable decrease in concentrations. In the upper 4 monitoring stations, the concentration has decreased from 2.5 to approximately 1.5 mg/l. The biggest change is seen at Puente de la barca, where the peak concentration has decreased from 45 to 10 mg/l. Downstream of Puente de la barca, concentrations are again lower at Toledo (8 mg/l), Castrejon (9 mg/l) and Talavara (8 mg/l). In the lower 200 km of the river, the concentrations range from 4 mg/l (Valdecanas) to 2 mg/l (Alcantara). The decrease in concentrations in the year 1993 is largely a result of the construction of numerous sewage treatment plant (STP) facilities in many regions, especially in the capitol of Madrid.

Mercury:

The graphs of mercury show the maximum measured concentrations for each location in the sampling periods of 1983 and 1993. In both 1983 and 1993, there are no concentrations shown for mercury on the graphs. We interpret this as meaning that all measured concentrations are below the detection limit of 0.0001 mg/l. In 1993, this interpretation is confirmed, as monthly monitoring results at stations Talavara and Alcantara show all water quality measurements of mercury are less than 0.0001 mg/l. In 1983, it is not certain if measurements have been made. A check of monitoring at station Talavara shows that there were no measurements of mercury.

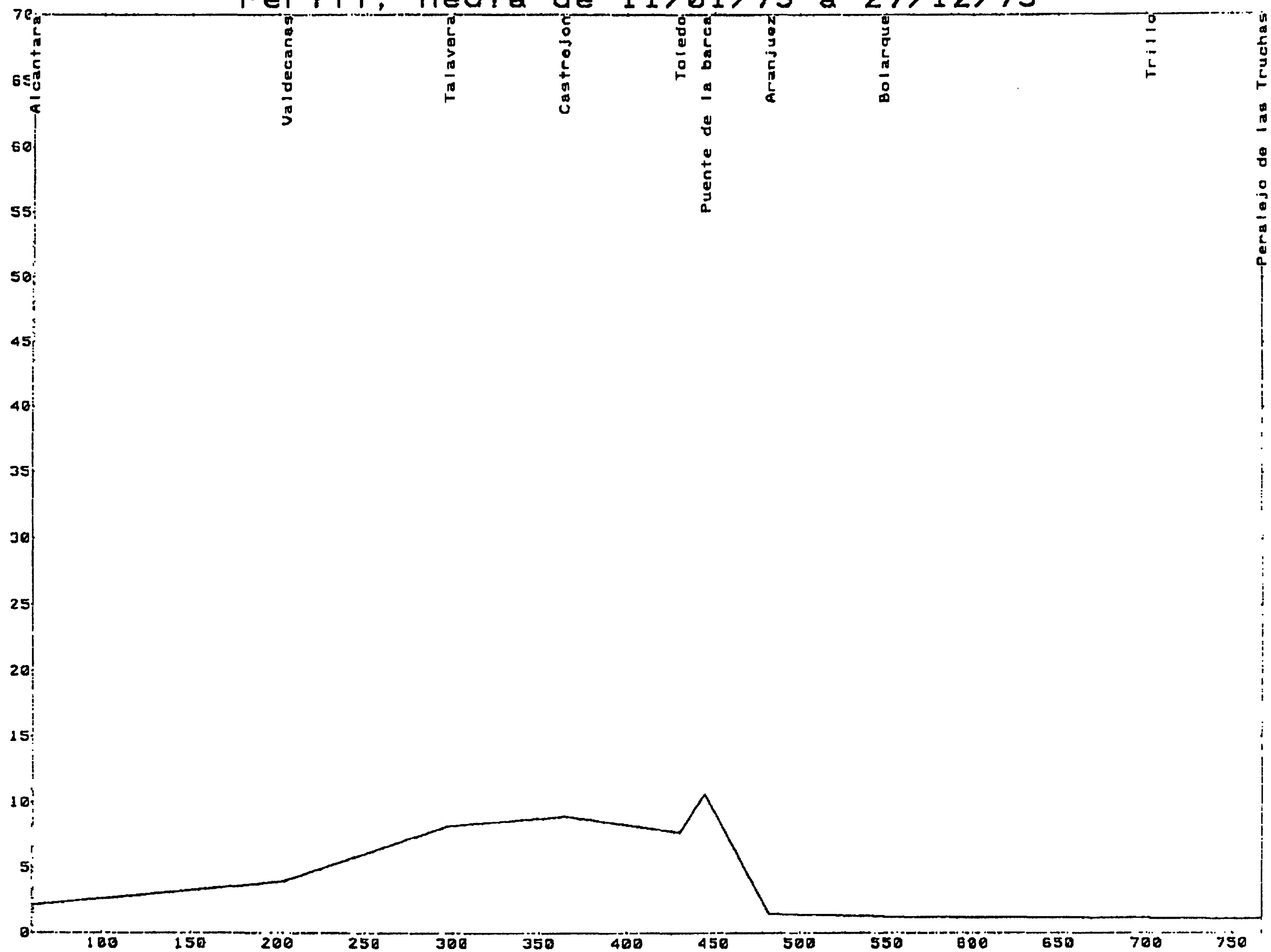
Cadmium:

In 1983, for the 4 upstream monitoring stations (Peralejo de las Truchas, Trillo, Bolarque and Arañjuaz) the Cd concentrations are below the detection limit of 0.0001 mg/l (or perhaps cadmium was not measured at these stations). These stations are in the upper 250 km of the river. A maximum concentration of 0.04 mg/l (40 μg/l) is seen at Puente de la barca. This is the highest concentration measured in the river. Downstream of Puente de la barca, lower concentrations were measured at Toledo (0.01 mg/l), Castrejon (0.03 mg/l) and Talavara (0.01 mg/l). In the lower 200 km of the river, concentrations are 0.02 mg/l (Valdecanas) and below detection limit at Alcantara (or perhaps not measured).

In 1993, the concentrations of cadmium are all lower than in 1983. For the 7 upstream monitoring stations (Peralejo de las Truchas, Trillo, Bolarque, Aranjuaz, Puente de la barca, Toledo and Castrejon) the Cd concentrations are below the detection limit of 0.0001 mg/l (we assume that cadmium was measured at these stations). The only concentration above the detection limit is seen at Talavara, where the maximum concentration is 0.0004 mg/l (4 μg/l). Downstream of Talavara, concentrations are again below detection limit.

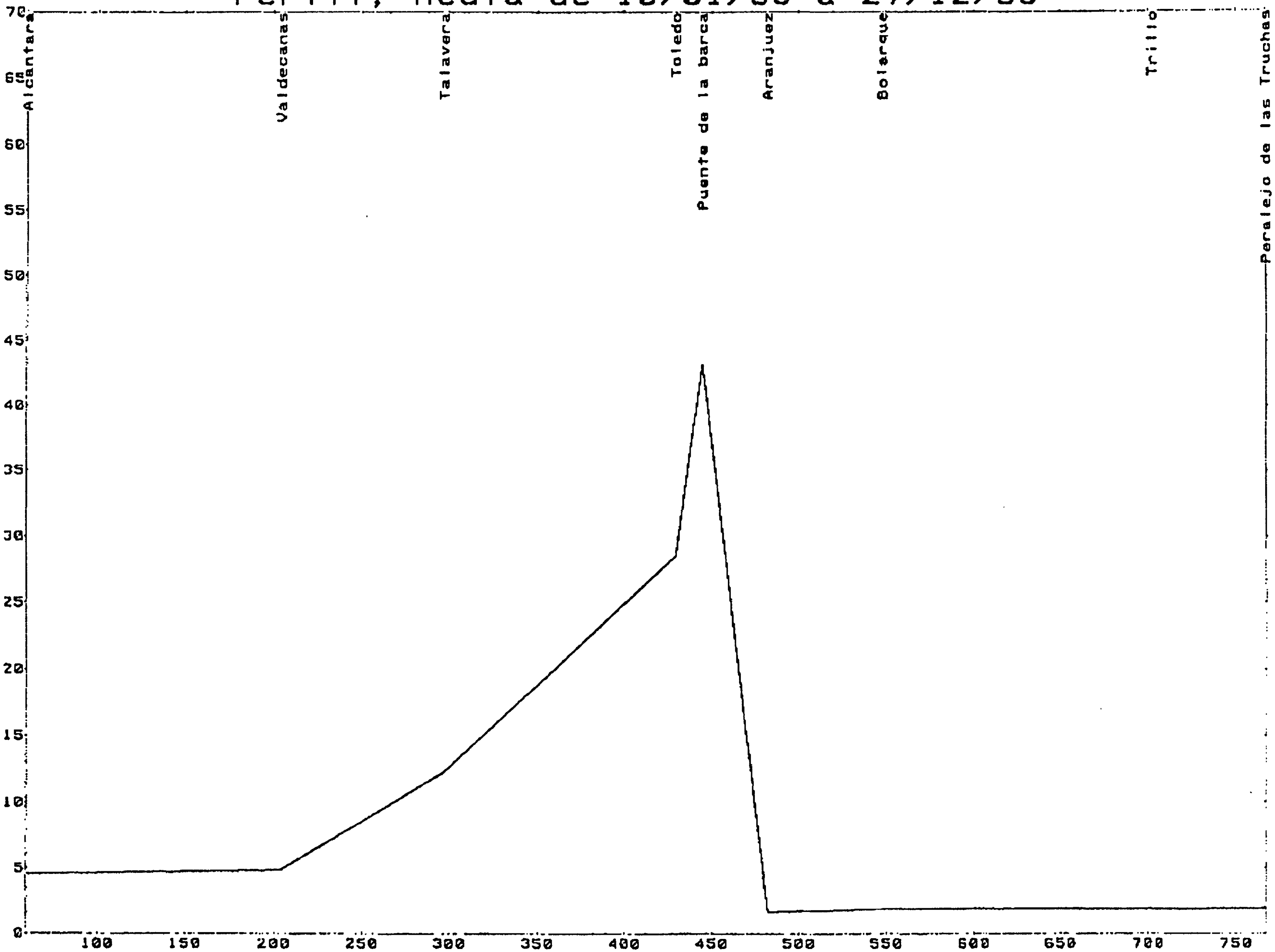
VST :TAJO (RIO) BDBO:D.B.O.

Perfil, Media de 11/01/93 a 27/12/93



VST :TAJO (RIO) BDBO:D.B.O.

Perfil, Media de 10/01/83 a 29/12/83

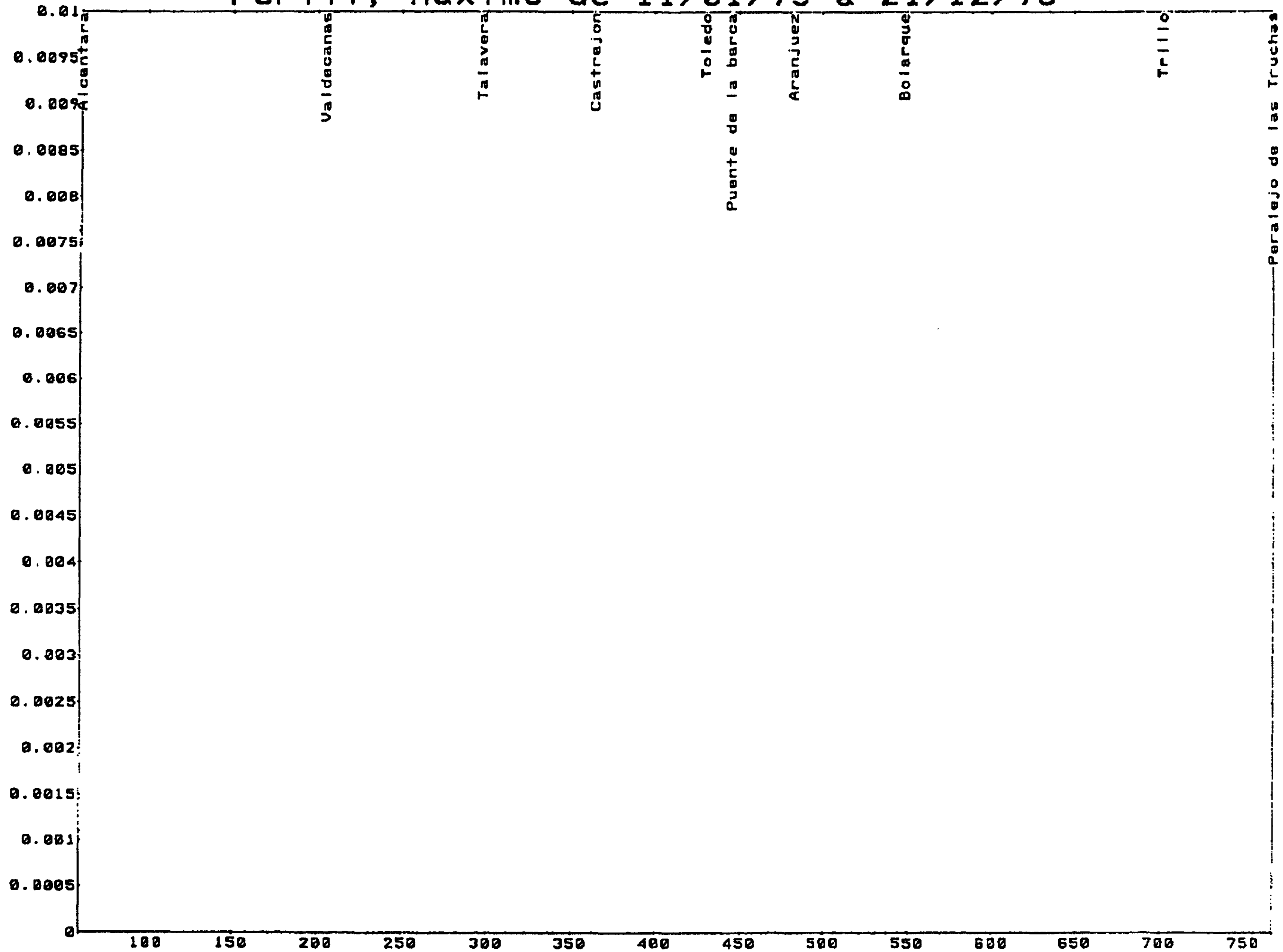


VST :TAJO (RIO) HG:Mercurio

Perfil, Máximo de 10/01/83 a 29/12/83

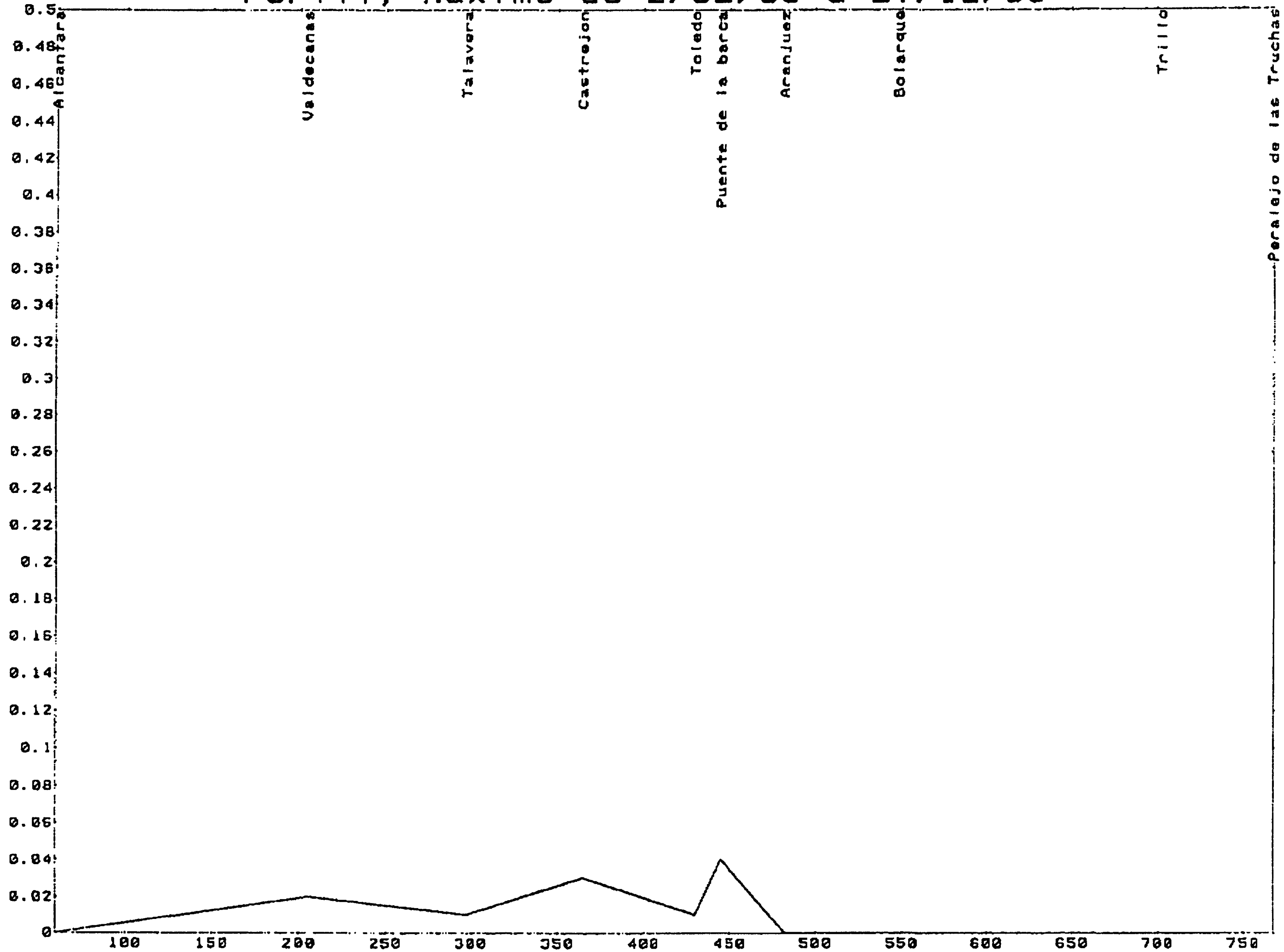
VST :TAJO (RIO) HG:Mercurio

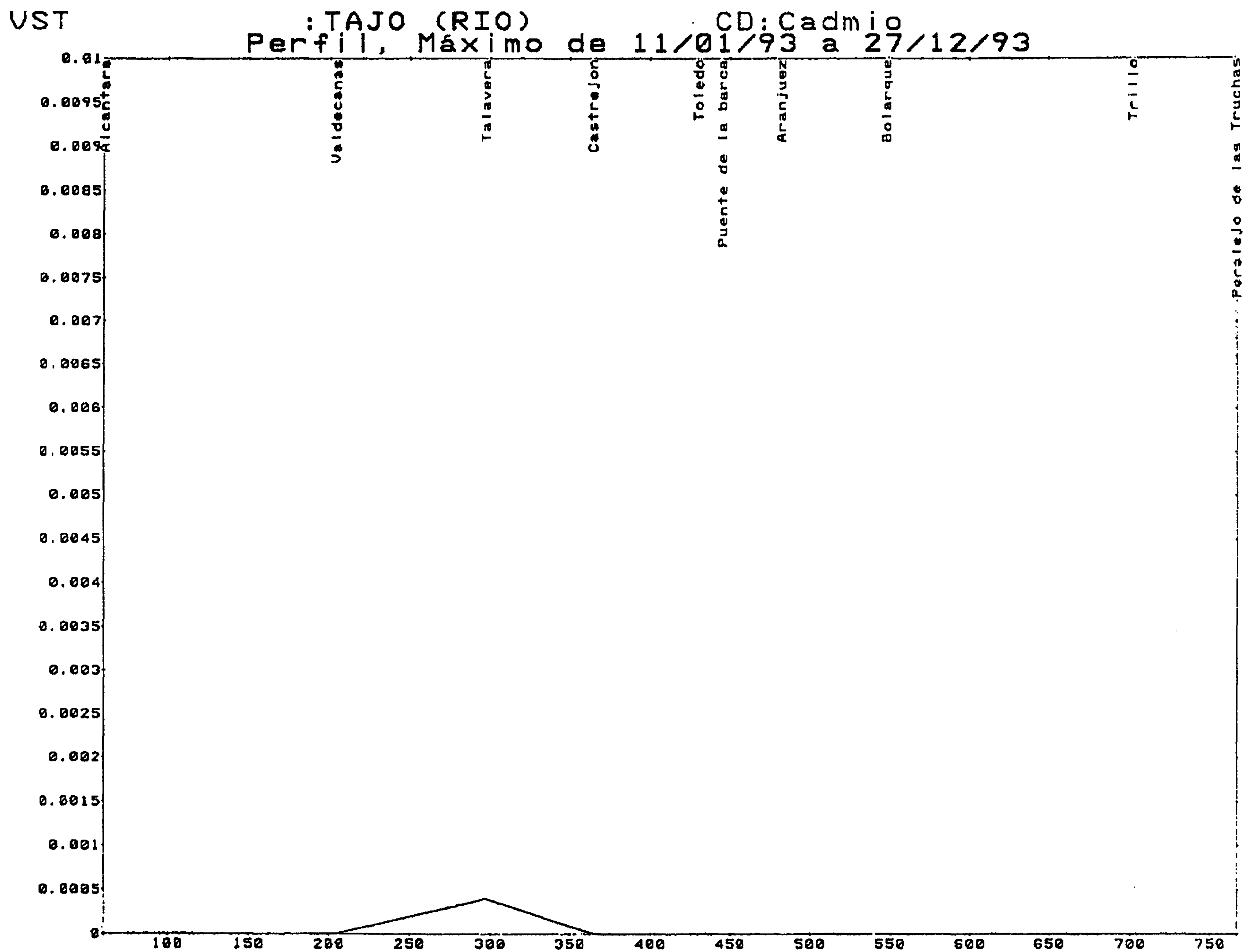
Perfil, Máximo de 11/01/93 a 21/12/93



VST :TAJO (RIO) CD:Cadmio

Perfil, Máximo de 2/02/83 a 29/12/83




VST
:TAJO (RIO)
CD:Cadmio
Perfil, Máximo de 11/01/93 a 27/12/93
Alcantara
Valdecanas
Talavera
Castrejon
Toledo
Puente de la barca
Aranjuez
Bolarque
Trillo
Peralejo de las Truchas
0.01
0.0095
0.009
0.0085
0.008
0.0075
0.007
0.0065
0.006
0.0055
0.005
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
100
150
200
250
300
350
400
450
500
550
600
650
700
750

Appendix G Summary of UK Water Pollution Control

Note: This text in this Appendix has been provided in full by the National Expert of the UK

Legislative history of water pollution control in the UK

The first statute to control water pollution in the UK was the River Pollution Prevention Act 1876. Under this, it was made an offence to discharge sewage or polluting matter into a watercourse. In the main, the procedure under this Act remained in use until 1955 when the foundation of the present system was laid down by the Rivers (Prevention of Pollution) Act. This established the procedure whereby anyone wishing to make a new discharge of sewage or trade effluent to a stream was required to seek the consent of the river board.

The Clean Rivers (Estuaries and Tidal Waters) Act 1960 extended this control system to all discharges commencing or altered after that date to most major estuaries, whilst the Rivers (Prevention of Pollution) Act 1961 strengthened the control system by bringing within it the pre-1951 discharges for which specific consent had not been required by the earlier Act. The Water Resources Act 1963 extended the control system to cover discharges to underground strata via wells, pipes or boreholes.

The Control of Pollution Act 1974 re-enacted and extended earlier controls. Its main features were that it extended the control system to all inland waters, estuaries, tidal rivers, the sea within a three-mile limit (and in certain cases beyond) and specified underground waters; it ensured that it was an offence to cause or knowingly permit any poisonous, noxious or other polluting matter to enter controlled waters, and it permitted discharges of trade or sewage effluent provided that a consent was obtained and that any conditions attached to that consent were observed.

The Water Act 1989 had several effects. It privatised the UK water industry, it strengthened the regulatory framework for water pollution control in England and Wales and it provided a firmer, statutory basis for improvements in water quality. This was achieved by separating the water supply and sewage treatment and disposal functions, which became the responsibility of the new water companies, from river management, pollution control and other regulatory duties, which became the responsibility of the newly-established National Rivers Authority (NRA). The NRA is an independent body charged with improving water quality standards and controlling pollution from the water industry as well as other industries and agriculture. The water quality and pollution control provisions of the 1989 Act have been consolidated into the Water Resources Act 1991; and the water industry provision into the Water Industry Act 1991.

Implementation of 76/464 in the UK

The EC framework Directive 76/464/EEC requires Member States to eliminate pollution from List I dangerous substances and to reduce pollution from List II substances. Subsequent "daughter" Directives established both Limit Values and Environmental Quality Objectives (EQOs) for List I substances. The UK uses the system of EQOs, which are transposed into national legislation as Environmental Quality Standards (EQSs) by the Surface Waters (Dangerous Substances) (Classification) Regulations 1989 and 1992, made under the Water Resources Act.

Consent system in the UK

Under the Water Industry Act 1991, all discharges of trade effluent to sewer are consented by sewerage undertakers. Discharges which are unconsented, or fail to comply with a consent, are illegal and those discharging illegally risk heavy penalties. Sewerage undertakers decide whether to accept discharges, and set consent conditions in order to control substances which could, for example, damage the sewerage and treatment systems, harm the environment, or lead to a breach of their sewage treatment works' (STW) discharge consents set by the NRA. Discharges containing the most dangerous substances (the UK 'Red List') are referred as 'special category effluent' to the Secretary of State to determine appropriate consent conditions. The Trade Effluents (Prescribed Processes and Substances) Regulations 1989, 1990 and 1992, made under the Water Industry Act, allow the Secretary of State to set consent conditions for these prescribed substances.

Under the Water Resources Act 1991 all discharges (including those from STWs) to receiving waters, which include the sea up to three miles from the coast, are consented by the NRA. The NRA sets conditions in consents which are designed to achieve EQSs for specific substances, which in turn enforce the EQSs set in EC Directives. The NRA monitors not only receiving waters but also certain discharges to ensure, amongst other things, that EQSs are met.

Under the Environmental Protection Act 1990, and the arrangements for integrated pollution control (IPC), operators of prescribed processes (set out in the Environmental Protection (Prescribed Processes and Substances) Regulations 1991) must apply for authorization from Her Majesty's Inspectorate of Pollution (HMIP). The IPC Act requires traders to use the best available techniques not entailing excessive costs (BATNEEC) to prevent the release of prescribed substances, or where that is not practicable, to reduce their release and render them harmless. Relevant statutory EQOs must also be achieved.

In the UK, some 80% of industrial discharges are to sewer, with only 20% directly into surface water.

Control of List II substances in the UK

Discharges of List II substances are controlled by the consent system under the Water Resources Act and Water Industry Act described above. Consents for List II substances are derived by the NRA from operational EQSs. These standards reflect in sewerage undertakers' consents for discharges to sewer. The UK is currently bringing forward a programme of statutory standards for List II substances seen as a priority for the UK.

Appendix H Daughter Directives and overview of List I substances

Table H.1: Summary of surface water directives for List I substances

substance	Council Directive number	scope of discharge limit values, quality objectives and dates	date of Council Directive	(final) limit value in grams/ton as a monthly average (for different sectors ranges are given)	water quality objective (w.q.o) as an arithmetic mean over a year in µg/l (unless stated otherwise)	date on which measures, necessary to comply with Directive 76/464/EEC, must be brought into force by Member States
Mercury	82/176/EEC	discharges by the chlor-alkali electrolysis industry	22 March 1982	0.5 (recycled brine; effluent chlorine plant) 1.0 (recycled brine; discharge from site industrial plant) 5.0 (lost brine; discharge from site industrial plant) The limit values are expressed in grams of mercury per ton of installed chlorine production capacity Discharge concentration < 50 µg of mercury per litre	1 (inland waters) 0.5 (estuary) 0.3 (territorial sea + internal coastal waters)	formal compliance: 01.07.83; standards to be met: 01.07.83 and 01.07.86
Cadmium	83/513/EEC	discharges by manufacturing of cadmium compounds and other industrial activities leading to the discharge of cadmium	26 September 1983	0.3 - 1.5 Discharge concentration < 0.2 mg of cadmium per litre	5 (inland waters) 5 (estuary) 2.5 (territorial sea + internal coastal waters)	formal compliance: 28.09.85; standards to be met: 01.01.86 and 01.01.89
Mercury	84/156/EEC	discharges by other sectors than chlor-alkali electrolysis industry	8 March 19984	0.03 - 5.0 Discharge concentration < 0.05 mg of mercury per litre	1 (inland waters) 0.5 (estuary) 0.3 (territorial sea + internal coastal waters)	formal compliance: 12.03.86; standards to be met: 01.07.86 and 01.07.89
Hexachlorocyclohexane (HCH)	84/491/EEC	discharges caused by the production of HCH and extraction of lindane	9 October 1984	2.0 - 5.0 Discharge concentration < 2 mg of HCH per litre	0.1 (inland waters) 0.02 (estuary waters + territorial sea)	formal compliance: 01.04.86; standards to be met: 01.04.86 and 01.10.88

Table H.1: Summary of surface water directives for List I substances (continued)

substance	Council Directive number	scope of discharge limit values, quality objectives and dates	date of Council Directive	(final) limit value in grams/ton as a monthly average (for different sectors ranges are given)	water quality objective (w.q.o) as an arithmetic mean over a year in µg/l (unless stated otherwise)	date on which measures, necessary to comply with Directive 76/464/EEC, must be brought into force by Member States
Carbon tetra chloride (CCl_4)	86/280/EEC	discharges caused by the production of carbon tetrachloride and chlorofluorocarbons	12 June 1986	2.5 - 40 Discharge concentration < 1.5 - 3 mg CCl_4 per litre	12 (inland, estuary, internal coastal, other than estuary + territorial waters)	formal compliance: 01.01.88; standards to be met: 01.01.88
DDT	86/280/EEC	discharges caused by the production of DDT including formulation of DDT on the same site	12 June 1986	4.0 Discharge concentration < 0.2 mg DDT per litre	10 ng/l (p-p'-DDT) and 25 ng/l (total DDT) for inland, estuary, internal coastal, other than estuary + territorial waters	formal compliance: 01.01.88; standards to be met: 01.01.88 and 01.01.91
Pentachlorophenol	86/280/EEC	discharges caused by the production of sodium pentachlorophenate by hydrolysis of hexachlorobenzene	12 June 1986	25 Discharge concentration < 1 mg PCP per litre	2 (inland, estuary, internal coastal, other than estuary + territorial waters)	formal compliance: 01.01.88; standards to be met: 01.01.88
Aldrin	88/347/EEC	discharges caused by the production of aldrin and-/or dieldrin and/or endrin and formulation at the same site	16 June 1988	3.0 Discharge concentration < 0.001 mg of "drins" per litre ("drins" = sum of Aldrin, Dieldrin, Endrin and Isodrin)	0.03 (sum of all "drins" with a max. of 0.005 for endrin) for inland, estuary, internal coastal, other than estuary + territorial waters	formal compliance: 01.01.89; limit values and w.q.o to be met: 01.01.89 tighter water quality objectives to be met: 01.01.94 (10 ng/l)

Table H.1: Summary of surface water directives for List I substances (continued)

substance	Council Directive number	scope of discharge limit values, quality objectives and dates	date of Council Directive	(final) limit value in grams/ton as a monthly average (for different sectors ranges are given)	water quality objective (w.q.o) as an arithmetic mean over a year in μg/l (unless stated otherwise)	date on which measures, necessary to comply with Directive 76/464/EEC, must be brought into force by Member States
Dieldrin	88/347/EEC	discharges caused by the production of aldrin and/or dieldrin and/or endrin and formulation at the same site	16 June 1988	3.0 Discharge concentration < 0.001 mg of "drins" per litre ("drins" = sum of Aldrin, Dieldrin, Endrin and Isodrin)	0.03 (sum of all "drins" with a max. of 0.005 for endrin) for inland, estuary, internal coastal + other estuary + territorial waters	formal compliance: 01.01.89; limit values and w.q.o to be met: 01.01.89 tighter water quality objectives to be met: 01.01.94 (10 ng/l)
Endrin	88/347/EEC	discharges caused by the production of aldrin and/or dieldrin and/or endrin and formulation at the same site	16 June 1988	3.0 Discharge concentration < 0.001 mg of "drins" per litre ("drins" = sum of Aldrin, Dieldrin, Endrin and Isodrin)	0.03 (sum of all "drins" with a max. of 0.005 for endrin) for inland, estuary, internal coastal + other estuary + territorial waters	formal compliance: 01.01.89; limit values and w.q.o. to be met: 01.01.89 tighter water quality objectives to be met: 01.01.94 (5 ng/l)
Isodrin	88/347/EEC	discharges of isodrin containing waste water originating the production of aldrin and/or dieldrin and/or endrin and formulation at the same site	16 June 1988	3.0 Discharge concentration < 0.001 mg of "drins" per litre ("drins" = sum of Aldrin, Dieldrin, Endrin and Isodrin)	0.03 (sum of all "drins" with a max. of 0.005 for endrin) for inland, estuary, internal coastal + other estuary + territorial waters	formal compliance: 01.01.89; limit values and w.q.o to be met: 01.01.89 tighter water quality objectives to be met: 01.01.94 (5 ng/l)

Table H.1: Summary of surface water directives for List I substances (continued)

substance	Council Directive number	scope of discharge limit values, quality objectives and dates	date of Council Directive	(final) limit value in grams/ton as a monthly average (for different sectors ranges are given)	water quality objective (w.q.o) as an arithmetic mean over a year in µg/l (unless stated otherwise)	date on which measures, necessary to comply with Directive 76/-464/EEC, must be brought into force by Member States
Hexachloro-benzene (HCB)	88/347/EEC	discharges caused by: * production and application of HCB; * production of PER and CCl4 via per-chlorination; * production of TRI and/or PER via other production routes.	16 June 1988	1.5 - 10 Discharge concentration < 1 - 1.5 mg of HCB per litre	0.03 (inland, estuary, internal coastal, other than estuary + territorial waters)	formal compliance: 01.01.90 standards to be met: 01.01.90
Hexachlorob-utadiene	88/347/EEC	discharges caused by: * production of PER and CCl4 via per-chlorination. * production of TRI and/or PER via other production routes.	16 June 1988	1.5 Discharge concentration < 1.5 mg of BCBD per litre	0.1 (inland, estuary, internal coastal, other than estuary + territorial waters)	formal compliance: 01.01.90 standards to be met: 01.01.90
Chloroform	88/347/EEC	discharges caused by the production of chloro-methanes	16 June 1988	7.5 - 10 Discharge concentration < 1 mg CHCl3 per litre	12 (inland, estuary, internal coastal, other than estuary + territorial waters)	formal compliance: 01.01.90 standards to be met: 01.01.90

Table H.1: Summary of surface water directives for List I substances (continued)

substance	Council Directive number	scope of discharge limit values, quality objectives and dates	date of Council Directive	(final) limit value in grams/ton as a monthly average (for different sectors ranges are given)	water quality objective (w.q.o) as an arithmetic mean over a year in µg/l (unless stated otherwise)	date on which measures, necessary to comply with Directive 76/464/EEC, must be brought into force by Member States
1,2-dichloroethane (EDC)	90/415/EEC	discharges caused by: * the production and/or conversion of 1,2-EDC; * application of 1,2-EDC as a degreasing agent; * application of 1,2-EDC for the production of ion-exchangers.	27 July 1990	2.5 - 5 Discharge concentration < 0.1 - 2.5 mg of EDC per litre	10 (inland, estuary, internal coastal, other than estuary + territorial waters)	formal compliance: 01.01.92 limit values to be met: 01.01.95 water quality objectives to be met: 01.01.93
Trichloroethylene (TRI)	90/415/EEC	discharges caused by: * production of TRI and PER; * application of TRI as a degreasing agent for metal surfaces.	27 July 1990	2.5 Discharge concentration < 0.1 - 0.5 mg TRI per litre	10 (inland, estuary, internal coastal, other than estuary + territorial waters)	formal compliance: 01.01.92 standards to be met: 01.01.93 and 01.01.95

Table H.1: Summary of surface water directives for List I substances (continued)

substance	Council Directive number	scope of discharge limit values, quality objectives and dates	date of Council Directive	(final) limit value in grams/ton as a monthly average (for different sectors ranges are given)	water quality objective (w.q.o) as an arithmetic mean over a year in $\mu g/l$ (unless stated otherwise)	date on which measures, necessary to comply with Directive 76/464/EEC, must be brought into force by Member States
Tetrachloroethylene (PER)	90/415/EEC	discharges caused by: * production of TRI and PER (TRI-PER process); * production of CCl4 and PER (TETRA-PER process); * application of TRI as a degreasing agent for metal surfaces; * production of chlorofluorocarbons.	27 July 1990	2.5 Discharge concentration < 0.1 - 1.25 mg of PER per litre	10 (inland, estuary, internal coastal, other than estuary + territorial waters)	formal compliance: 01.01.92 standards to be met: 01.01.93 and 01.01.95
Trichlorobenzene (TCB)	90/415/EEC	discharges caused by: * production of TCB; * production and/or conversion of chlorobenzenes by chlorination of benzene	27 July 1990	0.5 - 10 Discharge concentration < 0.5 - 1 mg of TCB per litre	0.4 (inland, estuary, internal coastal, other than estuary + territorial waters)	formal compliance: 01.01.92 standards to be met: 01.01.93 and 01.01.95

Table H.2 Overview of chemical and environmental characteristics of substances, for which Daughter Directives are adopted by the Council

substance	chemical characterization	toxic)[1]	bioaccumulative)[1]	persistent)[1]
Mercury	heavy metal	x	x	x)[2]
Cadmium	heavy metal	x	x	x)[2]
Hexachlorocyclohexane (HCH; e.g. lindane)	non volatile chlorinated hydrocarbon; insecticide	x	x	x
Carbon tetrachloride	volatile chlorinated hydrocarbon	x		x)[3]
DDT (dichlorodiphenyl-trichloroethane)	non volatile chlorinated hydrocarbon; insecticide	x	x	x
Pentachlorophenol (PCP)	non volatile chlorinated hydrocarbon; wood preservative	x	x	x
Aldrin	non volatile chlorinated hydrocarbon; insecticide	x	x	x
Dieldrin	non volatile chlorinated hydrocarbon; insecticide	x	x	x
Endrin	non volatile chlorinated hydrocarbon; insecticide	x	x	x
Isodrin	non volatile chlorinated hydrocarbon; by-product "drins"-production	x	x	x
Hexachlorobenzene (HCB)	non volatile chlorinated hydrocarbon; wood preservative, fungicide	x	x	x
Hexachlorobutadiene (HCBD)	non volatile chlorinated hydrocarbon; by-product, solvent	x	x	x
Chloroform	volatile chlorinated hydrocarbon; solvent	x		x)[3]
1,2-Dichloroethane (EDC)	volatile chlorinated hydrocarbon; VC-production	x		x)[3]
Trichloro-ethylene (TRI)	volatile chlorinated hydrocarbon; solvent	x		x)[3]
Tetrachlorothylene (PER)	volatile chlorinated hydrocarbon; degreasing solvent	x		x)[3]
Trichlorobenzene (TCB)	chlorinated hydrocarbon; organic intermediate, solvent	x	x	x

)[1] ecotoxicological studies on the "464-substances" as commissioned by the EC
)[2] heavy metals are considered to be persistent in the aquatic environment.
)[3] half-life time in aquatic water systems is relatively small;
half-life time in air is relatively high ("persistent in air").

Table H.3 Production and application processes leading to releases of List I substances. Large scale applications of a substance as a raw material are indicated by (a); An "indirect" release of a substance (e.g. discharge as a by-product during production of other products) is indicated as (r); miscellaneous applications of the substances are also given.

substance	production processes	Means of environmental release: • (large scale) applications (a), • "indirect" releases (manufacturing byproducts (r)), • miscellaneous applications
Mercury	* chlor-alkali electrolysis.	* fluid cathode in electrolysis process (a).
Cadmium	* manufacture of cadmium compounds; * manufacture of pigments; * manufacture of stabilizers; * manufacture of primary and secondary batteries.	* metallurgy (zinc mining, lead and zinc refining and non ferrous metal industry) (r); * electroplating (a); * manufacture of phosphoric acid and/or phosphate fertilizer from phosphate rock (r); * miscellaneous remaining applications (source: EC008): nuclear reactor neutro-absorbing rods, semi-conductors and as catalyst.
Mercury	* manufacture of mercury catalysts used in the production of vinyl chloride; * manufacture of organic and non-organic mercury compounds; * manufacture of primary batteries containing mercury.	* chemical industry using mercury catalysts in the production of vinyl chloride (a); * chemical industry using mercury catalysts in other processes than the production of vinyl chloride (a); * non ferrous metal industry (mercury recovery plants; extraction and refining of non ferrous metals (r); * treatment of toxic wastes containing mercury (r). * miscellaneous major applications (source: EC008): - electrical equipment; - paints; - measurement and control systems; - fungicide in paints; - remaining applications (dental use, laboratories etc.)
Hexachlorocyclohexane	* production of HCH; * extraction of lindane; * production of HCH and extraction of lindane.	* miscellaneous applications (source: GEN022) as a component of insecticides; * miscellaneous applications (source: EC008): veterinary public health, household purposes, wood preservation. Use of technical and enriched HCH is prohibited within the EU; * γ-HCH (lindane) is widely used in the EU as an insecticide and a rodenticide.
Carbon tetra chloride	* production of carbon tetrachloride by perchlorination; * production of chloromethanes by chlorination (including high-pressure electrolytic chlorine generation) and from methanol.	* production of chlorofluorocarbons (a); * miscellaneous applications (sources: GEN022 and EC008): - refrigerants, - metal degreasing, - agricultural fumigant, - chlorinating organic compounds, - production of semiconductors, - solvents (fats, oils, rubber etc) or extractant, - foam blowing agent

Table H.3 (continued)

substance	production processes	Means of environmental release: • (large scale) applications (a), • "indirect" releases (manufacturing byproducts (r)), • miscellaneous applications
DDT (dichlorodiphenyl-trichloroethane)	* production of DDT including formulation of DDT on the same site	* miscellaneous applications (source: GEN008): - insecticide for tobacco and cotton; - pesticide (tussock moth) * the application of DDT as an insecticide in the EU is prohibited (sources: EC and EC008) * DDT is also a starting material in the manufacture of dicofol (source: EC008); dicofol is an widely used acaracide within the EU (source: EC).
Pentachlorophenol	* production of sodium pentachlorophenate by hydrolysis of hexachlorobenzene.	* miscellaneous applications (source: GEN022): - fungicide - bactericide - algicide - wood preservative * the application as a herbicide is almost prohibited in the EU (source: EC); * miscellaneous applications (source: EC008): - conservation of leather and textiles; - additive in mineral oil and paints; - sanitary industry
Aldrin	* production of aldrin and/or dieldrin and/or endrin and formulation at the same site.	* the application of aldrin in the EU as an insecticide is prohibited (source: EC).
Dieldrin	* production of aldrin and/or dieldrin and/or endrin and formulation at the same site.	* the application of dieldrin in the EU as an insecticide is prohibited (source: EC).
Endrin	* production of aldrin and/or dieldrin and/or endrin and formulation at the same site.	* the application of endrin in the EU as an insecticide is prohibited (source: EC).
Isodrin		* (by product) caused by the production of aldrin and/or dieldrin and/or endrin; * the application of isodrin in the EU as an insecticide is prohibited.
Hexachlorobenzene (HCB)	* production and further processing of HCB	* production of tetrachloroethylene (PER) and carbon tetrachloride via perchlorination (r); * production of trichloroethylene and/or tetrachloroethylene via other routes (r); * miscellaneous applications (source: GEN022): - organic synthesis - wood preservative * the application of HCB as a fungicide in the EU is prohibited (source: EC); * miscellaneous industrial applications (source: EC008) as hydraulic fluids, pyrotechnics, fire retardant etc.

Table H.3 (continued)

substance	production processes	Means of environmental release: • (large scale) applications (a), • "indirect" releases (manufacturing byproducts (r)), • miscellaneous applications
Hexachlorobutadiene		* production of tetrachloroethylene (PER) and carbon tetrachloride via perchlorination (r); * production of trichloroethylene and/or tetrachloroethylene via other routes (r); * miscellaneous applications (source: GEN022): - solvent for elastomers - heat transfer liquid - transformer and hydraulic fluid - wash liquor for removing C-4 and higher hydrocarbons
Chloroform	* production of chloromethanes using methanol or a combination of methanol and methane; * production of chloromethanes by chlorination of methane;	* production of chlorofluorohydrocarbons * miscellaneous applications (sources: GEN022 and EC008): - production fluorocarbonplastics - solvent - analytical chemistry - fumigant - extractant and solvent in the preparation of dyes, drugs, pesticides, flavourings; - use in photographic processing; - electronic manufacturing - refrigerant, aerosol propellant; - extractant or degreasant; * the application of chloroform for plant protection purposes in the EU is prohibited (source: EC)
1,2-Dichloroethane (1,2-EDC)	* stand alone production of 1,2-EDC * production of 1,2-EDC and conversion or application at the same site	* conversion of 1,2-EDC into other substances than vinyl-chloride; * application of 1,2-EDC for degreasing purposes of metal surfaces; * application of 1,2-EDC for the production of ion exchangers; * miscellaneous applications (sources: GEN022 and EC008): - production of vinyl chloride, trichloroethylene, vinylidene chloride and trichloro-ethane; - lead scavenger in anti knock gasoline; - paint, varnish and finish removers; - metal degreasing, - soaps and scouring compounds, wetting and penetrating agents; - organic synthesis, ore flotation; - solvent, fumigant; - additive to gasoline (lead scavenger).

Table H.3 (continued)

substance	production processes	Means of environmental release: • (large scale) applications (a), • "indirect" releases (manufacturing byproducts (r)), • miscellaneous applications
Trichloroethylene (TRI)	* production of trichloroethylene (TRI) and tetrachloroethylene (PER)	* application of TRI for degreasing purposes of metal surfaces; * miscellaneous applications (sources: GEN022 and EC008): - extraction solvent for oils, fats, waxes - solvent dying; - dry cleaning - refrigerant and heat-exchange liquid; - fumigant; - cleaning and drying electronic parts; - diluent in paints and adhesives; - textile processing; - chemical intermediate; - aerospace operations (flushing liquid oxygen); - textile cleaning; - carrier solvent; - solvent extractor.
Tetrachloroethylene (PER)	* production of trichloroethylene (TRI) and tetrachloroethylene (PER) (TRI-PER-process); * production of carbon tetrachloride and tetrachloroethylene (PER) (TETRA-PER-process);	* application of PER for degreasing purposes of metal surfaces; * production of chlorofluorohydrocarbons; * miscellaneous applications (sources: GEN022 and EC008): - dry-cleaning solvent; - vapour-degreasing solvent; - drying agent for metals and certain other solids; - vermifuge; - heat-transfer medium; - production of fluorocarbons; - processing and finishing in the textile industry.

Table H.3 (continued)

substance	production processes	Means of environmental release: • (large scale) applications (a), • "indirect" releases (manufacturing byproducts (r)), • miscellaneous applications

Trichlorobenzene (TCB)	* production of TCB by hydrodechlorination of HCH and/or conversion of TCB;
	* production and/or conversion of chlorobenzenes by chlorination of benzene;
		* miscellaneous applications (sources: GEN022 and EC008):
		- 1,2,3-TCB is used as an organic intermediate;
		- 1,2,4-TCB is used as:
		  - solvent and extractant in chemical manufacturing;
		  - dyes and intermediates;
		  - dielectric fluid;
		  - synthetic transformer oils;
		  - lubricants;
		  - heat transfer medium;
		  - insecticide;
		  - carrier in textile industry;
		- technical grade TCB is used as:
		  - solvent and extractant;
		  - carrier in textile industry;
		  - dielectric fluid;
		* the application of 1,2,3-TCB for plant protection purposes in the EU is prohibited (source: EC).

European Commission

Impact of Directive 76/464/EEC and its daughter directives on the most important surface waters in the Community

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Fax (32-2) 511 01 84

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Avenue du Roi 202/
Koningslaan 202
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Fax (32-2) 538 08 41
E-mail. jean de lannoy@infoboard be

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