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NRA-National Centres 2

# THE NATIONAL CENTRE FOR TOXIC AND PERSISTENT SUBSTANCES



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## INTRODUCTION

As "*Guardians of the Water Environment*" the National Rivers Authority (NRA) has statutory duties and powers to protect the aquatic environment from pollution. These duties are contained in the Water Resources Act (1991) which is the primary legislation for controlling and preventing water pollution. As part of



its duty, the NRA is required to monitor water quality, investigate pollution incidents, control discharges by consents and maintain and improve the quality of all inland, coastal and groundwaters.

National Centres are being developed in the NRA so that specialist knowledge can be used to maximum effect. Staff working on complex national issues are concentrated within one location, and offer a focal point, both for internal and external advice.

From April 1996, the NRA's duties will be adopted by the Environment Agency, which will be formed by the merger of the NRA, Her Majesty's Inspectorate of Pollution and the Waste Regulatory Authorities. It is anticipated that National Centres will continue to play an important role within the new Agency.

## THE NATIONAL CENTRE FOR TOXIC AND PERSISTENT SUBSTANCES (TAPS)

The TAPS Centre provides a team dedicated to national issues relating to toxic and persistent substances. The group will enable the current and future commitments for these substances to be met in an efficient and cost-effective manner.

The TAPS Centre has 10 full time staff and a further 11 who have both Regional and National Centre responsibilities. The Centre is based at the Anglian Regional Office at

Peterborough, with a satellite unit in the Thames Region at Reading.

The Centre covers four key areas which are detailed overleaf. These are:

- i) North Sea\PARCOM;
- ii) Pesticides and other Toxic Substances;
- iii) Environmental Toxicology;
- iv) Eutrophication and Toxic Algae.



## NORTH SEA / PARCOM COMMITMENTS

The UK is required through various international agreements and commitments to reduce the quantities of certain hazardous substances and nutrients entering the sea.

### The Paris Convention

The UK is a Contracting Party of the 1974 Paris Convention, which is aimed at preventing and reducing marine pollution. The Convention is administered by the Paris Commission (PARCOM). In 1988, PARCOM decided to implement a comprehensive annual study of selected pollutants and the first such study was carried out during 1990. The mandatory parameters to be monitored were five metals (mercury, cadmium, copper, zinc and lead), four nutrients (nitrate, orthophosphate, total nitrogen and total phosphorus), one pesticide (gamma HCH, also known as lindane) and two general parameters (suspended particulate matter and salinity). PCBs were to be monitored on a voluntary basis for seven congeners (different forms of PCB).

### The North Sea Conference Declaration

By 1984 it was generally perceived (by the public and also by some Governments) that slow progress was being made in reducing pollution of the North Sea. As a result a series of Ministerial Conferences were held: the first in Germany in 1984; the second in London in 1987; the third at the Hague in 1990, and a fourth in Denmark in June 1995. At the end of each Conference the Ministers agreed objectives by way of a Declaration.

In the Declaration from the Second

Conference in 1987, the need to adopt a precautionary approach in relation to the most dangerous substances (defined as those that are persistent, toxic and liable to bioaccumulate) was a major feature. Amongst other issues the Ministers agreed to take measures to:

- reduce the input loads of dangerous substances, from rivers and estuaries, to the North Sea by around 50% by 1995 using input load in 1985 as a baseline;
- reduce inputs of phosphorus and nitrogen by around 50% between 1985 and 1995 into areas where these inputs are likely to cause pollution.

At the Third Conference in 1990, Ministers agreed a common list of 36 dangerous substances, referred to as Annex 1A. They also reiterated their previous commitments and in addition agreed:

- to reduce the total inputs, from all sources, of dioxins, mercury, cadmium and lead by around 70% or more between 1985 and 1995;
- to make substantial reductions in the quantities of pesticides reaching the North Sea with special attention to phasing out those which are the most persistent, toxic and liable to bioaccumulate;

- to phase out and destroy all identifiable PCBs by 1999.

The Fourth Conference accepted that some of the 1995 reduction targets would not be met but agreed to remain committed to reaching them as soon as possible

### Monitoring

The Department of the Environment (DoE) is ultimately responsible for meeting the UK's international obligations. However, the DoE requires the NRA to monitor and control the discharge of hazardous substances to water on their behalf and report the results on an annual basis.

Therefore, the NRA undertakes a detailed estuarine and coastal water monitoring programme which includes sampling all the main freshwater rivers and all significant trade and sewage effluents (around 350 sites) for the purposes of the Paris Commission and North Sea requirements.

The TAPS Centre collects and collates the results of this PARCOM and Annex 1A monitoring for the NRA. After detailed validation, these data are stored centrally on the TAPS Centre's computer system and are used to produce:

- National and Regional Reports;
- Geographical Analysis (GIS);
- Advice and guidance;
- Graphical presentation of data.



## EUTROPHICATION AND TOXIC ALGAE

Eutrophication is the enrichment of waters by nutrients, particularly phosphorus and nitrogen. Common sources of nutrients are detergents and human waste in sewage effluents, and fertilisers and farm wastes.

Eutrophication can lead to excessive growth ("blooms") of toxic algae. The TAPS Centre coordinates and assists the NRA's work on toxic algae and eutrophication, providing advice on related issues.

Eutrophication can lead to blooms of algae and other aquatic plants in both fresh and marine waters. These interfere with many aspects of water use, e.g. through toxicity, deoxygenation (killing fish) and impeding flow (flood risk). In cases where waters are heavily used for different activities (recreation, fisheries, conservation, drinking water supply, etc) the overall financial losses resulting from eutrophication can be considerable, both in the UK and abroad.

The chemicals produced by blue-green algae can be toxic to mammals. In 1989 a number of dogs and sheep died after ingesting a toxic algal scum at Rutland Water (Leicestershire), and two soldiers were hospitalised after canoeing on Rudyard Lake (Staffordshire). Recreational water users may be harmed simply through contact with toxic algal material. There is a 60-70% chance that a bloom of blue-green algae will be toxic.

Marine algal blooms can also cause problems. Some species are potentially

toxic, contaminating shellfish that feed on them. Humans eating contaminated shellfish can suffer serious health problems (shellfish poisoning). Some algae kill fish and other marine organisms, while others cause aesthetic problems through discolouring coastal waters ("red-tides"), or decaying to leave sewage-like slime on bathing beaches.



The Toxic Algae Task Group was established to assess the incidence of toxic algae and to recommend future monitoring and control measures. In 1990, the Task Group published its report, "Toxic Blue-Green Algae" and subsequently information leaflets were produced on both blue-green and marine algae. A Water Quality Series Report on marine algae is being produced.

Monitoring programmes have identified the high priority waters most likely to develop blue-green algal problems. Freshwaters are sampled reactively as a result of public queries. At bathing beach sites, samples are taken for marine algal analysis, either routinely or when blooms are evident.

A number of R&D projects have taken place, including an investigation of the fate and behaviour of blue-green algal toxins, and the development of computer models, such as PROTECH (Phytoplankton Response to Environmental Change), to enhance understanding and management of the problem. The Centre is also involved in the assessment of novel algal control treatments.

Control of algae may provide part of the solution, but in the long-term a wider eutrophication control strategy is required. This will consider management of not only the effects, but also the causes, of eutrophication.

Furthermore, it will enable eutrophication control to proceed on a more informed, coordinated basis. Various projects will provide information on different aspects of eutrophication management, and contribute to the development of the strategy. These include:

- The production of a manual of eutrophication control methods (preventative, e.g. nutrient removal at sewage works, and restorative, e.g. lake aeration);
- The assessment of the cost-effectiveness of different eutrophication control methods;
- A review of the legislation that enables eutrophication control;
- The development of appropriate environmental quality objectives and standards that allow the satisfactory protection of different water uses;
- A review of current R&D activity, in the UK and abroad, relating to eutrophication and its control.

There is no easy, instant solution that can be applied universally to all waters suffering from eutrophication problems. Action Plans are being developed for individual waters, on a case by case basis. These will examine the characteristics of a water body and the surrounding catchment (water quality, dimensions, flow, meteorology etc), and use computer models, such as PACGAP (Prediction of Algal Community Growth and Production) to suggest, and simulate the impacts of, possible solutions. Information provided by the projects listed above will enable the selection and implementation of the most cost-effective control strategy for that water body.



## OUTPUTS

### The TAPS Centre:

- Provides advice on toxic and persistent substances for the NRA
- Acts as a focal point for outside organisations on toxic and persistent substances
- Produces Water Quality Series Reports and other reports
- Produces and maintains national databases on toxic and persistent substances
- Produces leaflets and guidance
- Supplies data to regulators and other organisations
- Recommends and co-ordinates research and development
- Makes recommendations for reducing the concentration of toxic and persistent substances and nutrients in Controlled Waters
- Implements strategies for controlling toxic and persistent substances and nutrients
- Recommends monitoring strategies
- Lobbies and advises Government departments

### Available publications:-

Leaflets and guidance documents available from the TAPS Centre:

- Blue-Green Algae
- Marine Algae
- Agricultural Pesticides and Water
- Think Water - Keep it Clean
- The Use of Herbicides In or Near Water (£5.00)

### Water Quality Series Reports available from HMSO:

- Toxic Blue-Green Algae. (No. 2. September 1990 £15.00).
- Contaminants Entering the Sea (No. 24. May 1995 £15.95).

### CONTACTS IN THE NATIONAL CENTRE

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NORTH SEA

PARCOM

PESTICIDES

TOXICOLOGY

EUTROPHICATION

TOXIC ALGAE



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## PESTICIDES

A pesticide is defined, under the Food and Environment Protection Act (1985), as "any substance, preparation, or organism prepared or used for destroying any pest". Pesticides include herbicides, fungicides, insecticides, molluscicides, rodenticides, growth regulators and masonry and timber preservatives.

The use of pesticides has increased substantially since the development of synthetic pesticides in the 1940's and there are now about 450 pesticides approved for use in the UK. They are used to control a wide range of weeds, pests and diseases in arable crops and are also used on roads, railways, in homes and gardens, in timber treatments, as antifouling treatments on boats and as veterinary medicines, such as sheep dips. This increase in use has resulted in low concentrations of a wide range of pesticides being detected by the NRA in many surface and groundwaters.

Pesticides and related compounds are potentially "poisonous, noxious or polluting" substances under the Water Resources Act (1991) and therefore the NRA has a primary role in controlling and preventing pesticide pollution of water. Furthermore, the NRA is responsible for ensuring water quality meets standards stipulated in a number of EC Directives, some of



which specify maximum values for pesticides and other toxic and persistent chemicals. It is essential that contamination by pesticides is prevented in order to comply with EC Directives, safeguard drinking water supplies and protect fish and aquatic life.

The NRA uses its consenting powers to limit pesticides discharged to the aquatic environment from point sources e.g. manufacturing or industrial plants, in order to meet the standards in the EC Directives. It is not, however, possible to use this approach to control pesticides arising from diffuse sources e.g. leaching and run-off from agricultural land, during their approved use. Control of diffuse pesticide inputs to water bodies requires a co-ordinated approach. This will involve liaising and co-operating with regulators and educating pesticide users to adopt "Best Practice" to minimise pesticide pollution of water.

The TAPS Centre is in regular contact with the Department of the Environment (DoE), Pesticides Safety Directorate, Health and Safety Executive, British Agrochemicals Association and National Farmers Union on pesticide issues and provides information and advice on preventing pesticide pollution.

To ensure the aquatic environment is protected, the NRA undertakes a large and diverse pesticide monitoring programme, which must be carefully targeted to ensure value for money. Each year, Regions supply this monitoring data to the TAPS Centre,

where the data (currently over 250,000 pesticide measurements a year) are collated and summarised nationally. This allows reports to be written and advice on monitoring strategies to be implemented. To improve targeting of pesticide monitoring, the NRA, through the TAPS Centre, is developing a modelling system for the Prediction Of Pesticide Pollution In the Environment (POPPIE). The main uses of POPPIE will be the:

- Prediction of ground and surface water quality with respect to pesticides;
- Guidance of monitoring programmes - targeting specific compounds;
- Identification of potential problem compounds;
- Production of national scale vulnerability assessments;
- Assessment of leaching/run-off potential for new pesticides.

The TAPS Centre has also recently become advisors to the DoE, on the potential impact on the aquatic environment of the pesticides being approved or reviewed by the Advisory Committee on Pesticides (ACP). The ACP is the Committee which advises the Government on pesticide registrations under the 1986 Control of Pesticides Regulations. The TAPS Centre is also represented on the Sub-Committee on Pesticides (SCP) and the Environment Panel which provide technical and scientific advice to the ACP.

## ENVIRONMENTAL TOXICOLOGY

A large number of potentially toxic chemicals are used, manufactured and transported within England and Wales. A significant proportion of these can enter the aquatic environment as a result of their use, accidents, spillages, transport, or via consented discharges.

Information on the potential effect of these chemicals on water bodies is required by the NRA for a number of key activities, such as setting consents, managing pollution incidents, during operational investigations and when preparing expert witness statements.

The TAPS Centre (Environmental Toxicology Unit, based in Thames Region) provides information, advice and guidance on the potential environmental impact of these chemicals. A national advisory service for NRA staff provides and assesses data on:

- Substance identification;
- Fate and behaviour;
- Toxicity;
- Analytical requirements;
- Relevant standards.

In addition, data and technical expertise is provided to assist in the development of internal policy and the

classification of substances, e.g. for the Groundwater Directive. The Centre also carries out a range of hazard assessments in relation to products intended for use in or near water or where direct or indirect contamination of surface or groundwater is likely to occur.

In assessing the impact of chemicals on the water environment, the TAPS Centre acquires and uses the best available environmental data to ensure that decision making processes are underpinned by good science. The Centre maintains and reviews a wide range of literature including internal and external chemical review documents and manufacturers data. In addition, a number of computer databases are subscribed to and others are being reviewed. Links are also maintained with external organisations such as the Water Research Centre, the National Chemical Emergency Centre and manufacturers of toxic substances for additional data and advice.

The Centre is also responsible for an R&D project to develop Environmental Quality Standards (EQSs) for chemicals prioritised by the NRA. This is linked to the derivation of EQSs by the DoE. Reviews of generic groups of compounds of concern are also undertaken in order to identify priority compounds for EQS development. In addition, advice and guidance on the suitability and use of water quality standards available in both the UK and elsewhere are provided.



TAPS  
Toxic and Persistent Substances