Heads in the sand over Europe's most dangerous chemicals

Governments ignoring legal obligations in the phasing out of Nonylphenol water pollution

12 May 2010

Executive Summary

Many chemicals can cause irreversible damage to humans and animals. Emissions of such hazardous chemicals have to be phased out and their uses should be substituted with safer alternatives according to EU water and chemical legislation.

Greenpeace investigated progress with phasing out emissions of the well-known environmental pollutant Nonylphenol in five EU member states, the Czech Republic, Germany, Slovakia, Spain and the UK. Nonylphenol, a very hazardous, hormone disrupting chemical which presents particular threats to human and animal fertility, has been identified by the EU in 2001 for a emission phase out. It is released by industrial activities using this substance or its ethoxylates, Nonylphenol-ethoxylate. It also leaches from consumer products, for example textiles where it is used during production. In 2003, marketing and use of Nonylphenol and Nonylphenol-ethoxylate as such or in preparations in the EU has largely been banned, but its presence in consumer article is still allowed.

Despite well documented high levels of NP emissions into our aquatic ecosystem and publicly available monitoring data, which show concentrations close to maximum allowed levels, authorities ignore legal requirements to act. According to their River Basin Management Plans, no problem is detected and thus no further action is taken.

But by ignoring it, the problem has not disappeared. The five member states are very likely to breach maximum allowed concentrations in future in particular pollution hot spots, which are often waste water treatment outfalls. In addition they fail to take action to further reduce and eventually phase out all emissions of Nonylphenol as required by the EU Water Framework Directive.

Those failures seem to be based on a systematic misapplication of the legal requirements. There is strong evidence that the case of Nonylphenol is symptomatic of a failure to deal with other highly toxic substances. As a consequence a significant level of pollution with hazardous substances would be tolerated, contributing to the toxic cocktail in our rivers, lakes and seas. This does not confirm Europe's role as global frontrunner in clean waters and chemical safety.

Therefore, Greenpeace recommends member states to establish the phase out objective for hazardous chemicals in its water management planning and to ensure the objective is achieved, which might include calling for tightening EU internal market controls. The Commission must ensure the full enforcement of the respective EU legal requirements and prepare as a minimum an EU restriction for consumer articles containing traces of NPE.

1. Background

Many chemicals can cause cancer, damage fertility or accumulate in humans and animals. These risks cannot be adequately controlled, their release into the environment must be eliminated as a priority and their uses should be substituted with safer alternatives. This is what the European Union decided in 2000 with the Water Framework Directive by establishing a list of 'priority hazardous substances' for phase-out within 20 years and in 2006 with the new EU chemical safety regulation REACH introducing an authorisation process for 'substances of very high concern'.

It is time to check whether these laws are delivering.

We chose a case in hand, the well-known environmental pollutant Nonylphenol (NP), which the EU identified in 2001 as a 'priority hazardous substance'. It is a very hazardous hormone-disrupting chemical which presents particular threats to human and animal fertility. NP is released by industrial activities inside and outside Europe using this substance or its ethoxylates, Nonylphenol-ethoxylate (NPE). It also leaches from consumer products, for example textiles where it is used during production.

In order to find out whether the elimination of NP from our waters is happening in practice, we assessed publicly available information in the Czech Republic, Germany, Slovakia, Spain and the UK, namely the River Basin Management Plans and Pollutant Emission Registers as required under EU environmental laws.

The use and risks of Nonylphenol and Nonylphenol-ethoxylates

This summary information is based on the Greenpeace publication Hazardous Chemical Pollution of the Pearl River (Greenpeace 2009).

Nonylphenol belongs to the group of Alkylphenols, which are manufactured almost exclusively to produce alkylphenol ethoxylates, a group of non-ionic surfactants. The most widely-used alkylphenol ethoxylates are ethoxylates of Nonylphenol (NPEs) and, to a lesser extent, Octylphenol. Once released into the environment, alkylphenol ethoxylates can degrade back to alkylphenol, which is persistent, bioaccumulative and toxic to aquatic life.

NPEs have been used as surfactants, emulsifiers, dispersants and wetting agents in a variety of industrial and consumer applications. The largest share has been in industrial and institutional cleaning products (detergents), with smaller amounts used as emulsifiers, textile and leather finishers and as components of pesticides and water-based paints.

NP and its derivatives are found widely in fresh and marine waters and, in particular, sediments, in which these persistent compounds accumulate. Because of their release into water, they are also common components of sewage effluents and sludge, including that applied to land. NP has been detected in rain and snow in Europe. Research into levels in wildlife remains limited, although there have been reports of significant levels in both invertebrates and fish in the vicinity of sites of manufacture and/or use of alkylphenol ethoxylates and close to sewer outflows. NP and Octyphenol accumulate in fish and other organisms, biomagnifying up the food chain. More recently, the presence of alkylphenols as contaminants in human tissues has also been reported.

The most widely recognised hazard associated with NP and Octylphenol is undoubtedly their oestrogenic activity, i.e. their ability to mimic natural oestrogen hormones. This can lead to altered sexual development in some organisms, most notably the feminisation of fish.

In rodents, exposure to Octylphenol caused adverse effects on male and female reproductive systems, including lower sperm production and increased sperm abnormalities. Effects on mammalian sperm function, DNA damage in human lymphocytes and impacts on immune system cells in vitro have also been described.

2. Policy developments

In 1998, the ministerial meeting of the Convention for the Protection of the North-East Atlantic (OSPAR Convention) agreed to cease all emissions of NP/NPE by 2020.

Subsequently the EU introduced this commitment into the EU Water Framework Directive in 2000 (WFD), which establishes that all emissions, discharges and losses of '*priority hazardous substances*' have to be phased out within 20 years with the ultimate aim of achieving close to zero concentrations in the aquatic environment. Nonlyphenol was identified as a priority hazardous substance in 2001 *(*Decision No 2455/2001/EC).

The phase out obligation is shared between member states and the European Union. Member states are responsible for taking all the necessary measures to achieve WFD objectives. The EU should step in when common approaches are more effective, for example if end-of-pipe measures are not technically feasible or too expensive and product controls based on the EU internal market rules would be required.

In 2003, the EU prohibited most uses and the marketing of NP and NPE, as well as its presence in preparations over 0.1% (Directive 2003/53/EC). Industrial uses which could guarantee no intentional release into the environment were excluded from the ban. The presence of NP or NPE in products, for example imported ones from regions without such restrictions, is not controlled by this prohibition.

In 2006, a new EU chemical safety policy reform was adopted – REACH (Regulation No 1907/2006/EC). It puts in place a general requirement for business to substitute substances of very high concern (SVHC) with safer alternatives. SVHC are chemicals that are hazardous due to their intrinsic properties, i.e. they could accumulate in the environment or cause irreversible damage.

In 2008, the EU established Environmental Quality Standards (EQS) for priority substances under the WFD, including all priority hazardous substances (Directive 2008/105/EC). The EQS for NP was set as 0.3µg/l annual average and 2.0µg/l maximum allowable concentration. The European Commission, at the time, should have proposed further emission control measures, but refrained, arguing that sufficient control measures are already in place. Member states are required to provide an inventory of emissions of priority substances, but with an unclear deadline (most likely 2015) and a pending technical provision to be established by the Commission.

In 2009, countries had to present their River Basin Management Plans (RBMP), which are the WFD's main implementation reporting instrument. The RBMPs have to include the foreseen or adopted measures to achieve the WFD objectives, including the phasing out of emissions, discharges and losses of priority hazardous substances 20 years after their identification.

3. Implications for national water policies

The 27 EU member states are required to fully implement the WFD from 2000 and the Environmental Quality Standards Directive from 2008. Taken together, both these directives require member states to do everything necessary for Nonylphenol to:

i) Achieve a phasing out discharges, emissions and losses; and

ii) Ensure all water bodies achieve the EQS by 2015.

This should trigger the following minimum activities:

- By 2004, as part of required Pressures and Impacts Analysis, member states have to investigate NP emissions in order to establish for all water bodies the risk of failing the objectives. According to the EU Common Implementation Guidance (CIS (2003)) the risk of failure has to be assessed for all water bodies for priority hazardous substances, whereby the guidance spells out that both objectives, phasing out of discharges and achieving the EQS are to be considered. In addition, it is suggested to use the OSPAR Guidelines for Harmonised Quantification and Reporting Procedures for Hazardous Substances (HARP-HAZ) (OSPAR 2001) for establishing the right information on pressures. As outlined in the previous chapter, NP/NPE in finished consumer products represents a gap in the 2003 amendment to the Marketing and Use Directive in the control of NP emissions. We can thus reasonably expect an investigation into whether this gap could lead to a failing of the objectives. If such a pollution risk were identified, either a Member State or the European Commission could use Article 69 of the REACH regulation to start the preparation of a proposal to restrict the marketing of articles containing NPE.

- By 2006, establish a monitoring programme based on Pressures and Impacts Analysis. This means that NP should be monitored in order to:
  - Confirm the status of water bodies identified as being at risk of not achieving the EQS set for NP;
  - Document the progressive reduction in concentrations which requires appropriate trend monitoring according to CIS Guidance CIS (2009); and
  - Ascertain the cause and effect of failing good ecological water status, i.e. reduced species abundance due to fertility damage, which could be due to NP pollution.
- By 2009, adopt River Basin Management Plans (RBMPs) that summarise the findings of the Pressures and Impacts Analysis and the monitoring programmes and establish in particular for NP the necessary measures in order to achieve the EQS by 2015 for all water bodies and aim at ceasing or phasing out discharges, emissions and losses (WFD Article 4.1). As a minimum the measures must include:
  - *"For point source discharges liable to cause pollution, a requirement for prior regulation...or for prior authorisation, or registration based on general binding rules, laying down emission controls for the pollutants concerned..."* (WFD Article 11.3(g));
  - *"In accordance with action taken pursuant to Article 16, measures to eliminate pollution of surface waters by those substances specified in the list of priority substances agreed..."* (WFD Article 11.3(k)). Whereby Article 16.8 states that *"... in the absence of agreement at Community level Member States shall establish ... controls on the principal sources of such discharges, based, inter alia, on consideration of all technical reduction options."*

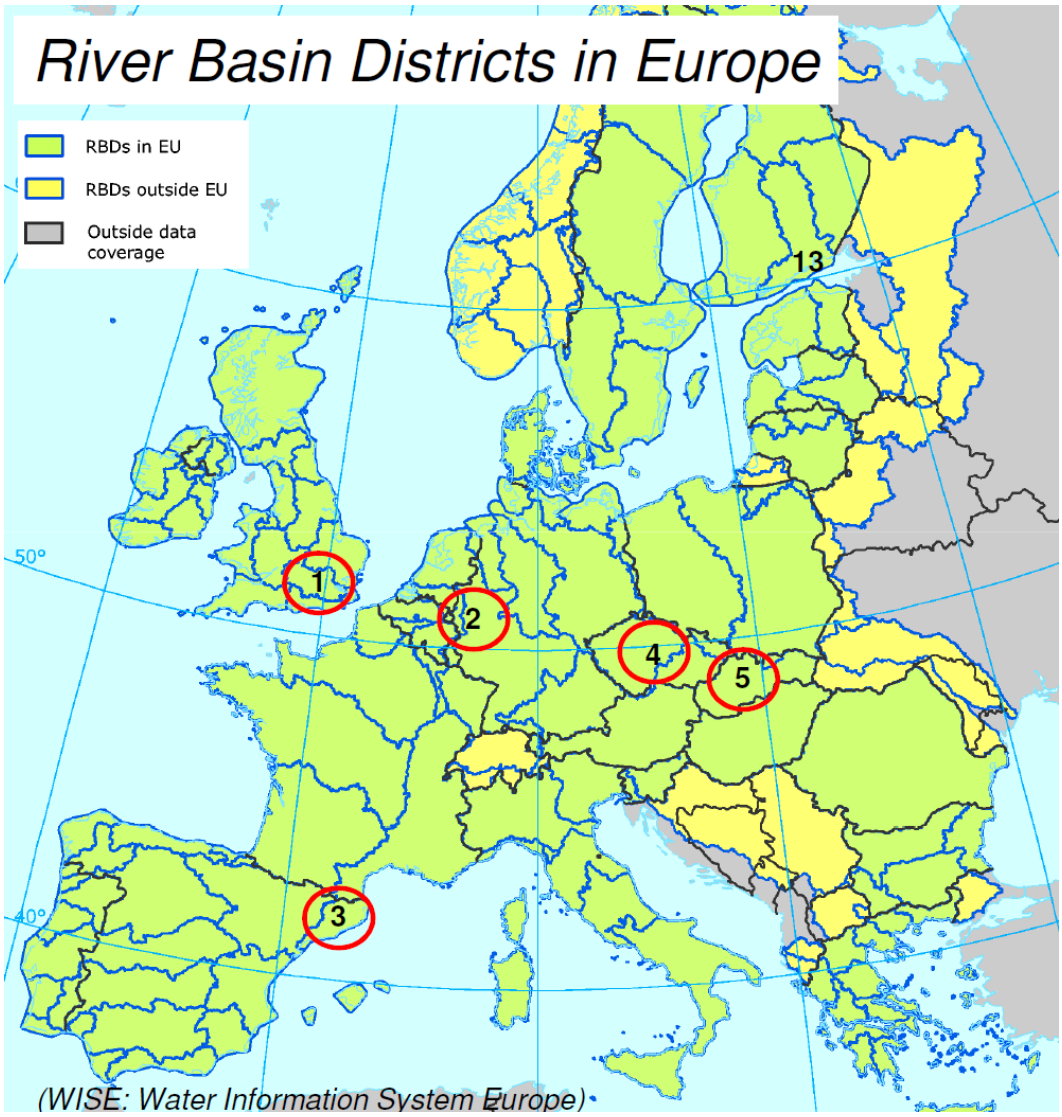
4. Greenpeace's investigation - our approach and findings

4.1. Assessment method

During February and March 2010, Greenpeace collected publicly available information in Spain, Germany, the UK, the Czech Republic and Slovakia using a common questionnaire. Main information sources were:

- River Basin Management Plans and their background documents:
  - (1) UK Thames –DEFRA (2009)
  - (2) Germany North-Rhine-Westphalia (NRW) - Landtag (2010)
  - (3) Spain Internal Basins of Catalonia - ACA (2009)
  - (4) Czech Republic Ohre and Lower Elbe as available at http://www.poh.cz/VHP/vhp.htm
  - (5) Slovakia Danube and Slovakia Vistula, as made available at http://www.enviro.gov.sk/servlets/files/23379

- Pollutant release and transfer registers:
  - EU: http://prtr.ec.europa.eu/
  - UK: http://prtr.defra.gov.uk/
  - Germany: http://www.prtr.bund.de/
  - Spain: http://www.prtr-es.es/
  - CZ: http://www.irz.cz/
  - Slovakia: http://nrz.shmu.sk/index.php



- Other information on monitoring data including:
  - Germany North-Rhine-Westphalia, Ministry of Environment, NRW (2010)
  - International Commission for the Protection of the Rhine, IKSR (2010)
  - ACA, the Water Agency of Catalonia, made available documents upon request
  - Czech Programme for the reduction of surface water pollution caused by hazardous and priority hazardous substances, (CZ 2009)

As a first step, we assessed the information available in the RBMPs with regard to:

- Assessment of failures, or risks of failures, to achieve the NP EQS, such as the number of water bodies, monitoring approaches and observed trends and emissions inventories, and;
- Proposed measures to achieve the EQS and the phase out of emissions by 2021.

In a second step, we assessed NPE emissions and NP water quality information available from other sources in order to verify the plausibility of the findings in the RBMPs.

4.2. Assessments and findings

No information provided by the RBMPs and background documents

None of the five investigated RBMPs or readily accessible background documents provide specific information about NP/NPE monitoring and objectives. No indication is given as to whether an assessment of the pressures and impacts of NP/NPE has been undertaken, whether concentrations have been monitored for investigation or surveillance and what the results were. In addition, no information is provided on how monitoring strategies were designed to detect potential NP pollution and how mixing zones, which allow accounting for dilution effects for high concentrations at the point of discharge, were considered in establishing whether the EQS will be achieved by 2015.

The general assumption seems to be that if existing monitoring did not indicate NP concentrations in excess of the EQS as set by the 2008 directive, then no further action is required.
With regard to the environmental objectives, some RBMPs mention the specific EQS to be achieved for NP in 2015 and some refer to the WFD objective to phase out all NP emissions, but did not specify what that means in practice.

None of the five RBMPs mention existing or newly-established measures to reduce or phase out emissions of NP or the need for further EU actions.

We conclude that the information provided by the RBMPs and background documents is inadequate to judge whether NP pollution occurs and whether WFD objectives will be met. No specific measures to phase out of emission, discharges and losses of NP are established.

Authorities failed to demonstrate that they coherently monitor and assess NP pollution. No trend analysis, assessment of the influence of dilution factors and how this is accounted or pressure analysis was provided to establish with what certainty the NP EQS will be achieved by 2015 and emission will be phased out.

We can only assume that the authorities concluded that if existing and non-specific monitoring does not indicate concentrations above the limit, then no reason for further action exists. This is insufficient for two reasons:

- If concentrations do not decrease and are still close to the EQS, it is very likely that limits will be breached in future; and
- Meeting the EQS is not sufficient to eliminate NP pollution achieve a phase out of all emissions, discharges and losses.

Cross-checking with other information

We obtained actual monitoring data, in some cases from alternative sources, including international river commissions (IKSR, ICPDR) or national and regional databases.

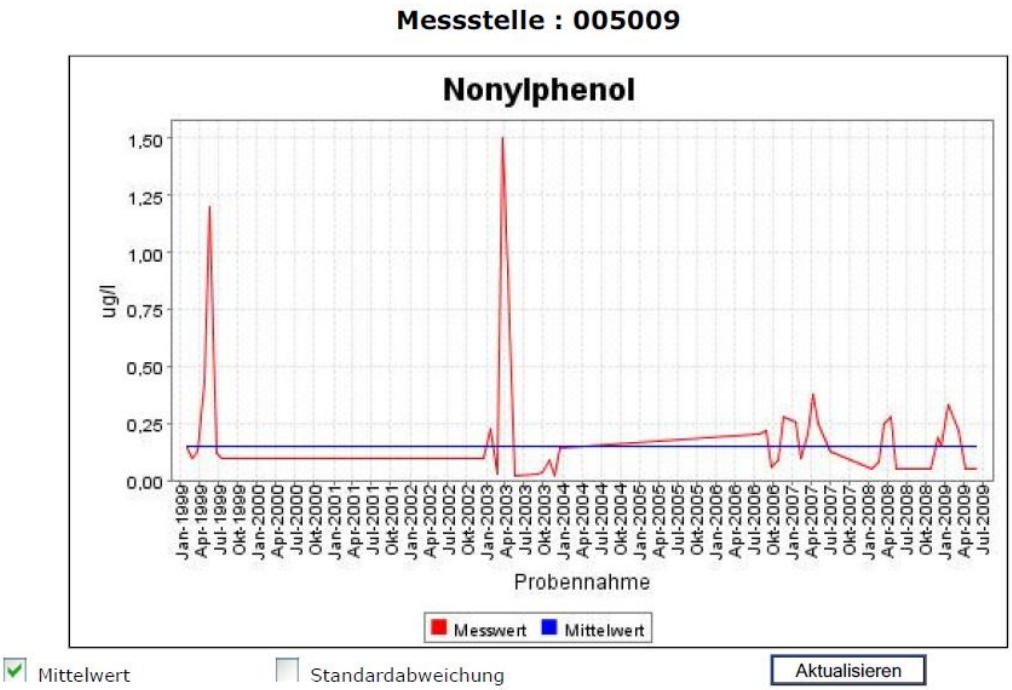
In Slovakia, some data from 2004 was available from end–of-pipe waste water discharges. In three cases, the monitored concentrations suggest a failure to meet the EQS, at least if no significant dilution factor is assumed. The approach taken by authorities could not be confirmed from the available documents.

In the Czech Republic, NP is monitored at 79 sites with no reported EQS failures. A programme was approved on 22 March 2010 and became accessible in April 2010. The data indicates significant emissions other than from urban waste water, though it is not conclusive about emission sources or the impact on EQS standards. Average monitoring data is established at 0.113 and the 90% percentile is at 0.2µg/l. The programme fails to outline any measures to control NP pollution.

In Germany NRW, hundreds of potential monitoring points are available, but it is difficult to access the data in a systematic manner. Sample data for two sites (Figures 1 and 2) shows significant NP pollution, just below the EQS.

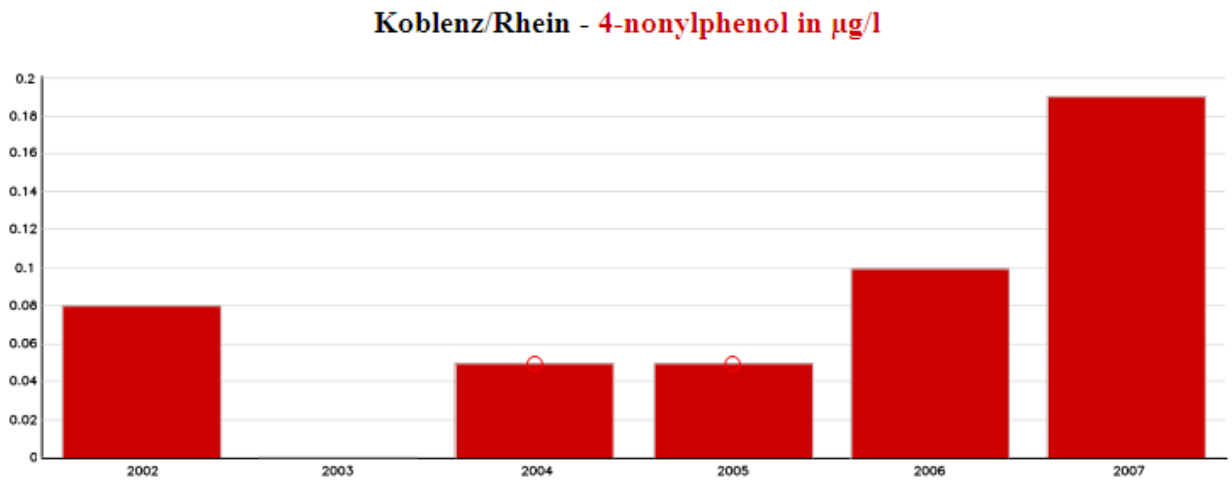
In Spain, the sharing of competences between several authorities per river basin makes it difficult to access information. The Catalonian Water Agency provided on request water sampling data. In four monitoring locations the maximum allowable NP concentration was surpassed. The highest concentration of 142.8µg/l was measured in April 2008 (Riera de Riudoms).

Figure 1: Monitoring results in NRW, Emscher before entering the Rhine (NRW 2010)



Statistische Kenndaten	
Anzahl	92
Minimum	0,0210
Maximum	1,5000
Mittelwert	0,1537
Standardabweichung	0,2110

Figure 2: Monitoring results in the Rhine at Koblenz (IKSR 2010)



In relation to reported emissions data, we found the following from national and EU PRTRs:

- The UK dataset on NP/NPE emissions in the EU PRTR allows a breakdown to river basin level. For the Thames River Basin District, 16tonnes were released in 2007 from 22 sewage treatment plants. UK-wide 66tonnes are reported to be released in 2007 from 112 sewage treatment plants. In addition, some 1.1tonnes were reportedly emitted from other industrial activities;
- The Spanish national PRTR reports some 1.19tonnes of NP/NPE emissions in 2008, of which 1.18 tonnes were released from 12 Urban Waste Water Treatment Plants (UWWTP). Nine out of these 12 are located in RBD internal basins in Catalonia, which contributed 1.09 tonnes;
- The German PRTR reports one tonne of emissions in 2007, of which 0.35tonnes were released from seven UWWTP;
- The Czech programme (CZ 2009) provides monitoring from 30 UWWTP. The average NP concentration is 0.49 µg/l; and
- No emission data was made available in Slovakia.

These figures suggest that urban waste water and sewage treatment plants are the biggest sources of NP emissions. This finding is consistent with the limited scope of the 2003 EU emission controls, which largely prohibit industrial discharges and the marketing of NP/NPE containing products, but allows textiles and other consumer articles containing NP/NPE to be sold. It is likely NP/NPE is released during the daily use of such items and collected by the urban sewage systems before released into the aquatic environment.

This emissions path is further confirmed in detail by a study of NPE in T-shirts conducted in 2008, which could explain some 18tonnes of NPE losses from textiles into sewage systems in Sweden. NP, the breakdown substance of NPE, then passes waste water treatment plants and is discharged into the aquatic environment (SSNC 2008).

The following table provides a rough estimate of NP emissions per person per year. It shows that between 0.24g and 2.53g per person per year are emitted via urban waste water treatment. This variation by a factor ten could be explained by different treatment levels, consumption habits and lifestyles. These emission figures are re-confirming earlier findings. For example OSPAR (2001) quotes following discharge factors 547mg NP/person/year and 1269mg NPE/person/year found in Sweden and 1500mg NP and NPE/person/year in Norway.

Such emissions levels would mean that between eight and 80million people are sufficient to achieve NP concentrations close to the EQS in Europe's biggest river – the Rhine. Around 50million people live in the Rhine River Basin. This estimate appears to be confirmed by monitoring data from the Rhine at Koblenz (Figure 2).

Table 1: Analysis of reported NP emissions into the aquatic environment

Country / RBD / City	Data source	total kg/year	from UWWTP	No. of plants	Est. population connected	Av. emission g/cap & year
Spain, Internal Basins of Catalonia	nat PRTR for 2008	1,100	1,091	9	3,705,000	0.30
Prat de Llobregat in Barcelona	nat PRTR for 2008	561	561	1	1,093,000	0.51
Stuttgart	nat PRTR for 2007	144	144	1	600,000	0.24
UK, Thames	EU PRTR for 2007	16,400	16,400	22	13,000,000	1.26
London, Crossness STW	EU PRTR for 2007	3,800	3,800	1	1,500,000	2.53
Stockholm	SSNC 2008	850	850	1	850,000	1.00

We conclude that available NP monitoring data shows no reduction of pollution and confirms high concentrations close to the EQS. In some cases concentrations measured at the outlet of UWWTP are above the EQS.

Significant NP emissions into the aquatic environment are documented over the last decade and reported in national registers, predominantly via waste water treatment plants. Emissions can be explained by releases from consumer articles, such as textiles. The average annual emission per person after waste water treatment is between 0.24g and 2.53g in our six cases. This variation could be explained by different treatment levels and lifestyles.

Emission levels are high enough to cause the failing of the EQS, particularly during droughts. It seems largely a matter of when and how far away from discharge points monitoring takes place.

5. Conclusions

A snapshot survey of the WFD implementation in five countries shows that Europe is not on track to eliminate Nonylphenol water pollution. Five of the five member states we investigated are ignoring EU legal requirements with regard to ensuring transparent water management and the phase out NP emissions.

The assessment of the risk of failing to achieve the EQS for NP in all water bodies and to take action to cease all discharges of NP are fundamental legal requirements arising from the WFD. The assessment has either not been carried out or is not transparently documented in all five member states investigated. No measures are presented in the RBMPs on how to achieve a cessation of NP emissions. Member states appear to assume that no action is required if general and unspecific monitoring does not find NP concentrations above the EU quality standard.

This approach is proven flawed by our investigation, because:

- Publicly available water quality and emissions data do not confirm decreasing NP concentrations. Current monitoring of NP concentrations is not targeted at detecting pollution. Concentrations measured are nevertheless close to the EQS. There is a high risk that countries will fail to achieve the EQS in all water bodies by 2015. In order to hide such legal breaches, authorities could be tempted to avoid monitoring pollution hotspots and ensure a dilution factor big enough to stay just below the standard.
- An equally important WFD objective is the phasing out of NP emissions with the aim of achieving close to zero concentrations in Europe's waters. This means that aside from whether quality standards are met or not, further emissions reductions have to be ensured. Considering the well documented and publicly reported high levels of emissions via the urban drainage system, further emission control measures are required to achieve a phase out.

The failure to take action to phase out Nonylphenol seems to be based on a systematic misapplication of the WFD legal requirements. There is strong evidence that the case of NP is symptomatic of a failure to deal with other highly toxic substances. As a consequence, a significant level of pollution with hazardous substances is and will be tolerated until member states or the Commission take action. Considering that new chemical uses are developed every day, often involving hazardous chemicals, the resulting toxic cocktail in our rivers, lakes and seas looks set to remain ineffectively addressed.

The application of the precautionary principle in the EU is being undermined and Europe's role as global governance power and exporter of chemical safety standards is under threat.

6. Recommendations

In order to ensure that the WFD and REACH deliver the phase out of emissions and a substitution of hazardous substances, Greenpeace recommends the following actions.

Member states should urgently tackle priority hazardous substances, namely by:

- Establishing and specifying the objective to phase out emissions of priority hazardous substances in their RBMPs;
- Set up targeted water quality monitoring to detect pollution from priority hazardous substances. This requires for NP the monitoring of effluent quality of Urban Waste Water Treatment Plants and surface water quality in short distance downstream of outlet;
- Establish emissions inventories for NP/NPE and check effectiveness and enforcement of the 2003 marketing and use ban; and
- Adopt measures to phase out all NP emissions within the remaining decade before deadline and report if measures are not feasible at national level for technical reasons, disproportionate cost or legal constraints and thus EU actions would be required.

The Commission has to step up its enforcement activities and implementation of REACH requirements. Namely, it should:

- Recognise that EQS is not the relevant regime for checking compliance with the phase out objective for priority hazardous substances;
- Check compliance of RBMPs with the relevant WFD requirements for transparency, pressures and impacts analysis and the phase out obligations and start infringement procedures immediately in the case of non-compliance; and
- Speed up REACH implementation, including the preparation of an EU restriction for articles containing traces of NPE.

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