



Priority substances: Issues for human health (Source Control & Public Health Impacts)

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The Water Framework Directive

- Many good intentions and an attempt to change thinking to a more holistic approach to controlling water pollution.
- Good ecological and chemical status for surface waters. Good quantitative and chemical status in all groundwaters. No deterioration and restoration of deteriorated waters.
- There are issues for Europe.
 - Small supplies with very limited resources.
 - Historical pollution of groundwater (and ground).
 - The way in which standards are implemented.
 - Implementation of the polluter pays principal.
- The priority substances list is naturally always out of date but there is an unwillingness to properly revise and an unwillingness to rethink policy.
- That isn't helped by short political and financial cycles.
- Does the priority substances list actually divert attention from achieving the long-term goals of the WFD?



How do priority substances reach humans?

- In many cases not through water.
 - Water may be a minor source of exposure for humans.
- Routes of exposure through water
 - Drinking water
 - Bathing – minor
 - Consumption of freshwater (and marine) animals and plants
 - Irrigation?
- Perception plays an important role in the way standards are set for human health.
- Should we be clearly separating ecological health and human health?



Protecting Human Health

- WFD doesn't specifically aim to protect public health, e.g. it doesn't deal with pathogens - very important for human health and are the first objective of drinking water safety.
- Does controlling discharge to water make a significant difference to human exposure? Often not, e.g. hormones and other EDCs that are removed in rivers and in basic drinking water treatment.
- Does that mean we shouldn't bother? Of course not, but discharge standards can be a blunt instrument. For individual substances to achieve efficient protection need to understand the sources, routes and changes in the environment.
- Groundwater is different, early prevention is vital. Once polluted with persistent substances then stays polluted for a long time in most cases.
- Standards that are designed to protect public health often include some "precautionary" values, e.g. pesticides, or an element of precaution that causes confusion. Lack of true transparency.



Issues for Controls

- Protecting aquatic life is more straight forward in terms of standards.
- Diffuse sources remain a significant difficulty for all environmental protection.
- Groundwater is very complex because normally limited treatment and fundamentally needs to start from the premise of prevention - but not always obvious, e.g. fire fighting foams. What happens when a standard is reached or breached?
- Creates considerable difficulties when we don't know how long it will be before inputs cease.
- New contaminants (emerging contaminants) are being found all the time but dealing with everything on a substance by substance basis means we are always chasing our tail. We still aren't very good at spotting and preventing problems before they arise.



Surface water versus groundwater

- Most **discharges** reach surface water. Minimisation of discharges of a wide range of substances beyond the priority substances list is appropriate and necessary.
- Groundwater discharges controlled (to an extent).

This should be happening under the groundwater directive and is vital for the future.
- Some substances are **only** of interest for groundwater, e.g. tri/tetrachloroethene. Contamination should now be entirely historical.
- Problems with contamination in the ground that continues to pollute, e.g. PFOS/PFOA.
- Issues for diffuse pollution.
- Some substances readily removed by surface water treatment, e.g. hormones, but others depending on available treatment.
- There are several good reasons for treatment but mostly these are not specifically for priority substances although the pesticide parameter has resulted in much more widespread introduction of advanced treatment.



Standards

- There are significant differences between standards to protect aquatic life and standards for drinking water. Their purpose is different and so is the way they are implemented, so it shouldn't be a surprise.
- Not all priority substances are included (or will be included) in the drinking water directive which provides the standards for drinking water in the EU.
- The drinking water standards include several “precautionary” standards not necessarily directly based on health protection, e.g pesticides and “carcinogens”.
- Relevant metabolites from pesticides is interesting and very controversial, particularly in relation to priority substances.



Drinking water standards

- Generally measured at the tap as absolute maxima.
- Very high level of compliance in Europe – over 97%.
- Issue over small (private) supplies where resources are very limited.
- The standards are largely based on the second edition of the WHO Guidelines for Drinking Water Quality – we now have the fourth edition and will soon have a first addendum to the fourth edition. The standards need to be brought up to date.
- There are two groups of chemicals – those that are considered to be health related (includes some precautionary values) and those that are not considered to be of health significance but may affect acceptability or reflect operational issues.
- The Directive is under consideration for revision – proposals for standards being discussed. More flexible monitoring arrangements already introduced.



“Drinking Water Health Parameters”

- **Not from source water:**

Treatment – **Acrylamide**, **epichlorohydrin**, trihalomethanes, bromate, nitrite.

Materials – Antimony, benzo(a)pyrene and four PAH, *cadmium*, copper, lead, *nickel*, **vinyl chloride**.

- **Surface water**

Cyanide, nitrate, pesticides, (boron, chromium).

- **Groundwater**

Arsenic, benzene, boron, **chromium**, 1,2-dichloroethane, **fluoride**, *nickel*, nitrate, pesticides, **selenium**.

- **Uncertain**

- Mercury.



Comparative values

Parameter	DWD	EQS	Comment
Benzene	1 µg/l	10 µg/l	Removal
Cadmium	5 µg/l	< 1 µg/µg/l	WHO 3 µg/l
1,2-DCE	3 µg/l	10 µg/l	Removal – WHO 30 µg/l
Lead	10 µg/l	7.2 µg/l	Complex sampling
Mercury	1 µg/l	0.05 µg/l	Removal – WHO
Nickel	20 µg/l	20 µg/l	
PAH (4)	0.1 µg/l	< 0.1 µg/l	From coal tar linings
B(a)P	0.01 µg/l	0.05 µg/l	From coal tar linings
Chloroform	100 µg/l	2.5 µg/l	THMs
Tetra/trichloroethene	10 µg/l	10 µg/l each	



Possible Changes for DW Directive

- Out ?

Benzene, 1,2-DCE, mercury, (cyanide).

- In ?

Uranium, *PFOS/PFOA*, HAAs, chlorite, chlorate, microcystin,



The Polluter pays?

- The WFD emphasises prevention, the principle of prevention of pollution at source and the polluter pays principle was specifically adopted.
- Is this working and do we make it clear to politicians, the public and industry that we all have responsibility for polluting?



Key questions for priority substances policy and human health.

- Does the whole policy need a rethink in terms of the substances concerned and where they can be controlled? Is the priority substances list a distraction and an excuse for not tackling the overall problems?
- Should policy be related to the key sources and where the best point of intervention is for **minimisation**?
- The problem of emerging contaminants is a significant one for human health perception, and possibly human health, but particularly for the health of the aquatic ecosystem. Is this the point where the two objectives align and is it a driver for changing the approach?
- Water resources are under increasing pressure in many places, does this provide another incentive for making policy more holistic and looking at the whole managed water cycle?
- Should we be trying to focus on taking a long-term view of improving wastewater treatment and infrastructure with a view to minimising contamination by many(most) contaminants, including pathogens, in order to protect aquatic life and human health and to improve the prospects for wastewater reuse and resource management?