Chapter 4.8

Microbiology

1. Introduction

There are no standards for microbiology to achieve Good Ecological Status for water bodies. There is therefore no 'gap' in terms of the 'internal' objectives of the WFD that needs to be addressed and costed.

Microbiological objectives are essential for achievement of WFD 'external' objectives for Protected Areas under related Directives – the Bathing Waters and Shellfish Waters Directives. Costs of measures to meet the objectives of the revised Bathing Waters Directive are being developed through a separate partial impact assessment. Costs for shellfish waters will be driven by actions arising from the Agency's recently completed Pollution Reduction Programmes. The pCEA therefore did not identify and cost measures for this pressure.

Similarly, actions taken to achieve microbiology objectives under the related Directives are not likely to contribute greatly to the achievement of GES by reducing other pressures. The inter-relationship between these Directives and the WFD is considered in detail in Chapter 2 on the policy context.

Some measures taken by the agriculture sector to meet WFD objectives may also reduce contamination by microbiology, e.g. by cryptosporidium. These benefits are noted and valued in the Nutrients Chapter. Measures taken to reduce NADWP, such as tackling misconnections, are also likely to reduce microbiological contamination but no research is yet available to assess and quantify the extra benefits from these measures. Finally, measures taken to reduce nutrients discharges by the water industry may also have a positive impact on FIO pressures. No information on the quantum of this effect is available yet.

2. Relevant WFD objectives

- Good Ecological Status is not relevant for microbiology as there is no standard.
- Protected Area Objectives for Bathing Waters and Shellfish Waters are directly relevant to microbiology.
- 'Prevent deterioration of status' may also be relevant within Protected Areas.
- Protected Area Objectives for Drinking Water may also be relevant.

PA objectives distinguish between 'mandatory' standards and 'guideline' standards.

3. Extent of Pressure and Trends

Microbiological contamination causes failure of Bathing Waters and current Shellfish Water standards. Measures to address these failures and to go beyond the requirements of the Directives are being considered. No information is currently available about the extent of failure from microbiology at DWPA standards.

There is also little information on the microbiological suitability of water used for irrigation of ready-to-eat crops such as salads, for which there are potential food safety implications. This water use takes places mainly in the Anglian, Midlands and Southern Environment Agency regions. River flows in these areas can contain high

concentrations of sewage effluent during the summer irrigation season. Stricter upstream discharge standards could generate benefits for this group of farmers.

Blocked sewers may cause higher FIO loadings than Combined Sewer Overflows since blockages are associated with low-flow periods when there is little dilution available in the sewer network and river flows are low, while CSOs occur in periods when high dilution is available. Further investigation of measures to address blocked sewers may be needed. Septic tanks also contribute to pressure from FIOs.

Underlying trends are broadly favourable to a reduction in microbiological pollution of water bodies. The reduction of livestock numbers under CAP (Common Agricultural Policy) reform could reduce microbiological pollution from agriculture, but the extent of this effect is uncertain. A report for Defra considering on FIO pressures is in its final stages.[1] Provisional indications are that FIO losses will be reduced by 26% as a whole, mainly due to the predicted reduction in livestock numbers between 2007 and 2015 from a 2000 baseline. The identification of the gap for FIOs is particularly complex as failures occur at time of heavy rainfall/high flow and therefore it is not certain whether the measures suggested to tackle FIO failures would prevent failure under these conditions. Recent research by ADAS and CREH [17] for failing bathing waters and shellfish waters was inconclusive as to whether the suggested mitigation measures put in place to deal with FIOs are effective in coping with these heavy rainfall/high flow events.

Climate change is likely to exacerbate this pressure as more intense summer storms may increase short–term microbiological pollution from agricultural run-off or discharges from combined sewer overflows.

A significant influence on FIO pressures will be the impact of measures taken to meet WFD objectives for nutrients, particularly in England. These impacts have only been partly quantified or assessed for impact on compliance with relevant microbiological standards. Measures that would be expected to have a positive impact include agricultural measures such as Water Protection Zones and non-agricultural diffuse measures, including attention to ‘misconnections’ or ‘misuse of drainage systems’ and leaking sewers.

4. Apportionment

River Basin Characterisation (Phase 1) did not address microbiology but the Environment Agency (EA) has produced risk assessments and maps for Bathing and Shellfish waters during RBC (Phase 2). The EA has also completed a semi-quantitative assessment of the contribution of various sources. The main contributors to failures of new bathing and existing shellfish water microbiological standards are likely to be the water industry, agriculture and non-agricultural diffuse pollution. The basis is expert opinion backed up by case studies in some locations and agrees well with research for Defra by ADAS using a land run-off model at areas linked to ‘poor’ bathing waters.[2] More information on these issues will be available in the forthcoming consultation documents for the revised Bathing Waters Directive. Currently, a more detailed apportionment is not available.

[1] Chambers et al (2007): in preparation

[2] ADAS, CREH (Centre for Research into, Environment and Health), IGER (Institute of Grassland and Environmental Research), (Jan 2007) , APPLICATION OF THE *FIO-SA* MODEL TO FAILING BATHING WATERS AND SHELLFISH WATERS

5. Measures to meet WFD objectives

Measures to meet rBWD and SWD microbiological standards will include action on a fairly local scale including typically:

- Further treatment at particular sewage discharges (e.g. UV treatment) and reducing the frequency of operation of combined sewer overflows
- Improving the integrity of sewerage networks – leaks, misconnections and abuse of drainage systems.
- Reducing diffuse agricultural pollution through WPZs.

Although these measures overlap with those that are being considered to tackle other pressures, they are unlikely to contribute much to the GES objective when they are specifically aimed at microbiological pollution and are implemented on a small scale. The measures will generally be geographically limited to small catchments impacting on the protected areas. However, broader initiatives to change land management practices, for example under the Catchment Sensitive Farming initiative, are likely to have positive impacts on multiple pressures. General countrywide reductions through potential application of general binding rules would also contribute. Conversely, measures taken to meet GES objectives, notably to reduce N, P and sediment, have the potential to have a major impact on microbiological pollution in protected areas because their geographical coverage is much wider, as noted above.

6. Cost effectiveness of measures

Information on costs was provided by the agriculture group for Water Protection Zones using the ADAS Faecal Indicator Organisms Source Apportionment model. The effectiveness of such measures for achieving compliance with objectives has not been assessed. The most effective measures for agriculture in reducing microbiology pressures are: reduce overall stocking rates; establish constructed wetlands; locate site heaps away from water. In terms of cost effectiveness, the priority measures are: Reduce stocking rates when wet; reduce grazing time; reduce overall stocking rates; batch store slurry.

Further input from the water industry is awaited on the likely benefits in microbiology as a result of rolling out treatment for P at wastewater treatment plants.

Further information on costs will be available on the completion of the Regulatory Impact Assessment for the implementation of rBWD carried out by Cascade Consulting. This work includes an attempt to assess the impact on compliance of percentage reductions in microbiological pollution which will:

a) help to determine the extent of specific BW measures required and,
b) help to determine the impact on BW compliance of measures taken to meet other WFD objectives.

Bathing Water-related measures include UV treatment and reducing the impact of CSOs. However, information is not available on the contribution BW measures might make to meeting other WFD objectives.

7. Measures to reduce uncertainty

Steps have been taken to tightly define implementation scenarios for water against the new microbiological standards. The Cascade Impact Assessment will cost minimum implementation and explore the costs of doing slightly more than the minimum required by the rBWD in terms of Bathing Water quality which will inform decisions on the level of ambition. The main uncertainties probably relate to identification of the sources of microbiological pollution and the effectiveness of

measures. There would be similar uncertainties regarding any measures for shellfish waters. No information is currently available on issues pertaining to DWPAs.

8. Further considerations

For rBWD, Cascade will be generating costs for water industry measures, sewer network integrity, and measures for agriculture sector measures. However, distributional trade-offs on grounds of cost effectiveness are unlikely to be an issue as the most cost effective combination of measures for the different sectors would be broadly proportionate to the apportionment of the pressure across sectors.