

UK Technical Advisory Group on the Water Framework Directive

Guidance on general principles for pressures & impacts analysis (Final)

This Guidance Paper is a working draft defined by the UKTAG. It documents the principles to be adopted by agencies responsible for implementing the Water Framework Directive (WFD) in the UK. This method will evolve as it is tested, with this working draft amended accordingly.

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WFD Requirement:	Article 5; Annex 2 Characterisation: risk & pressures analysis	UKTAG Review:	5 June 2003 Risk Categories (v5) agreed: 25/11/03 Amended (v6): 14/01/04

1. Purpose of this Paper

- 1.1 The paper sets out UKTAG's guidance on the general principles for the first pressures and impacts analyses required by Article 5 of the Directive.

2. The Directive's requirements

- 2.1 As part of a review of the impact of human activity on the status of waters (the pressures and impacts analysis), Article 5 and Annex II of the Water Framework Directive require Member States to:
 - (a) Collect and maintain information on the type and magnitude of the significant pressures to which surface water and groundwater bodies in each River Basin District are liable to be subject; and
 - (b) Carry out an assessment of the risk that these bodies will fail to meet the Directive's environmental objectives.
- 2.2 Member States must complete the first reviews of the impact of human activity by 22nd December 2004, and report the results to the Commission by 22 March 2005. The reviews are therefore urgent priority tasks in the implementation of the Directive.

3. Background to UKTAG Guidance

- 3.1 There are currently substantial differences in the scope, quality and quantity of information available within the different parts of the UK and the Republic of Ireland for use in the pressures and impacts analysis. For example, there are extensive and often quite detailed data on water abstraction pressures in England and Wales whereas in Scotland and Northern Ireland such information is very limited.

- 3.2 The differences in quality of information result in different confidence levels in datasets across the UK. This has an ongoing impact in the confidence in any results from pressures and impacts analyses. One outcomes of this, is that risk of failing good status may be underestimated in some areas and overestimated in others and will need to be standardised as the methods and datasets improved across the UK.
- 3.3 Methods adopted in the pressures and impacts analysis may also differ between different parts of the UK and Ireland, as they will be have been developed in relation to the data that is available locally.
- 3.4 UKTAG has produced a series of guidance documents with the aim of promoting a consistent approach to the pressures and impacts analysis across the UK and Ireland. Therefore:
- (a) Specific guidance papers have been produced for each of the main pressures affecting water bodies in the UK, including point source discharges; diffuse source discharges; abstraction; and engineering works;
 - (b) Where there are substantial differences in the data available and the methods used across the UK, the guidance papers describe a default approach designed to ensure that as many as possible of the greatest risks to the achievement of the Directive's objectives can be identified during this first phase of the river basin planning cycle, even for the most data poor parts of the UK;
 - (c) Where different approaches have been adopted by different countries/agencies, these have also been included; and
 - (d) A level of confidence in the data has also been assigned in light of 3.1 and 3.2 above.

4. Content of this paper

- Overview of approach to impacts and pressures analysis (Section 5.0)
- Approach to categorising risks (Section 6.0)
- Presenting the results of the first and impacts analysis (the risk categories) (Section 7.0)
- Definition of relevant environmental objectives under the Directive (Section 8.0)
- Definition of pressures under the Directive (Section 9.0)
- Definitions of Impacts with respect to Impacts and pressures analysis (Section 10.0)

5. Approach to impacts and pressures analysis: a first overview

5.1 The identification of pressures and the assessment of risks to the achievement of the Directive's objectives resulting from those pressures are on-going tasks within the planning process. Their results will underpin the setting of environmental objectives and the design of the monitoring programmes and the programmes of measures (see Figure 1).

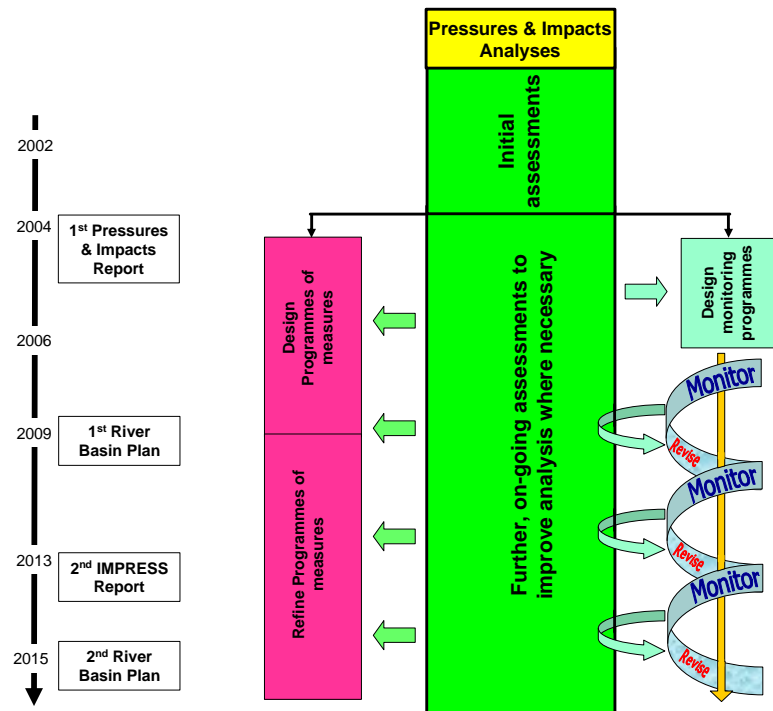


Figure 1: Role of the pressures and impacts analysis in the river basin planning process

5.2 The results of the pressures and impacts analysis must also help **differentiate and prioritise future management actions**. It is important that this agenda for action is clear and that its presentation:

- a) does not mislead by implying, for example, that:
 - The water environment is in a worse condition than the available evidence suggests; or
 - Water bodies not identified as being at significant risk will be ignored completely
- b) clarifies how the results of the pressures and impacts analysis are intended to enable actions to be prioritised and phased according to current understanding of the level of risk to the water environment. For example, the TAG categories are intended to differentiate between those water bodies which are most likely to need action to address significant risks to the achievement of the Directive’s objectives in the first planning cycle from those for which there may be a longer-term need for data collection and assessment.

5.3 After 2004, further more detailed analyses will be targeted at reducing the areas of greatest uncertainty in these initial judgements, and at providing the information with which to design effective programmes of measures. The further analyses are likely to require improved assessment methods and/or better data on pressures, water body characteristics or impacts. Another of the functions of the first analyses will be to help identify these requirements.

6. Aim for first pressures and impacts analysis in 2003/2004

6.1 In undertaking the first pressures and impacts analyses, TAG’s aims are to enable the identification by its member agencies of:

- (a) The most significant risks to the achievement the Directive’s environmental objectives based on existing information; and
- (b) The information and methods necessary to improve the scope and quality of the analyses during the next phase of the river basin planning cycle.

6.2 The categorisation of bodies at risk makes clear that the pressures and impacts analysis is intended to identify significant risks. Describing a water body as not being at significant risk does not mean that there is no risk at all.

(Note: In undertaking this approach, it is recognised conceivably, no or very few water bodies could be said to be at no risk of failing to achieve good status in 2015. All could therefore be identified as being at risk of failing the Directive’s objectives. However, **without some form of risk-based prioritisation**, the task of river basin management would become unmanageable.)

6.3 It was recognised that **water bodies subject to pressures that are already controlled in such a way that good status is met** should not be identified as being at risk.

For example, water bodies may be subject to potentially significant discharges from single or multiple sources. These discharges may already be satisfactorily controlled, such that they are not causing impacts that would prevent the achievement of good status. In such cases, the bodies should not be identified as being at risk of failing good status because of the discharges. However, strategies to ensure the achievement of the Directive’s objective of preventing deterioration in status will be necessary. Such strategies are likely to involve consent compliance monitoring, consent reviews and relevant investment needed to maintain the controls.

7. Presenting the results of the first pressures and impacts analysis

7.1 The results of the pressures and impacts analysis will be reported using the following categories and sub-categories:

WFD Category	UKTAG Reporting Category	Examples	Actions
1. Water bodies at risk of failing to achieve an environmental objective	(1.a) Water bodies at significant risk	<p><u>Impact data (if available):</u> Indicates, with suitable confidence, a class worse than good or a class fluctuating between good and moderate</p> <p><u>Pressure analysis:</u> Magnitude of pressure clearly much greater than a relevant risk threshold or the confidence that the risk threshold has been exceeded is otherwise adequate (e.g. information on the magnitude of the pressure is known to be reliable).</p>	<p>Identifies water bodies for which consideration of appropriate measures can start as soon as practical:</p> <ul style="list-style-type: none"> • Identification of measures; • Decision on whether alternative objectives are warranted (e.g. HMWB designation); • Implementation of appropriate measures; • Operational monitoring – e.g. to assess the effectiveness of the measures

WFD Category	UKTAG Reporting Category	Examples	Actions
	(1.b) Water bodies probably at significant risk but for which further information will be needed to make sure this view is correct	<p><u>Impact data (if available):</u> Impact data, although not providing sufficient confidence on its own of a significant risk of failure to achieve good status, appears in conjunction with information on pressures to indicate a significant risk probably exists.</p> <p><u>Pressure analysis:</u> The estimated magnitude of pressure and its predicted impact is at or above the relevant risk threshold but the confidence in the information on the pressure is not considered sufficiently reliable to be sure that the threshold has been exceeded</p>	Focus for more detailed risk assessments (including, where necessary, further characterisation) aimed at determining whether or not the water bodies in this category are at significant risk in time for the publication of the interim overview of significant water management issues in 2007.

WFD Category	UKTAG Reporting Category	Examples	Actions
2. Water bodies not at risk of failing to achieve an environmental objective	(2.a & 2.b) Water bodies not at significant risk on the basis of available information	<p><u>Pressure and impact analysis:</u> Water bodies not considered on the basis of available information to be subject to pressures or predicted impacts greater than a risk threshold and for which there are no measured impacts (if impact data is available) showing that the status is worse than good. The balance of probability is that these water bodies are not at significant risk of failing to achieve the Directive's objectives;</p>	<p><u>(2.a) Water bodies for which confidence in the available information being comprehensive and reliable is low</u></p> <p>Work on these water bodies will be focused on appropriately improving the quality of information on pressures and their likely environmental effects in time for the second pressures and impacts analysis due to be completed in 2013.</p> <p>In the meantime, water bodies in this (and any other) risk category will be moved to one of the other categories if relevant information on pressures and impacts comes to light indicating that assignment to a different risk category is appropriate (e.g. improved information on pressures obtained through the operation of regulatory regimes; surveillance or equivalent monitoring; etc).</p> <p><u>(2.b) Water bodies for which confidence in the available information being comprehensive and reliable is high</u></p> <p>Review for the next pressures and impacts analysis report in 2013 to identify any significant changes in the situation</p>

7.2 A breakdown according to the main pressures will also be provided, including point source discharges, diffuse source discharges, abstractions, impounding works and alterations to the morphology of surface waters.

8. Relevant environmental objectives under the Directive

8.1 The pressures and impacts analysis will provide an assessment of the risk of failing the following environmental objectives, based on existing information:

Environmental Objectives	
For surface waters	<p>(a) Protecting, enhancing and restoring <u>all non-artificial surface water bodies</u> with the aim of achieving good ecological status and good surface water chemical status by 22nd December 2015.</p> <p>(b) Protecting and enhancing <u>all artificial surface water bodies</u> with the aim of achieving good ecological potential and good surface water chemical status by 22nd December 2015. (refer 8.2 below for issues in relation to potentially heavily modified water-bodies)</p> <p>(c) Preventing deterioration of <u>all surface water bodies</u> from one status class to another</p> <p>(d) Achieving compliance with any water-related standards and objectives for Protected Areas by 22nd December 2015, unless another deadline is specified in the Community legislation establishing the Protected Area.</p>
For groundwater	<p>(e) Protecting, enhancing and restoring <u>all bodies of groundwater</u> with the aim of achieving good groundwater status by 22nd December 2015 (i.e. a body that may already be at poor status or which may deteriorate to poor status before 2015 if appropriate measures are not taken should be identified as being at risk).</p> <p>(f) Preventing deterioration in status of <u>all bodies of groundwater</u></p> <p>(g) Reversing any significant and sustained upward trend in the concentration of any pollutant in order to progressively reduce pollution of groundwater (i.e. any body in which a significant and sustained upward trend may be present should be identified as being at risk)</p> <p>(h) Achieving compliance with any water-related standards and objectives for <u>Protected Areas</u> by 22nd December 2015, unless another deadline is specified in the Community legislation establishing the Protected Area.</p>

8.2 Special case for certain potentially heavily modified water bodies:

- (a) Among other things, all surface water bodies will be subject to an assessment of the risk that they will fail to achieve good ecological status because of alterations to their morphology. In some cases, where a risk is identified, it may be appropriate to designate the water bodies as heavily modified, as permitted by paragraph 3 of Article 4 of the Directive. Where it is intended to proceed with such a designation, an assessment of the risk of the water body failing to achieve good ecological potential, the objective for heavily modified water bodies, will also be required.
- (b) There are serious practical difficulties in completing this second risk assessment for all potentially heavily modified water bodies within the time period of the first pressures and impacts analysis. These difficulties have been recognised across Europe. The Common Implementation Strategy's IMPRESS and HMWB guidance documents recommend that

the deadline for assessing risks of failure to achieve good ecological potential may be extended beyond 2004.

- (c) For the purposes of the first pressures and impacts analysis, assessments will, where possible, be made of the risks of failing good ecological potential for all potentially heavily modified water bodies that have been changed from one surface water body category to another (e.g. a river impounded to form a lake). This is important because the same pressure may present very different levels of risk depending on the category of surface water against which its potential impacts are assessed (e.g. the original river water body or the current lake water body).

9. Pressures

- 9.1 For the purposes of the pressures and impacts analysis, pressures are defined as the proximate cause of any human-induced alterations to:

Pressures	
For surface waters	a) The <u>hydromorphological or physico-chemical</u> conditions needed to support the biological quality elements, achieve any relevant environmental quality standards or achieve the objectives for Protected Areas (e.g. abstractions; impounding works; diffuse source discharges; point source discharges); or b) The <u>biological quality elements</u> (e.g. fishing; vegetation clearance).
For groundwater:	c) The <u>concentrations of pollutants</u> in groundwater (e.g. point and <u>diffuse discharges</u>); or d) <u>The level of groundwater</u> (e.g. abstractions; artificial recharge; land sealing)

- 9.2 A **significant pressure** is a pressure that on **its own or in combination with other pressures and in the absence of suitable measures, including any existing controls**, is liable to cause a failure to achieve one or more of the environmental objectives specified in paragraph 1 of Article 4 of the Directive. The lead authorities in each part of the UK will establish registers of significant pressures.

Note: These registers of significant pressures will not be finalised by the end of 2004, and the identification of significant pressures will continue in the next phase of the river basin planning process. For 2004 the focus will be on aiming to identify the most significant pressures.

10. Impacts

- 10.1 Impacts are adverse effects of pressures on characteristics of the water environment that may be important to the achievement of one or more of the Directive’s environmental objectives. The pressures and impacts analysis will assess impacts using where available:
 - (a) Direct measurements of impacts from existing environmental monitoring (e.g. water quality monitoring data); and
 - (b) Predictions of impacts based on an assessment of the likely effects of identified pressures.

- 10.2 A measured or predicted impact will be regarded as significant if it is likely to compromise the achievement of one or more of the Directive's objectives. If this is the case, the affected water body, or bodies, will be identified as being at risk. Significance criteria are included in the specific guidance papers for the main pressures on surface water bodies and groundwater bodies (see also paragraph 13.5 below).
- 10.3 For surface waters, the immediate impacts of a pressure may be on those (i) general physico-chemical conditions (e.g. pH, nutrient levels, oxygen balance, etc) or (ii) hydromorphological conditions that are important for the biological quality elements. These immediate impacts will be regarded as significant in terms of risk to the achievement of good status if considered likely to result in one or more of the biological quality elements failing to meet the conditions specified in Section 1.1 of Annex V of the Directive. Such assessments will be based on current knowledge supplemented, where available, by biological monitoring data.
- 10.4 The principal source of measured impacts on surface waters is the monitoring data used in the existing national classification schemes used by the different parts of the UK and Ireland. Until the new classification schemes required by the Directive have been developed, the results of these existing schemes will be used appropriately and where possible to help judge whether water bodies are at risk.
- 10.5 Pressures will not necessarily act independently. For example, point and diffuse sources discharges of nutrients will have a combined affect. The impact of discharges of metals may depend on the acidity of the surface water, and acidity may be affected by, among other things, the extent of coniferous plantations within the catchment. Even though no one pressure may be of sufficient magnitude to result in failure to achieve good status, their cumulative effects could create a substantial risk. Knowledge permitting, such combination affects will be considered when predicting impacts from identified pressures.
- 10.6 A water body subject to a significant pressure (see paragraph 9.2) will not be identified as being at risk if that pressure is subject to an existing regulatory control such that its environmental impacts are considered unlikely to compromise the achievement of the Directive's objectives.
- 10.7 The default deadline for achieving good status for surface water bodies and groundwater bodies is 2015. Consequently, in assessing risks to the achievement of good status for bodies currently worse than good status, the pressures and impacts analyses has to aim to identify potential reductions in pressures and their associated impacts that may occur before 2015, other than those that may result from the implementation of the programmes of measures (i.e. impacts that will not need to be addressed by the programme of measures).

Relevant types of information uses in assessments of pressures and impacts change include:

- (a) Data indicating a long-term downward trend in: (i) the scale of the impact of the pressure on the water body (e.g. a downward trend in the concentration of a pollutant); (ii) the activity responsible for a pressure; or (iii) the pressure itself;

- (b) Measures which will be undertaken directly by a public body, under contract to a public body, or in fulfilment of a condition imposed by a public body, and which have a confirmed implementation timetable considered likely to deliver the necessary improvements in status.

Similarly, assessments of the risk of failing to prevent deterioration in status will be based on:

- (c) Data indicating a long-term upward trend in: (i) the scale of the impact of the pressure on the water body (e.g. an upward trend in the concentration of a pollutant); (ii) the activity responsible for a pressure; or (iii) the pressure itself;
- (d) Known planned increases in a pressure which may require the application of suitable measures that to ensure deterioration in status is prevented.

10.9 It may not be possible to relate identified changes in pressures to specific water bodies. For example, water demand forecasting may identify the need for an increase in abstraction but it may not be possible to identify which water bodies would be used to meet this demand. In such cases, the potential change in pressure will be noted in general terms in the pressures and impacts analysis for the River Basin District.

11. Information about pressures - Activities

11.1 To aid economic analysis, the information collected about a pressure should identify the human activity, or activities, with which it is associated. In the case of some pressures, the activity may have ceased (e.g. mining in the context of discharges from an abandoned mine workings, discharges from contaminated land). This will be noted in the description of the pressure.

11.2 For consistent recording of activities, a Standard Industry Code (SIC), if one exists, should be included in the description of the pressure as follows:

- (a) For the purposes of the first pressures and impacts analysis, pressures should, at a minimum, be related to one of the activities in the highest level of the SIC classification system.
- (b) Where information is readily available, the more detailed SIC activity code level should be used.
- (c) Where a pressure is caused by more than one activity, each relevant SIC code should be identified
- (d) Where an activity associated with a pressure is not covered by any SIC code, a new common description should be identified to describe the human and economic components of the activity.

Note: Common SIC codes have been listed in TAG guidance: *TAG 2003 WP 7a (02) SIC codes for describing activities (v1) 15-08-03*.

11.3 Where relevant and possible given the existing information and the timescale for completing the analysis, pressures should also be characterised in terms of (a) their source (e.g. application of nitrogen as fertiliser within a catchment); and (b) the pressure experienced by the body of water (e.g. a diffuse discharge of a particular quantity of nitrates).

12. Water Body delineation

12.1 The purpose of identifying water bodies is to provide for a description of the status of the water environment. Information on status will not become fully available until after the start of the monitoring programmes at the end of 2006. Consequently, the water bodies identified for the first pressures and impacts analysis will principally be used to distinguish parts of the water environment considered to be at risk of failing to meet the Directive's objectives from parts that are not considered to be at risk. This delineation of water bodies will be refined where necessary after 2004 and again once information from the monitoring programmes becomes available.

12.2 Ideally, the initial delineation of water bodies would start with a map of known or predicted significant impacts from all pressures. The best fit water bodies would then be identified to provide for an appropriate description of differences in risk, or estimated status.

However, the water bodies defined for the first pressures and impacts analysis will be delineated before the work to identify potentially significant impacts has been completed. Lakes and transitional waters will normally be considered as single water bodies, and will only be sub-divided into more than one water body where information is already available to indicate clear differences in the natural characteristics of, or human impacts on, different parts of these waters. The initial water bodies used for rivers and coasts will either represent the full extent of each contiguous stretch or area of one type or be based initially on stretches or areas derived from those currently used to map the quality of these waters in existing national classification schemes.

12.3 The pressures and impact assessment will consider the inter-relationship between water bodies, and how pressure applied to one water body may be transferred to other water bodies. For example, discharges to a body of groundwater or a body of surface water may affect several connected water bodies).

13. Components of a pressures and impacts analysis

13.1 Where monitoring data on impacts is available, these will be used to inform the pressures and impacts analyses. However, the impacts of a number of pressures relevant to the analyses have not been routinely monitored across the UK. Consequently, in many cases the first analyses will be based largely on predicted impacts from actual or estimated information on pressures.

13.2 The basic components involved in predicting if a significant impact, and hence a risk of failing to achieve one or more of the Directive's objectives, is likely are illustrated in Figure 2 below. A simple description should be produced explaining how these components have been considered within the methods used in the analyses. This is important to make clear how judgements about risks to the Directive's objectives have been reached, and what assumptions have been made.

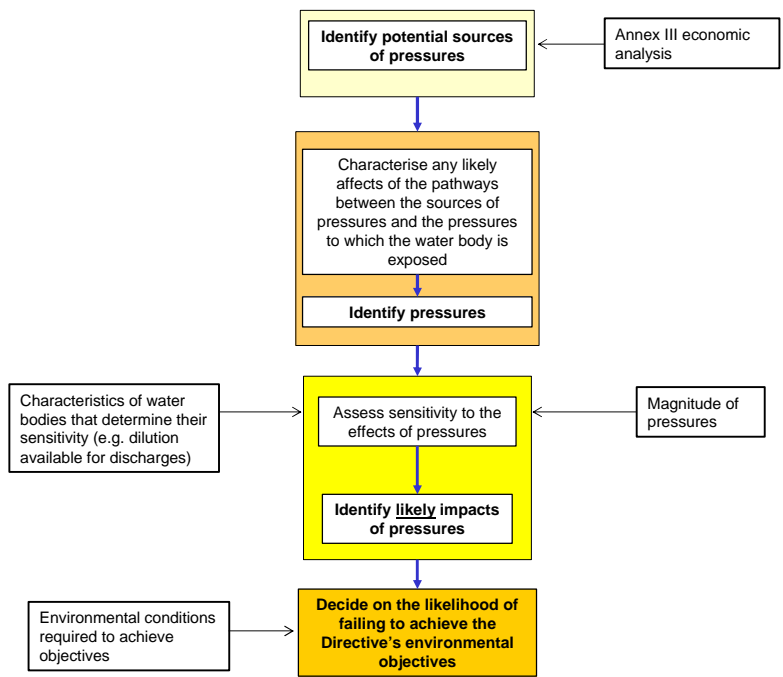


Figure 2: Generalised components of a risk assessment based on predicting impacts. Note the pathway between some sources of pressure and the pressure experienced by the water body may have no or negligible affect (e.g. abstractions from a water body)

13.3 The first analyses will attempt to make use of existing data and information on both pressures and impacts in the most appropriate way to support a screening level assessment (see Figure 3). In doing so, the analyses will among other things aim to draw on, and summarise, any more detailed level analyses that have already been undertaken for specific water bodies or groups of water bodies.

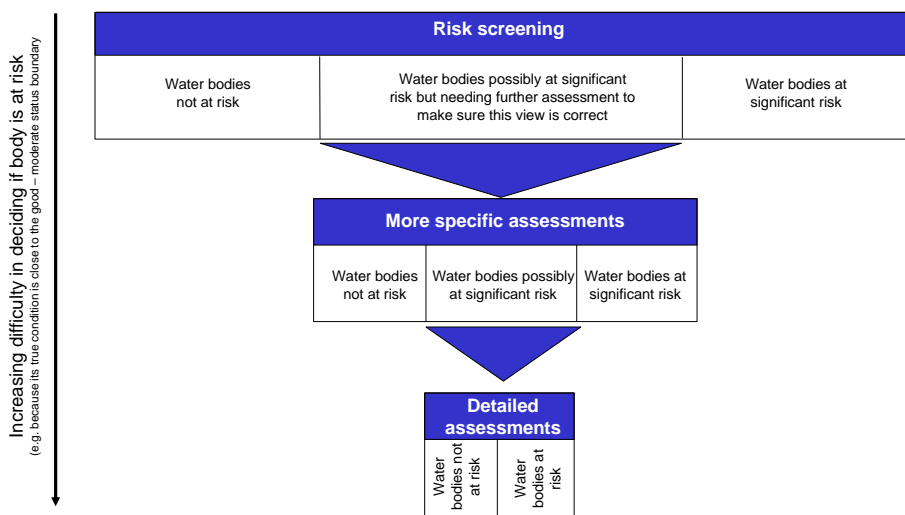


Figure 3: For the most part, the first pressures and impacts analysis will be a screening level assessment. This will help target on-going assessment work.

- 13.4 Suitable data for the analyses may be available at a national or local level. Expert and local knowledge can provide a valuable source of information on which risk assessments may be based, and will be sought where considered feasible within the limited time period for completing the first analyses. Local expert information, where used, will be taken into account within a documented criteria-based assessment framework designed to reduce bias and inconsistency, and ensure that the basis for the judgements is clear.
- 13.5 Judgements about whether a water body is at risk of failing to achieve one or more of the Directive's objectives will be based on:
- (a) Comparison of the estimated level of impact with a threshold representing the level of impact considered likely to compromise an objective; and
 - (b) An estimate of the level of confidence in the estimated impact
- 13.6 The thresholds chosen to represent the level of impact from a pressure considered likely to compromise one or more of the Directive's objectives will be relevant to the nature of the information and methods available to undertake the analyses for particular water bodies. Thresholds will be derived for use with (a) existing monitoring data on impacts; and (b) estimates of pressures and impacts. Where similar data and methods are available for the analyses across the UK, the relevant TAG guidance sets out common thresholds. Where different methods or different data are available, the guidance provides default thresholds, designed to ensure the most significant risks can be identified consistently across the UK.
- 13.7 The impact of a pressure will depend on the sensitivity of the water bodies subject to that pressure. For example, everything else being equal, a small river will have less dilution capacity than a big river, and would be likely to experience a bigger impact from the same size discharge than the big river. Where differences in sensitivity are known and identifiable with the information available, they will be taken into account (e.g. by setting appropriate thresholds for waters with different sensitivities) when predicting likely impacts from identified pressures.
- 13.8 The rationale for choice of threshold type and value will be made clear. Where (a) the thresholds prove ineffective at distinguishing waters known to be at risk of failing to achieve the Directive's objectives from those that are not or (b) the data and methods required to assess risks against the thresholds cannot be obtained and applied in the time available, the thresholds may be revised by TAG.
- 13.9 The use of matrices is recommended to facilitate the assessment of whether a water body is at risk of failing to meet an objective. Matrices allow information on the pressure, water body sensitivity and impacts to be combined in coming to an overall judgement. In the example given below, the risk threshold is defined as combinations of two qualitative scales representing pressure and sensitivity.

		Sensitivity of Water Body to Pressure		
Magnitude of Pressure		High (H)	Moderate (M)	Low (L)
High (H)		HH (At Risk)	HM (At Risk)	LH (At Risk)
Moderate (M)		MH (At Risk)	MM (At Risk)	ML (Not at Risk)
Low (L)		LH (At Risk)	LM (Not at Risk)	LL (Not at Risk)

Note: Shaded area denotes water body at risk of failing to achieve an objective

- 13.10 The first step in a screening analysis is to screen out: (a) pressures that are not significant; and (b) water bodies that are clearly at risk or clearly not at risk of failing to achieve their objectives (see Figure 4). The screening process should start by excluding from further consideration those pressures to which the water body, or group of bodies, are unlikely to be subject. Where pressures are present, generic-screening criteria can be identified and used to screen out pressures of magnitudes expected to have obviously significant or obviously insignificant effects on groups of water bodies with particular characteristics.
- 13.11 The appropriate values for the screening criteria will depend on the characteristics and hence sensitivity of the water bodies to the pressures. In applying screening criteria, account will be taken of all sources of the pressure, and the potential risks from combinations of different pressures.

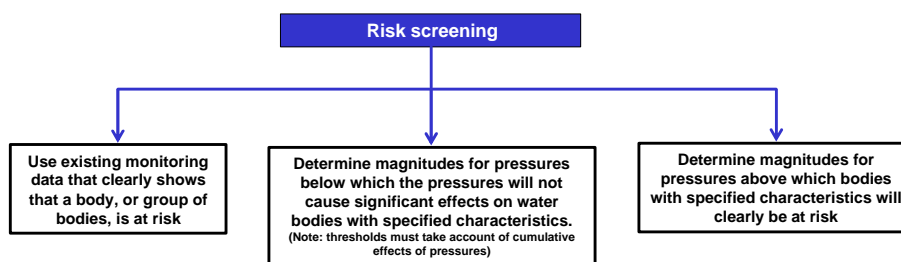


Figure 4: The use of simple screening rules. Screening rules can help ensure that the effort involved in the pressures and impacts analyses is proportional to the difficulty in judging the risk to the achievement of the objectives.

14. Uncertainties in the pressures and impacts analysis

- 14.1 An assessment of risk requires a weighing up of the balance of evidence to reach a judgement about what may happen. Each bit of evidence used in the assessment will have some uncertainty attached to it. The uncertainties in the first pressures and impacts analysis are likely to be much greater than in future analyses because:
- (a) The environmental conditions required to meet most of the Directive’s objectives will not have been determined by the deadline for completing the first pressures and impacts analyses. For example, the values for the boundaries between the ecological status classes for surface waters are not expected to be finally determined until after the end of the intercalibration exercise and the start of the monitoring programmes in 2006. The environmental quality standards for the priority substances, which form part of the definition of good surface water chemical status, will not be finalised until the agreement of Article 16 daughter directives. Elements of the groundwater objectives also await clarification in the Article 17 daughter directive.

- (b) The confidence in the estimated environmental effects of different pressure types will also be very variable, depending to a great extent on the availability and quality of information and assessment expertise. Many of the pressures and impacts relevant under the Water Framework Directive have not previously been routinely analysed across the UK.

14.2 The consequence of these uncertainties is that judgements on which bodies are at risk, and which are not, are likely to contain more errors in the first pressures and impacts analyses than will be the case in subsequent planning cycles. It is be important to be aware of the sources of uncertainty in the analyses so that monitoring programmes can be designed and targeted to provide the information needed to improve the confidence in the assessments (see Figure 5).



Figure 5: Changing levels of uncertainty over which surface water bodies are likely to fail to achieve good status

14.3 For the purposes of the first pressures and impacts analyses, the level of confidence in the information and judgements used in assessing the risk of failing to achieve an objective will be assessed using a simple three-level categorisation of **high**, **medium** or **low** confidence (see Annex 1). The sources of uncertainty will also be documented so that areas requiring improved information or methods can be identified.

Annex 1**Outline framework for considering uncertainty in first pressures and impacts analysis**

Confidence scale for the first pressures and impacts analyses	Assessment of confidence		
	High (Minimum of all three categories in bold for high confidence)	Moderate (Combination of high and low score of factors listed in adjacent columns)	Low (Maximum of only one of category in bold for low confidence)
Quality of data	Good data on which to assess likelihood and magnitude of pressure and/or impact		Limited or no data on which to assess likelihood and magnitude of pressure and/or impact
Threshold value	Indicator >> or << than threshold between at risk and low risk		Indicator approx. = threshold between at risk and low risk
Exposure pathway	Pathway leading from activity to pressure and impact well characterised		Pathway leading from activity to pressure and impact not well characterised
Indicator/measure of pressure or impact	Direct measure of impact or pressure Based on measures of pressures		Proxy measure of impact or pressure Based on measures of pressure sources
Pressure type	Single source pressure		Multiple source pressures
Assessment method	Peer reviewed or accepted, regulatory assessment, numerical model		Expert judgement. Simple mathematical model.
	Statistical methods, measures of uncertainty		Mean values, no measures of uncertainty
	Monte Carlo ('stochastic') based methods.		Mean values only
	Direct methods		Use of analogous systems

Key:

Text in bold denotes categories essential for deciding if confidence is high or low

Annex II

Technical background to risk assessment

The identification of water bodies at risk of failing to achieve the Directive's objectives requires either a qualitative or quantitative description of the nature of the risk. This description can include a wide variety of components including information or judgements on:

- The activities or drivers giving rise to the pressures,
- The nature of the pressure (including whether it is a point or diffuse pressure, episodic or continuous, etc),
- A description of the pathway leading from the source of the pressure to a water body being exposed to the pressure,
- The probability and magnitude of the pressure to which the water body is exposed
- The susceptibility or sensitivity of the water body to the pressure to which it is exposed
- The probability and magnitude of the impacts of the pressure on the water body.

Uncertainty is a characteristic of all data and methods of assessment. Uncertainty arises from:

- Natural variability in the environment,
- A lack of knowledge of complex environmental systems and pathways,
- Limitations with data (sampling design, bias, errors, small sample sizes)

Risk assessment aims to explicitly acknowledge uncertainty. It aims to manage uncertainty by using information on pressures and impacts in combination to come to an overall judgement as to the level of risk. The basic premise being that, where there is evidence of a significant pressure, and a significant impact, and where we know that there is a strong or direct pathway from the source of the pressure leading to water body exposure, and that the water body has characteristics that make it susceptible to this pressure, then we can have greater confidence that it is at risk from this pressure than where one or more of these elements is absent.

The assessment aims to be precautionary. By precautionary, there needs to be high confidence that water bodies classified as not at risk will meet their relevant status classification and objectives.

This does not mean that such water bodies are not exposed to some degree of pressure, or that their risk is zero. Water bodies are exposed to many pressures. Of these, many are already controlled and managed, to achieve an acceptable or tolerable level of risk to water body good status.

Worst case assumptions can be justified as precautionary. However, risk assessments that include a number of (or based only on) worst-case assumptions can be overly unrealistically conservative. The aim should be an unbiased estimate of the risk. Worst cases assumptions should generally be avoided, and be identified and justified when used.

The risk of a water body failing to achieve its objectives will be a function of:

- The magnitude and probability of the pressure;
- The probability and magnitude of the water bodies' exposure to the pressure;
- The sensitivity of the water body and biological quality elements to the exposure.

Knowledge of the sensitivity of the water body and elements to the pressure allows an assessment of potential impact, in the absence of collaborative data. Where impact data are available, this will naturally include the effect of sensitivity.