The Progression towards Ecological Quality Standards

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1. Introduction: Purpose, Terminology and Scope

Despite the dramatic growth of 'environmental law' over recent years, the coherence of the subject remains open to debate. Laws relating to pollution control, biodiversity protection and regulation of land use adopt sharply contrasting approaches towards markedly different concerns which often seem to have little, if anything, in common. Repeated initiatives directed towards the 'integration' of the different parts of the subject presuppose, rather than articulate, the common elements of the distinct areas of concern. The fundamental questions of what 'the environment' encompasses and what legal approaches are needed to 'protect' or 'enhance' it, and why, are as open to debate as ever they were.

The challenge of a unified theory of environmental ontology must wait for another day and another author, but the scope for greater integration of legal methodology is a more accessible field of investigation. The purpose of this article was to explore the scope for a better-coordinated approach across two different branches of environmental law. More specifically, the aim is to examine the extent to which regulatory approaches to the protection of the environmental media of water, air and land can be more closely paralleled in regulation applicable to the living things dependent upon those media. In essence, the issue to be addressed is the extent to which it is feasible for biodiversity law to parallel regulatory strategies that have been adopted in relation to pollution control?

For the purposes of this discussion, a rather stipulative approach to terminology is needed to draw out a contrast between the inanimate and animate components of our surroundings. Hence, 'the environment' is used hereafter in a narrow sense, encompassing only issues relating to the media of air, water and land.[1] 'Environmental quality law', therefore, is normally concerned with the contamination or pollution[2] of these physical media by substances that are present through human

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[1] Similarly, see section 1(2) Environmental Protection Act 1990.

[2] For a discussion of the contrasting meanings of 'contamination' and 'pollution', see W. Howarth and D. McGillivray, *Water Pollution and Water Quality Law* (2001) section 1.3.

intervention and perceived to be capable of being harmful. By contrast, the living components of the ambience, their interrelationships and relationships with the environmental media can be seen as parts of a global ecosystem, or biosphere, and the law relating to this is characterised as 'ecological law'. Certainly, 'environmental' and 'ecological' are commonly used in other senses in different contexts, and quite often without their precise sense being made clear, but, for the following discussion, an explicit discrimination is needed between laws relating to living things and those that relate to the inanimate physical media that support them. The critical question of how human beings feature within ecosystems must necessarily be broached, but this issue is reserved for later discussion.[3]

This separation between environmental and ecological law is needed, not least, to emphasise contrasts between the different ways in which the two branches of the law have developed historically and to chart their respective states of progress. If anything, environmental and ecological laws are measured by their consequences in halting harms and securing perceived 'improvements'. The firm view taken here is that restricting human activities for environmental or ecological reasons is not an end in itself, but a means of achieving such improvements. However, the approach of using the law purposively, to achieve defined objectives, rather than simply as a means of prohibiting miscellaneous instances of undesired conduct, has progressed much further in environmental quality law than in ecological law. Despite the retarded progress in formulating explicit objectives for ecological law, a consequentialist approach is gaining momentum through the more explicit status that has been given to ecological objectives in recent European Community legislation. Whilst this progress is generally to be welcomed, some reservations need to be offered about the approach that has been taken to formulating 'ecological quality standards' and the basis for ecological valuation that seems to underlie initial initiatives in this respect.

Some explicit boundaries to the discussion are needed from the outset. Alongside the fermentation processes of politics, economics and a range of social concerns, environmental and ecological policies have to be recognised as culturally and geographically determined. Different nations, quite rightly, adopt different priorities, and any attempt to detach these priorities from their context will inevitably be misleading. For this reason, it has to be stressed that the context of the present work is the regulation of the environment and ecosystems of the UK placed, as it is, within a body legislation adopted at European Community level and influenced by a range of wider regional and international commitments. The point to be emphasised is that the UK, and particularly England and Wales, is amongst the most heavily industrialised and extensively developed countries in the world. For that reason, literature detailing legal approaches to conservation and management of supposed 'wilderness' areas, apparently untouched by human impacts, has limited relevance. The geographical context excludes wildernesses of a kind that are found in other countries, and the historical impacts that have shaped the national terrain, its environmental media and biodiversity need to be appropriately accommodated and valued in a contextually specific approach to ecological legislation.

[3] See Section 5.3 below ('*Human Beings and Ecosystems*') on the role of humans in ecosystems.

A second qualification is that the discussion focuses primarily upon developments in the regulation of the aquatic environment. Legislation concerning water quality has, historically, been amongst the most precocious and progressive in both national and European Community law.[4] In relation to ecological quality, it is evident that the most significant and momentous developments are taking place in relation to aquatic species and ecosystems. This is not to suggest any particular priority over other environmental media, but merely that impacts on water and its living constituents are being seen as more immediately accessible to regulation than other sectors. The principles that are emerging to address the aquatic environment may eventually be reapplied to other sectors of the environmental media and to non-aquatic biodiversity, but water is being used as a testing ground.

Inevitably, therefore, a primary focus of the article is upon the ecological elements of the European Community Water Framework Directive,[5] viewed from a national context. First, the Directive needs to be seen as providing the foremost example of the application of ecological quality standards in Community Law and contrasting markedly with the use of obscure or generalised ecological standards in previous legislation. Second, the Directive needs to be seen as being founded upon a particular conception of ecological goals based, broadly, on the idea of 'naturalness'. The concluding parts of the article offer some reservations as to whether this approach is appropriate in the UK context.

2. The Progression from Prohibitions to Standards

The starting point for the discussion is the progression from a reactive approach to perceived environmental quality problems to a purposive approach directed towards securing defined objectives. The traditional, human-centred, conception is that the surroundings that humans inhabit are for human benefit and must be regulated accordingly.[6] Hence, the history of environmental quality law is a sequence of responses to progressively identified adversities needing a legal response. Broadly, these have been the need to prevent transmission of disease (through public or environmental health legislation); to prevent human beings being poisoned by water, air or land (through pollution-control restrictions); the need to preserve public amenity in land use (through planning law); and to meet aesthetic and cultural requirements for both the built and the natural environment (through protection of buildings and landscapes).[7] From a human perspective, the evolution of environmental

[4] See D. Freestone, 'European Community Environmental Policy and Law' in R. Churchill, L. Warren and J. Gibson (eds), *Law, Policy and the Environment* (1991) at 143 (quoting S.P. Johnson and G. Corcelle, *The Environmental Policy of the European Communities* (1989) at 25) and G. McLeod, 'Approaches to Setting of Priorities and Policies Amongst Water Quality Protection and Enhancement Alternatives: the European Community' in P. Thomas (ed.), *Water Pollution: Law and Liability* (1993) at 8.

[5] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. For initial national transposition, see Water Environment (Water Framework Directive) (England and Wales) Regulations 2003, SI 2003 No. 3242.

[6] For an interesting recent discussion of the traditional instrumental focus of thinking about the environment and its philosophical roots, see S. Coyle and K. Morrow, *The Philosophical Foundations of Environmental Law: Property, Right and Nature* (2004).

[7] See D. Hughes et al, *Environmental Law* (4th edn, 2002) Chapter 1 and S. Bell and D. McGillivray, *Environmental Law* (6th edn, 2005) Chapter 2, for introductions to the historical development of environmental law in the UK, and see A. Markham, *A Brief History of Pollution* (1994) for a historical discussion of the problems being confronted.

quality lawmaking represents an evolving hierarchy of priorities that have been addressed by legislation enacted in a broadly corresponding chronological order. The key points to be appreciated about this hierarchy are its reactivity and negativity. The awareness that some state of affairs can be characterised as 'an environmental quality problem', and the generation of sufficient consensus that it is cost beneficial to address it through legislation, is followed by legal mechanisms to prohibit or regulate the activity, usually by qualified prohibitions of various kinds.[8] Until fairly recently at least, the focus has been upon what things laws can be used to prevent, rather that what positive environmental goals laws can facilitate. Legislatures and environmental activists seem to have had firm convictions about what activities needed to be banned, but have tended to reflect less fully upon what state of the environment should count as 'satisfactory' or 'acceptable', nor how that state might be realised by legal means.[9]

The major turning point in environmental quality law was the recognition that it could be redirected towards the realisation of positively stated environmental quality objectives specified through precisely formulated environmental quality standards.[10] Despite long-standing national opposition,[11] the key initiatives in this respect have come from the European Community environmental legislative programme. Illustrations are numerous of fairly early Community directives establishing standards for water and air quality.[12] Typically, these consist of a scientifically informed numerical specification of what concentration of a particular contaminant is permissibly present in some part of an environmental media, with corresponding obligations upon the Member States to take necessary legal and administrative measures to ensure that each parameter is realised.

It should be noted, however, that these ostensible environmental quality standards are actually strongly anthropocentric in character, insofar as they are primarily guided by scientific knowledge of levels of exposure to different substances that are likely to cause adverse health effects in human beings. What purports to be an 'environmental quality standard', on closer examination, often actually turns out to be public health standard, almost entirely orientated towards the protection of human welfare and neglecting the requirements of non-humans. A neat illustration of this is provided in the European Community Directive concerned with limit values and

[8] See Royal Commission on Environmental Pollution, Twenty-first Report, *Setting Environmental Standards* (1998) Cm 4053 para 1.32 to 1.33 on the implications of increasing environmental awareness.

[9] Similarly, on the lack of focus upon environmental goals in the United States, see W.F. Pedersen, '"Protecting the Environment" – What Does that Mean?', 27 *Loyola of Los Angeles Law Review* (1994) 969.

[10] 'Standard' is here being used in a narrow sense of a statement of precise chemical and physical parameters that determine the acceptability of a part of an environmental medium for a particular purpose. Hence, a contrast is to be drawn with an environmental quality objective, which states the general purposes for which an environmental medium is to be used, whereas an environmental quality standard defines, in precisely stated parameters, what quality is needed for that purpose to be realised. Generally see W. Howarth and D. McGillivray, *Water Pollution and Water Quality Law* (2001) sections 1.4.3 to 5 on the contrast between water quality objectives and water quality standards. See also, Royal Commission on Environmental Pollution, Twenty-first Report, *Setting Environmental Standards* (1998) Cm 4053, at 4 and Annex C, setting out a range of different senses in which the term 'standard' is used in environmental quality management contexts.

[11] Generally see G. Richardson, A. Ogus and P. Burrows, *Policing Pollution* (1982) 62–64 and D. Vogel, *National Styles of Regulation: Environmental Policy in Great Britain and the United States* (1986) 87–90.

[12] See Royal Commission on Environmental Pollution, Twenty-first Report, *Setting Environmental Standards* (1998) Cm 4053, Annex C, listing a range of European Community directives establishing environmental quality standards applicable to different environmental media.

quality objectives for mercury discharged by the chloralkali industry.[13] The Directive has as its purpose 'to protect the aquatic environment of the Community against pollution by certain dangerous substances'. One of the quality objectives set under the Directive is a 'biological standard' set for fish, so that the concentration of mercury in fish flesh is not to exceed 0.3 mg/kg. Despite first impressions, this limit is actually set purely to protect the health of human consumers, not to protect fish or the aquatic ecosystems of which they form a part.[14] This is not to suggest that legislating to secure human-centred goals for the environment is never beneficial to its nonhuman living constituents, but merely that such benefits tend to be incidental rather than purposeful.[15]

From a human standpoint, the neglect of the wider environment and its nonhuman constituents may not be seen as a serious problem. Certainly, natural landscapes, species and habitats, and even parts of the built environment, can be seen as worthy of protection because of the aesthetic or cultural value that humans attach to them. The essentially utilitarian progression[16] of environmental quality law need not exclude regulation seeking to secure less tangible cultural benefits. However, historically, these things have been placed well down the list of priorities when gauged against more pressing concerns about preventing more direct kinds of harm to the health or immediate well being of human beings.

2.1 The Challenge of Intrinsic Value

The new challenge arises where elements of the environment and ecosystem are recognised to have a value that is not purely dependent upon their capacity to provide human benefit. Perhaps the ultimate environmental quality standard is that the environmental media should be contaminated by a level of human-produced pollutants set at zero.[17] In respect of hazardous substances at least, this position seems to be

[13] Directive 82/176/EEC. Another example is to be seen in the interpretation of the Directives concerned with waters for freshwater fish (78/659/EEC) and shellfish waters (79/923/EEC). Both Directives have as their purpose the protection and improvement of respective waters for ecological and economic reasons. A key contrast between the two is that the preamble to the Shellfish Waters Directive explicitly refers to the need for protection of shellfish consumers, thereby recognising its human health basis, whereas the Freshwater Fish Waters Directive makes no corresponding provision, suggesting that it is directed primarily towards ecological objectives. Despite the differences in wording of the Directives, the European Court of Justice has interpreted the Freshwater Fish Waters Directive as having a human health purpose simply because the salmonid and cyprinid species covered by the Directive may be consumed. Again, it transpires that a directive appearing to have a primarily ecological objective is actually intended to secure human-centred purposes that are not apparent from its wording. See Case C-298/95 *Commission v Germany* [1996] ECR I-6747 and discussion of this case in W. Howarth and D. McGillivray, *Water Pollution and Water Quality Law* (2001) at section 15.3.3.

[14] Royal Commission on Environmental Pollution, *Setting Environmental Standards*, Twenty-first Report (1998) Cm 4053 Annex C para 26.

[15] See the discussion of the 'comfortable assumption' that standards devised for human protection are necessarily sufficient to protect species and ecosystems, at Section 3.4 below.

[16] On the utilitarian justification for protection of environmental quality generally, see J. Passmore, *Man's Responsibility for Nature: Ecological Problems and Western Traditions* (1974); J.R. Des Jardins, *Environmental Ethics: An Introduction to Environmental Philosophy* (4th edn, 2005) particularly Chapters 2 and 4; and I.M. Carr, 'Saving the Environment – does utilitarianism provide a justification?' *Legal Studies* (1992) 92.

[17] It might be argued that this standard was envisaged by the Drinking Water Quality Directive (80/778/EEC as amended by 98/83/EC) in setting a limit of 0.1 parts per billion for any pesticide in drinking water. This low limit was seen as a surrogate zero because it was set beyond the limits of measurability at the time of its adoption. See Evidence Submitted by Water UK (Z34) at 162 of Evidence to House of Commons, Environment, Food and Rural Affairs Committee, *Progress on the Use of Pesticides: The Voluntary Initiative* (Eighth Report of Session 2004–05, HC 258, 2005). Also see S. Tromans, 'High Principles and Low Cunning: Putting Environmental

accepted as a longer-term objective at a regional international level under the OSPAR Convention.[18] The OSPAR *Hazardous Substances Strategy* is particularly ambitious in seeking to reduce the concentrations of hazardous substances in the environment to near background values for naturally occurring substances and close to zero for man-made synthetic substances. Additionally, the strategy requires the parties to 'make every endeavour' to move to the complete cessation of discharges of hazardous substances by 2020.[19] Although somewhat aspirational, in not being formulated as a strictly binding legal obligation upon the parties, the OSPAR environmental quality standard exceeds what is required for purely human benefit and reflects the preamble to the Convention: 'recognising the inherent worth of the marine environment'.

The 'inherent worth' position is an endorsement of the need for species and habitats to be protected, regardless of any benefit they may bring to the well-being of human beings. Whilst, in times gone by, this perspective might have been regarded as rather eccentric, it has gained increasing ground as a policy objective. Notably, the preamble to the Convention on Biological Diversity[20] recognises 'the *intrinsic* value of biological diversity' alongside the diverse benefits that it brings to human beings. The new concern is with variability among living organisms and the ecological complexes of which they are a part, and this includes diversity within species, between species and of ecosystems.[21]

It is not the purpose of this discussion to revisit the extensive literature on arguments for and against the intrinsic value of nature or the philosophical implications of the ecocentric position in allocating rights to non-humans.[22] The lesser aim is to limit the discussion to the legal implications which follow from a recognition of the inherent worth of the environment and the ecosystems that it supports. On this, it is apparent that purely human-centred objectives for the quality of the environmental media have been superseded, or at least supplemented, by the need for diversity of species and ecosystems to be maintained and enhanced for their own sake. Moreover, in the same way as environmental law has progressed from the negative to the positive, from prohibitions to environmental quality standards, it needs to be considered to what extent it is feasible for ecological laws, founded upon intrinsic value, to follow a similar progression. Certainly, early laws protecting species and habitats have been based upon prohibiting the worst kinds of destructive activity impacting upon endangered flora and fauna and have paralleled the early approach to pollution law

Principles Into Legal Practice' *Journal of Planning and Environment Law* 779 (1995) at 783, stressing the 'precautionary' character of the pesticide parameter.

[18] 32 ILM 1069 (1993) and see OSPAR website, http://www.ospar.org.

[19] See and OSPAR *Hazardous Substances Strategy* (1998, and reaffirmed 2003, Reference number: 2003-21) available at OSPAR website, http://www.ospar.org. Also see the discussion of the European Community Water Framework Directive 2000/60/EC at Section 4 below.

[20] United Nations Convention on Biological Diversity 31 ILM 818 (1992) and http://www.biodiv.org. For general commentary, see L. Glowka et al, *A Guide to the Convention on Biological Diversity* (1994) and Secretariat of the Convention on Biological Diversity, *Handbook on the Convention on Biological Diversity* (2001) Earthscan.

[21] Art.2 Convention on Biological Diversity, defining 'biodiversity'.

[22] For useful starting points on these debates see D. Pepper, *Modern Environmentalism: An Introduction* (1996) particularly Chapter 2; A. Light and H. Rolston III (eds), *Environmental Ethics: An Anthology* (2005) Part III; R. Eliot (ed.), *Environmental Ethics* (1995); J.R. Des Jardins, *Environmental Ethics: An Introduction to Environmental Philosophy* (4th edn, 2005); and D. Wilkinson, 'Using Environmental Ethics to Create Ecological Law' in J. Holder and D. McGillivray (eds), *Locality and Identity: Environmental Issues in Law and Society* (1999) at 17, for a discussion of some of the legal implications of ecocentric valuation.

in their negativity.[23] The challenge for the next generation of ecological laws is to progress from this reactive approach towards securing positive objectives for wildlife and ecosystems by legal means. The present focus of attention is upon how this is to be done and how 'ecological quality standards' might parallel, and interrelate with, those standards concerned with the quality of the environmental media.

3. Ecological Quality Standards and Other Kinds of Approach

Although examples of environmental quality standards are now familiar and manifold in the UK and European Community legislation, the concept of an 'ecological quality standard' is less clearly understood, and some observations are needed upon the rather uncompromising sense in which the term is used here.

As has been stated, an environmental quality standard is a scientifically formulated and numerically expressed specification of the maximum level of contamination that is legally permissible in a given part of the physical environment. As a direct counterpart of this, an ecological quality standard should be a statement of the minimum acceptable state of ecosystems and their biological components, with a corresponding legal obligation that no deterioration below that standard should be permissible. Hence, for flora, fauna and habitats, ecological quality standards are intended to serve as a mandatory baseline for minimal levels of diversity and abundance, specified quantitatively for each component, and backed by legal obligations to ensure their realisation.

It is recognised, however, that the distinction between standards for biotic and abiotic components of the overall environment adopted here is not always adhered to. An alternative view is that 'ecological quality standards' should encompass requirements needed for the environmental media as well as the living things dependent upon them. Under the Convention on Biological Diversity, for example, an 'ecosystem' is defined as 'a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.[24] On that basis, ecological quality standards should extend to water, air and land quality where these impact upon living things, whereas the view is taken here that standards for contamination of environmental media are best treated separately, with proper account being taken of impacts of contamination upon living things. Assimilation of environmental and ecological standards may be desirable in the longer term, but for the present the distinction is usefully maintained to emphasise the contrasting issues needing to be addressed in establishing ecological quality standards.

[23] Nationally, see Part I Wildlife and Countryside Act 1981 (extensively amended by the Countryside and Rights of Way Act 2000) concerned with the protection of birds, other animals and plants (in part, consolidating earlier bird protection legislation) and Part II concerned with protection of Sites of Special Scientific Interest and other areas of conservation importance. At European Community level, see the Wild Birds Directive (79/409/EEC) and the Habitats Directive (92/43/EEC), again largely concerned with the prohibition of various kinds of destructive activity.

[24] Art.2 Convention on Biological Diversity, emphasis added. Similarly all-encompassing definitions are adopted in environmental science. See R. O. Brooks, R. Jones and R.A. Virginia, *Law and Ecology: The Rise of the Ecosystem Regime* (2002) at 7: 'Ecology is the study of the relationship of organisms and their environment. The environment includes other individuals in its population, other populations of plants and animals with which an organism and its population interacts, and the physical and chemical factors that influence life (i.e. the abiotic environment)'.

Another issue which is far from being resolved is the proper spatial scope of an ecological quality standard. As has been observed,

> the scale of analysis and action should be determined by the problem being addressed. It could, for example, be a particle of soil, a pond, a forest, a biome or the entire biosphere, and it should be recognised that ecosystems exist at all scales and with any chosen boundaries. The choice of ecosystem boundaries has important implications on management because many important species have distributions which cross ecosystem boundaries, thus making management difficult.[25]

Although, conveniently for regulatory purposes, the physical environment divides itself into water, air and land, and allows environmental quality standards to be specifically formulated for each of these media or their subcategories, the counterparts for subdivision of ecosystems are less readily apparent. Categorisation of distinct ecosystems is necessary for the setting of ecological quality standards, but the categorisation process is presently at an early stage of development. Internationally, initial emphasis has been placed upon large marine ecosystems, typically areas greater than 200,000 km2, representing regions having unique hydrographic regimes, submarine topography, productivity and trophically dependent populations.[26] However, the potential for aquatic or terrestrial ecosystems to be more narrowly drawn is unlimited, and the issue of defining the extent and character of the area over which a particular ecological quality standard should apply is far from being resolved.

Alongside the issue of the geographical extent of an ecosystem, there is an equally problematic issue of how many elements within that ecosystem are to be the subject of ecological quality standards. In responding to a request from the OSPAR Commission for advice on the formulation of ecological quality objectives, the International Council for the Exploration of the Sea expressed a concern that, over time, the number of ecological quality elements and ecological quality objectives could increase to become impracticably large. The Council took the view that it was important, at least at the commencement of discussion, to focus upon a small number of objectives for the state of ecosystems, since the complexity of decision-making would increase as the number of objectives increased. Accordingly, it advised that a limited number of ecological quality objectives and ecological quality elements should be adopted and used as the basis for further work programmes.[27]

[25] *Report of the Study Group on Ecosystem Assessment and Monitoring, Marine Habitat Committee*, International Council for the Exploration of the Sea, ICES CM 2000/E:09 Ref.: ACME, 8–12 May 2000, para 5.1(1) available at the ICES website, http://www.ices.dk.

[26] Ibid, para 5.1(2).

[27] See ICES, *Report of the ICES Advisory Committee on Fishery Management and Advisory Committee on Ecosystems, 2004* (2004) para 2.1.7.1 available on ICES website, http://www.ices.dk. It must be stressed, however, that the points were made in the context of establishing ecological quality objectives rather than ecological quality standards (see n 10 above on this contrast). In the terminology used by ICES, an 'ecological quality objective' is a statement of the desired level of ecological quality relevant to a reference level. 'Ecological quality' refers to the structure and function of the marine ecosystem, taking account of the biological community and natural physiographic and climatic factors as well as the physical and chemical conditions including those resulting from human activities (see ibid). Similarly, see also the ten ecological quality objectives, with the 21 associated ecological quality elements, agreed by the Fifth North Sea Conference, as the basis for a pilot project for the North Sea (Bergen Declaration 2002, Annex 3 available at odin.dep.no/md/nsc/). These ecological quality objectives are seen by OSPAR as describing a desired level of ecological quality against which the effects of human activities can be judged, and against which the effectiveness of measures to achieve a healthy marine environment can be assessed. Again, the provisional and aspirational nature of the exercise characterising a 'desired' state of the marine environment, in terms of 'ecological quality objectives' of this kind, contrasts with the

Unavoidably, therefore, a degree of selectivity is needed in the initial selection of those elements for which ecological quality standards are provided, but this does not preclude the progressive expansion of standards to an indefinite number of different species and habitat types.[28]

3.1 Pseudo Ecological Quality Standards

In order to illuminate what ecological quality standards are not, it may be helpful to distinguish ecological quality standards from some other approaches to ecological management.

An initial contrast that needs to be drawn is with the use of biological elements as 'indicators' of the general state of the environment and progress towards sustainable development. For example, the *Biodiversity Strategy for England*[29] sets out policies and objectives for the protection and enhancement of nature, accompanied by 'headline indicators', intended to give a broad overview of trends, which have since been supplemented by further indicators.[30] It is envisaged that the success of the *Strategy* will be measured by monitoring information gathered in relation to each of the different indicators. For this purpose, populations of wild birds, conditions of sites of special scientific interest and the status of certain priority species and habitats, and other matters of ecological significance, are monitored to gauge improvements.[31] An analogous approach has been used by the European Environment Agency which has adopted an indicator-based system for its assessment and reporting on the state of the European environment and progress towards agreed targets, encompassing indicators for biodiversity.[32]

Whatever the advantages of using the abundance of particular species or habitats to measure periodic progress or regress in biodiversity conservation, it must be stressed that 'indicator' approaches fall some way short of what is required by ecological quality standards. Indicators may allow useful comparisons to be drawn between monitoring information and allow a quantified assessment to be made in relation to strategic goals, but they do not set precise objectives of what must be achieved for any particular kind of biodiversity or impose any legal requirements

quantified and mandatory form of ecological quality standards as indicated above. Hence, whilst recognition of the concept of ecological quality objectives has been identified as a strong point of the OSPAR approach towards eutrophication, its weaknesses are that no quantitative criteria have been agreed, and there is no certainty that the process will result in such criteria [European Commission, DG Environment, *Criteria Used for the Definition of Eutrophication in Marine and Coastal Waters* (2001) (a report prepared by Environmental Resources Management, authors M.M. Gavin, S Borgvang and C. de Meeus) 71–72].

[28] See Section 4 below on Annex V to the Water Framework Directive (2000/60/EC) which requires assessment of the composition and abundance of phytoplankton, aquatic flora, benthic invertebrate fauna and fish in relation to the assessment of ecological good status for surface water but avoids the specification of ecological quality standards at the level of individual species within these categories.

[29] Department for Environment, Food and Rural Affairs, *Working with the Grain of Nature: A biodiversity Strategy for England* (2002), available at DEFRA website, http://www.defra.gov.uk.

[30] Department for Environment, Food and Rural Affairs, *A Biodiversity Strategy for England – Measuring Progress: baseline assessment* (2003), available at DEFRA website, http://www.defra.gov.uk.

[31] On the use of biological indicators to assess progress towards sustainable development, see Department for Environment, Transport and the Regions, *Quality of Life Counts: Indicators for a Strategy for the Sustainable Development for the United Kingdom: a Baseline Assessment* (1999), available at http://www.sustainable-development.gov.uk.

[32] See European Environment Agency website on use of indicators, and particular the indicator 'Cumulated area of nationally [nature protection] designated areas over time in (Pan) Europe', available at http://www.eea.eu.int.

in respect of their realisation. Monitoring biodiversity changes is a markedly different exercise from being required to secure specified ecological objectives.
Second, 'ecological quality objectives' must be distinguished from other kinds of strategic goal of broader or narrower compass. For example, a stated 'headline' objective of the European Community sustainable development strategy is to halt the loss of biodiversity by 2010.[33] Although it is laudable to seek a reversal in the trend of deterioration of species and habitats and the stabilisation of biodiversity levels by 2010, even if this is achieved, it would not necessarily amount to the realisation of a satisfactory or acceptable state for species and habitats. Halting deterioration and establishing legally binding standards for biodiversity as positive obligations are significantly different exercises, since stabilising levels of biodiversity does not necessarily involve securing a level of biodiversity that is satisfactory. Likewise, the narrower biodiversity objective, for protected areas and species, under the Habitats Directive, of securing 'favourable conservation status'[34] falls short of an ecological quality standard, even in respect of the particular areas and species to which it applies. 'Favourable conservation status' gives no indication of what particular level of biodiversity or abundance needs to be secured, beyond that of a species or habitat maintaining a stable state on a long-term basis.[35] This leaves open the possibility that a species or habitat could meet the favourable conservation status requirement merely by being maintained in a stable state, albeit with a historically low population or small area. A 'stable' conservation status is not necessarily the same thing as a 'satisfactory' one, and it is the latter rather than the former that ecological quality standards should seek to address.
In summary, the uncompromising character of ecological quality objectives must be recognised. The end point, it must be reaffirmed, is the formulation of precise qualitative and quantitative standards for each kind of biodiversity, analogous to existing legal obligations in respect of meeting and maintaining quality standards for the environmental media.

3.2 Ecological Requirements in Environmental Quality Directives

Another kind of pseudo ecological quality standard is to be seen in the incorporation of ecological requirements in legal measures that are primarily concerned with

[33] European Commission, *A Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development*, COM(2001) 264 final, available at europa.eu.int. See also the recent consultation on a new strategy, commenced in July 2004, which has prompted the criticism that the existing strategy is 'too vague and lacks a real definition and specific objectives, targets and deadlines' (EurActive, 'Stakeholders to revive EU's sustainable development strategy', News Release 14 April 2005, at http://www.euractive.com).

[34] Art.2(2) of the Habitats Directive (92/43/EC) requires measures taken pursuant to the Directive to be designed to maintain or restore, at a favourable conservation status, natural habitats and species of wild fauna and flora of Community interest. Art.1(a, e and i) of the Directive provides the following definitions. The expression 'conservation status' means the sum of the influences on a natural habitat and its typical species that may affect its long-term natural distribution, structure and function as well as the long-term survival of its typical species within the European territory of the Member States. The conservation status of a habitat will be 'favourable' where its natural range, and areas within that range, are stable or increasing; the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and the conservation status of its typical species is 'favourable'. Similarly, the conservation status of a species will be 'favourable' when population dynamics data on the species indicated that it is maintaining itself on a long-term basis as a viable component of its natural habitats; the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and there is, and will probably continue to be, a sufficiently large habitat to maintain its population on a long-term basis.

[35] See the discussion at Section 5.1 below on the dubious status of ecological 'stability'.

environmental quality. Whilst it has been noted that ecological quality standards may in the future encompass requirements for the environmental media determined by genuine biological needs, this is not evidenced by past 'backdoor' attempts to legislate for ecological quality in primarily environmental quality measures.[36] In the first place, ascertaining whether a legal measure concerned with the environment encompasses ecological concerns is not always straightforward. A law against pollution, for example, could be motivated by the need to protect human health, to protect the quality of the environmental media, to protect the living things dependent on that media, for aesthetic reasons or for any combination of these purposes. National legislation is notoriously obscure as to its objectives. Parliamentary debates are frequently uninformative or inconsistent, and it is a matter of guesswork to ascertain whether, or to what extent, a pollution-control measure actually has ecological protection as a part of its rationale. Commendably, European Community environmental legislation contrasts with national law in that its objectives are expressly stated in preliminary recitals and judicial interpretation is undertaken with explicit attention to the purposes of legislation.[37] Hence, a contextual or purposive reading of an 'environmental' directive, alongside its background and objectives, makes it more readily apparent whether the measure is intended purely to protect the quality of the environmental media or whether ecological benefits are envisaged. The difficulty, however, with much Community environmental legislation is that lip-service seems to be paid to the ecological objectives of a measure, but it usually proves to be little more than that. Stating that a directive, that is primarily concerned with environmental quality, is also intended to provide benefits to species and ecosystems, or the broader 'environment' as a whole, does not sufficiently clarify the character or extent of the ecological protection that is intended or the ecological result to be achieved.

3.3 Case Study: The Agricultural Nitrates Directive

The preceding points, about generalised or obscure ecological quality standards in environmental quality legislation, are best illustrated by example. Although other instances could be chosen,[38] a good case study of the use of unsatisfactory ecological

[36] With the possible exception of the Water Framework Directive (2000/60/EC), discussed at Section 5 below.

[37] See, for an example from an environmental context, Case C-72/95 *Aannemerbedrijf P. K. Kraaijeveld BV and Others v Gedeputeerde Staten Van Zuid-Holland* [1997] Env LR 265 at para 28, emphasising the need for purposive interpretation where there is a disparity between national language versions of a Directive.

[38] Directive 96/62/EC on ambient air quality assessment and management provides another pertinent example of 'obscure' ecological standards in a non-aquatic context. The Directive seeks to establish a common framework for setting objectives for ambient air quality in the Community to avoid, prevent or reduce harmful effects on human health and the environment as a whole. Environmental impacts, other than human health, are relevant to limit values, represented in a level of air quality, set to avoid, prevent or reduce harmful effects on humans and/or the environment. Hence, when setting limit values, account must be taken of various criteria including the sensitivity of flora and fauna and their habitats (Annex II). However, the mechanisms by which account is to be taken of ecological impacts under secondary directives concerning particular contaminants are unclear. See, for example, Directive 1999/30/EC relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air. This Directive notes that ecosystems should be protected against the adverse effects of sulphur dioxide and that vegetation should be protected against the adverse effects of oxides of nitrogen, but there is no indication that other pollutants covered by the Directive have any harmful ecological impacts. By way of background to the Directive, the European Commission scientific working groups *Position Paper of Sulphur Dioxide* (1997) (at europa.eu.int) also notes the adverse effects of the contaminant on plants, though it is far

standards is to be seen in the European Community Agricultural Nitrates Directive.[39] The underlying objective of the Directive is to reduce water pollution caused by nitrates from agricultural sources and to prevent further such pollution.[40] The initial question is the reason why the Community should be seeking to reduce nitrate contamination of waters and the implications for ecological quality standards.

A range of undesirable impacts are recognised by the Directive:

> it is therefore necessary, in order to protect human health and living resources and aquatic ecosystems and to safeguard other legitimate uses of water, to reduce water pollution caused or induced by nitrates from agricultural sources and to prevent further such pollution...[41]

This indicates that four distinct objectives are being pursued: (1) protection of human health; (2) protection of living resources; (3) protection of aquatic ecosystems; and (4) safeguarding other legitimate uses of water. Notably, however, the Directive does not establish any relative priority between these different purposes nor does it expressly address the question of whether a water quality standard established for one purpose is necessarily appropriate for the others.

The public health impact of nitrate contamination of water has been a prominent feature of previous Community legislation, which requires that water supplied for domestic use should not exceed 50 mg/l, with the same threshold imposed as an imperative requirement for 'raw' water, abstracted for supply after treatment.[42] The reasons for a precise parameter for nitrate lie in relatively well-documented health concerns and the adoption, by the Community, of a precautionary approach to maximum levels of nitrate in water originally formulated by the World Health Organisation.[43] It is not surprising, therefore, that the same parameter for nitrate should be adopted in the Nitrates Directive, insofar as its objectives encompass the protection of public health. What is less clear is what parameter for nitrate is needed to meet the ecological objectives of the Directive.

The mechanisms of the Nitrates Directive involve, amongst other things, the designation of nitrate-vulnerable zones, comprising areas of land which drain into certain polluted or vulnerable waters and which contribute to, or potentially contribute to, nitrate pollution. Designation of areas is determined by three criteria: (1) whether

from clear how the recognised adverse impacts upon plants are reflected in the numerical threshold value for sulphur dioxide that is proposed or adopted in the Sulphur Dioxide Directive. As with the Agricultural Nitrates Directive, the inference that is indicated is that the ambient air quality legislation is heavily orientated towards human health impacts and covers ecological impacts in only a cursory and imprecise manner.

[39] Directive 91/67/EEC and generally see, European Commission, *The Implementation of Council Directive 91/676/EEC Concerning the Protection of Waters Against Pollution Caused by Nitrates from Agricultural Sources*, COM(2002)407, available at europa.eu.int.

[40] Art.1 Agricultural Nitrates Directive.

[41] Recital 6 Agricultural Nitrates Directive.

[42] Drinking Water Quality Directive (80/778/EEC, subsequently amended by 98/83/EC) Annex 1 parameter n.20. 'Raw water' abstracted for supply purposes, after treatment, is subject to the Drinking Water Abstraction Directive (75/440/EEC, as amended by 79/869/EEC) which imposes the same parameter for nitrate in respect of water which is subject to normal physical treatment, chemical treatment and disinfection before supply (Annex I parameter n.7).

[43] Concerns about methaemoglobaemia or 'blue baby syndrome' and gastric cancer were identified by the World Health Organisation [World Health Organisation, *European Standards for Drinking Water* (1970) and (1971)]. Although reservations were expressed as to whether the parameters established by the Drinking Water Directive were genuinely needed to safeguard health by the Royal Commission on Environmental Pollution, Sixteenth Report, *Freshwater Quality* (1992) para 7.127. Generally see S. Elworthy, *Farming for Drinking Water* (1994).

surface waters contain more nitrate than the concentration allowed by the Drinking Water Abstraction Directive;[44] (2) whether ground waters contain more than 50 mg/l nitrates; and (3) whether natural freshwater lakes or other bodies, estuaries, coastal waters and marine waters are found to be 'eutrophic'.[45]

Notably, the three criteria for designation of nitrate-vulnerable zones reveal significantly different underlying concerns justifying the imposition of restrictions upon land use. The first two categories apply the same parameter, 50 mg/l of nitrate, as a basis for designation of surface waters or ground waters. Since the parameter had been previously used as a public health standard for drinking water, it might be thought that the standard should only be applied to waters intended for that purpose. However, this is not the case, since the first two categories concern all surface and ground waters, not merely those that are to be used for water supply purposes.[46] It appears that a water quality standard, formulated for the specific purpose of protecting public health, has been translated into a standard that needs to be applied to all waters within the scope of the Directive, even where public health issues are not directly relevant. For certain waters, therefore, it appears that a public health standard is being adopted either for the protection of the ecological quality of waters or to safeguard other legitimate uses of water.

The third criterion, listed above, for designation of nitrate-vulnerable zones is motivated by more directly ecological concerns. For the purposes of the Directive, 'eutrophication' means the enrichment of water by nitrogen compounds, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned.[47] Naturally, waters range between oligotrophic (nutrient poor) and eutrophic (nutrient rich) and support distinctive communities of flora and fauna specially adapted to the particular trophic state of a kind of water. In an uncontaminated state, water will be in trophic balance, as between the input of nutrients and their uptake by flora. However, the addition of further nutrients to the water, commonly from agricultural activities or the discharge of sewage effluent, disturbs this equilibrium. Although a limited addition of nutrients may enhance the plant and animal diversity in a water,[48] in

[44] Directive 75/440/EEC.

[45] Art.3(1) and Annex IA Agricultural Nitrates Directive.

[46] Case C-69/99, *Commission v United Kingdom* [2000] ECR I-10979.

[47] Art.2(1) Agricultural Nitrates Directive. See also the OSPAR, *Strategy on Eutrophication* (1998 revised and reaffirmed 2003, Reference number: 2003-21) which defines 'eutrophication' as 'the enrichment of water by nutrients causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned, and therefore refers to the undesirable effects resulting from anthropogenic enrichment by nutrients as described in the Common Procedure' to assess and classify eutrophication status on a common basis. The overall objective of the *Strategy* is 'to combat eutrophication in the OSPAR maritime area, in order to achieve and maintain a healthy marine environment where eutrophication does not occur', with this being achieved by 2010. On progress towards this objective, see *OSPAR Integrated Report 2003 on the Eutrophication Status of the OSPAR Maritime Area Based Upon the First Application of the Comprehensive Procedure* (2003); *Ecological Quality Objectives for the Greater North Sea with Regard to Nutrients and Eutrophication Effects* (2005); and *Common Procedure for the Identification of the Eutrophication Status of the OSPAR Maritime Area* (Reference number: 2005-3). See OSPAR website http://www.ospar.org.

[48] See Royal Commission on Environmental Pollution, Twelfth Report, *Managing Waste: The Duty of Care* (1985) Cmnd 9675 para 7.49, but contrast Royal Commission on Environmental Pollution Sixteenth Report, *Freshwater Quality* (1992) Cm 1966 paras 3.8 and 2.18. Similarly, it has been noted that, 'at a theoretical level, it is possible that species diversity may not respond consistently to eutrophication—eutrophication in an oligotrophic system might conceivably result in an increase in species diversity, while eutrophication at higher ambient

extreme cases, of eutrophic or hypertrophic waters, excessive algal growth may cause oxygen levels to fluctuate to such a degree that diversity of animal and plant life declines. In such a state, the conditions may favour the growth of potentially toxic cyanobacteria, commonly called 'blue-green algae', with consequent deterioration of the amenity value and potential uses of the water.[49]

Eutrophication is the ecological phenomenon that the Directive seeks to avoid insofar as it produces an undesirable disturbance to the balance of the organisms present and the quality of the waters. However, the issue of what kind and degree of disturbance should be considered 'undesirable' is unspecified and seems to require an intricate ecological value judgment to be made. The reasons for the seemingly evasive approach towards ecological quality criteria under the Directive appear to lie in the lack of a consensus as to what level of protection is actually needed for living resources and aquatic ecosystems.

Even the supposed harm of 'eutrophication' is conceptually problematic.[50] Although the phenomenon is an important ecological concern, it is difficult to relate it directly to any precise water quality parameter since the adverse effect of any concentration of a particular nutrient is so greatly dependent upon the characteristics of the receiving waters in what is supposed to be their uncontaminated state. A small amount of nutrient addition to an oligotrophic water may have a highly damaging effect on a rare species of aquatic flora and fauna, whereas a relatively large amount of nutrient may have little effect upon water that is already naturally eutrophic. Hence it has been observed:

> eutrophication describes a process rather than a state and studies have shown that it is controlled by a number of factors. These include nutrients, flow rate of waters, shading and turbidity, depth, temperature and turbulence. The relationship of many of these factors to eutrophication is not easily quantified. The assessment of whether a stretch of water actually or potentially is eutrophic is not possible simply by reference to numeric chemical criteria. A number of symptoms should be considered in order to come to a judgement as to whether an individual stretch of water is suffering or likely to suffer from eutrophication. The importance of particular symptoms will depend on local circumstances.[51]

nutrient concentrations may reduce it. Changes in species diversity are the sum of many effects, and eutrophication can rarely be assumed to occur in isolation from other anthropogenic factors' (European Commission, DG Environment, *Criteria Used for the Definition of Eutrophication in Marine and Coastal Waters* (2001) at x).

[49] See National Rivers Authority, *Toxic Blue-Green Algae* (1990) and B. Moss, J. Madgwick and G. Phillips, *A Guide to the Restoration of Nutrient-Enriched Shallow Lakes* (1996).

[50] See European Commission, DG Environment, *Criteria Used for the Definition of Eutrophication in Marine and Coastal Waters* (2001). This report provides a review of the different existing criteria used by European Community Member States to define 'eutrophication' and provides suggestions for the common criteria and indicators that should be used. The report emphasises important distinctions (and potential confusions) between the process of 'eutrophication', and its causative factors and symptoms and consequences.

[51] *Government Response to Consultation on Criteria and Procedures for Identifying Sensitive Areas and Less Sensitive Areas (Urban Waste Water Treatment Directive) and "Polluted Waters" (Nitrates Directive) in England and Wales* (incorporated in DoE, MAFF and WO, *Methodology for Identifying Sensitive Areas (Urban Waste Water Treatment Directive) and Methodology for Designating Vulnerable Zones (Nitrates Directive) in England and Wales* (1993) Annex B para 9. Similarly, it has been observed that 'the most important implication [for criteria for 'eutrophication'] is that it is impossible to regard formulations of the form 'an increase of x grams of algae per square metre' or of 'y grams of chlorophyll per litre', as some defining boundary which, when passed, becomes eutrophication. Eutrophication can occur anywhere on a continuum from low oligotrophic to extreme hypertrophic, and small absolute changes at the oligotrophic end of the spectrum may nevertheless have a very significant impact. As we know, although some sophisticated methods such as algal bioassays have been developed in some countries, there is no 'standard' universal measurement in Europe' (European Commission, DG Environment, *Criteria Used for the Definition of Eutrophication in Marine and Coastal Waters* (2001) at 5).

Implicitly, therefore, some national scepticism existed as to whether environmental quality law possessed the subtlety to recognise the variable sensitivity of different waters to nutrient enrichment, given the inappropriateness of any absolute or comprehensive way of characterising the process of 'eutrophication'.

The European Court of Justice recently had to grapple with the concept of 'eutrophication' in proceedings against France under the Urban Waste Water Treatment Directive.[52] This Directive makes comparable provision to the Agricultural Nitrates Directive, in requiring the designation of sensitive areas in respect of the eutrophication of waters by nitrogen and/or phosphorous arising from discharges of urban wastewater. The Commission's complaint was that France had failed to identify the waters and designate the sensitive areas in respect of eutrophication where sewerage infrastructure improvements were needed. Under both directives, the definition of 'eutrophication' is similarly formulated. In the context of urban wastewater treatment, the Court characterised 'eutrophication' as the confluence of four criteria: (1) the enrichment of water by nutrients; (2) the accelerated growth of algae and higher forms of plant life; (3) an undesirable disturbance of the balance of organisms present in the water; and (4) a deterioration of the quality of the water.[53] The critical difficulty lies in showing that the level of enrichment that takes place is 'undesirable' and, as the Court emphasised, that this encompasses significant harmful effects not only upon flora and fauna, but also upon humans, the soil, water, air or landscape.[54] Specifically, changes in the abundance of species involving loss of ecosystem biodiversity, nuisances due to the proliferation of opportunistic macroalgae and severe outbreaks of toxic or harmful phytoplankton constitute an 'undesirable' disturbance of the balance of organisms present in the water.[55] 'Deterioration' entails a reduction in the quality of the water which produces harmful effects for ecosystems, but also deterioration in the colour, appearance, taste or odour or any other change which prevents or limits water uses such as tourism, fishing, fish farming, shellfish farming, abstraction of drinking water or cooling of industrial installations.[56] Applying a precautionary approach[57] to the causal link between nutrient inputs and the observed states of the waters under consideration, the Court found that France had failed to designate the waters as sensitive for the purposes of the Directive.

Despite the insights provided by this judgment, the continuing problem is that identification of ecological quality standards under both the Agricultural Nitrates Directive and the Urban Waste Water Treatment Directive remains obscure. The guiding criterion remains that of a 'significant undesirable deterioration' affecting flora, fauna and ecosystems.[58] By contrast with the precisely expressed numerical standard for public

[52] 91/271/EEC and Case C-280/02 *Commission v France* [2004] All ER (D) 142 (Sep). See also, Case C-258/00 *Commission v France* [2002] ECR I-5959.

[53] Case C-280/02 *Commission v France* [2004] All ER (D) 142 (Sep) para 18.

[54] Ibid, para 22.

[55] Ibid, para 23.

[56] Ibid, para 24.

[57] Ibid, para 34.

[58] As it has been observed 'most, perhaps all, EU marine waters have been subject to eutrophication over a period of hundreds, perhaps thousands, of years. For EU waters the question 'has eutrophication occurred?' may therefore be fairly simply answered 'yes'. The question of interest is really, 'has unacceptable eutrophication occurred'; this cannot be answered by appeal to 'science' or fact alone' (emphasis added) [European Commission, DG Environment, *Criteria Used for the Definition of Eutrophication in Marine and Coastal Waters* (2001) at 30].

health, the vague negativity generated by a lack of any ecological quality standards required by these directives is striking.

In summary, the ecological elements of the Agricultural Nitrates Directive suffer from over-ambitious intentions and lack of attention to the difficulties of implementation. Ecological concerns are 'tagged on' to a directive that is primarily concerned with public health issues and, whereas public health standards are fairly precisely stipulated, the ecological and other aims of the Directive leave ascertainment of corresponding water quality standards as a matter of guesswork.

Although purporting to be adopted for various purposes, the Agricultural Nitrates Directive adopts a generalised or obscure treatment of ecological quality standards. Although there is no reason to suppose that the standards needed to protect species and ecosystems are the same as those which are needed to protect human health, no indication is given as to what approach is needed where there is a disparity. Probably, as a consequence of the relative lack of scientific information about many kinds of ecological impact, the underlying assumption seems to be that human health standards will necessarily be good enough to meet ecological requirements.

Although accepting the technical difficulties, and simple lack of adequate knowledge about the living natural environment, enacting obscure ecological requirements into legislation is not an adequate response to the impacts of unsatisfactory environmental quality upon the non-human parts of the environment. An observation of the Royal Commission on Environmental Pollution deserves reiteration:

> Despite the great difficulties involved, determining dose-effect relationships for the effects of substances on the natural environment is an essential exercise if appropriate environmental policies are to be adopted. When environmental policies or standards are adopted, it should always be made clear in an explicit statement whether they are designed to protect the natural environment, human health, or both, and the degree and nature of the protection that they are intended to afford.[59]

The failure to take heed of this sound advice has resulted in the unsatisfactory provision for ecological protection. More generally, it may have served to foster a complacent belief that environmental quality law is formulated with sufficient stringency to meet any kind of ecological requirement.

3.4 The Comfortable Assumption Discredited

The comfortable assumption that environmental quality standards are necessarily sufficient to meet ecological needs is challenged by the opinion of Advocate General Van Gerven in the *Marismas de Santonia* case.[60] The circumstances of the case concerned Spain's failure to designate an ornithologically important area as a special protection area, under the European Community Wild Birds Directive, and the failure to take sufficient protection measures against pollution or deterioration of the habitat.[61] The various complaints raised by the Commission included an allegation that the discharge

[59] Royal Commission on Environmental Pollution, *Setting Environmental Standards*, Twenty-first Report (1998) Cm 4053 para 2.50.

[60] Case C-355/90 *Commission v Spain* Opinion of Advocate General Van Gervan [1993] ECR I-4221.

[61] Wild Birds Directive (79/409/EEC) Art.4, concerning special conservation measures for Annex I species and migratory birds, and the need to avoid pollution and deterioration of habitats in protected areas and to 'strive to' avoid this in areas outside protected areas.

of wastewater into the area had damaging impacts because it contained toxic substances that were highly detrimental to the ecological conditions of the site. It was contended that the effluent would have adverse effects on species of birds as a result of changes in the plankton, algae and invertebrates that provided food for bird species.[62]
In its defence, the Spanish Government maintained that no Community measure concerning the quality of water had been shown to have been infringed. Although the veracity of this assertion was contested by the Commission, the Advocate General's opinion was that, as a matter of principle, conformity with Community water legislation did not prevent the wastewater discharges constituting 'pollution of habitats' for the purposes of the Wild Birds Directive.[63] Although more concisely stated, the Court of Justice seemed to accept this reasoning in emphasising that detriment to the ecological conditions was the critical issue, rather than conformity with environmental quality legislation.[64]
The inference to be drawn from these observations is that the obligations upon Member States in respect of protecting ecologically designated areas may actually be stricter than obligations that arise under general environmental quality legislation. Hence, meeting Community requirements for air and water quality, and waste management, may not be sufficient where adverse impacts upon protected areas are identified. Certainly, the observations that have been noted were made in relation to the protection of an area of special ornithological significance, and the need to avoid pollution and deterioration of habitats outside protected areas may not be so strictly construed. Nonetheless, the observations demonstrate the need for caution in assuming that an environmental quality standard is sufficiently stringent to meet ecological protection purposes or to serve as an ecological quality standard. Put another way, conservation law may sometimes have an anti-pollution dimension that is stricter than that provided for in environmental quality legislation.
With the comfortable assumption discredited, the need for explicit and determinate ecological quality standards, as opposed to obscure ecological requirements in environmental quality directives, becomes all the more pressing. The present focus of attention in this respect is the European Community Water Framework Directive.

4. The Water Framework Directive

The furthest point presently reached in the progression towards ecological quality standards lies in the European Community Water Framework Directive.[65] Alongside

[62] [1993] ECR I-4221 para 51.
[63] Ibid, paras 53 and 54.
[64] Ibid, paras 52 and 53.
[65] For general academic literature on the Water Framework Directive see D. Matthews, 'The Framework Directive on Community Water Policy: A New Approach for EC Environmental Law' *Yearbook of European Law* (1997) at 191; W. Howarth, 'Accommodation Without Resolution? Emission Controls and Environmental Quality Objectives in the Proposed EC Water Framework Directive' *Environmental Law Review* (1999) at 6; D. Grimeaud, 'Reforming EU Water Law: Towards Sustainability' *European Environmental Law Review* (2001) pp 41–51, 88–97 and 125–135; A. Farmer, 'The EC Water Framework Directive' *Water Law* (2001) at 40; G. Kallis and D. Butler, 'The EU Water Framework Directive: Measures and Implications' *Water Policy* (2001) at 125; W. Howarth and D. McGillivray, *Water Pollution and Water Quality Law* (2001) Chapter 5. From the perspective of environmental nongovernmental organisations, see World Wide Fund for Nature and European Environmental Bureau, *'Tips and Tricks' for Water Framework Directive Implementation* (2004), available at http://www.eeb.org.

its importance in comprehensively updating and integrating previous Community water legislation, the Directive also introduces some radical innovations in the sustainable management of the aquatic environment. Most notably for the present discussion, it provides the foremost example of a Community measure explicitly requiring precise ecological criteria to be formulated to determine what should count as a satisfactory biological state of aquatic quality.[66]

4.1 The Ecological Good Status Requirement

Setting aside discussion of the intricate legal and administrative details and complex scientific tasks that are involved in securing 'good water status'[67] of all relevant waters by 2015, the main concern here is with the ecological requirements that underlie the Water Framework Directive and the general approach towards ecological quality standards that is adopted. Whilst previous attempts to legislate for surface water quality at Community level have focused upon physical and chemical parameters, the Directive takes an ambitious step beyond this in seeking to characterise water quality in explicit and precise ecological terms which form a part of the 'good status' requirement for surface waters within its scope. Recognising that the Directive is primarily focused upon environmental quality, it is clear that it incorporates elements that come closer to ecological quality standards than anything previously seen in Community law. So far as surface waters are concerned, the Directive stipulates that 'good surface water status' means the status achieved when both its ecological status and its chemical status[68] are at least good.[69] 'Good ecological status' is the status of a body of surface water when so classified in accordance with Annex V to the Directive.[70] The crucially important Annex V provides the mechanism for assessing the ecological status of any surface water. Broadly, the approach taken is to set out, for each kind of water, what would be expected for that water to be classified as having a particular quality status according to a range of ecological parameters. Hence, in relation to different kinds of water, the composition and abundance of phytoplankton, aquatic flora, benthic invertebrate fauna and fish need to be assessed. Essentially, the approach is that of characterising a paradigm of each type of water and stipulating features of its biological and hydromorphological quality which must be met by actual waters to satisfy a particular ecological quality classification. The exercise of applying Annex V to the Directive in practice is of considerable technical complexity, given the range of water categories that are involved and the diverse range of parameters that need to be taken into account in determining the status of any particular water. This is clearly an undertaking, demanding a high level

[66] Although see the *Proposed Ecological Quality of Water Directive* COM(93) 680 final, which, though abandoned, can be seen as a precursor of ecological measures incorporated in the Water Framework Directive.

[67] The point may fairly be made that 'good status' is a somewhat ambiguous requirement which may serve as an aspiration rather than a mandatory obligation because of the range of exceptions and qualifications which are allowed in relation to its realisation. The main exceptions relate to artificial and heavily modified surface waters, phased achievement of objectives, less stringent environmental objectives, temporary deterioration of water status, and new modifications of physical characteristics and sustainable development activities (see Art.5(4) to (8) Water Framework Directive). The cumulative effect of these exceptions may be that there are actually quite extensive bodies of waters to which the good status requirement will not be fully applicable.

[68] 'Good chemical status' is achieved where the environmental objectives of the Directive are met, so that environmental quality standards (established under Annex IX to the Directive) standards for priority substances (under Art.16(7) and Annex X) and other relevant environmental standards are realised (Art.2(24)).

[69] Art.2(18) Water Framework Directive.

[70] Art.2(22) Water Framework Directive.

of coordinated scientific expertise and common understanding across the Member States.[71]

On this, it is notable that the European Commission is taking an active role in providing guidance to Member States as to the correct approach to be taken in national practice pursuant to a Common Implementation Strategy. This involves the establishment of a range of specialist groups, Expert Advisory Forums, bringing together national experts from the Member States, to provide a series of guidance documents formulated at Community level. This pooling of expertise is seen as vitally important as a means of securing consensus on issues such as the common approach to ecological classification across the Community.[72] Further to assist this endeavour, Member States are engaged in an 'intercalibration' exercise comparing sites in different Member States.[73] The results of this exercise will be evaluated to ensure that the requirements for good status are consistently applied across different Member States. Hence, final detailed criteria for ecological good status await the outcome of the intercalibration exercise.[74]

4.2 High Status and 'Minimal Anthropogenic Alteration'

Although most of the substantive environmental objectives of the Water Framework Directive are concerned with the achievement of good status for particular waters, it is significant that Annex V to the Directive is concerned with the classification of waters into several different ecological quality categories. Hence, it lists the requirements for water to be placed under four classifications, respectively termed 'high', 'good', 'moderate' and 'bad' (for all waters below moderate status). This classification system is particularly revealing in what it shows about the ecological valuation criteria underlying the Directive.

In short, ecological valuation is measured according to the degree to which biological elements show 'levels of distortion' resulting from human activity. Hence, good ecological status will be established only where biological elements deviate from undisturbed conditions 'only slightly'. As a general matter, 'high' status is established where (amongst other things)

There are no, or only very minor, anthropogenic alterations to the values of the physicochemical and hydromorphological elements for the surface water body type from those normally associated with that type under undisturbed conditions.

71 Generally see European Commission website, europa.eu.int/comm/environment/water/water-framework/implementation.html.

72 Generally see European Commission, *Common Implementation Strategy for the Water Framework Directive (2000/60/EC): Strategic Document* (2001) and on ecological classification see *Guidance Document No 13: Overall Approach to the Classification of Ecological Status and Ecological Potential* (2005), available at forum.europa.eu.int/Public/irc/env/wfd/library.

73 Para 1.4.1 Annex V Water Framework Directive requires the results of the intercalibration exercise to be published by the Commission with 6 years of the entry into force of the Directive (22 December 2006). See Common Implementation Strategy, *Guidance Document No 6: Towards a Guidance on Establishment of the Intercalibration Network and the Process of the Intercalibration Exercise* (2003) and *Guidance Document No 14: Guidance on the Intercalibration Process 2004–2006* (2005). The UK is participating in the exercise through the Ribble Pilot River Basin Project, see http://www.environment-agency.gov.uk/regions/northwest/501317/.

74 Until common criteria for ecological status are determined at Community level, national guidelines have been adopted for this purpose. See Water Framework Directive United Kingdom Technical Advisory Group, guidance http://www.wfduk.org/tag_guidance/.

The values of the biological quality elements for the surface water body reflect those normally associated with that type of water under undisturbed conditions, and show no, or only very minor, evidence of distortion.[75]

Similarly, in respect of 'fish fauna', the high-status category is defined as follows:

Species composition and abundance correspond totally or nearly totally to undisturbed conditions.

All the type-specific disturbance-sensitive species are present.

The age structures of the fish communities show little sign of anthropogenic disturbance and are not indicative of a failure in the reproduction or development of any particular species.[76]

For a range of other ecological characteristics, a similar formula is followed.

Hence, the foremost objective, so far as ecological quality of water is concerned, is that of securing or maintaining 'undisturbed conditions' or 'minimal anthropogenic alteration'. Apparently, the underlying value premise is that the 'best' aquatic environments are those where there is no evidence of human impact to be found. Minimal anthropogenic impact or 'back to nature', as it may be dubbed, seems to be the ultimate strategic goal for aquatic ecosystems.

Minimal anthropogenic impact, as the ultimate ecological objective underlying the Water Framework Directive, has not been formulated in isolation from other developments. As has been seen, a comparable line of thought is to be discerned in the *OSPAR Strategy on Hazardous Substances*, which has the ultimate aim of achieving concentrations of naturally occurring substances in the environment near background, or natural, levels and close to zero for man-made synthetic substances.[77] Implicitly, the OSPAR environmental quality goal for the marine environment is one where the presence of contamination, by either natural or manufactured substances, corresponds to a state of minimal anthropogenic impact. The Water Framework Directive takes this approach a step further in applying a comparable strategy to the ecological quality status of waters within its scope. The difficulty with this is that the 'baseline' of zero contamination can be fairly clearly drawn in an environmental quality context, but it is less clear what state should serve as a corresponding baseline for ecological quality purposes.

4.3 The Implications of 'Minimal Anthropogenic Impact'

Although most of the key obligations under the Water Framework Directive concern mechanisms to secure good status, rather than high status, there is a general obligation to maintain the high status of those waters that are so classified. This arises from the obligation upon Member States generally to prevent a deterioration of the status classification of waters.[78] Hence, those waters that are found to be of high status must be retained at that standard, and actions likely to cause the naturalness of these waters to be compromised may only be authorised under stringent conditions.[79] To that extent, maintaining minimal anthropogenic impact is a legally binding obligation.

[75] Para 1.2 Annex V Water Framework Directive.
[76] Para 1.2.1 Annex V Water Framework Directive.
[77] OSPAR, *Strategy on Hazardous Substances* (1998, revised and reaffirmed 2003, Reference number 2003-21) available at OSPAR website, http://www.ospar.org, and discussed at Section 4 above.
[78] Art.4(1)(a)(i) Water Framework Directive.
[79] Art.4(7) Water Framework Directive.

Securing and maintaining minimal anthropogenic impact or 'naturalness', as an ecological goal underlying the Water Framework Directive, has far-reaching implications for regulatory priorities in respect of those activities that may adversely impact upon the aquatic environment. In some spheres, the impacts are fairly clear. In respect of chemical contamination of waters, for example, waters will have to meet the environmental objectives of the Directive. This means that 'programmes of measures'[80] will need to be put in place to ensure that effluent discharges and diffuse sources of pollution do not allow water quality parameters to be exceeded in receiving waters. Where maintenance of high status of waters is involved, restrictions of this kind will need to be especially stringent.

In respect of ecological status, however, the implications of what needs to be done to fulfil the requirements of the Directive are less clear. One revealing illustration is to be seen in the Directive's treatment of hydromorphological conditions that prevent the ecological status requirements of the Directive being achieved. Although the precise meaning of 'hydromorphological conditions' is not defined in the Directive, it seems to be particularly relevant to situations where the required ecological status of a watercourse is not being met because of some change in the physical state, or pattern of flow, of waters brought about by human intervention. Typically, this might arise where a river has suffered an adverse ecological impact through impoundment or abstraction of waters, or through insensitive flood defence activities that have resulted in 'canalisation' and consequent habitat deterioration for aquatic species.

Programmes of measures must include actions to address significant adverse impacts, and these must include measures to ensure that the hydromorphological conditions of waters are consistent with the achievement of the ecological quality required by the Directive.[81] In blunt terms, this seems to mean that where a watercourse has been physically modified to such an extent that it fails to meet the requirements of ecological 'good status', something should be done to address that failing.

An initial inference might be that the worst effects of hydromorphological modification, such as where a major infrastructure project for water supply, hydroelectricity or flood defence, at immense cost, should be required to be removed to enable the ecological objectives of the Directive to be fulfilled. The reality, however, is that this is unlikely to happen because major physical modifications of this kind may allow such waters to be classified as 'artificial or heavily modified'.[82] The effect of this will be that a lesser ecological requirement will need to be met. Rather than achieving ecological good status, such water will only need to meet the lower standard of 'ecological good potential'. Within quite broad limits, the Directive recognises that where waters have been adversely affected by past activities, exceptions must be allowed where reversal of past impacts will not be feasible or would be disproportionately expensive. Nonetheless, accepting that damage to the hydromorphology of a surface water cannot feasibly be undone in many instances, the Directive requires the highest

[80] Art.11 Water Framework Directive.

[81] Art.13(3)(i) Water Framework Directive.

[82] Under Art.4(1)(a)(iii) Water Framework Directive and see Common Implementation Strategy, *Guidance Document No 4: Identification and Designation of Heavily Modified and Artificial Water Bodies* (2003), available at forum.europa.eu.int/Public/irc/env/wfd/library.

possible ecological status to be achieved that is consistent with impacts that could not reasonably have been avoided due to the nature of the human activity.[83] For future projects, however, the Directive envisages an increasing stringency being applied in authorisation procedures for projects capable of having an adverse impact on the hydromorphology of surface waters. Hence, it will need to be shown that future projects which involve the modification of the physical characteristics of a surface water are justified according to a series of requirements. These require it to be shown that a modification is of 'overriding public interest',[84] in terms of human health or safety, or sustainable development, and that the benefits of the project cannot feasibly be achieved by other means.[85] Not before time perhaps, the ecological impacts of development projects upon waters will need to be fully evaluated against precise criteria and justified before they are allowed to proceed.[86]

5. Reservations

There are three general kinds of reservation that need to be expressed about the approach towards ecological quality standards taken in the Water Framework Directive. The first is the concern that ecological quality standards may be set at a level that takes insufficient account of natural variability and are incapable of realisation. The second is the issue of whether 'naturalness' is a realistic benchmark for setting ecological standards in the first place. Third, is the profound and intractable problem of how ecological quality standards should take account of human beings as components of ecosystems.

5.1 The Achievability of Ecological Standards

As the geological history of ecosystems reminds us, the living species that now exist are only a minute proportion of those that have previously existed and are now extinct.[87] Whilst recognising the present role of human impacts in generating

[83] Art.4(5)(b) Water Framework Directive.

[84] Note that the concept of imperative reasons of 'overriding public interest' has previously been used in the Habitats Directive (92/43/EEC) as a basis for allowing proportionate derogation from obligations in respect of protected sites [under Art.6(4)] and the protection of species from derogation (under Art.16). In relation to Art.6, the European Commission has provided guidance on its interpretation, European Commission, *Managing Natura 2000 Sites: The Provisions of Article 6 of the Habitats Directive 92/43/EC* (2000) at 44. On the national interpretation of 'overriding public interest' see J. Holder, 'Overriding Public Interest in Planning and Conservation Law', *Journal of Environmental Law* (2004) at 401 (commenting on In *Newsum and Others v Welsh Assembly Government* [2004] EWHC 50 (Admin), but see also reversal of this decision by the Court of Appeal in [2004] EWCA (Civ) 1565.

[85] Art.4(7) Water Framework Directive.

[86] The point may be fairly noted that ecological impacts may constitute 'significant effects on the environment' in relation to public or private development projects that fall within the scope of the Environmental Assessment Directive (85/337/EEC as amended by 97/11EC). This requires an identification of the direct and indirect effects of a project on fauna and flora, amongst other things (Art.3) and that information about such impacts should be taken into consideration in the development consent procedure (Art.8). However, the Directive provides no explicit or precise criteria as to what impacts are to count as 'significant' or what substantive consequences follow from this. Generally see J. Treweek, *Ecological Impact Assessment* (1999); S. Tromans and K. Fuller, *Environmental Impact Assessment – Law and Practice* (2003); and J. Holder, *Environmental Assessment: The Regulation of Decision Making* (2004). By comparison, the requirements of the Water Framework Directive are considerably more specific and more demanding, particularly in relation to waters of high ecological status.

[87] E.O. Wilson, *The Diversity of Life* (1992) particularly Chapter 10.

threats to the survival of many existing species, the natural phenomenon of species being extinguished and new species coming into existence should not be overlooked, nor should the constant readjustment of balances between different species and their ecosystems. What might be perceived as a static situation is, in reality, a dynamic and inherently unstable ecological progression in which the impact of human activities is only one amongst many factors affecting the continually changing relationships between species.

There can be no dispute that a belief in a 'balance of nature' is a deep-seated paradigm in the history of western thought,[88] which has a compelling simplicity. Classically stated,

> Nature, left undisturbed, so fashions her territory as to give it almost unchanging permanence of form, outline and proportion... In countries untrodden by man ... the geographical conditions may be regarded as constant and immutable.[89]

However, the idea that nature, free from human interference, adheres to the unshifting equilibrium that is suggested by the paradigm has become increasingly difficult to reconcile with the mounting body of ecological evidence, suggesting dramatic oscillations in populations of species for reasons that may have no necessary connection with human interference. As a relatively early ecological scientist observed:

> This relative instability of the ecosystem, due to the imperfections of its equilibrium, is of all degrees of magnitude, and our means of appreciating and measuring it are still very rudimentary. Many systems (represented by vegetation climaxes) which appear to be stable during the period for which they have been under accurate observation may in reality have been slowly changing all the time, because the changes effected have been too slight to be noted by observers. Many ecologists hold that *all* vegetation is *always* changing.[90]

Since this observation was offered, the myth of the balance of nature has been more fully exposed. Indeed, much ecological and legal scholarship has been devoted to the issue of what model of ecosystems should succeed the now discredited equilibrium paradigm and what consequences follow in respect of ecological legislation that is based on the attractive, but false, assumptions upon which it rested.[91]

Notwithstanding the deconstruction of the idea of ecological stability, the difficulties inherent in enacting legal standards which require any particular ecological objective to be achieved have been recognised for some time. The dynamic character

[88] See D.B. Botkin, *Discordant Harmonies: A New Ecology for the Twenty-First Century* (1990) particularly Chapter 5 which traces the ancient origins of the idea of a 'divine order' of nature.

[89] G.P. Marsh, *Man and Nature* (1864) quoted by D.B. Botkin, *Discordant Harmonies: A New Ecology for the Twenty-First Century* (1990) and quoted by J.B. Weiner, 'Beyond the Balance of Nature', 7 *Duke Environmental Law & Policy Forum* 1 (1996) at 7.

[90] A.G. Tansley, 'The Use and Abuse of Vegetational Concepts and Terms', 16(3) *Ecology* 284 (1935) at 302.

[91] See, for example, A.D. Tarlock, 'The Nonequilibrium Paradigm in Ecology and the Partial Unraveling of Environmental Law', 27 *Loyola of Los Angeles Law Review* (1994) at 1121; J.B. Weiner, 'Beyond the Balance of Nature', 7 *Duke Environment Law & Policy Forum* (1996) at 1; and D.B. Botkin, 'Adjusting Law to Nature's Discordant Harmonies', 7 *Duke Environmental Law & Policy Forum* (1996) at 25. This article purposefully sidesteps broader discussion the merits and demerits of the 'ecosystem management' approach to conservation, which have been the focus of much debate in the United States, but less prominent in the UK. For a classic starting point on the extensive literature, see, R.E. Grumbine, 'What is Ecosystem Management? 8 *Conservation Biology* (1994) at 27 and, covering more recent developments, R.O. Brooks, R. Jones and R.A. Virginia, *Law and Ecology: The Rise of the Ecosystem Regime* (2002).

of ecosystems and the elusiveness of identifying, measuring and realising what is to count as a 'satisfactory' ecological state may explain why binding standards of this kind have previously been resisted in national law.

For example, an opportunity arose to introduce ecological quality standards as statutory water quality objectives under the Water Resources Act 1991.[92] However, proposals to establish ecological quality objectives for water, and to regulate effluent discharges to ensure that these were met, came to nothing for reasons which reflect broader difficulties with this kind of objective.[93] In 1995, the UK Government took the view that quality standards for water use classes should be kept as simple and cost effective as possible by only setting parameters that were objective and properly measurable. Following this approach, a proposal for a water quality category for 'general ecosystems' was abandoned because existing methodologies did not allow sufficiently clear parameters to be established and monitored. Moreover, it was thought that the biological quality of rivers could not be directly linked to controls applied through effluent discharge consents, since there are factors other than water quality which affect biological communities. It would not be possible to know whether biological water quality objectives were capable of being achieved by pollution-control measures alone. Consequently, it would not be reasonable to impose potentially unachievable water quality objectives as legally binding obligations.[94]

The adoption of Annex V to the Water Framework Directive presupposes that a methodology for assessing ecological quality of waters is now capable of being devised and will be sufficiently rigorous to allow obligations of this kind to be provided for in law. However, the question remains whether it will always be possible to ensure that any specified level of ecological quality of water, required by the Annex, can actually be realised in practice.

The central difficulty remains that natural populations of any species may be subject to wide demographic variation due to a range of factors that are imperfectly understood and may be of a non-anthropogenic kind. Populations of many aquatic organisms, for example, will show significant seasonal variation, particularly where migratory species are involved, variations due to site-specific conditions and variations, perhaps for largely unknown reasons, which are not necessarily related to water quality or hydromorphology.[95] The assumption that a poor ecological status of

[92] Under sections 82–84 Water Resources Act 1991. See the Surface Waters (River Ecosystem) (Classification) Regulations 1994 SI 1994 No.1057, though it is understood that no designation has ever been made of any waters for which water quality objectives are established under these Regulations.

[93] A comparison may also be drawn with the difficulties that have arisen in establishing water quality standards, at state level, for designated used such as fisheries under the United States Clean Water Act (33 U.S.C. section 1313(c)(2)(A) (2000)) where there has been a reluctance to factor in non-water quality-related threats to species, if necessary, recognising the need for a precautionary element in the assessment of such threats. See C.N. Johnston, 'Salmon and Water Temperature: Taking Endangered Species Seriously in Establishing Water Quality Standards', 33 *Environmental Law* (2003) at 151. See also R.W. Alder, 'The Two Lost Books in the Water Quality Trilogy: The Elusive Objectives of Physical and Biological Integrity', 33 *Environmental Law* (2003) at 29, on the broader failings of the Clean Water Act to secure 'physical and biological integrity' of waters.

[94] See also Department of the Environment, *Freshwater Quality: Government Response to the Sixteenth Report of the Royal Commission on Environmental Pollution* (1995) at 10.

[95] See R.W. Edwards, 'Introduction' in P.J. Boon and D.L. Howell (eds), *Freshwater Quality: Defining the Indefinable* (1997) at 3 and K.B. Pugh, 'Organizational Use of the Term 'Freshwater Quality' in Britain' ibid at 20. For more instances of the ways in which a water body can be subject to variation for natural or other causes, see European Commission, Common Implementation Strategy for the Water Framework Directive (2000/60/EC), *Guidance Document No.13: Overall Approach to the Classification of Ecological Status and Ecological Potential* (2005) Annex I para 3.3.

particular waters is always due to anthropogenic influence, need not, therefore, be well founded. Likewise, the supposition that an 'improvement' in water quality or alteration of hydromorphological conditions is guaranteed to secure a corresponding improvement of the ecological status of those waters, perhaps to realise a particular ecological quality standard, is far from established.[96] In short, it may be impossible to meet an ecological quality standard, first, because it is not known what action is needed to realise it or, second, because the failure to meet the standard is due to non-anthropogenic reasons that no human action can prevent.

The contrast between ecological quality standards and environmental quality standards in this respect is readily apparent. An environmental quality standard which, for example, limits the maximum amount of a chemical that may be present in a sector of the environment is always, in principle, achievable where that chemical enters the environment by human agency. Taking regulatory action to prohibit or restrict the entry will ensure that, sooner or later, the standard is met. An ecological standard that requires that a certain composition or abundance of particular species of flora or fauna must be present in a specified part of the environment cannot be similarly guaranteed. This is particularly so where the means of achieving it is not known or the reasons for a failure to meet the standard are non-anthropogenic. The causality relationship, underlying environmental quality standards and mechanisms for their realisation may not necessarily hold insofar as ecological quality standards are at issue.

The concern, therefore, is that imposing a legal requirement that an ecological standard must be achieved may be requiring the unachievable unless the instability of ecosystems is somehow built into that standard. Clearly, there is a practical challenge involved in reconciling the need for explicit and determinate ecological quality standards with natural variability, but variability in environmental quality has been recognised in previous Community legislation concerning water quality.[97] Perhaps, a comparable approach to natural variability needs to be somehow incorporated in relation to ecological quality standards. Depending upon the way that precise criteria for abundance and variety of species are eventually formulated, and the extent to which they accommodate variation, Annex V to the Water Framework Directive may be adhering to a paradigm of ecological stability which is no longer endorsed by ecological science. Moreover, the assumption that it makes about the achievability of ecological quality standards may prove to be ill founded.

[96] For example, 'even for those areas, such as the Dutch coastal zone and the Wadden Sea, where it was assumed that the tenfold increase in plant production since the 1950s was controlled by phosphorus, a reportedly significant reduction in phosphorus inputs has not resulted in the expected reduction in plant growth' [European Commission, DG Environment, *Criteria Used for the Definition of Eutrophication in Marine and Coastal Waters* (2001) at 28 citing V.N. De Jong, 'High Remaining Productivity in the Dutch Western Wadden Sea Despite Decreasing Nutrient Inputs from Riverine Sources 33 *Marine Pollution Bulletin* (1997) at 427].

[97] See, for example, the Bathing Water Directive (76/160/EEC) which measures compliance in statistical terms, so that conformity is shown where 95% of samples for imperative parameters and 90% of other parameters are met (other than coliforms which require 80% compliance), with samples being taken at specified intervals and sampling points (Art.5 and Annex). See W. Howarth and D. McGillivray, *Water Pollution and Water Quality Law* (2001) section 5.5.2. On the practical implications of dealing with the uncertainty of data in relation to the classification of variable water bodies, see European Commission, Common Implementation Strategy for the Water Framework Directive (2000/60/EC), *Guidance Document No.13: Overall Approach to the Classification of Ecological Status and Ecological Potential* (2005) Annex I (on the Technical Approach on Achieving and Reporting Adequate Confidence and Precision in Classification).

5.2 'Naturalness'

The ecological keystone of the Water Framework Directive is that the best ecosystems are those that show no signs of human intervention or only minimal anthropogenic impact. So far as it is possible to do so, waters should be maintained at, or restored to, this natural state. The golden age for aquatic ecosystems, it might be speculated, was some time before human activities first began to impact upon them, and the strategic ecological objective seems to be that of returning waters to this state insofar as this is feasible.

Even in those countries where large areas of land have escaped the most obvious impacts of human development, there are profound doubts about the existence of truly pristine ecosystems. As has been confidently asserted,

[t]here is no longer any part of the Earth that is untouched by our actions in some way, either directly or indirectly, there are no wildernesses in the sense of places completely unaffected by people.[98]

However, this passage needs to be read as a broad statement which encompasses the full range of effects attributable to non-developmental impacts, such as climate change, ozone depletion, migration of toxic substances, destruction of habitat, wildlife extinction and introduction of non-native species.[99] The assertion that no genuine 'wilderness' exists is scientifically incontrovertible insofar as it is impossible to find any area of the globe that is completely unimpaired by any of these factors. Nonetheless, there is a perception that requiring a total absence of any measurable form of human impact for an area to qualify as a 'wilderness' is setting too high a standard, and areas should not be disqualified where the impacts are of an indirect or imperceptible kind. Ecological scientists might justifiably assert that this willingness to accept areas as pristine, where they have been changed by human action, is an illusion or self-deception. Nonetheless, most of us, placed in an area hundreds of miles from human habitation, without any discernable signs of development or other human impact, could hardly be accused of misusing the English language by describing such an area as a 'wilderness'. The dispute, therefore, is about the disparity between common perception and ecological science.

The debate about the existence of wilderness, or how 'wilderness' is to be defined, is not directly relevant to the UK where claims to areas of land with wilderness status are not commonly made. However, the argument is paralleled by one couched in the equally obscure terminology of 'naturalness' and the arguably illusory character of areas of land claimed to be 'natural'. As has been pointed out,

There are no truly natural areas left in Britain. Everything except remote cliff ledges has been affected either directly or indirectly by man...Nature is always trying to restore some sort of

[98] D.B. Botkin, *Discordant Harmonies: A New Ecology for the Twenty-First Century* (1990) at 194 and see also B. McKibben, *The End of Nature* (1990).

[99] B. Pardy, 'Changing Nature: the Myth of Inevitability of Ecosystem Management', 20 *Pace Environmental Law Review* 675 (2003) at 679. Similarly, it has been suggested that even upland rivers in Britain are significantly damaged by acidification, excessive penetration of sunlight increasing water temperature, soil erosion clogging the gravel where fish spawn and dams and weirs blocking the passage of migratory fish (Anon, 'Defining Ecological Quality: The Water Framework Challenge', 347 *ENDS Report* December (2003) at 22.

equilibrium, and given sufficient time she succeeds in establishing new communities, into the organisation of which the human factor may enter to a greater or a lesser degree.[100]

The unavoidable fact is that the national landscape has been almost completely modified by the activities of past generations through a range of agricultural practices and development activities. The extent of human intervention is such that almost nothing remains that is 'natural', in the sense of never having been impacted upon directly or indirectly by human beings. Similar observations may be offered about the 'natural' status of aquatic ecosystems, where human intervention over many centuries has resulted in the extensive hydrological modification of waters and their catchments, and involved the introduction of many non-native species of fauna and flora that would not 'naturally' be present. In a strict sense, the 'natural' status of land, water and ecosystems might be seen to be 'corrupted' beyond redemption.

On the other hand, it is far from clear that 'naturalness' is generally understood in the minimal anthropogenic impact sense adopted by the Water Framework Directive or that achieving this state is actually seen as a contemporary conservation priority.[101] In the first place, it is far from clear that most of us would understand 'naturalness' in the sense of being totally pristine. In the second place, the quest for minimal anthropogenic impact dismisses or devalues human impacts that may actually be regarded as ecologically beneficial.

A good legal example is to be seen in the *Star Pit* case,[102] where the dispute was about the powers of the Nature Conservancy Council to designate a Site of Special Scientific Interest.[103] The site at issue consisted of an area of shallow saline water, which lay in a disused clay pit, and supported a population of scarce water beetles which, the Council maintained, justified the designation of the site. The peculiarity of the factual situation was its artificiality. The circumstances that created and maintained the habitat for the population of beetles were the result of the pumping of saline water into the Star Pit from an adjoining area which was used as a landfill site and the pumping of water out into an adjoining dyke. The pumping operations, which had taken place for a relatively short period of less than ten years, had the effect of maintaining the shallow depth of saline water upon which the beetles depended. If the salinity of the water had decreased, or the water level been allowed to rise to a higher level, it was thought that the population of beetles would have been lost. Both of these

[100] W.D. Adams, *Nature's Place* (1986) at xi. See also W.D. Adams, *Future Nature* (1996) at 5, where the same author even seems to have had some doubts about the 'naturalness' of the coastline: 'The coast of the UK seems to be natural and unchanging, but its naturalness and sense of permanence is to a large extent illusory. Not only is it an illusion, it is one deliberately created, a skilful *trompe l'oeil* ... [Its] naturalness ... is achieved by a whole battery of legal and administrative measures ... and by a wide range of organisations ... [who] make their contribution to the 'naturalness' of the coast ...'.

[101] A contrast may also be drawn between minimal anthropogenic impact and the legal understanding of 'naturalness' in another context. 'Natural habitats' is defined for the purposes of the Habitats Directive (92/43/EEC) to mean 'terrestrial or aquatic areas distinguished by geographic, abiotic and biotic features, whether entirely natural or semi-natural' [Art.1(b)]. In *Newsum and Others v Welsh Assembly Government* [2004] EWHC 50 (Admin) at paras 118–120, it was stated that 'semi-natural' means natural 'partly by the activity and effect of nature and partly by the activity and effect of man' and, on that basis, the argument that the site was not seminatural was rejected.

[102] *R v Nature Conservancy Council, ex parte London Brick Property Ltd* [1996] Env LR 1.

[103] Under section 28 Wildlife and Countryside Act 1981, now amended by the Countryside and Rights of Way Act 2000.

factors depended upon the continuation of pumping operations which were entirely under human control.

Legally, the *Star Pit* case is important in establishing that the prospect of loss of a habitat at some stage in the future is not a reason why an area should not be designated as a Site of Special Scientific Interest, providing that it meets the special interest criteria at the time when the designation is confirmed. Factually, the case provides a pertinently extreme illustration of the dependency of nature upon conditions created and maintained almost entirely by human intervention. Far from minimal anthropogenic impact, the survival of the beetle population actually required significant anthropogenic impact on a continuing basis.

The *Star Pit* case might be seen as an acute example of biodiversity being dependent upon human activity, but it is far from being an isolated example of the need for conservation of a non-natural ecosystem. A rough and ready survey of the seven site-specific cases on 'nature conservation' reported in the 2004 volume of the *Environmental Law Reports* indicates a high proportion of situations where the site at issue had little, if any, claim to be 'natural' in the minimal anthropogenic impact sense.

Hence, in *Fisher v English Nature*,[104] the site, which was found to be properly confirmed as a site of special scientific interest because of its bird population, was an area of intensively farmed land, almost entirely the result of intensive farming activities and certainly not a 'natural' habitat.[105] In *Newsum v Welsh Assembly*,[106] the site at issue was a disused quarry in which water had accumulated and had been colonised by protected great crested newts over the previous twenty years. Although the issue was specifically raised as to whether this site was a sufficiently 'natural' habitat for the purposes of the Habitats Regulations, it was found to be within the broad category of a 'semi-natural' habitat within the meaning of the Regulations and the Habitats Directive.[107] In *Trailer and Marina (Leven) Limited v Secretary of State for the Environment, Food and Rural Affairs and English Nature*,[108] the site at issue was a length of canal which had been constructed in 1802, but ceased to be used by commercial traffic in 1935.[109] Again, given the human construction of the canal, it must be characterised

[104] [2004] Env LR 7 [2003] EWHC 1599 (Admin) QBD (Admin Ct) (under section 28 Wildlife and Countryside Act 1981, as amended).

[105] The area was found to be especially suitable for nesting by stone curlew because cultivation had resulted in large areas of relatively bare ground with only short vegetation. This suited the curlews because the unobstructed vista allowed them to be aware of predators, and the open stony ground allowed their eggs to be camouflaged.

[106] [2004] Env LR 39 [2004] EWHC 50 (Admin), reversed by the Court of Appeal in [2004] EWCA (Civ) 1565.

[107] Conservation (Natural Habitats etc) Regulations 1994 (SI 1994 No.2716) and the Habitats Directive (92/43/EEC). See n 101 above on the definition of 'natural habitats' (including 'semi-natural habitats') under Art.1(b) Habitats Directive.

[108] [2004] Env LR 40 [2004] EWHC 153 QBD (Admin) (subsequently see *R (on the Application of Trailer & Marina (Leven) Ltd) v Secretary of State for the Environment, Food & Rural Affairs and English Nature* [2004] EWCA Civ 1580) where the dispute concerned compensation in relation to management agreements for sites of special scientific interest (under sections 28–32 Wildlife and Countryside Act 1981, as amended by section 75(1) and Schedule 9 Countryside and Rights of Way Act 2000) and its compatibility with rights of peaceful enjoyment of property (under Art.1 of Protocol 1 of the European Convention on Human Rights).

[109] Perhaps as a result of the disuse, and because of the clean and calcareous water supply, the canal supported an exceptionally wide range of aquatic plants and was rated amongst the best national examples of standing water plant diversity.

as a non-natural habitat, but was nonetheless noted as being one amongst a number of canals supporting the greatest diversity of plant species of all categories of still waters.[110]

Clearly, it would be rash to draw categorical inferences from such a limited survey of the factual contexts of cases raising quite different legal issues. Nonetheless, if those disputes that have come to be considered by the national courts are anything to go by, the application of conservation law to non-natural habitats is a major concern. The indications are that a significant proportion of those sites that give rise to legal proceeding could not be categorised as 'natural', in the minimal anthropogenic sense, but this is not seen as having any adverse reflection upon their conservation importance.

It is difficult to see how far this line of reasoning can be pursued. Recognising the non-natural character of much that is considered worthy of ecological protection is not the same thing as supposing that artificiality is worthy of ecological protection for its own sake. Nonetheless, the point remains that 'naturalness', as it is commonly understood, is a remarkably flexible concept that does not preclude human impact and, in the circumstances of an extensively developed country, many conservation tasks seem to be intimately dependent upon continuing human intervention. The disparities, therefore, between what is commonly regarded as being of ecological value and the need for minimal anthropogenic impact approach are readily apparent. The apparent failure of the Water Framework Directive to recognise this disparity in approaches to ecological valuation must, therefore, be a matter of concern.

[110] The other four reported cases on site-specific nature conservation, and the sites at issue, were the following. First, *R.* (on the *Application of Brown) v Secretary of State for Transport* [2004] Env LR 2 [2003] EWHC 819 (Admin) QBD (Admin Ct) involving a challenge to a planning permission and compulsory purchase orders for the construction of a bypass bridge over the Taw estuary on the basis that an existing site of special scientific interest (under section 28 Wildlife and Countryside Act 1981) should have been designated as a special protection area under the Wild Birds Directive (79/409/EEC) and that a licence should have been obtained in respect of deliberate disturbance of protected species [under Reg.39 Conservation (Natural Habitats etc) Regulations 1994, SI 1994 No.2716]. The site was an area of saltmarsh which seems to have been 'natural' insofar as there was no indication of it having been modified by human activity, though few details of the character of the site are provided in the report. Second, *Bown v Secretary of State for Transport, Local Government and the Regions* [2004] Env LR 26 [2003] EWCA Civ 1170 (the Court of Appeal decision in Env LR 2) in relation to the planning permission allowing the construction of a bypass bridge over the Taw estuary. Although more evidence was considered as to the populations of protected birds inhabiting the site, no further information was provided as to its natural or modified character. Third, *Moggridge v National Assembly for Wales* [2004] Env LR 18 [2003] EWHC 2188 (Admin) QBD (Admin Ct), concerning challenge to compulsory purchase orders to allow road construction associated with a business park development, amongst other things, because construction would disturb a protected bat population and insufficient regard had been given to obligations under the Habitats Directive (92/43/EC) and the Conservation (Natural Habitats etc) Regulations 1994 (SI 1994 No.2716) giving rise to an offence concerning the disturbance of bats. Although information about the site was sparse, the project was located in an urban area surrounded by coal mining, industrial and agricultural communities. It was noted that ongoing surveys indicated that the bats roosted in holes in trees on land on the site of the proposed road, and these trees would need to be felled to allow the road to be constructed. The 'natural' character of the woodland was not specifically addressed. Fourth, *R (on the Application of Friends of the Earth) v Environment Agency* [2004] Env LR 31 concerning a challenge to a modification of a waste management licence allowing the dismantling of ships containing toxic waste substances at a location close to a site of special scientific interest and a special area of conservation (under the Habitats Directive (92/43/EC) and the Conservation (Natural Habitats & c.) Regulations 1994, SI 1994 No.2716). The dismantling site was located in a heavily industrialised area, between a power station and a chemical plant, but fronted on to a channel, directly opposite to the special area of conservation. The area itself was described as comprising intertidal sand and mudflats, rocky shore, saltmarsh, freshwater marsh and sand dunes, and supporting large numbers of water birds. The general impression was of a natural 'oasis' closely surrounded by the most intrusive kinds of industrial land use.

5.3 Human Beings and Ecosystems

The issues concerning 'naturalness' prompt the broader question of the extent to which human beings should be seen as a part of, or apart from, natural ecosystems. On this, it is notable that the minimal anthropogenic impact requirement under the Water Framework Directive takes the extreme position that the best ecosystems are those in which human beings play no part, or almost no part. Depending upon what view is taken of the concept of 'naturalness', it is at least arguable that the all-pervasiveness of human impacts is such that an ecosystem that genuinely met this criteria does not exist, for the reasons given previously. However, defining high-status ecosystems out of existence seems a rather pointless exercise, and it may be more productive to focus attention upon the exact meaning of 'minimal' in the context of minimal anthropogenic impact.[111]

The dilemma is whether human beings should be placed within or outside ecosystems. The argument for inclusion is that humans are animals that have lived alongside other species for a great length of time. They have as good a claim to be a 'natural' part of an ecosystem as any other species that inhabit it. There is little apparent difficulty in accepting this view in relation to primitive hunter-gatherer *Homo sapiens*, despite increasing evidence of the significant impacts they had upon ecosystems even in prehistoric times.[112] However, recognising the biological claim of human beings to be regarded as a part of an ecosystem leads down a slippery slope to the conclusion that all human impacts are, therefore, 'natural' modifications of ecosystems. The inference that buildings, roads and all the other infrastructure that is a part of life in a developed country is a part of a natural ecosystem is one that must be resisted if only for the reason that it seems to rob the concept of 'naturalness' of any distinct meaning. A similarly absurd consequence might be that ecological quality standards would need to be formulated for the number and kind of human being that would need to be present in each kind of ecosystem!

The dilemma of characterising the place of human beings in ecosystems is a modern reformulation of the most ancient of philosophical challenges, that of determining the extent to which human beings are in or out of nature, and this quandary is not resolvable outside equally weighty debates about the essential character of 'human beings' and 'nature'.[113] Nonetheless, some insights into whether human beings should be seen as residents of, or intruders upon, natural ecosystems have been offered in the analogy of a marketplace. Hence, it is suggested that

[111] On the meaning of 'minimal', it has been noted that the Water Framework Directive defines '*good* ecological status', amongst other things, to allow 'low levels of distortion' of biological elements resulting from human activity, but these should deviate from undisturbed conditions 'only slightly' (see Annex V Table 1.2), see Section 4 above. 'Minimal', therefore, seems to be used to mean something less than 'slight' in the terminology of the Directive, but the practical meanings of these terms remain to be determined. On the implications of defining high-status ecosystems out of existence, see the comments attributed to Paul Logan of the Environment Agency reported in Anon., 'Defining Ecological Quality: The Water Framework Challenge' *ENDS Report* 347, December 22 (2004) at 24.

[112] See D.B. Botkin, *Discordant Harmonies: A New Ecology for the Twenty-First Century* (1990) at 52, giving the example of how populations of tree species have been extensively modified by burning by American Indians and see L. Gooden, 'Preserving Natural Heritage: Nature as Other', 22 *Melbourne University Law Review* (1998) at 719 on the need to displace the 'separate' vision of people and nature with a more integrative approach to natural heritage law.

[113] For an interesting recent discussion of the broader context, see S. Coyle and K. Morrow, *The Philosophical Foundations of Environmental Law: Property, Rights and Nature* (2004).

human beings move from being benign components in natural ecosystems at the point where they exert disproportionate influence upon that ecosystem by the exertion of a monopoly power over environmental modification.[114] Conversely, the test of 'disproportionate influence' in the use of a monopoly power may be seen as another equally slippery slope in begging the question, disproportionate to what?[115] In which case, it has to be acknowledged that humans are unavoidably immersed in nature but have to make choices about how to act. The monopoly power of humans over other nature is not going to disappear but needs to be exercised benignly in the interests of all ecosystem components, including human beings: 'Nature in the twenty-first century will be a nature that we make; the question is the degree to which this moulding will be intentional or unintentional, desirable or undesirable'.[116] Put another way, the key legal choice to be made is about the allocation of rights and duties that distinguish humans from other components of ecosystems and determine how individuals are allowed to act in relation to other kinds of biodiversity. Humans, therefore, are part of nature, but have powers and obligations that distinguish their position from the rest of nature.

All this is difficult to reconcile with the minimal anthropogenic impact requirement under the Water Framework Directive, which supposes that any human impact upon an ecosystem inevitably reduces its value. Although ambiguous as to the meaning of 'minimal', the requirement seems close to a denial that humans are a part of nature. Beyond that, minimal anthropogenic impact suffers from the almost exclusive focus upon the negative impacts of human beings featured in the human–nature debate. The possibility that human beings might ever have a positive effect upon ecosystems seems to be excluded as a matter of principle.

These assumptions have been seen to lead to counter-intuitive conclusions when applied to extensively developed countries like the UK. As the previous discussion of 'naturalness' has demonstrated, the ordinary understanding of naturalness does not preclude human involvement, and a large proportion of legal disputes seem to be about non-natural habitats which have been quite substantially influenced by human impacts. The fact that these ecosystems have value because of human involvement, rather than despite it, seems to show a degree of symbiosis between humans and other living things which contradicts valuation by minimal anthropogenic impact. Undeniably, many of the disputes reaching the courts are about parcels of nature that human beings have themselves created, but they are valued nonetheless because of that. In short, ecological valuation according to the minimal anthropogenic impact principle seems to rest upon a 'them and us' philosophy that measures the value of ecosystems according to the degree of human exclusion and denies that human impacts can ever be beneficial to ecosystems. Both of these assumptions are difficult to defend for the reasons that have been given. The two-way relationship of interdependency between humans and the global ecosystem may actually be greatly more significant than minimal anthropogenic impact recognises.

[114] B. Pardy, Changing Nature: the Myth of Inevitability of Ecosystem Management', 20 *Pace Environmental Law Review* 675 (2003) at 684–685. Also see O.A. Houch, 'Are Humans Part of Ecosystems?', 28 *Environmental Law* (1998) at 1, suggesting that although humans are parts of ecosystems, they are not the measure of ecosystems and management goals need, primarily, to consider species other than human beings.

[115] J.B. Ruhl, 'The Myth of What is Inevitable under Ecosystem Management: a Response to Pardy', 21 *Pace Environmental Law Review* 315 (2004) at 319.

[116] D.B. Botkin, *Discordant Harmonies: A New Ecology for the Twenty-First Century* (1990) at 193.

The alternative to the 'back to nature' philosophy underlying the Water Framework Directive would be an approach to ecological valuation which takes greater account of human interrelationship with species and habitats. Certainly, ecosystems that have attained and maintained a degree of stability, despite, or because of, human involvement should be protected from sudden or serious disruption. For example, longstanding farming practices involving particular livestock grazing or land use regimes, which have enabled distinctive kinds of flora and fauna to thrive, should be protected by legal means where necessary to maintain a level of biodiversity.[117] Similarly, forestry activities that have proved their value in supporting the range of biodiversity characteristic of coppiced woodland should be continued. Many other kinds of developed land use might equally give rise to important and valuable ecosystems which justify legal protection. However, caution clearly needs to be exercised in relation to abrupt developmental changes in land use that may cause ecological damage because of the incapacity of key species to adapt to such changes. Nonetheless, an approach which focuses upon the sustainability[118] of diverse ecosystems with a human component seems to correspond more closely with general perceptions of ecological valuation and offers a degree of flexibility that minimal anthropogenic impact denies. Hence, ecological quality standards should reflect and respect balanced symbiosis between human and non-human ecological components, in many instances, not so much despite the human component as because of it.

6. Conclusions

If ecological law is to catch up with the consequentialist methodology of environmental quality law, ecological quality standards need to be formulated and legal powers used purposively to ensure that those standards are achieved and maintained. Generalised concerns with ecological impacts in environmental quality directives, and the obscure provision for adverse ecological impacts to which these give rise, are an unsatisfactorily indirect approach. Whilst recognising present limitations of knowledge of the dynamics of ecosystems, and the character and extent of human impacts upon species and habitats, ecological quality standards are needed to specify explicit and determinate requirements for the biological constituents of the environment. The formulation of ecological quality standards is a significantly different exercise from that of establishing environmental quality standards. Environmental quality standards may coherently be based upon the achievement of levels of anthropogenic

[117] Notably, the Habitats Directive (92/43/EEC) lists under Annex I (concerned with Habitat Types of Community Interest whose conservation requires the designation of special areas of conservation) lowland and mountain hay meadows (habitat types 38.2 and 38.3). This is a curious example of a terrestrial habitat, which is recognised to be of value at Community level, but necessarily dependent upon an anthropogenic impact on a continuing basis.

[118] 'Sustainability' here refers to situations where a reasonably consistent level and quality of biodiversity has been attained over time and nothing prevents abrupt discontinuation. It is necessary to contrast and distance this idea from that of 'sustainable development', which is concerned, amongst other things, with changes to land use that may be justified on the basis of an assessment of developmental benefits weighed against environmental costs [on the vast literature on sustainable development a good starting point is M. Sunkin, D. Ong and R. Wight, *Sourcebook on Environmental Law* (2nd edn, 2002) Chapter 1]. Ecological sustainability is suggested as a basis for identification of ecosystems with a human component that should be ecologically valued and, therefore, justify legal protection, not to determine the very different issue of whether that ecological value may be sacrificed in return for a developmental gain.

contamination levels that are close to zero, since there is no great difficulty in regarding this as a 'natural' state of the environmental media. In relation to ecological quality standards, however, the 'baseline' against which such standards need to be set is less clear, and setting such standards involves challenging issues of ecological valuation alongside the appreciation that there are practical limits to the achievability of any standard because of the variability of nature.

The incorporation of ecological quality criteria, as a measure of the quality of an environmental media, under the Water Framework Directive is commendable. However, the criteria for ecological valuation, and particularly the criterion for high-status ecosystems, generate counter-intuitive consequences when applied in the context of an extensively developed country such as the UK. In particular, the ambiguity of the concept of 'naturalness' and the degree of symbiosis between human and non-human components of ecosystems seem to be neglected or underestimated. Minimal anthropogenic impact turns out to be either an elusive or an inappropriate standard to address undeniably important conservation concerns. Somehow, the initial approach to ecological quality standards needs to be developed to accommodate unavoidable ecological change and to recognise the potential value of anthropogenic impacts where these are sustainable and conducive to maintaining or enhancing biodiversity. The uneasy feeling is that the Water Framework Directive has wedded itself to some dubious assumptions about ecological valuation.

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