

## Valuing the Water Environment: A Review of International Literature

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This paper summarises an international literature review undertaken to inform Scottish implementation of the Water Framework Directive, which explored evidence from across the globe concerned with public perceptions and values in relation to the water environment as a basis for comparison with other aspects of the environment and with the Scottish situation. Its sources were mainly recent, published English-language academic literature and web-accessible resources. Its main topics are: water quality, quantity and safety, recreational and tourist use, aesthetics and landscape, the water environment as nature, resource management and education.<sup>1</sup>

### Main Findings

- The literature reviewed reflects a variety of methodological approaches, with economic valuation and quantitative surveys being prevalent. Information about public perceptions of the water environment for Scotland and the UK is scarce and largely concerns *water quality*. English-language texts from European and international sources offer more varied evidence, and the academic literature largely originates from North America, Australia and New Zealand.
- Most academic literature investigates environmental attitudes on a case-study, site-specific level, and there are significant gaps in the knowledge base.
- Policy thinking and formation on the water environment tend to reflect ecological and economic priorities rather than social values and perceptions. Limited evidence was, therefore, found for the integration and taking account of public perceptions and attitudes in terms of policy engaging with or commissioning research. Available information, much of it from Germany and New Zealand, again, tended to concern perceptions and views of *water quality*.
- Across the board, people's views and values towards the water environment are apparently influenced by diverse factors: socio-economic, demographic, geographical and cultural variables; one's prior knowledge of, interaction with, and use of a water environment, and its nature.
- Perceptions of, and attitudes to, *water quality* are the most important environmental priority in relation to other water environmental concerns. Evidence suggests that the public consider themselves to be well informed about this, but that further education and increased awareness are required in relation to particular issues of *water quantity*.
- Education, information provision and communication are fundamental means by which the values that different groups of people assign to the water environment may be influenced by policy-makers, those responsible for managing the water environment over the long term and those concerned to engage the public in that management.

<sup>1</sup> A full report from the review is accessible at:  
<http://www.scotland.gov.uk/Topics/Research/Research/17692/SocialResearchPubs/Introduction>.

## Background

Scotland depends socially, culturally and economically on the quality of its water environment. The EC Water Framework Directive 2000/60/EC (WFD) applies to all water in the natural environment and is implemented in Scotland by the Water Environment and Water Services (Scotland) Act 2003. The Scottish Executive and the Scottish Environmental Protection Agency (SEPA) need to make informed, defensible decisions which are informed by the values and priorities expressed by the Scottish public in regard to the desirable outcomes for WFD implementation. A clear need, therefore, exists for a good understanding of the values of the public in relation to the (water) environment. The Scottish Executive is, therefore, engaged in a programme of research to elicit public priorities and values. This has entailed a public attitudes survey, the findings from which have now been published;<sup>2</sup> qualitative in-depth research with the public, which is in progress; and the review of international evidence which is reported here.

## Key Aims and Methodology

The aim of the literature review was to examine recent (from the past five years) and contemporary research and thinking on how the people of Scotland view the natural environment and what their environmental priorities might be, with a focus on water. The review includes evidence from Scotland and the UK level, as well as relevant texts from Europe, and the rest of the world. It considers perceptions of, and values placed on, the water environment.

The key objectives for the review are to explore: (1) evidence for perceptions of the water environment amongst the general public in Scotland and the UK; (2) specific evidence in other countries on attitudes to the water environment; (3) the relative values which are placed on different attributes of environmental features and issues; and (4) whether the views of different groups of people vary in significant ways and what factors influence shared and divergent views.

Using a set of search terms, the review identified 177 accessible references, of which 132 consisted of academic literature, with the remainder being evidence for relevant policy and datasets. The main topics for the review were derived from recurrent themes in the evidence: water quality, quantity and safety, recreation and tourism use, aesthetics and landscape, water as part of nature, resource management and education.

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<sup>2</sup> This is entitled "Valuing the Water Environment: A Survey of Scottish Public Attitudes" and is available at <http://www.scotland.gov.uk/Topics/Research/Research/17692/SocialResearchPubs/Introduction> The Research Findings is available in hard-copy.

## Water Quality

'Quality' refers to the level of purity and pollution of water. Forty-three texts primarily concerned with perception of, and attitudes to, water quality and pollution were reviewed.

Few exclusively Scottish studies exist which analyse public perceptions and attitudes toward a polluted environment. However, existing studies indicate that water quality is a concern amongst the public and in many studies it is the most significant factor affecting perceptions of, and attitudes to, the water environment.

The literature shows that an attitude toward water quality may be influenced by a number of factors which may be described in terms of a person's perceptions, valuing and experiences of the water environment more generally: whether and how they presently use the water environment; whether they perceive they have an option to use the water environment in the future; altruism (whether they are concerned that other people can enjoy the water environment); a sense of bequest (how important is leaving it for future generations); existence values (the water environment should exist even if no one sees it); intrinsic values (all ecosystems have the *right* to be supported by humans); and obligation (general public have a responsibility to respect the water environment).

European studies indicate public levels of concern about water pollution. In a survey for the European Commission, water pollution was identified as one of the environmental problems that people worry most about. Similar results were found by the Irish Environmental Protection Agency, which has an ongoing research programme entitled "Environmental Attitudes, Values and Behaviour in Ireland".

A number of academic studies of perceptions of water quality originate in the USA. For example, a survey of beachgoers in California demonstrated that Los Angeles county residents view the ocean more as a place of pollution than a vibrant and healthy place for boating and swimming. Moreover, results suggest that residents tend to hold perceptions of water quality that are at odds with data on bacteriological measures of water quality and that these perceptions are influenced by the media. A common emerging theme in all studies is that perceptions of water quality vary by socio-demographic (especially, age, income and education level) and geographical variables (distance from waterbody).

Information about policy engagement from Ireland, Denmark, Germany and France was reviewed, but more evidence was accessible in English from New Zealand than elsewhere. Small-scale surveys undertaken there by regional councils show that water pollution emerges as the pre-eminent environmental issue for many regions and that the public believe the main causes of water pollution are farming, sewage and stormwater.

## Water Quantity and Safety

Water quantity is defined here as the volume of, and supply available from, a waterbody. Related to this is the need for water reuse, water scarcity, and the possibility of a resultant water conflict. Water safety encompasses public health, flooding and risk, where risk is defined as “the interaction between vulnerability and hazard, where hazard is the probability that a phenomenon liable to cause a disaster will occur, and vulnerability the condition whereby a population is exposed”.<sup>3</sup> One such risk is flooding.

Fifty-eight texts were reviewed, many of which concentrated on safety and derived from a North American or Middle Eastern context. A common theme in all studies is that attitudes to flood risk and willingness to accept flood prevention schemes vary according to institutional, locational and socio-economic factors.

Public perceptions of water quantity are not well documented in the Scottish, UK or wider-European literature.<sup>4</sup> Literature from some other countries does, however, better document attitudes to water quantity. Policy evidence in Australia and New Zealand is paramount. In Australia the CSIRO Tropical Ecosystems Research Centre undertakes a number of projects to investigate the values the public assign to water environments. One particular study investigates the attitudes of Aboriginal land owners to water quantity and includes the development of catchment models to resolve conflicts of water use. In New Zealand, the Ministry for the Environment has developed a Water Allocation Programme, aimed at sustainable development of water resources by removing unnecessary constraints to water availability and promoting efficiency of use to reduce the risk of scarcity.

With increased water scarcity in several regions of the world, conflict over the resource results. Moreover, use values (the various uses that the public has for water environments) contributes to conflict. The literature demonstrates that water conflicts regularly arise in relation to: resources; marine reserves and fishing; nature protection; conservation versus development of water environments; and tourism and recreational activities.

As perceptions of water quantity and safety vary by social, demographic and geographical variables, the literature demonstrates the importance of bringing together the divergent values of different (for example, recreation) groups, and the role of education and information-provision, stakeholder dialogue and methods such as workshops and consultations, to achieve conflict resolution over the water environment or water resource.

3 Surez, F.S. and R.J. Lombardo (2004) “Pitting the polluted against the flooded: water resource management in the Tigre, Buenos Aires.” *Environment and Urbanization* Vol. 16, No. 2, pp. 185-197.

4 Although this may be expected to change, even if temporarily, given the widespread media coverage of water shortages across Europe during recent summer seasons.

## Recreation and Tourism

Water is a key aspect of outdoor recreation and tourism, whether that engagement is relatively ‘passive’ (for example, picnicking or walking on the shore) or ‘active’ (for example, swimming and boating). Thirty-two texts on this theme were reviewed, predominantly concerned with recreational and tourist values in relation to the recreational (water) environment. The environmental perceptions of specific recreation groups, such as fishers and boaters, are considered.

There are relatively few Scottish and UK studies concerned explicitly with recreational values, perceptions and attitudes in relation to the water environment, but they indicate that the public regard water environments highly for their recreational values. Results often show that older people, females, those with high incomes and, almost inevitably, perhaps, those living closer to water areas value the water environment to the greatest extent. Lochs and rivers are important attributes of the tourist and recreation experience, along with mountains, hills, nature and wildlife.

Several studies on the attitudes, perceptions and values of recreation water environments were reviewed from North America, Australia and New Zealand. Many ask respondents what they would be willing to pay to conserve their recreation environment. They also demonstrate that recreationalists perceive the (water) environment in a different way to non-recreationalists and that the relative values (including monetary values) placed on this environment differ according to socio-economic background and other demographic variables and the type of recreation activity engaged in – fishers, for example, value the water environment in a different way to boaters.

## Aesthetics and Landscape

Fundamental to aesthetic perceptions and valuing of the water environment is the concept of ‘landscape’, which can carry multiple, contested, often highly subjective and personal meanings. For the purposes of this review, a generalised notion of ‘landscape’ is taken to be integral to one’s perception of a water environment. Twenty-four texts were reviewed in exploring landscape and aesthetics.

The academic literature suggests that water is one of the most important aesthetic elements of the landscape, with the presence of a water body adding a high value to an outdoor environment. Indeed, one study found that wide views of water can add an average of 59% to a domestic property.<sup>5</sup> However, there are important cultural differences in the meanings attached to the aesthetics of a water landscape and to water as a substance. For example, water can be presented as a dangerous or regenerative force; as

the substance of spiritual and social identity; or as a symbol of power and agency. Aesthetic values assigned to the water environment also vary according to age, with adults and children perceiving the water environment in different ways.

The Australian CSIRO Tropical Ecosystems Research Centre and French Cemagref are examples of research centres where programmes with an explicit policy purpose have been conducted into perceptions of landscape, indicating, for example, that perceptions vary according to the geographic location of respondents.

## Nature

Although nature, like 'landscape' and aesthetic constructions, is a contested concept, it is deployed here in a widely used sense to encompass the various elements of the natural environment. This includes the impacts of vegetation on a person's environmental perception, the ecology of an area and its scientific values, and the importance (or otherwise) of biodiversity. Thirty-five texts were reviewed under this theme.

Evidence originating in Scotland and the UK indicates that although water environments are very important ecosystems for the promotion of biodiversity, biodiversity as a dimension of 'nature', is not a public priority for the water environment. There are significant differences between age groups concerning the importance of nature for the water environment, with its level of importance increasing with a person's age.

Research from a European perspective indicates that the public do not possess a basic knowledge about the functions of nature and that their knowledge of nature and the water environment is limited. Studies from further afield which were reviewed have shown that the presence of vegetation increases the value placed by the public on water environments (for instance, anglers in a US study prefer increased aquatic vegetation in the water environment). Such valuing of the environment in relation to ecological values is determined in part by cultural context.

## Resource Management

Public attitudes to conservation, perceptions of water resources and values were considered, in a review of forty-four texts relevant to the theme of water resource management.

Many studies of the water environment address it with a central concern for resource management. There is a body of evidence documenting the ways in which resource managers value and prioritise the water environment – in

ways which are, unsurprisingly, quite different to members of the public. What also emerges from the literature, is the need for the water resource manager to be cognisant and understanding of the different perspectives of the water environment and levels of engagement with the subject amongst the general public, and the importance of them appreciating that with increased communication, public willingness to participate in water resource management can grow. Evidence from other countries on the effectiveness of engagement (and of *how* to engage) is important for Scotland given the centrality of participation in WFD, so transferable lessons may be taken from elsewhere.

In Scottish and UK contexts, studies suggest that environmental participation often increases in relation to age, being in a smaller household size, home ownership, income, educational attainment, membership of community organisations, and gender (females having higher levels).

A number of European resource management studies have been conducted to inform implementation of the WFD and these often focus on the participatory process. A good example is the ADVISOR programme, which addresses an integrated evaluation for sustainable river basin governance. Five case studies are assessing water management projects in Greece, Portugal, Spain, the Netherlands and Scotland, each demonstrating the importance of involving the public from an early stage in the management process and maintaining communication links.

A plethora of texts exists outwith Europe concerned with the management and conservation of water environments. Although academic literature often emerges from North America, it is in New Zealand where evidence of engagement by policy makers seemed to be most accessible. Again public participation is identified as a key stage within the resource management process.

## Education

Closely related to the theme of resource management is education. For the purposes of this review, education is broadly defined as the provision of information to, and communication with, the public regarding their environment, and in particular the water environment. Information and education are used to persuade the public to adopt behaviours that are compatible with the water environment and to influence values, perceptions and understanding, while still allowing freedom of choice. Forty-five texts were reviewed for this theme.

One Scottish study which exemplifies well the relevance of education to the values placed on the water environment is provided by Storrier and McGlashan (2006),<sup>6</sup> who studied the Forth Estuary Forum's Coastal Litter Campaign, which aimed to raise public awareness regarding beach litter in the Firth

<sup>6</sup> Bourassa, S.C., M. Hoesli and J. Sun (2004) "What's in a view?" *Environment and Planning A*, Vol. 36, No. 8, pp.1427-1450.

of Forth. Beach cleans were implemented as a public participation exercise and evidence suggested that this activity focussed public attention on the issue of marine litter and created a sense of environmental responsibility. Thus, education through activity rather than just information-provision promoted successful environmental education of the public, specifically local communities. Raising public awareness was the only way to guarantee reduced marine litter and education was required to modify public perceptions and behaviours. Other Scottish and UK evidence illustrates the benefits of media campaigns to raise public awareness and influence public perceptions and attitudes.

Furthermore, evidence from Europe, where, as in the UK, education is a key element of WFD implementation, underlines that attempts to educate the public should not assume the existence of a homogenous community of like-minded people.

Beyond Europe, the New Zealand Department of Conservation (DOC) has an important educational role in the country's water management framework. To address public perceptions and understanding of the marine environment, the DOC ran a public awareness campaign (Sea Our Future) during 2004-2005, during which the public was educated on the importance of biodiversity, conservation and the seascape, deriving numerous educational and environmental benefits and illustrating that "information kits" (hard-copy or Internet based resources detailing the importance of the water environment) can be a useful means by which to educate the public.

## Conclusion

This study has shown that there is a multi-disciplinary research base, drawing on a diverse range of qualitative and quantitative methods. Some overall conclusions from the review can be grouped under the following headings: public values and perceptions; priorities; current evidence and gaps in the knowledge-base; and lessons for Scotland.

### ***Public values and perceptions***

The water environment has a range of values, both human and natural. It has use and non-use values, with people engaging with water environments positively (for example, recreation and education) and negatively (for example, generating water pollution or experiencing flooding).

Evidence from across the board suggests that people's views and values towards the water environment are

influenced by a variety of factors, including: socio-economic and demographic differences (gender, age, education, residence, religion, social class, income and employment); geographical and cultural contextual variables (for example, one's country of origin or the location of the waterbody); the extent and nature of prior knowledge of an environment; how one interacts with and uses the water environment; and the type of water environment (for example, seashores are often valued more highly than either rivers or lakes). Variation in values and perceptions is also partly due to differences and uncertainties in different methodological approaches.

These differing values and perceptions can be elicited, harnessed and influenced through education, information-provision, communication and awareness-raising and, when necessary, effective conflict resolution.

### ***Priorities***

Emerging from the literature, public priorities for the water environment appear to be: quality, quantity and safety, recreation and tourism use, aesthetics and landscape, nature, resource management and education. Perception of, and attitudes to, water quality is the most important environmental priority in relation to other (water) environmental concerns.

In addition, the issue of conflict emerges as a recurrent theme. Where concerns over the water environment and resources arise, education is a useful tool with which to resolve conflict alongside tailored and effective information and communication, fundamental means by which the values that different groups of people assign to the water environment may be understood and, where need be, influenced. There is a need to ensure that the public are well informed (for example, through media campaigns) for the purposes of fostering effective participation and to avert certain forms of conflict. This review indicates that the public are well informed with reference to water *quality*, but that increased awareness is required in relation to water *quantity*.

### ***Current evidence and gaps in the knowledge-base***

In comparison with other countries, such as some of those implementing WFD, North America, Australia and New Zealand, evidence for perceptions of the water environment amongst the general public in Scotland (and, indeed, the UK) is sparse. Available evidence is largely concerned with perceptions of water quality, so there are considerable gaps in the knowledge-base.

The literature reflects diverse methodological approaches to better understanding people's perspectives and their relationships with the water environment, although common

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6 Storrier, K.L. and D.J. McGlashan (2006) "Development and management of a coastal litter campaign: the voluntary coastal partnership approach". *Marine Policy*, Vol. 30, No. 2, pp. 189-196.

approaches include economic valuation and quantitative surveys. Studies are often empirical, case-study, site-specific level, and derive from diverse disciplines (including geography, psychology, economics, sociology, anthropology, politics, history, environmental sciences, environmental management/planning and ecology).

Observing the evidence that exists elsewhere, gaps in the evidence base for Scotland concern: recreational and tourist values of water environments; the resource manager's perspective of the water environment; the importance that the public attach to nature within water environments; and public attitudes to, and perceptions of, water *quantity*.

### **Lessons for Scotland**

The literature reviewed has identified a number of potential lessons for WFD implementation in Scotland. In particular, evidence from Australia and New Zealand offers a number of useful perspectives. The projects undertaken by the

Australian CSIRO Tropical Ecosystems Research Centre, which incorporates social values into environmental policy, are especially useful, eliciting the values of the public and developing river basin catchment models to resolve conflicts over the water environment. The New Zealand Government has also identified all water bodies of national importance based on a range of values, including natural heritage, recreation, cultural and historical heritage, irrigation, energy, industry and domestic use and tourism. Public awareness campaigns in other countries, such as that conducted by the New Zealand Department of Conservation during 2004-2005, can also provide insights and lessons into how to educate the public on the importance of the water environment.

Finally, potential lessons could also be drawn for Scotland from the considerable body of resource management literature which exists, especially in relation to participation and engagement.

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