



SCOTTISH EXECUTIVE

Valuing the Water Environment: A Review of International Literature

Environment Group



**VALUING THE WATER ENVIRONMENT: A REVIEW OF
INTERNATIONAL LITERATURE**

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CONTENTS

EXECUTIVE SUMMARY		1
CHAPTER 1	INTRODUCTION	3
CHAPTER 2	WATER QUALITY	8
CHAPTER 3	WATER QUANTITY AND SAFETY	14
CHAPTER 4	RECREATION AND TOURISM	20
CHAPTER 5	AESTHETICS AND LANDSCAPE	24
CHAPTER 6	NATURE	27
CHAPTER 7	RESOURCE MANAGEMENT	30
CHAPTER 8	EDUCATION	34
CHAPTER 9	OVERVIEW AND CONCLUSIONS	38
REFERENCES		42
ANNEX		56

EXECUTIVE SUMMARY

1. This report offers a background review of international literature in English which was conducted to inform Scottish implementation of the Water Framework Directive. It explores the public's perceptions of, and values placed on, the water environment. Its sources are mainly published academic literature, evidence of policy engagement, datasets, and web resources. To conduct the review, a systematic computerised search of academic literature, policy literature and datasets was undertaken.
2. Recurring themes in the literature, which provide the main topics for the review, are: water quality; water quantity and safety; recreation and tourism; aesthetics and landscape; nature; resource management; and education.
3. Various methodological approaches are evident in the literature, with economic valuation and quantitative surveys being particularly common, and it is clear that the water environment has a range of values, both human and non-human, and it has both use and non-use values.
4. Evidence for perceptions of the water environment amongst the general public in Scotland and the UK is sparse, and what is available is largely concerned with perceptions of water *quality*. English-language texts from European and international sources (largely North America, Australia and New Zealand) offer more varied evidence. Most of the academic literature investigates environmental attitudes on a case-study, site-specific level, and the topics explored can be largely grouped under three themes: recreation, water resources and ecology.
5. Policy thinking and policy-formation in relation to the water environment tend to reflect ecological and economic priorities rather than social values and perceptions. Limited evidence was, therefore, found of the integration and taking account of public perceptions and attitudes in terms of policy-makers 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.
6. Abundant examples were found for the different ways in which people engage with the water environment positively (for example, recreation and education) and negatively (for example, generating water pollution or experiencing flooding). One example is the way in which water can add a positive economic value to the environment. While people value the water environment highly for outdoor recreation, values vary according to the recreation group to which they belong. The presence of vegetation also increases the value placed on water environments by the public.
7. The views and values of different groups of people vary in significant ways. Factors influencing shared and divergent perceptions include: socio-economic and demographic differences; geographical and cultural variables; one's prior knowledge of an environment; the user group involved; and the type of water environment.
8. Although variations in values and perceptions are partly due to the different locations and characteristics of respondents, it should also be recognised that differences and uncertainties can also arise from the different methodological approaches adopted.

9. Water *quality* clearly emerges as the most important environmental priority in comparison with other concerns about the water environment. 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*.

10. There appears to be a need, across the board, for recognition of education, information-provision and communication as 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.

11. The theme of conflict emerged as important across different themes discussed in the review. Conflicts regularly arise in relation to the water environment. The value of education and awareness-raising in helping to avoid and resolve conflict is clear from the findings.

12. Gaps in the evidence-base for Scotland, based, in part, on analysis of available evidence from elsewhere which was subject to the review, include information about: recreational and tourist values; the resource manager's perspective of the water environment; the importance that the public attach to nature within water environments; public attitudes to, and perceptions of, water quantity. Primary data-collection would be needed to address many of these gaps.

13. Central to WFD is the issue of engagement and participation, with WFD demanding a high degree of public involvement, placing the people of Scotland at the heart of managing the water environment. In this respect, evidence generated in Australia and New Zealand offers a number of useful perspectives, indicating, for example, that education and awareness-raising can prevent conflict and should be an integral element of river basin management. The review, therefore, identifies a number of important lessons for WFD implementation in Scotland.

CHAPTER ONE INTRODUCTION

1.1 This report offers a background review of international literature to inform Scottish implementation of the Water Framework Directive. It explores the public's perceptions of, and values placed on, the water environment. Its sources are mainly published English-language academic literature, policy evidence and datasets, and web resources.

Background

1.2 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 Act establishes for the first time a source-to-sea planning framework for river basin management, designed to help reduce levels of pollution and to protect habitats in support of Scotland's biodiversity. It creates a strategic framework to protect Scotland's water environment.

1.3 At the heart of the WFD are objectives to prevent deterioration of water status and to try to restore all waters to 'good' ecological status by 2015, unless it is disproportionately expensive, technically infeasible to do so, or if the specific water body is heavily modified. The Scottish Environmental Protection Agency (SEPA) is the lead authority in the Act, although the Scottish Ministers also have responsibilities.

1.4 In addition to these scientific and economic factors, the Scottish Executive and SEPA will 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. As the people of Scotland are all 'stakeholders' in water, engaging the public is crucial to the process of implementing the WFD.

1.5 A clear need, therefore, exists for high quality evidence and good understanding of the values of the public in relation to the (water) environment, in order to inform policy decisions. To meet this need the Scottish Executive has commissioned three projects to elicit and explore public priorities and values in relation to the water environment, of which this review of evidence in terms of existing literature is one. Results from a representative survey of the Scottish public, exploring how they perceive and value the water environment have also recently been reported (Scottish Executive, 2006). A third project, being undertaken by Ipsos MORI with Mott MacDonald Consultants, involves in-depth qualitative work which will gather and explore the opinions and priorities of the Scottish public and key stakeholder groups in regard to the quality of the water environment, also exploring the decision-making process. It will report early in 2007.

Key aims

1.6 The aim of this study 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. The review includes evidence

from Scotland and the UK level, followed by relevant texts from Europe, and the rest of the world. It considers perceptions of, and values placed on, the water environment.

1.7 The key objectives for this review are to explore:

- evidence for perceptions of the environment (water in particular) amongst the general public in Scotland and the UK;
- specific evidence in other countries on attitudes to the water environment;
- the relative values which are placed on different attributes of environmental features and issues in Scotland, the UK and other countries;
- whether the views of different groups of people vary in significant ways and what factors influence shared and divergent views.

Review Methodology

1.8 To conduct this review, the following tasks were undertaken.

- Referring to the initial aims and objectives, a set of search terms was developed.¹
- Using these terms, a systematic computerised search of academic literature, policy literature and datasets was conducted.
- Literature (abstracts and, where available, full documents) was collated in the software package ‘Endnote’, and then read and analysed. Key words and themes were identified.
- In addition, the following individuals and organisations were contacted for relevant publications and research evidence: academics in institutions with an interest in this topic, Scottish Natural Heritage (SNH), Macaulay Institute, Scotland and Northern Ireland Forum for Environment Research (SNIFFER), Department for Environment, Food and Rural Affairs (DEFRA), and European governments currently implementing the WFD.

1.9 All searches were limited to English-language texts published in the last five years, back to 2001, and evidence was sought first from a Scottish perspective, then from the UK level, followed by Europe and then the rest of the world.

Theoretical Background

1.10 The methodology above identified 177 accessible references, of which 132 consisted of academic literature, the remainder being policy evidence and datasets. The majority of the academic literature explores environmental attitudes on an empirical, case-study, site-specific level. It is noted that perceptions of, and attitudes to, water environments are dependent upon the type of water environment experienced (sea/ocean, lakes/lochs, rivers/streams or wetlands). Although the literature encompasses a number of different disciplines (including geography, psychology, economics, sociology, anthropology, politics, history, environmental sciences, environmental management/planning, and ecology), key theoretical approaches, definitions and concepts can be identified as particularly prominent.

¹ For a detailed list of search terms and resources see the annex.

Definitions, Concepts and Methods

1.11 Although there is a plethora of **perception** definitions in the multidisciplinary academic literature, one widely accepted definition is provided by Gold: “perception is the psychological function that enables the individual to convert sensory stimulation into organised and coherent experience” (1980, 19). Perception research began in the discipline of psychology in the 1960s and gained much importance in the 1970s, leading to its development in a number of social science disciplines including geography, economics and sociology.

1.12 The notion of a distinctive **environmental perception**, concerned to elucidate the processes whereby individual human beings acquire, process and arrive at some conscious apprehension of spatial-environmental information, is associated with the rise of perceptual studies from the late 1960s onwards. A comprehensive definition of environmental perception is provided by Kweon et al (2006, 73): “an information processing system in which individuals actively explore their surroundings and extract and use information in constant interaction between themselves and their environment.”

1.13 Public perception encompasses attitudes and concerns (Brody et al, 2004) where an **attitude** is “a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour” (Meyerhoff 2006, 211). There is a spectrum of attitudes, from disdain to apathy to enthrallment (Manuel, 2003).

1.14 The concept of value is widely debated within the academic literature. **Values** are defined as standards which serve as guiding principles in our lives (Kaltenborn and Bjerke, 2002). The literature identifies a range of environmental values – scientific, aesthetic, economic, environmental, social, health, recreational and religious – and such values are thought to determine attitudes and behaviour toward specific aspects of the environment.

1.15 A number of theoretical approaches have been developed to assess the human, natural and economic values placed on the natural environment. Two key approaches are:

- ecocentric value orientation (an environment/ecosystem has intrinsic value, independent of human interests);
- anthropocentric value orientation (an environment satisfies human utilitarian needs).

Thus, many people may express a preference for water environments, but for different reasons. Some may want to protect a landscape because it serves human utilitarian needs, while others may emphasise ecocentric values (Kaltenborn and Bjerke, 2002).

1.16 According to Goetgeluk (2005), the added value of water to the environment depends upon: (1) type of water (sea/ocean, lakes/lochs/ponds, rivers/streams/canals, and wetlands/marshlands); and (2) positive and negative values, where the former includes accessibility to, and size of, the water area and the latter includes water pollution and the risk of flooding.

1.17 Theorists argue that values and perceptions are also differentiated by user group, for example the perceptions of recreationalists versus farmers, and explained by a variety of factors. Sensory experience, prior knowledge (degree of familiarity with the watercourse), socio-demographics (for example, age, sex, education, and income), spatial and locational elements, and economics are all examples of such factors.

1.18 Assessing perceptions of, attitudes to, and values placed on the water environment involves the implementation of a variety of methods. Both qualitative and quantitative methods have been adopted by researchers. Examples of the former include unstructured interviews, anecdotal reports, historical explorations, narratives, participant observation and photography. Questionnaire surveys, structured interviews, and mapping are examples of the latter approach.

1.19 Conventionally, the methods available to environmental economists for the estimation of environmental values have been differentiated into revealed preference and stated preference approaches. Whilst the former tries to infer the value people place on environmental goods from their actual behaviour, the latter asks respondents about their willingness to pay for the option to use recreational resources or for a quality change to these resources, and, thus is based on people's intentions (Hanley et al, 2003).

1.20 The travel cost method (TCM) is an example of a revealed preference technique, based on actual behaviour. It is used by economists to estimate use values for non-market goods, such as recreational resources, and is essentially founded on the simple rationale that people from different geographical locations bear different travel costs when visiting a site and visit at different rates. By tracing the relationship between travel expenditures and visitation rates (trips per annum for example), demand curves can be estimated for water environments. From these demand curves, consumer surplus – the difference between the most an individual would pay per trip and what they actually pay – can be estimated, providing a monetary value for a day out in, for example, a lake area.

1.21 The TCM is relatively uncontroversial because it is modelled on standard economic techniques for measuring values and it uses information about actual behaviour rather than responses to hypothetical scenarios. In contrast, the Contingent Valuation Method (CVM) is the most widely applied stated preference technique which asks individuals for their response to hypothetical changes in environmental quality. In contingent valuation surveys the public is directly questioned about its willingness to pay (WTP) or willingness to accept compensation (WTAC) for certain hypothetical changes in environmental quality. CVM asks respondents to explain how they would behave if the market existed. Although there are many criticisms of the CVM, mostly levelled at its hypothetical nature, it is widely adopted by economists to value the natural environment.

1.22 When reading this review, it is important to bear in mind that the diverse methods that have been adopted by the researchers working in and across a range of disciplines will have influenced their results.

Review Outline

1.23 The most salient themes and issues which recurred in the literature were selected as the main chapter-themes for this review:

- Water Quality (including pollution)
- Water Quantity and Safety (including water reuse, supply, scarcity and conflict; and risk, flooding and public health)
- Recreation and Tourism
- Aesthetics and Landscape

- Nature (including vegetation, ecology and biodiversity)
- Resource Management
- Education (including communication)

1.24 Each topic is investigated as an individual section, and each section deals separately with Scotland and the UK, Europe, and then literature from elsewhere. Only the key (the most relevant which are also methodologically robust) texts are reviewed and additional texts which are not subjected to a full review are included in the references. In each chapter section, academic literature is reviewed first, followed by evidence from policy engagement.

1.25 The review concludes by identifying the priorities held by the public for the water environment, flagging-up gaps in the evidence for Scotland, based on observation of what exists elsewhere. Areas of possible further research are identified, as are the lessons for WFD implementation in Scotland.

CHAPTER TWO WATER QUALITY

2.1 Forty-three texts were reviewed in this chapter which concerns literature on perceptions and attitudes in connection with water quality and water pollution. 'Water quality' refers to the level of purity of water. If water quality is negatively defined, it can be said that water pollution is present. Indicators of water pollution include a lack of water clarity and few (or dead) fish (Faulkner et al, 2001).

Scotland and UK

2.2 Few exclusively Scottish studies exist which analyse public perceptions and attitudes toward a polluted water environment. However, in a 2002 survey of public attitudes to the environment in Scotland (Scottish Executive, 2005), 30% of respondents indicated that they were very worried about pollution of rivers, lochs and seas. In addition, 49% of all respondents stated that they were very worried about raw sewage discharged into the sea, while 27% were very concerned about the quality of drinking water. The 4,000 person sample was representative of people throughout Scotland, and the findings indicate how important water quality issues are rated in relation to other environmental concerns, such as waste disposal (25% were very worried about this), global warming by greenhouse gases (25%), genetically modified crops (24%), forestry (11%) and using up non-renewable resources (21%). Raw sewage put into the sea came top of a list of 23 current environmental concerns.

2.3 Hanley et al (2003) used a combined stated and revealed preference approach to value the benefits of coastal water quality improvements, focussing on Scotland's south-west coast, where beaches had consistently failed to meet water quality standards under the Bathing Waters Directive. A series of focus groups with the local population indicated that people were aware that there was a water quality "problem" at their local beaches and that sewage discharges were in some way to blame. In a subsequent questionnaire survey, 414 respondents were asked to rate site water quality on a five-point scale ranging from very good to very poor. Over all beaches, 30% of ratings were for either poor or very poor water quality. In terms of the likely impact of water quality improvements on people's behaviours, 63% of respondents stated that they would visit the beach more frequently if quality improved. An average of ten additional visits per person would be made to a beach area should water quality improve. Using aggregate benefits, if water quality were to improve, 2.6 million more trips per annum would be made to bathing waters in south-west Scotland, with an overall economic value of £1.25 million.

2.4 In a similar study, Cooper et al (2004) used the contingent valuation method to analyse the impacts of possible lake water quality improvements, using a lake in East Anglia as a case study. From a small-scale questionnaire (of just 200 people), they concluded that an individual's 'willingness-to-pay' for improved water quality was determined by motivational factors. Specifically, an individual's attitude toward water quality improvements was influenced by 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 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 (the general public have a responsibility to respect the water environment). Thus, although this sample was relatively small, the findings were valuable.

2.5 In a study of perceptions of water quality improvements following remediation work in the Pymme's Brook catchment, north London, Faulkner et al (2001) found that local residents were aware of, and concerned with, indications of water pollution. Following completion of the remediation scheme, residents perceived the watercourse to contain less rubbish and sewage fungus, and to have an improved colour and smell. However, respondents' perceptions were found to vary when the study population was sub-divided using a range of parameters. For instance, frequent observers of the brook were most likely to correctly identify sewage as the main form of pollution, and residents who lived in the area for over twenty years gave higher value to the remedial work, pointing to individual and group differences in perceptions and attitudes.

2.6 In 2001 DEFRA carried out a survey of public attitudes to quality of life and the environment, including public perceptions of river water quality. When prompted, over half of all respondents (54%) were very worried about pollution in rivers, bathing waters and beaches. Without prompting, water pollution was regarded as an issue of concern for the future. Like the Scottish Executive 2002 survey, water pollution was the environmental issue about which respondents had most concern.

2.7 Both these governments surveys, undertaken through a concern to understand public perceptions and priorities in relation to quality of life and the environment, found that water quality was a public priority.²

2.8 Additional quantitative and qualitative research to elicit the values placed on the water environment by the public is being undertaken by Ipsos MORI for the Scottish Executive. For the quantitative work-stream, the Scottish Executive (2006) commissioned a module of questions in the April/May 2006 wave of Ipsos MORI's Scottish Social Policy Monitor. The results indicate that the public value the water environment and consider important to people's quality of life. Around half of respondents stated that it was very important, and only 7% said that it was not important. In terms of water quality, most people think that the quality of Scotland's water environment is good, but that coastal waters around Scotland are of a lesser quality than lochs, rivers and streams, and that the quality is poorer in urban areas than in rural areas. Pollution and sewage were seen as the biggest threats to Scotland's water environment, but, only a small minority of people were pessimistic about the future of the water quality in Scotland. Recently commissioned qualitative research will analyse perceptions, attitudes, values and priorities in greater depth.

2.9 Another UK text, Richards et al (2002), attempted to ascertain the attitudes of regulators and industry towards water pollution, as they diverge importantly from those of the general public.

² The Environment Agency (EA) has recently commissioned a study on the relationship of poor water quality to social deprivation in England and Wales. This research will provide recommendations on the most effective ways of addressing inequalities in relation to water quality.

Europe

2.10 Based on a 2001/2002 study, Kelly et al (2003) focus on the cultural sources of environmental attitudes and behaviour in Ireland and show that respondents are deeply concerned about water pollution. Of the various socio-demographic variables considered (gender, age, education, residence, religious attendance, social class, income and public sector employment), education proved to be the most powerful predictor of environmental attitudes, with high incomes and social class also predictive of perceptions. Those with high educational attainment, greater incomes and identifying as middle or upper class were more likely to be concerned about the environment and to recognise water pollution.

2.11 Eggert and Olsson (2003) implemented a valuation study of water quality in the Swedish West Coast. They determined that the water environment provides different values to various groups in society, which engenders conflicting interests. For instance, fish which represents one value to commercial fishers, another to recreational fishers, and others to the broad public in terms of biodiversity. In general, water quality values were found to be substantial and avoiding potential losses an important task for policy-making. Eggert and Olsson's results show that respondents have a high level of environmental concern and heterogeneous preferences for water environments.

2.12 A study of water quality is provided by Euzen (2002), who investigated perceptions of water quality in Paris. The conclusion reached was that the perceptions of water producers and water consumers do not correspond.

2.13 A 2004 survey of 24,786 EU citizens, conducted for the European Commission, identified water pollution as one of the environmental problems that people worry most about (TNS, 2005), echoing the findings of the earlier Scottish Executive and DEFRA surveys. Nearly half of the respondents were worried about water pollution (47%), with the highest percentage (71%), in Slovenia. It was the most important environmental concern for the Finns, with a score of 66%. This was also the case for Greece (59%), Denmark and Portugal (both at 57%), Belgium and Spain (both at 52%) and Ireland (50%).

2.14 Policy interest in Europe is evident through the gathering of evidence by the Danish, Irish, German and French Governments and the European Commission.

2.15 The Danish Ministry of Environment commissioned Pedersen's (2005) water quality study on the economic value of clean aquatic environments calculated the economic value of clean aquatic environments in Denmark. Pedersen concluded that economic values vary for different study-areas, partly due to differences and uncertainties in economic valuation methods, and partly due to the different locations and respondents characteristics.³

2.16 The Irish Environmental Protection Agency (EPA) has initiated investigations into the social aspects of the WFD and undertaken studies on general public attitudes. In particular, they have commissioned a number of research projects under a programme-title, "Environmental Attitudes, Values and Behaviour in Ireland". Grounded in a representative sample survey of the adult population in the country, as well as an in-depth exploration of

³ Building on this study, the Danish Environmental Research Institute plan to investigate the economic valuation of aquatic areas in Denmark during the latter part of 2006.

environmental meanings using qualitative methodologies, it started in January 2002. Findings provide evidence of high public concern about water pollution (Irish EPA, 2006).

2.17 Both the French and German Governments have conducted research into freshwater systems, water quality and water pollution (for example, Cemagref (2006) in France). A survey for the German Federal Environmental Ministry in 2004, entitled *Environmental Awareness in Germany*, which investigated the public's perception of water quality through interviews with 2,018 persons, discovered a lower environmental awareness in younger age groups. There was generally a positive judgement of environmental quality in Germany and 43% percent of respondents believed that there had been great advancements in the quality of German waters from 2002 to 2004 (German Federal Environment Ministry, 2006).

Global

2.18 Beyond Europe, a number of English-language texts concerned with perceptions of water quality originate from the USA. For example, Brody et al (2005) explored perceptions of water quality across watersheds in San Antonio, Texas, investigating the extent to which perceptions of water quality were spatially correlated across two watersheds. Using a mapping technique they were able to explain why clustering of perceptions occurred in specific locations, their results demonstrating that environmental perceptions are spatially dependent across the landscape.

2.19 Elaborating on the spatial dimension, Burger (2003) investigates an urban area, examining the perceptions amongst users of the waterfront area of New York/New Jersey Harbour estuary. Water pollution was viewed as the most important problem in New Jersey, and removing pollution was rated the most important way to improve the waterfront habitat. People valued the waterfront for walking, providing open green space, and as a place to commune with nature without people. Management options people favoured were removing pollution and cleaning up rubbish and adding educational signs and information brochures about the remaining, natural habitat. Age, income and education influenced environmental perceptions.

2.20 Two other, relevant US studies explore the public perceptions of beaches and water quality. Turbow et al (2004) conducted a survey of beachgoers in California to assess perceived water quality and the perceived health risk for swimming. Proximity of residence to the beach was strongly associated with perceptions of water quality. Although 83% of respondents felt that water quality was important in deciding to go to the beach, only 25% of respondents who did not plan to swim cited pollution or contamination as a reason not to swim. Similarly, Pendleton et al (2001) conducted a survey of beach use and perceptions in the coastal beaches of Los Angeles, uncovering that Los Angeles County residents viewed the ocean as a place of pollution rather than a vibrant and healthy place for bathing and swimming. In this random survey of 400 households, respondents were asked about their beach use and perceptions of coastal water quality. The results suggested that residents tend to hold perceptions of marine water quality that are at odds with data on bacteriological measures of water quality, and that perceptions of coastal water quality may be influenced less by coastal education campaigns and more by the media.

2.21 Education and awareness-raising also emerge as pertinent in a study conducted by Tran et al (2002) in Holbox Island, Mexico. A survey to ascertain public attitudes and perceptions

of water pollution, showed that local inhabitants did not perceive pollution as a serious menace to their coastal community but that most would be willing to participate in long-term water quality monitoring. The study indicates the importance of making local players more articulate and skilled at expressing themselves and engaging with policy. It also shows the usefulness of environmental education and public awareness campaigns in providing important local players with knowledge about environmental and social issues, thereby enabling policy makers to incorporate the desires of the local inhabitants in making the appropriate choices for preservation and development of water environments.

2.22 In the context of this review, New Zealand offered the most abundant, accessible evidence for how policy-makers have engaged with how people value the water environment. There, the Ministry for Environment has commissioned a yearly survey of 2,000 respondents on “Public Perceptions of New Zealand’s Environment”. The 2004 survey examined a variety of environmental issues, and pollution issues (air, water, and solid waste disposal) were rated as the most important environmental issue facing the country. There was a 96% increase, compared to an equivalent survey in 2002, in the percentage of respondents who judged that water pollution was the most important issue (Hughey, 2004). The latter results also illustrated that 24% of respondents rated the quality of rivers, lakes, wetlands and marine fisheries as ‘bad’ or ‘very bad’ and water pollution was rated as the most important environmental issue facing New Zealand. Respondents were asked to identify up to three main causes of damage to water in rivers and lakes, with farming (43%) and sewage and stormwater (41%) emerging as the main ones selected. Regional responses differed significantly, as did perception by ethnic group (New Zealand Ministry for Environment, 2004).

2.23 A smaller study, undertaken on behalf of the Waikato Regional Council in 2004, found that 45% of respondents (local residents) were concerned about water pollution, and that water pollution was considered the most important issue facing the region (Environment Waikato and Gravitas Research and Strategy Limited, 2004). In relation to the region’s natural environment, specifically, 14% of respondents valued rivers highly and 7% valued the coast and beaches highly.

2.24 Additional relevant international texts include a paper by Alam and Marinova (2003), in which they estimate the total value for the community of a cleanup of the Burigana River in Bangladesh. The cleanup programme aimed to improve water quality and the findings suggested that not only were a significant proportion of residents willing to pay for water quality improvements, they were also willing to contribute in non-monetary ways (mainly their time). Johnson et al (2005) in an analysis of public opinion and environmental attitudes in the USA, suggest that environmental opinions, including attitudes to water quality, are influenced by real environmental conditions and are responsive to policy outputs alongside improved environmental conditions. In an Australian context, Friend and Coutts (2006) consider the importance of local community involvement for the implementation of a Water Quality Improvement Programme.

Summary

2.25 The evidence, particularly data from general population surveys, suggests that water quality is a concern amongst the public, and often the most significant factor affecting perceptions of, and attitudes to, the water environment. Across the literature a common

theme is that perceptions of water quality vary by socio-demographic and geographical variables.

2.26 Of particular relevance to Scotland is that water quality is an important issue for the public and that people believe they are relatively well informed about water pollution.

CHAPTER THREE WATER QUANTITY AND SAFETY

3.1 Water quantity and supply and water safety are considered in this chapter, which discusses attitudes to reuse, scarcity, conflict, risk, flooding and public health. Fifty-eight texts were reviewed and the most relevant are outlined here.

3.2 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 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” (Surez and Lombardo 2004, 189). One such risk is flooding.

3.3 There are many definitions of “conflict” in the academic literature, many social science ones including the notion of conflict being internalised, where there are two sides knowingly or deliberately opposing one another. In this chapter, “conflict” is appropriated in a more traditional, specific and technical sense: conflict is “goal interference attributed to others” (Manning 2001, 203). While Scotland needs to acknowledge the growing concern over access to water trans-nationally, and the serious conflict, even war, that results in the context of our global responsibilities and sustainable development, conflict has been dealt with here in terms of more national and local scales and the lessons that might be learnt from relevant evidence elsewhere.

Scotland and UK

3.4 Relevant to this topic are Werrity’s (2002) flooding study and a Scottish Executive (2005) survey of public attitudes. The former addresses flooding from the perspective of climate change, while the latter examines directly the Scottish public’s attitudes to flooding. In the 2002 survey, respondents were asked about their perceptions of the current threat of flooding in Scotland. Overall, 31% of people thought flooding was ‘quite a high risk in a few areas of Scotland’ and 15% said that it was ‘quite a high risk in many areas’. A quarter of respondents thought that it was a ‘very high risk’ in a few or many areas (23%), and 4% said that flooding was ‘not a risk at all’ (Scottish Executive, 2005).⁴

3.5 From the perspective of resource conflict, Sidaway (2005) deliberates the benefits that can be derived from resolving environmental disputes through conflict resolution. He argues that environmental disputes in Scotland fall into two main categories: (1) developments that fall within the statutory remit of the development control and planning system; and (2) a large

⁴ A further study Executive is being conducted by the University of Dundee, entitled “Exploring the Social Impact of Flooding in Scotland”. This research will gather evidence for a range of social impacts for residents of areas where there is flooding or a risk of flooding, by investigating the effect of their location on attitudes, behaviours and perceptions of their property, security and safety, and personal well-being. It has been exploring ‘what works’ in terms of flood awareness and prevention schemes for different groups and locales and provides baseline data for future examination of the non-economic impacts of flooding. Black and Burns’ (2002) study also assesses flood risk in Scotland, looking in particular at physical evidence and Scottish rivers.

range of other issues, including land management, conservation areas, access for recreation, afforestation, species protection, coastal fisheries and fish farming, shipwrecks and pollution. Through Scottish examples, he illustrates that there can be movement from “conflict to consensus”, and flags up that, “the definition of conflict and its means of resolution are culturally determined” (Sidaway, 2005, xiv). Despite the potential challenges of cultural context, potential avenues of resolution include eliciting the values of different recreation groups, education and information provision, encouraging stakeholder dialogue and engaging in workshops and consultations. These could be adopted to resolve conflicts over the water environment and water resource.

3.6 Sidaway also recognises the value of generic consensus building⁵ as a generic process that can be used to prevent or resolve conflict, as long as its application is tailored to the specific situation and follows a set of key principles of process design. It should start with an assessment of the ways of achieving more effective public participation (op cit, 259). More specifically, consensus building entails a four-stage process: (1) initiation – responding to a current conflict by recognising the opportunity to negotiate and realising the value of mediation; (2) inclusiveness – ensuring that an impartial conflict assessment is undertaken to identify stakeholders and their underlying concerns, and to set out the basic structure of possible negotiations for ratification by stakeholders; (3) information – obtaining relevant information on issues underlying the dispute and circulating information widely; and (4) influence – obtaining a firm commitment in advance from the ultimate decision-makers that they will act on the outcome of the negotiations (261). For Sidaway, mediation is most effective to reduce conflict at an early stage in the conflict process.

3.7 Three UK studies examine risk perception and associated attitudes. Both Baggett et al (2006) and Myatt et al (2003) illustrate that knowledge of risk varies between stakeholder groups involved in water environments. Brouwer et al (2001) offer a comparative study, indicating that public perception of health risks varies according to nationality and country of origin – perhaps because of the nature and ecological quality of the water environment, and people’s dependence upon it, in their country of origin.

3.8 Thinking about evidence generated from a policy perspective, a relevant Scottish water use report is by the Scotland and Northern Ireland Forum for Environmental Research (SNIFFER, 2005).⁶ This identified how different sectors of the economy in Scotland and Northern Ireland use water and the benefits of water use for individuals and organisations in these. It was found that the value of water to an individual user depends on a number of features of their water use, including the volume of water used and the nature of use, and water use, clearly, has different economic values for households, agricultural irrigation, aquaculture, salmon angling, industry and hydropower.

3.9 Findings from the public attitudes survey for the Executive, described in Chapter 2 (2006) contains information relevant to Scottish perceptions of water quantity and safety. Drinking water and health were the two most commonly given reasons for the importance of the water environment. However, the quality of coastal waters around urban areas, the risk of flooding and preventing damage to wildlife habitats were considered priorities for

⁵ Consensus building is “a collaborative approach to making a decision in which the interested (or disputing) parties identify common ground and work voluntarily towards finding a mutually acceptable solution towards a contentious problem” (Sidaway 2005, 67).

⁶ This project was conducted to meet the requirement of Article five of WFD, which requires Member States to undertake an economic analysis of water use for each river basin district.

improvements by more people than ensuring a reliable water supply for homes and industry. When questioned about water shortages, the majority of people in Scotland (58%) did not consider serious water shortages likely in the next few years; less than a third (28%) said that shortages were likely. It is important to note that the survey was undertaken before a dry summer for Scotland and before high media attention surrounding a drought situation in England and other parts of Europe. Nevertheless, 22% of respondents did think there that serious water shortages would be likely in the next few years, the most commonly given reason for this being climate change/global warming.

3.10 In relation to water supply, another survey commissioned by the Scottish Executive, Brauholtz et al (2005), explored domestic customers' priorities for investment in the water industry over the next ten years, through a quantitative telephone survey of 3,000 respondents conducted in 2004. The survey was supplemented by eight qualitative focus groups with 60 participants in Edinburgh, East Kilbride, Oban and Aberdeen, capturing a range of communities. Eighty-nine percent of people were satisfied with their water supply services, including 40% who were very satisfied. Over half mentioned the quality of coastal and bathing waters (58%) or the quality of river waters (53%) as needing improvement; a significant number of these people said that these required "a great deal" of improvement (57% and 51% respectively). Fifty-six percent of householders thought that current standards should be maintained when preventing homes and gardens from being flooded with sewage. When customers were asked how much, if anything, they would be willing to pay each year to increase spending on maintenance and improvement in water supply services, 54% maintained they would be willing to pay something. The research indicated that Scottish Water customers were happy with their water services, however, the environment is an area where they think improvement is necessary.

3.11 A second UK (England and Wales) water supply study was part of the WaND project (Water Cycle Management for New Developments).⁷ The aim of WaND is to support the delivery of integrated, sustainable water management for new developments by the provision of tools and guidelines for project design, implementation and management. Its work packages focus on water supply, along with social issues. Work Package Four of the project looks at social and economic aspects, which includes collection and analysis of the views of various stakeholders (mainly developers) on sustainable water management innovations and on better understanding their decision-making processes for sustainable water management (WaND, 2006).

3.12 Water supply, as used here, is almost synonymous with water quantity. Concerns with public perceptions of water quantity are not well reflected in available UK policy evidence literature. This may change following water shortages in the south-east of England over summer 2006 and the associated media coverage. The BBC news website, for example, considers how the current situation compares to the drought of 1976 and how water can be conserved; and shows that early action to save water can help combat extreme measures like hosepipe bans in the future. The Environment Agency provides details on drought orders and notes that every water company in England and Wales is required by Government to produce a drought plan. Drought plans detail the operational steps that must be taken as a drought progresses. These range from publicity campaigns and communication strategies to customer

⁷ This WaND Project, running April 2003-April 2007, is an Engineering and Physical Sciences Research Council (EPSRC) and industry/regulator-funded project, and part of the Sustainable Urban Environment initiative.

restrictions and drought orders. A number of water companies, for instance south east water, already have drought orders in place. More importantly for this review, the communications strategy contained within drought orders engage the public with issues surrounding water supply (and hence water quantity).⁸ According to the Environment Agency (2003), the communications plan should ensure that key messages are communicated effectively in order to influence customers to use water carefully. Still, more detailed research on public attitudes to water quantity could be usefully elicited by the water companies.

3.13 In terms of flooding and risk research, the Environment Agency (2006) recently commissioned a relevant study in England and Wales.⁹ The aims of this were: (1) to help the Agency to understand the social impacts of flooding; (2) to examine how flood risk is distributed in relation to patterns of social deprivation in England; and (3) to make recommendations for the most effective ways of addressing inequalities in relation to flooding. In addition to a review of relevant flood risk and environmental inequalities literature and a two-day workshop with stakeholders, a GIS-based data analysis exercise was undertaken. This examined the deprivation characteristics of populations living within and outside of the delineated risk areas in the English regions. It found that flooding impacts on people's physical and psychological health, possessions and economic assets, on households and communities. Unsurprisingly perhaps, residents in deprived neighbourhoods were likely to be less well prepared to cope in the event of a flood and in its aftermath, and that the most deprived proportions of the population were 62% more likely to be living in areas at high risk of flooding. The Agency (2006) recommended that flood risk management needs to be increasingly responsive to the social distribution and social impacts of flood risk.

Europe

3.14 European studies concerned with quantity and safety again concentrate on perceptions of flooding and risk. Basing his research on the River Thur in eastern Switzerland, Zaugg (2003) discusses flooding and flood prevention. He shows that different stakeholders have different perspectives of flooding, and that conflict is concerned with the territoriality and scale of flood prevention projects. Using a Swedish case study, Sjolander-Lindqvist (2004) discusses the effects of risk and uncertainty on the farming community, including farmers' sense of locality and found that the values farmers hold toward risk differed from those of non-farming local residents.

3.15 A European instance of policy engagement with flooding perception research is provided by the EU LIFE project, "The Wise Use of Floodplains". Relevant to public and stakeholder participation in the WFD implementation process, the project includes work on five EU floodplains. It trails a range of stakeholder participation techniques (including questionnaires and training programmes) to generate and appraise diverse management

⁸ For instance, the communications strategy for south west water was based on an early spring water quantity awareness campaign, including the release of information to customers through the media and an advertising campaign to promote "Waterwise" messages (offering advice on water efficiency and conservation). Further activities included mail drops to customers in areas facing particular water difficulties.

⁹ Previous studies undertaken by the EA between December 2004 and July 2005 address flooding from the perspective of urban and rural issues, stakeholder engagement, community and citizen engagement and social science. These reports found that people who are already experiencing social and economic deprivation are a significant proportion of the total numbers currently at risk from flooding, and, for sea flooding, constitute the majority of those at risk in England.

scenarios for integrated floodplain restoration (EU LIFE, 2006). Similarly, the ADVISOR research programme is relevant to both water supply (hydraulic projects in Spain, Portugal and Greece) and flooding (flood protection project in the Netherlands), while the French Cemagref research project includes a consultation with the general public, during 2006-2008, as part of the WFD public participation process, investigating perceptions of water resources, uses and risk.

Global

3.16 The international literature identifies attitudes to both water quantity/supply and water safety, including the sub-topic of water reuse, which is addressed in a number of studies concerned with public participation and perception. Hartley (2006) has identified a number of themes that are crucial in maintaining public confidence in water reuse, for example, promoting communication and public dialogue and managing information for all stakeholders; and, in an Australian case study, Russell and Hampton (2006) discuss the challenges in understanding public responses and providing effective public consultation on water reuse. They argue that current understanding of public reactions to water recycling is insufficient, and there needs to be a broad appraisal of the information needs of the public.

3.17 Another prominent sub-topic in the literature is that of perceptions of water scarcity and the resultant conflict. Water scarcity has been addressed in Indian, US and South African contexts by Mehta (2001), Routhe et al (2005) and Smit and Jacobs (2004) respectively. A consensus amongst these studies is that scarcity is both a biophysical (“real”) and a perceived phenomenon. Conflict over water resources may be a consequence of either. These studies demonstrate how perceptions of water scarcity vary with locale and local water-uses.

3.18 Cortese (2003) provides a relevant US study of the conflicting uses of the Arkansas River, in the context of the arid and semi-arid western US, where water has always been a source of conflict. Deploying multiple methods, including a telephone survey and focus groups, the author identified the recurring social, economic and environmental issues voiced by a wide variety of rural and urban interest groups. He derived a set of community values for water: ecological values (abundant wildlife, pristine vegetation, clean water), economic values (impacts on the local economy), recreational values, and social values (quality of life). The range of values varied for different groups, such as local business interests, fishers, government officials, boaters, environmentalists and local residents, between which conflict often arises. Similar findings regarding conflict over water resources were found in a US context by Williams (2001) and in a Middle Eastern context by Vukovic (2004).

3.19 Water safety encapsulates the problems of risk and flooding. Studies of risk were which were reviewed, were, again, from the US (Campbell et al, 2002; and Gregory et al, 2001) and the Middle East (El-Zein et al, 2006). Both indicate that risk knowledge varies according to demographics and interest group. One dimension of risk, flooding, has particularly been studied in great detail and in a number of contexts (see Clark et al (2002) for a US example, and Suarez and Lombardo (2004) for a South African). Jose et al (2001) offer a comparative analysis of the flooding effects on a wetland community in Mexico, while Rashed (2003) studied the attitudes of floodplain residents in Dhaka, India. 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.

3.20 Finally, the topic of public health was considered in relation to water safety. For example, Turbow et al (2004) show that the perceptions of swimming-related health risk in Orange County, California differs according to beach area, although 84% of beach visitors surveyed were not highly concerned with swimming-related health risks. But the results suggested that public health impacts are dependent on locality.

3.21 In terms of the evidence for policy-makers' engaging with this topic, three projects were identified during the review search. In Australia, the CSIRO Tropical Ecosystems Research Centre undertakes a number of projects to incorporate social values into environmental policy. One such project is an investigation of the indigenous cultural values of water in the Daly River region of the Northern Territory (CSIRO, 2006), which seeks to elicit the values associated with water use by Aboriginal land owners, 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, enabling sustainable development of water resources by removing unnecessary constraints to water availability and promoting efficiency of use. As part of this programme, a project entitled "Attitudes and Barriers to Water Transfers" involved interviews of water users and regional council staff to assess their issues and attitudes to water transfer. Seventy-five percent of users supported the concept of water transfer (New Zealand Ministry for the Environment, 2001).

3.22 In the Middle East, water scarcity and conflict research is paramount. National policy and research focussing on water scarcity in the area take a regional or national perspective, with emphasis on alternatives to conflict. A number of policy-relevant studies have been conducted to find solutions to water scarcity in the face of increasing demand (for example, Lipchin et al, 2004). These studies show how cultural background, geographic location, gender, income and education influence the way in which people perceive and value water resources in the Middle East.

3.23 The literature exemplifies the differing nature of conflicts over water, for instance, conflict over: water resources and water development (Cortese, 2003; and Lein, 2004); marine reserves and fishing (Eggert and Olsson, 2003); nature protection/conservation and development of water environments (Getzner, 2002); tourism (Tzatzanis and Wrbka, 2002); and recreational activities (Manning, 2001).

Summary

3.24 Although there is wide and varied treatment of issues relating water quantity/supply and water safety in the literature identified for this review, for the Scottish and UK contexts, deeper research into public attitudes and perceptions for quantity would be useful.

3.25 At a global level, increased incidences of water scarcity and supply disruptions (real or perceived or feared) point to increasing likelihood of conflict over the resource, with differential use values further compounding and engendering dispute.

3.26 Although the literature again suggests that perceptions of water quantity and safety vary by social, demographic and geographical variables, conflict resolution is one way by which different perceptions can be converged.

CHAPTER FOUR RECREATION AND TOURISM

4.1 Literature concerned with recreational and tourist values in relation to the recreation water environment is reviewed in this chapter, which considers the environmental perceptions of specific recreation groups, such as fishers and anglers. Thirty-two texts were reviewed.

4.2 Recreation is “activity (or deliberate inactivity) that is voluntary and which is engaged in for the purposes of enjoyment and satisfaction during time which is free from obligations, i.e. during leisure time” (Butler et al 1998, 3). And water is a key resource, as it encourages the undertaking of many activities, whether passive (for example, picnicking or walking on the shore) or active (for example, swimming and boating). Tourism is defined as the act of travel for the purpose of recreation and the provision of services for this act.

Scotland and UK

4.3 Very few Scottish or UK studies are concerned explicitly with recreational values, perceptions and attitudes in relation to the water environment. Consequently, comparative perception studies of the general recreation environment have been discussed.

4.4 However, one recreational study concerned with perceptions of the water environment is provided by Dalrymple and Hanley (2005). Using Loch Lomond, as an exemplar, they consider three issues: noise, crowding and environmental damage. They argue that rather than ecological values being imperative to the visitor, social values, in particular noise pollution, have the most significant influence on perceptions of Loch Lomond. Through creation of a travel cost model and contingent valuation model, they illustrate that improvements to the water environment would increase the number of trips made to the study area, and visitors would be willing to pay to fund such improvements. Explicit monetary values were assigned to the water environment, with a day at Loch Lomond valued at £20.53 per trip. Visitors were found to be willing to pay an additional £1.76 (a car parking fee) to fund environmental improvements, an expression of the high value people place on the Loch Lomond area for outdoor recreation. The results indicate that older people, females, those with high incomes and those living closer to water areas value the water environment to the greatest extent.

4.5 The Scottish Recreation Survey, undertaken 2003/2004, set out to monitor people’s participation in, and attitudes toward, outdoor recreation in Scotland (SNH, 2005). Environmental issues reported as important to the public included access to the countryside, responsible environmental behaviour and the need for managers to address any environmental and social problems encountered during a recreation visit, such as litter or crowding. In addition to this SNH survey, others are implemented on a regular basis by Scotland’s two national park authorities for Loch Lomond and the Trossachs and for the Cairngorms, which aim to capture visitor perception of recreation environments.

4.6 A similar survey was commissioned by the Forestry Commission in 2005 to explore explored public perceptions of Scottish forestry, with specific reference to public access to woodlands and recreation (mruk, 2005). A comparative Scottish academic study by Hanley et al (2001) is their investigation of mountaineering in Scotland.

4.7 Like the academic literature reviewed above, evidence of policy-makers engaging in with public recreational values, perceptions and attitudes in relation to the water environment is sparse. The SNH (2005) survey outlined above was a sample of 12,000 Scottish adults. Water was the most popular outdoor recreation destination, with 31% of outdoor recreation visits water-related (the next most popular destination was local parks at 22%). For 5% of respondents, fishing was their main recreation activity.

4.8 In 2003, the Scottish Executive commissioned a survey on “Public Attitudes to Access to the Countryside”. A sample of 2,074 Scottish adults was interviewed, being questioned about the activities they undertook and levels of access to the countryside in Scotland. This was prior to the implementation of the Land Reform (Scotland) Act 2003, which established rights of responsible access to land and inland water for recreation and passage. A main finding of the paper was that just over a quarter of all adults participated in open-air recreation at least once a week. Respondents were presented with a list of different types of countryside and asked how they would feel about going across each type of land and water for recreational purposes. Over half stated that they would ‘always feel free’ to cross seashores (82%), lochshores or riverbanks (64%), canal towpaths (61%), and rivers (58%) or lochs (58%).

4.9 Research by VisitScotland (the national tourism agency) provides evidence that the natural environment is a key part of what visitors value about the country (2002). Scenery was rated by at least 90% of tourists as an attribute particularly associated with Scotland after their visit. Lochs and rivers were important attributes of the tourist experience, as were mountains and hills and nature and wildlife. A significant proportion of respondents (23%) rated beaches as ‘poorer than expected’.

Europe

4.10 Two European academic studies of recreational values are noted here for their relevance. Firstly, Pereira et al (2005) investigated public attitudes towards recreation and tourism in the Lake Vela area of Portugal. The area was seen to be attractive to visit for the following main reasons: to spend some hours in a calm and healthy environment (67.6%), to spend time with friends/family (58.2%), for picnics (49.5%), and for wildlife observation (46.7%). Secondly, Tzatzanis and Wrška (2002) examined the conflict between tourism and conservation values in Greece. They showed how the expansion of tourism in Greece had altered public perceptions of their coastal environments. Tourist development, in Crete for example, was reported as having degraded landscapes, both ecologically and aesthetically. However, awareness of this tourism impact was dependent upon the origins of the visitor and the level of personal environmental sensitivity.

Global

4.11 Beyond Europe, the studies which were reviewed concerning attitudes, perceptions and values of recreation water environments mostly came from North America, Australia and New Zealand.

4.12 From an American perspective, Bricker and Kerstetter (2002) investigated the values that whitewater rafters and kayakers attach to the South Fork of the American River, Western

USA. Whitewater recreationalists visiting the South Fork were surveyed to understand places they perceived as 'special' along the 21-mile river corridor. This included an open-ended mail survey following an on-site interview with each respondent. The results indicated that the meanings this group attached to special places are multi-dimensional and complex, ranging in focus from a specific geographical location to the social benefits accrued from visiting the river. Recreational values attributed to this water environment by visitors were categorised by the authors in terms of Environmental-Landscape, Human-Social, Heritage-Historic, or Commodity, influences on the different types of place-meanings which play an important role in an individual's preferences for places, as well as the ways in which participants in the research valued the South Fork of the American River corridor.

4.13 The recreational values of boaters are investigated in a study by Stewart et al (2003), which analysed boater preferences for beach characteristics along the Colorado River in the Grand Canyon, Arizona. Based upon a study of three recreational boater user groups (private trip leaders, commercial passengers and river guides), preferences for beach size, presence of shade on the beach, and presence of vegetation on the beach were examined. Large beaches with shade from trees were setting characteristics with highly reliable and strong user preferences, results which were the same regardless of respondents' past boating experience, boat type, or group size. In addition, size of beach was consistently reported to be a trip feature of moderate importance to respondents' river trip.

4.14 Lindsey and Holmes (2002) report the results of a survey of local and foreign tourists, visiting islands that were to be part of a Marine Protection Area (MPA) in Vietnam. Most respondents thought that rubbish on the beaches, water pollution and vendors on beaches were problems and that the MPA was a good idea. Foreign tourists were significantly more likely to perceive the presence of environmental problems than were Vietnamese tourists, and those who agreed there were environmental problems were significantly more likely to support the concept of an MPA, despite the potential for possible economic effects with distributive consequences. Willingness-to-pay for protection was modest and positively correlated with education and income. Although foreign tourists were on average willing to pay more, a larger proportion of Vietnamese tourists were willing to pay some amount to support the MPA. Analyses indicated that changes in income and education expected with economic development would be likely to increase both awareness of problems and WTP for protection.

4.15 The perceptions of tourists towards the Australian water environment were investigated by Priskin (2003). Structured surveys were administered to 702 visitors over two peak seasons in the Central Coast Region of Western Australia. Visitors were required to indicate their perceptions on a one to five scale. Participants in the following activities were included: swimming, boating, fishing, diving and snorkelling, (wind)surfing, sandboarding, four-wheel driving, walking, camping, horse-riding and sightseeing. Tourists had significantly variable demographic characteristics over two seasons and participated in different activities. However, perceptions of environmental degradation caused by individual activities did not vary significantly between seasons. The age, origin and level of education of visitors had more impact on perceptions than gender or income group.

4.16 Evidence was also reviewed from Australia, New Zealand and Singapore. The Queensland Government in Australia were, at the time of writing, conducting a study of international environmental values, including the development of an appropriate community consultation process. This work is concerned to take account of the cultural and spiritual

values of water, along with recreational ones. Recreational values are represented by either primary recreation (direct contact with water through, for example, swimming or snorkelling), or visual appreciation (activities involving no direct contact with the water, such as picnicking, bushwalking and sightseeing).

4.17 In 2004, the New Zealand Ministry for the Environment produced a report entitled *Water Bodies of National Importance. Potential water bodies of national importance for recreation value*. The project was part of the Government's Water Programme of Action aimed at examining how New Zealand should fairly use, protect and preserve water. The Programme identifies water bodies of national importance for a range of values, including natural heritage, recreation, cultural and historic heritage, irrigation, energy, industry and domestic use, and tourism. The report lists 105 potential freshwater bodies of national importance for recreation, including lakes, rivers and wetlands, generated as a consequence of surveys with active recreationalists (n=771) and the general public (n=1041). The Ministry also commissioned a visitor survey of 201 travellers (travelling through area) and 124 holiday-makers (spending at least one night) in the lower Waitaki Valley in 2005. The aim of the survey was to ascertain the extent and importance of river-orientated activity for the tourist and holidaymaker markets, their perceptions of the scenic and amenity value of the river valley, the significance of the river itself as a tourism resource and the relative significance of the lower Waitaki in the overall regional context. It was found that holidaymakers saw the river's specific character as a stronger contributor to the landscape than did the more transient travellers (New Zealand Ministry for the Environment, 2004).

4.18 Additional relevant international texts include Salz and Loomis (2004), who address the values placed on the recreation environment from the perspective of anglers. Their study was based in marine protected areas of the east coast of the USA and illustrated the distinctive values that anglers bring to their perceptions of water environments; and Shivlani et al (2003) who explore visitor preferences for public beach amenities and beach restoration South Florida, USA. They investigated visitor willingness-to-pay for beach nourishment and found that users are amenable to higher fees if they lead to greater resource protection.

Summary

4.19 Many of the studies reviewed for recreational and tourist values of water environments employ the contingent valuation method of economic analysis. People value the water environment highly for recreation – “when I'm on the water I'm directly where I want to be” (Williams 2001, 409) – and recreationalists perceive it in a different way to non-recreationalists. Evidence suggests that the relative values placed on this environment also differ according to type of recreation activity, socio-economic background and other demographic variables.

CHAPTER FIVE AESTHETICS AND LANDSCAPE

5.1 The aesthetic quality of the water environment is central to public perceptions and attitudes, and fundamental to aesthetic values is the concept of ‘landscape’, which has multiple, often contested, definitions. In this chapter, ‘landscape’ is treated as an integral element in the perception of a water environment, and, as Yamashita (2002, 3) notes, “water in the landscape tends to be dominant because of its visibility, its movement, reflections, and colour, its consequent contrasts to adjacent earth surfaces.”

Scotland and UK

5.2 Academic literature concerned with the construction of landscape in Scotland is plentiful, with a variety of conceptual approaches apparent (see, for example, Mitchell, 2002; Smout, 2001; Warren, 2002; and Watson, 2002). From a political-historical perspective, Rohde (2004) illustrates how the multi-faceted concept of landscape mediates cultural, social and political issues, and is continually evolving in response to aesthetic, ideological and institutional agencies. Using the Highlands of Scotland as an exemplar, he discusses community involvement in the construction of landscape.

5.3 From a more practical perspective, Somerville et al (2003) discuss the assessment of the aesthetic quality of a selection of beaches in the Firth of Forth. They surveyed fourteen beaches during 2002 and discovered that the aesthetic quality of rural and urban beaches was very similar. Litter was seen to be a crucial indicator of aesthetic beach quality.

5.4 Describing the groups inhabiting a river valley in the south of England, Strang (2005) considers how engagements with the water environment are experienced and interpreted within a specific cultural context. She discusses cultural differences in the meanings attached to the aesthetics of a water landscape, and water’s myriad of aesthetic qualities. For example, water can be presented as a dangerous or regenerative force (“a matter of life and death”, Strang 2005, 115); as the substance of spiritual and social identity; or as a symbol of power and agency.

5.5 An SNH-commissioned landscape perception survey, involving 516 telephone interviews with the Scottish public, found that respondents had little understanding of the marine landscape beyond the obvious fact that it includes the sea (George Street Research, 2005). However, in contrast, another SNH survey to assess the sensitivity and capacity of the landscape in relation to offshore windfarms, found that Scottish seascapes – “an area of any extent or scale which includes the sea as a key feature” (Scott et al 2005, 2) – are renowned and valued for their natural heritage.

Europe

5.6 Examples of European literature which tackle the importance of aesthetics and landscape to the perceptions of water environments include Goetgeluck and Priemus (2005), who provide evidence from the Netherlands, where they demonstrate that the aesthetic qualities of water add a high property value to residential environments. From an economics

perspective, they suggest added (monetary) values to an area of 10-15% for the seashore, 5-10% for river locations (streams), and 5% for lakes.

5.7 From a Norwegian perspective, Kaltenborn and Bjerke (2002) discuss the associations between environmental value orientations and landscape preferences. They ask why group differences in landscape assessment exist and recognise distinctions between anthropocentric, ecocentric and apathetic orientations toward the environment. Preferences for local landscapes and environmental value orientations were surveyed in a sample of the adult population of Røros, in southern Norway. The highest preference was expressed for wildland scenes containing water, followed by cultural landscapes (landscapes representing or evocative of local culture) and traditional farm environments. Landscapes with elements of modern agricultural practices were the least preferred category. Significant positive correlations were found between the ecocentric environmental value orientation and a preference for wildlands with water and for cultural landscapes. The anthropocentric value orientation correlated positively with a preference for farm environments, while environmental apathy was negatively associated with a preference for wildlands and cultural landscapes.

5.8 Cemagref have conducted research into perceptions of landscape, management and nature to inform policy engagement in France. More widely, the EC survey of European citizens demonstrated how values assigned to landscape vary with country. The idea of “green and pleasant landscapes” was mentioned most often by Cypriot citizens at 30%, for instance, while France had the lowest result (5%) for the same item (TNS, 2005).

Global

5.9 Research from a number of quite different cultural contexts is described in this section, indicating the variety of texts on the topic. Two Japanese studies were reviewed which offer interesting findings on differing perceptions of landscape with implications for planning. Firstly, Yamashita (2002) compared the perceptions of a Japanese river environment from the perspective of adults and children. Investigating the perception and evaluation of water in the landscape, participants were asked to take pictures of their environment and record their description of each scene on-site. Both perceptual and evaluative dimensions, such as the type of stream view chosen, the percent of water surface in a picture, the rate of selecting water as a subject for photography; and verbal descriptions of water features, were analysed. The study concluded that if adults are to be the dominant viewers of a landscape, appropriate arrangements of mid- to long-distance elements and dynamic aspects of water should be more significant in landscape planning. By contrast, when children are to be the main users of an environment, planners need to focus more on short-distance elements, including water, especially on its quality. In a second Japanese study, Asakawa et al (2004) analysed the perceptions of urban stream corridors within the greenway system of Sapporo. Neighbourhood residents’ perceptions of the stream corridors were surveyed using a questionnaire, and a census of the vegetation along the stream banks was also taken. The results indicated five important factors for stream perception: recreational use; participation; nature and scenery; sanitary maintenance; and water safety.

5.10 The impact of aesthetics and water landscapes on property values was the subject of a New Zealand study by Bourassa et al (2004). Several dimensions of aesthetics were analysed: type of view, scope of view, distance to coast, appearance of immediately

surrounding improvements, average quality of landscaping in the neighbourhood, and average quality of structures in the neighbourhood. It was found that wide views of water added an average of 59% to the value of a waterfront property but that this effect diminishes quite rapidly as the distance from the coast increases. The conclusion reached was that aesthetic externalities are multidimensional and can have a substantial impact on residential property values.

5.11 Haider and Hunt's (2002) Canadian study of the visual aesthetic quality of Northern Ontario's forested shorelines explored the relationships between scenic beauty and biophysical characteristics of the forested shorelines in the boreal forests. Tree size, tree mortality, conifer shrubs, tree density, amount of hardwood, and slope explained 60.2% of the variance in scenic beauty between the study sites. All variables influenced perceptions of forested water environments.

5.12 In terms of research undertaken to inform policy-making, the Australian programme at the CSIRO Tropical Ecosystems Research Centre (2006) shows that the northern Australian landscape provides a wide range of uses and benefits that are valued by people, and this full set of values should be incorporated into environmental policy. CSIRO continues to conduct environmental research, with a current focus on tropical rivers and river landscapes.

5.13 Additional relevant international texts which also emerged during the literature search include Gimblett et al (2001), who investigate landscape perceptions of the Colorado River, USA; and Piegay et al (2005), who explore public perceptions of wood in rivers for restoration purposes. This study, again based in the USA, suggested that 'riverscapes' with wood are less aesthetically pleasing, more dangerous and needing more improvement than riverscapes without wood.

Summary

5.14 Abundant evidence, from academic and policy-sponsored sources, illustrates how fundamental are aesthetics and landscape to perceptions of the water environment. Indeed, it is widely shown that "water is one of the most important aesthetic elements of the landscape" (Yamashita 2002, 3), adding high value to an outdoor environment.

5.15 Individual perceptions of aesthetic qualities vary according to landscape composition (for example, the presence of wood), socio-demographics, and the cultural background of respondent. As Warren et al (2005, 867) note, "landscape values are notoriously subjective."

CHAPTER SIX NATURE

6.1 Perceptions, attitudes and values in relation to nature are explored in this chapter, particularly with reference to the impacts of vegetation, ecology and biodiversity.

Definitions and Concepts

6.2 While nature, like ‘landscape’ and aesthetic constructions, is a contested concept with multiple meanings, for this review it is used to describe 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. Biodiversity is defined as the number and variety of living organisms and ecosystems.

Scotland and UK

6.3 A key UK study of the perception of nature is Powe et al (2004). Through eliciting the values that people place on biodiversity, Powe et al showed that the public may be willing to pay to fund biodiversity conservation. A questionnaire survey and focus groups revealed that participants’ willingness to pay was dependent upon whether the biodiversity outcomes were visible and local and that any possible achievements were well publicised.

6.4 An SNH survey cited in the previous chapter includes evidence about nature values from attitudes towards the natural heritage of Scotland (George Street Research, 2005). The survey sought to establish baseline information for public awareness of the natural heritage and the key ideas of biodiversity, landscapes, marine, protected sites and sustainability. For 67% of respondents, seas and coasts were important to them. Just over half of 16-30 year olds strongly agreed with this, compared to three-quarters of the 44-60 year olds (77%) and the over 60s (76%). The report speculates that this might be caused by a reduced exposure to seas and coastline among the younger generation. The findings generally confirmed the popular conception that people in Scotland are proud of their natural heritage and it appeared that the public predominately associate natural heritage with the countryside and the Highlands. Awareness of terms used in this context, except biodiversity, was high, although levels of understanding were mixed. The term biodiversity was only known by 51% of respondents, although 99% agreed that protecting the variety of wildlife and plant life in Scotland was important for future generations. There were significant differences between age groups in the responses to the statement that “learning about nature is time well spent”. Only 49% of the under 31s strongly agreed with this, compared to 85% of the over 60s. Variations between age groups appear to suggest that natural heritage and investing in its future is more important for the older generations than the younger generations.

6.5 A recent Executive-commissioned survey, *Scottish Biodiversity List Social Criterion: Results of a Survey of the Scottish Population*, undertaken to contribute to the social criterion used for the derivation of the Scotland’s biodiversity lists, produced ‘top ten’ lists for each of animals, plants and habitats which were most important to the public (Stewart, 2006). When asked about the habitats of most importance, the most frequently identified were hills and mountains (most important for 54% of respondents), lochs (54%), woodland (47%), beaches

(47%) and rivers and streams (45%). Lochs were therefore rated highly and perceived to be the most important water landscape for biodiversity.

6.6 Even more recently, the Scottish Executive-commissioned attitudes survey (2006) demonstrated that people consider the water environment to be important to their quality of life. Specifically, nature/wildlife was the third most commonly given reason for why the water environment is important.

Europe

6.7 Using the example of public attitudes towards a drainage basin in Southern Sweden, Lewan and Soederqvist (2002) focus on knowledge about how nature works and how this may be manifested in recognition of ecosystems among the general public. Focus groups research showed that the public had multiple ecosystem preferences but lacked a basic knowledge about the functions of nature, and their knowledge of the nature and environment of the drainage basin was limited.

6.8 The large-scale EC (2005) survey appears again to be the best source of available evidence for comparative data. The survey found that when referring to the natural environment, Europeans mostly think about “pollution in towns and cities”, followed closely by “protecting nature”. However, important and interesting variation between countries was uncovered. For example, at 38% Danes’ first association with the environment is the “protection of nature”, while on 1% of those surveyed in Malta (1%) reported the same.

Global

6.9 As noted above, nature, as defined here, includes the impact of vegetation on a person’s environmental perception. Henderson et al (2003) discuss this topic in a US context, exploring the impacts of aquatic vegetation on anglers’ perceptions through research in two South Carolina reservoirs. Their questionnaire survey found that anglers preferred increased aquatic vegetation. Economic models revealed that increasing plant coverage from current levels would increase angling effort by 11% to 14% and increase economic activity in selected economic sectors, such as lodging, by 18% to 63%. It was suggested that other groups such as pleasure boaters, water skiers, hunters and homeowners along the lakes should be studied using similar methods in order to determine whether their preferences correspond.

6.10 The ecology of an area and its scientific values are discussed in a paper by Aoyagi-Usui et al (2003). In this global comparative study, data from international surveys were analysed to explore ecological values that were found to be structurally different in Asian and Western countries. For example, it concluded that in the Netherlands and the United States, ecological values are linked with altruistic values which are perceived as being contrary to traditional values, whereas in Japan, Bangkok and Manila environmental values are linked with both traditional and altruistic values, illustrating the cultural determination of ecological values.

6.11 Three contrasting international studies of biodiversity which treat biodiversity as an integral component of nature are described here for their findings. In a telephone survey, Jorgensen et al (2001) asked northern Wisconsin property owners about their willingness to pay to preserve biodiversity in a chain of lakes. Many expressed negative attitudes towards

payment and therefore did not value biodiversity highly. Kerley et al (2003) also show that the perceptions of tourists can lead to an under-appreciation of biodiversity. Using Addo Elephant National Park, South Africa, as a case study, they found that tourist interest in biodiversity largely focussed on a few vertebrates, while invertebrates and plants were largely ignored. The findings, therefore, indicate that tourists focus on a few charismatic species and may hold misconceptions about the nature of biodiversity. Xue and Tisdell (2001) provide a comparative study of the ecological values of biodiversity in a Chinese setting, suggesting that conservation of biodiversity can generate considerable economic value.

6.12 As an instance of policy interest in this topic, in 2001 the New Zealand Ministry for the Environment produced nature indicators for the marine environment: the Environmental Performance Indicators (EPIs) measure, monitor and report on the marine environment and the effects of human activities. Indicators include percentage of beaches or coastal areas suitable for bathing, and indicators have been developed for biodiversity (Ministry for the Environment, 2001).

Summary

6.13 While ecological values are determined, in part, by cultural context, the reviewed literature does show that some generalisations may be drawn. For example, a number of studies show that vegetation increases the value placed by the public on water environments. It is also clear that, although water environments are very important ecosystems for the promotion of biodiversity, biodiversity itself does not emerge a public priority for the water environment.

CHAPTER SEVEN RESOURCE MANAGEMENT

7.1 Resource management is the sixth major theme explored in this review. Public attitudes to conservation, perceptions of water resources and values assigned in water resource management are considered here. Participation is an important element of resource management. According to Sidaway (2005, 259), public participation should be employed, to address public concerns, when developing a management strategy. Moreover, participation is at the heart of Scottish WFD implementation, which explicitly demands the creation of river basin management plans, providing an integrated participatory framework for the management of all water resources.

Definitions and Concepts

7.2 In the academic literature it is generally agreed that there are two approaches to resource management: management of people and management of the environment. Both approaches can be achieved through direct and indirect management. Management of people includes restrictions on entry to a water environment (a direct management practice) or providing environmental information to visitors (an indirect practice), while examples of the management of the environment include the construction of foot-bridges (a direct practice) or allowing the resource to remain in its current form (an indirect practice).

7.3 For this chapter, resource management is defined more widely to encompass conservation.

Scotland and UK

7.4 One of the few Scottish studies investigating resource management in a water environment context is provided by Werrity (2002). He suggests issues of concern that may arise for water resource managers that result from Scotland's variable climate and, therefore, explores the values of these professionals.

7.5 Barr et al (2005) address resource management from the perspective of waste management and conservation. Their paper examines their perceptions of water conservation in a sample of 1,265 households from Devon, which were found to vary according to demographic characteristics and whether individuals identified themselves as 'mainstream environmentalists', 'occasional environmentalists' or 'non-environmentalists'. Environmental concern increased with age, smaller household size, home ownership, income, educational attainment, and membership of community organisations, and was higher for females than males.

7.6 In Scotland, the Macaulay Institute's Socio-Economic Research Programme (SERP) focuses on understanding and managing environmental and rural issues from a policy perspective, through research directed towards 'participation and governance' and 'valuation and preferences'. Environmental and rural policy is treated as intersecting with a range of motives such as values, attitudes and norms, which determine individual and group behaviour. One aspect of SERP is to define and measure such motives and Macaulay are also analysing the many social and economic issues involved in the implementation of the Water

Framework Directive. To do this they are looking at the implications of future policy changes and assessing the cost-effectiveness of water management schemes. One example of this work is a project on ‘Measuring the benefits of environmental actions’, in which Macaulay are collaborating with land managers, farmers and local communities to increase awareness of sustainable environmental actions (Macaulay Institute, 2006).

7.7 A practical example of resource management and stakeholder involvement is the Ythan Project in Scotland (Morris, 2006). Funded by the European Commission’s Life Environment Fund, it aimed to involve local people in protecting, restoring and enhancing the River Ythan. It ran from August 2001 until February 2005 and was managed by a partnership of organisations which included Forestry Commission Scotland, Macaulay Land Use Research Institute, SEPA and SNH. Located north-east of Aberdeen, the Ythan catchment was designated as a Nitrate Vulnerable Zone under the European Nitrates Directive. The project involved local residents and land managers in the management and improvement of the catchment through a number of methods and raised awareness of the river amongst local stakeholders and the local community, an important initiative given the WFD requirement that stakeholders should be involved in resource management.

Europe

7.8 In a European context, resource management is often synonymous with conservation. De Ruyck et al (2001) have argued the importance of taking account public perceptions for coastal managers. To determine the view of the Belgian public on the country’s coastal water environment, a questionnaire survey was conducted with 100 respondents. Although a very small sample, they discovered that perceptions of, and attitudes to, the coastal zone differed for the following groups: politicians, coastal entrepreneurs and business people, naturalists and scientists, coastal residents and tourists.

7.9 Olsson et al (2004) also discuss integrating public attitudes into resource management and its relationship to conservation. They have analysed the emergence of social and cultural values within the previously ecologically dominated resource management framework in southern Sweden, and argue that management of wetland landscapes should occur along a social-ecological continuum.

7.10 Across Europe, a number of studies have been conducted on participatory processes to inform implementation of the WFD. One example is the ADVISOR programme, which is co-ordinated by the New University of Lisbon and has as its main objective to provide an integrated project evaluation framework and methodology for the sustainable governance of Europe’s river basins. Its many projects aim to provide a solution to a “policy gap” in the EU through: the establishment of an integrated theory and understanding of the process of evaluation of river basin projects; the development and testing of a number of practical evaluation tools; and a proposed integrated methodology for the evaluation of EU river basin projects. Five ADVISOR case studies have been assessing water management projects in Greece, Portugal, Spain, the Netherlands and Scotland, covering water management evaluations in the context of the Water Framework Directive (ADVISOR, 2004). The Scottish case study looked at the process for the designation of the River Ythan and its

estuary as a nitrate vulnerable zone, meriting a special action programme for the control of nitrate pollution from agriculture (see 7.7).¹⁰

7.11 Ireland offers another example government-commissioned research relating directly to the WFD. The Irish Heritage Council (2004) identified the implementation of the WFD as a major work area with a particular emphasis on public participation, and as such undertook a public consultation on views on water quality. The consultation covered the current state of Ireland's waters; the principles underlying the WFD; its practical implementation; and what else needs to be done. From 147 written responses to the consultation, the dominant concern for over 62% of respondents was in relation to water quality. Many suggestions were made for how the public could be involved in the implementation of the WFD, including a dominant theme concerned with the perceived need for a much greater level of public awareness. A second theme was the need for active, rather than passive, involvement of the public at all stages (from development of River Basin Management Plans, through their implementation, to their revision). Another concern was the need to provide support for the public to participate in implementation, and a fourth concern was the need to establish formal mechanisms or structures for representation of the public within the process of implementation for the WFD.

7.12 Additional European texts which are relevant but not discussed include Getzer (2002), who investigates public decisions about wetland protection in Austria and the importance of public participation in the resource management process.

Global

7.13 A plethora of texts exist outwith Europe concerned with the management and conservation of water environments, although their relevance varies widely. Three of the key texts emerge from North America. As Klessig (2001) demonstrates, lake management is often approached from a biophysical perspective and the social values of lakes are usually given less attention. However, through a discussion of U.S. lakes, he outlines society's needs in relation to water environments. He suggests that lakes can only provide optimal social benefits if management decisions recognise the full set of potential contributions they can make to society. The set of values that lakes can contribute to society are environmental, recreational, aesthetics, education, economic opportunity, emotional security, cultural opportunity, individual freedom and spirituality.

7.14 Eddy et al (2002) examine integrated management in Canada's northern marine environment, where there was an early effort to engage the northern coastal community of Churchill, Manitoba in the first stages of an integrated management plan. The steps taken included communicating the importance of management planning for the town's coastal region; conducting personal interviews on coastal activities and concerns with a representative sample of the community; mapping the results of these interviews; verifying results with the community; and evaluating the effectiveness of the process used. Those interviewed were more comfortable participating once they had had a number of opportunities to become familiar with the context of the study, and its relevance to them.

¹⁰ The others concerned evaluation processes for: the construction of a reservoir in the Evinos River Valley, Greece; the construction of the Alqueva Multipurpose Project, Portugal; the transfer of the River Ebro from the north to the south-east of Spain; and the Grensmaas water project in the River Meuse.

Public attitudes to resource management of water environments altered as communication and information availability increased.

7.15 Another North American study set out to ascertain whether the role of citizen participation in natural resource management was changing, using the Tennessee Valley Authority as a case study (Marshall and Jones, 2005). To assess the representativeness of citizen participation, the researchers conducted telephone surveys of area residents and participants. Results showed that citizens participating in natural resource management were not representative of the stakeholder population who would be impacted by the decisions being made. There were many significant differences between participants and non-participating locals. For instance, participants were generally older, disproportionately male, more educated and affluent, and had higher levels of political efficacy and trust in government.

7.16 The New Zealand Ministry for the Environment's Water Bodies of National Importance project, outlined above, also generates useful comparative evidence from a resource management perspective.

Summary

7.17 As might be expected, the evidence suggests that resource managers value the water environment in a different way to the public, the attitudes of which they need to understand and take account of.

7.18 With increased communication and information, public willingness to participate, a crucial element of water resource management, can grow. Evidence from other countries on the effectiveness of different approaches to and forms of engagement can offer valuable, transferable lessons for Scottish implementation of WFD. As examples of how policy decision-makers have engaged with this subject elsewhere, a number of European resource management studies have already been conducted to inform WFD implementation, while New Zealand offers other insights.

CHAPTER EIGHT EDUCATION

Definitions and Concepts

8.1 This final thematic chapter broadly defines education as the provision of information and communication for the public regarding the 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 (Manning, 2001).

Scotland and UK

8.2 One Scottish study which exemplifies well the relevance of education to the values placed on the water environment is by Storrier and McGlashan (2006), who studied the Forth Estuary Forum's Coastal Litter Campaign, which aimed to raise public awareness of beach litter in the Firth of Forth. Beach cleans were implemented as a public participation exercise, an activity which focussed public attention on the issue of marine litter and created a sense of environmental responsibility. Education and information-provision helped local communities to see beach litter as a significant problem that impacts upon their local environment and they were willing to engage in the coastal management process to tackle this issue. Storrier and McGlashan conclude that raising public informed awareness is the only guaranteed way of reducing marine litter and that education is needed to modify public perceptions of beach litter. In this specific instance, active participation, in addition to information-provision and awareness-raising, was instrumental in supporting successful environmental education of the communities involved.

8.3 The importance of education, information provision, and communication with the public is also outlined in Myatt et al's (2003) study of public perceptions and attitudes towards a coastal realignment scheme in Brancaster West Marsh, Norfolk. Traditionally, public perceptions and attitudes have not favoured the realignment of coastal areas, however, Myatt et al hypothesise that, with education and appropriate information, local residents may come to show a high level of support for this type of strategy. A postal questionnaire, mainly of attitude statements, was used to elicit resident perceptions and attitudes of the local environment, coastal flooding, coastal defence and managed realignment. Findings from the Brancaster scheme suggested that residents with a higher regard for the Environment Agency were generally more accepting of the scheme, although the results could not conclusively determine whether the majority of the respondents supported the scheme. Qualitative data also highlighted conflicting views among residents on issues of sustainability, hard and soft defences, economics, the environment and consultation. This was thought to have resulted from information feedback deficiencies between the public and operating authorities. The study concludes that the information needs of local residents and access to information need to be appreciated as integral components in the process of public understanding to be addressed and assessed on a case-by-case basis.

8.4 Palutikof et al (2004) examined public perceptions of climate variability in the UK, through postal surveys with residents of southern England and central and southern Scotland, determining that the perceptions in England and Scotland differed significantly. Such

locational differences, it was found, can be altered through increased communication and information provision.

8.5 As noted above, the Macaulay Institute's SERP initiative involves a number of projects relevant to education and increasing awareness. Their Rural Sustainability Programme, for example, looks at the impacts of policy changes upon society and the environment, including the introduction of the WFD. One of the key concepts driving SERP is to provide information about policy processes and the need to decode how people interact with information as expressed by different actors (e.g. experts or vested interest groups) (Macaulay Institute, 2006).

Europe

8.6 Davos et al (2002) have compared attitudes towards coastal environments using four case studies in Belgium, Greece, Spain and the UK. A major finding of their study was that existing communication between the public and coastal managers was currently inadequate. But, with increased communication, willingness to participate in coastal zone management would be expected to grow.

8.7 Similar conclusions are made by Lewan and Soedergvist (2002) in their study of knowledge and recognition of ecosystem services amongst the general public in a drainage basin in Scania, Southern Sweden. They suggest that human preferences are partly dependent on knowledge and information, and conclude that a widespread recognition of ecosystem services in policy and economics cannot be expected until the public acquires a critical level of basic knowledge about functions in nature.

8.8 Again, the aforementioned ADVISOR project provides relevant material (2006). It has found that ostensible attempts to foster public participation is often limited to education and providing information, despite the need to involve the public as early as possible in the water policy process. Tools to promote public participation can include consultations, workshops, participatory modelling and citizens' juries.

8.9 The European Commission survey into the environmental attitudes found that the majority of Europeans feel well informed about the state of the environment (TNS, 2005). Danish citizens reported feeling the most informed about environmental issues; the lowest scores were observed in Lithuania, followed closely by Portugal, where respectively only 34% and 39% of citizens felt well informed about environmental issues. Television news was by far the main source of information about the environment for European citizens. In most European countries, information on WFD implementation is available on the homepages of the competent authorities, along with links to other internet pages. Exhibitions, films, TV spots, press articles and similar actions are also means of communicating with the public about WFD.

8.10 German research for the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety suggest that the German public are generally well informed about environmental matters, deriving their information from a number of sources, including the media, publications and the internet. Environmental education has been successfully established in school curricula, teacher training courses and vocational training. Implementation of the WFD has allowed the German government to strengthen public

participation in the design, implementation and assessment of environmentally relevant projects and policies. In the first four years following entry to the WFD, the main focus in Germany has been on information and education (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2006). Ongoing public information and consultation for WFD will aim to further raise awareness of water protection issues among the public.

Global

8.11 Relevant literature from beyond Europe includes research by Alessa et al (2003), in their study of the intertidal zone of the Pacific Rim National Park, Canada, which examined the effects of human values, knowledge and perception. Attitudes, knowledge and perceptions were measured using a questionnaire survey and structured interviews undertaken in situ. It was shown that visitors who recorded less knowledge of intertidal ecology engaged in more anti-social behaviours than those recording more knowledge.

8.12 In another North American study, Bjorkland and Pringle (2001) discuss the importance of community education for the conservation of water environments. They claim that the inadequacy of current environmental education in the USA is apparent when examining the public's understanding of aquatic ecosystems. Despite more than twenty years of river conservation efforts, public knowledge of the degradation of the nation's riverine ecosystems and biodiversity is still extremely limited, pointing to the need for effective environmental education.

8.13 Based on the perspectives and experiences of school students in Australia and Brunei, a study by Fien et al (2002) explores how local cultural influences have an effect on the construction of youth environmental attitudes, highlighting the need for schools to do more in the area of environmental education.

8.14 The New Zealand Department of Conservation (DOC) has an important educational role in the country's marine 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 this, the public were educated on the importance of biodiversity, conservation and why the sea is so important and told about why that marine biodiversity is essential in a seascape (New Zealand Department of Conservation, 2006), deriving numerous educational and environmental benefits.

8.15 An additional relevant global text which also emerged during the literature search is by Krogmann et al (2001). Through a study of the perceptions of New Jersey farmers (USA), the authors argue that communication efforts should focus on practical information to which farmers can relate.

Summary

8.16 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 and are increasingly being pursued as a central element of WFD implementation policy by European Governments. The review of the literature on education has revealed several

important points, and, as Lee and Zhang (2005) recognise, attempts to educate the public should not assume the existence of a homogenous community of like-minded people.

CHAPTER NINE OVERVIEW AND CONCLUSIONS

9.1 This review has explored evidence of public attitudes, perceptions and values in relation to the water environment which may be relevant in terms of developing thinking about how the WFD is implemented. The review has shown that there is a multi-disciplinary research base, drawing on a diverse range of qualitative and quantitative methods. Some general conclusions have been grouped under five headings: (1) extent of current evidence; (2) public values and perceptions; (3) priorities; (4) lessons for Scotland; and (5) gaps in the knowledge-base.

Extent of current evidence

9.2 The scarce research on perceptions of the water environment amongst the general public in Scotland and the UK has been mostly concerned with perceptions of water quality. Most of the international academic literature that was reviewed investigates environmental attitudes on a case-study, site-specific level and the focus of these usually came under the themes of recreation, water resources or ecology.

9.3 Policy formation and decision-making on the water environment have tended to reflect ecological and economic priorities rather than social values and perceptions, and where these have been considered it has usually been concerned with people's views of water quality. Interesting material from Germany and New Zealand seemed to have the most potential relevance for Scottish policy engagement with public perceptions of the water environment.

Public values and perceptions

9.4 People engage with the water environment positively and negatively, with the evidence suggesting that water adds a positive economic value to the environment and vegetation increases the value that people place on the water environment. The public also value the water environment highly for outdoor recreation, with values varying by the recreation group to which people belong. The water environment, therefore, possesses diverse values, both human and natural, both use and non-use – “even unspectacular rivers provide a source of enjoyment and tranquillity for many who use only the riverbanks, view the river from afar, or who only know that it is there and available” (Asakawa et al 2004, 168).

9.5 Plentiful evidence also illustrates how the views and values of different groups of people vary in significant ways. Factors influencing shared and divergent perceptions include: socio-economic and demographic differences (gender, age, education, residence, religion, social class, income and employment); geographical variables (for example, respondent's country of origin or location of the waterbody); cultural context; prior knowledge of an environment; user group; and the type of water environment. Variation in values and perceptions is, therefore, largely influenced by location and by the characteristics of respondents. (However, it should also be borne in mind that variations in values and perceptions may be partly influenced by factors inherent in the methodological approach which has been adopted in a study.)

Priorities

9.6 Public priorities for the water environment emerging in the literature are water quality, water quantity and safety, recreation and tourism, aesthetics and landscape, nature, resource management and education. Perceptions of, and attitudes to, **water quality** is the most important environmental priority in relation to other water environmental concerns, including **quantity** and supply. This general observation based on the findings of this review is supported by the results of the public attitudes survey undertaken in Scotland in April and May 2006 (Scottish Executive, 2006).¹¹

9.7 The issue of conflict emerged as important within different themes of the review. The importance of education, information-provision and communication was clearly apparent as these are means by which the values that different groups of people assign to the water environment may be influenced and tools in the prevention, mitigation and resolution of conflict.

9.8 There is a need to ensure that the public are well informed for the purposes of fostering effective participation and to avert and address conflict. This review of literature suggests that the public consider themselves to be informed with reference to water quality, but that further education and increased awareness is required in relation to water quantity, supporting the findings of the Executive's recent survey.

Lessons for WFD implementation in Scotland

9.9 A plethora of literature has been identified during the course of this review. Although there are limitations to this evidence-base, mainly as a consequence of the cultural specificity of research and the English-language focus, a number of important lessons for WFD implementation in Scotland can be identified. Central to WFD is the issue of engagement and public participation, with WFD demanding a high degree of public involvement, placing the people of Scotland at the heart of managing the water environment. From this respect, evidence generated in Australia and New Zealand offers a number of useful perspectives, indicating, for example, that education and awareness-raising should be an integral element of river basin management. The projects undertaken by the Australian CSIRO Tropical Ecosystems Research Centre, which incorporates social values into environmental policy, is particularly useful, eliciting the values of the public and developing river basin catchment models to resolve conflicts over the water environment. Here 'learning through activity' was a successful mechanism of public engagement, echoing, for example, the findings of the Forth Estuary coastal litter campaign (Storrier and McGlashan, 2006). In New Zealand, the Ministry for the Environment's Water Allocation Programme encourages sustainable development of water resources by removing unnecessary constraints to water availability and promoting efficiency of water use. The New Zealand Government has also identified all water bodies of national importance for a range of values, including natural heritage, recreation, cultural and historical heritage, irrigation, energy, industry and domestic use and tourism. More specifically, public awareness campaigns, such as that conducted by the New

¹¹ Following extensive media publicity over the droughts in the south-east of England and across Europe in summer 2006, it would be interesting to see if there has been any shift in public perceptions and attitudes towards water quantity in Scotland since then.

Zealand Department of Conservation (DOC) during 2004-2005, can educate the public on the importance of the water and marine environment. Evidence from this suggests that with increased public awareness and education, conflicts can be averted.

9.10 The resource management literature, especially that concerned with participation and engagement, is, therefore, pertinent to Scottish implementation of the WFD. As Olsson et al (2004) note, public attitudes and participation must be integrated into resource management. A particularly useful way of achieving this is seen in Eddy et al's (2002) study of integrated resource management in Canada's northern marine environment. Here the coastal community was involved from the first stage of the catchment management plan and public attitudes to resource management of water environments were altered as communication and information availability increased. Similarly, the advantages of education, information provision, communication and public participation are outlined in Myatt et al's (2003) study of public perceptions and attitudes towards a coastal realignment scheme in Norfolk. They conclude that access to information is an integral component in the process of public understanding. Another relevant study is provided by Sidaway (2005), where he deliberates the importance of encouraging stakeholder dialogue and engaging in workshops and consultations, all of which should be adopted to resolve conflicts over the water environment.

Gaps in the literature and opportunities for further research

9.11 Given how values and perceptions differ on cultural, geographical and demographic grounds, it is inevitable that literature and data from elsewhere are not often immediately applicable or comparable to Scotland and Scottish WFD implementation. Therefore, further understanding (qualitative research) and data (quantitative research) is required in a Scottish context, providing, for example, baselines from which to measure future trends as a consequence of the WFD.

9.12 In comparison with the evidence that exists elsewhere, particular gaps in the evidence-base for Scotland are: (1) public attitudes and perceptions in relation to water quantity; (2) recreational and tourist values of water environments; (3) the resource manager's perspective on the water environment; and (4) the importance that the public attach to nature within water environments. Further evidence would also be valuable on the attitudes and priorities of different, and indeed under-represented, groups in Scotland, encouraging democratic engagement, which would require primary data collection. There are a number of key topics identified in this review which could be investigated in more depth in the Scottish context through quantitative or qualitative research.

9.13 Encouragingly, there are a number of studies which are addressing these evidence-needs. The recent survey of public views of the water environment (Scottish Executive 2006) and further in-depth, qualitative research on behalf of the Executive, which is currently underway to further explore public opinions and priorities, are examples of this. Relevant work has also been undertaken by the Macaulay Land Use Research Institute, both in terms of investigation public attitudes to water and in relation to broader issues around democratic participation and engagement in environmental management and decision-making. Meanwhile, SNIFFER (the Scottish and Northern Ireland Forum for Environmental Research) has an ongoing programme of research concerned with water which will yield relevant data, although most of their work is concerned with enhancing the scientific

evidence-base, and SEPA, as a responsible authority, conducts consultation on specific aspects of WFD.

9.14 In tandem with the need for rich and varied explorations of people's values towards the water environment, including monitoring of WFD implementation, the literature reviewed here also points to the importance of providing the public with reliable and accessible information and appropriate opportunities for involvement in order to meet the open, participatory principles of the Directive which require public trust and engagement in their water environment and well informed participants in decision-making and management processes.

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ANNEX

1. The search terminologies for inclusion to electronic sources were as follows: “(attitudes OR percept* OR values) AND environment AND Scotland”; “(attitudes OR percept* OR values) AND environment AND Scotland AND water”; “(attitudes OR percept* OR values) AND environment”; and “(attitudes OR percept* OR values) AND environment AND water”.
2. The sources used to identify the relevant texts included university libraries, university departmental websites, research council sites, and government and NGO sites. In addition, implementing the academic search involved entering the set search terms to the following electronic databases: Web of Knowledge, CSA Illumina¹², OCLC Firstsearch¹³, International Bibliography of Social Sciences, Dissertation Abstracts Online, Index to Theses, Social Science Information Gateway, and the Social Science Citation Index. For the policy search, the search terms were entered in the following electronic databases: Acompline/Urbaline, AgraNet, BRIX, CELEX, Idox, PAIS International, Policy Brief, Policy Library, Scottish Bibliographies Online, and UKOP. Finally, the search of datasets was undertaken using the following databases: National Digital Archive of Datasets, Office for National Statistics, Economic and Social Data Service, Centre for Longitudinal Studies, Question Bank, Social Survey Bank, and UK Data Archive.

¹² Searches a number of databases simultaneously including Community of Scholars, ASSIA, Aqualine, Biological Sciences, British Humanities Index, Conference Papers Index, Environmental Sciences and Pollution Mgt, Oceanic Abstracts, Sociological Abstracts, and Worldwide Political Science Abstracts.

¹³ Searches the following databases simultaneously: Geobase, Econlit, ArticleFirst, ECO, ERIC, Medline, PapersFirst, WorldCat, WorldCat Dissertations and PsychInfo.

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