

The Benefits of Inland Waterways

Phase 2 – Testing the Framework




Case Study Report

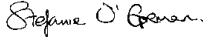


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1 Introduction

1.1 Objectives and scope

The role that the UK's waterways can play in generating societal benefits is increasingly being recognised at all levels of decision making. These benefits include leisure and recreation opportunities which contribute to improving physical and mental health, urban and rural regeneration, and benefits to the environment.

In 2009, the first study under Defra and the Inland Waterways Advisory Council's (IWAC) joint Research and Development (R&D) Programme¹ on the benefits of the inland waterways of England and Wales produced a **benefits transfer framework**². This framework is based on an evaluation of the literature covering both tidal and non-tidal inland waterways.

In order to develop and refine this work, Phase 2 of the project is focussed on **testing the framework** using real case studies. The case studies were selected to facilitate an extensive testing of the functionality of the framework and guidance, and are as follows:

- Droitwich Canal Restoration - the estimation of the marginal benefits;
- The River Medway - the estimation of the current benefits; and
- Limehouse Cut – the estimation of the marginal benefits provided by small improvements to towpath and mooring facilities.

The objectives of this testing are to:

- identify potential issues relating to the application of the framework and the guidance;
- recommend amendments to the guidance or framework to address any issues identified;
- provide additional information where possible to inform future decisions at each site; and,
- recommend priorities for the R&D programme, as appropriate.

Phase 2 provides worked examples of the use of the framework and its guidance as an aid to future users and to decision makers. It also further clarifies the issues users may encounter and identifies where care is required in the use and interpretation of the transfer values.

For the site managers of the case study sites, it is hoped that the analysis provides a greater understanding of the current and potential benefits offered by the sites, and a prioritisation of the benefits such that it is clear where efforts should be focussed in order to maximise benefits.

¹ The objectives of the R&D Programme are to: provide confidence in investment achieving value of money, improve investment decision making, inform policy, provide evidence on potential benefits, and identify beneficiaries. See 'the Benefits of Inland Waterways' report for more detail on this.

² The Benefits of Inland Waterways, Jacobs 2009. A report to Defra and IWAC. Project reference number: WY0101. Downloadable from <http://www.iwac.org.uk/reports/>

BOX 1 Key questions addressed by the case studies

1. Is the list of benefits in the framework comprehensive and accurate?
2. Are the monetary values provided in the framework in a form that is usable / compatible with available physical data?
3. What level of confidence can be attached to the monetary values derived given the different types of contexts the transfer values could be applied in?
4. Is the guidance clear and does it cover the process required in practice?
5. Does the guidance provide enough advice to the user on the physical data requirements and its availability?

1.2 Report outline

The following sections present the case studies - Droitwich (Section 2), River Medway (Section 3) and Limehouse Cut (Section 4). Each section follows the same format beginning with a summary of the case study purpose and key findings. A description of the site, details of the proposed changes to the site (where appropriate) and the objectives of the case study is then presented.

The case studies then go on to identify the likely key benefits provided at the site and to present an evaluation of these benefits using available site specific values and/ or default values provided in the framework. Where both site specific and default values are available, as is the case for some of the Droitwich benefits, a discussion around any variability in the values is provided. For each benefit considered, the 5 questions posed in Box 1 are addressed as appropriate, along with any recommendations identified.

2 Case Study 1 – Droitwich Canal Restoration

2.1 Overview

Purpose of Case Study

This case study applies the valuation framework and associated guidance to illustrate and test their facility to estimate the marginal changes in the benefits realised through the Droitwich canal restoration. The benefit estimates are forecasts, not estimates of the actual benefits realised, as the scheme is only now being completed.

Key Findings

- The list of framework benefits is considered to be comprehensive.
- The guidance is clear and the unit values presented correspond well to the available physical data for the site.
- Physical data was readily available in this case, due to the number of previous assessments undertaken to support restoration funding applications. This might not always be the case.
- Where site specific unit values are provided, these are likely to be more accurate than the default values presented in the guidance. However, confidence can be placed in the guidance default values as they were found on the whole to be similar to the site specific estimates.
- It is recommended that the guidance is amended to include the following:
 - a site specific literature or data review - this is important to assist the identification of relevant benefits, the physical quantity of those benefits (for instance the number of visitors) and any available site specific monetary data.
 - Reference to the use of an appraisal period over which benefits should be considered and the use of discounting to estimate present value estimates.

2.2 Background and site information

The Droitwich restoration project involves the restoration of 12km of waterway. The restoration will re-link the Junction Canal and the Barge Canal, where navigation was officially abandoned in 1939, by canalising a 550 m stretch of the River Salwarpe through the centre of Droitwich. The course of the river will be made wider and deeper and a weir will be constructed adjacent to the proposed Lock 7 to maintain the water levels. In order to minimise the mixing of canal water with river water, a pipeline will be built under the towpath, running from just above the new Lock 7 to just below the Barge Lock.

It will also link the Worcester & Birmingham Canal at Droitwich. The project includes the restoration of a number of locks and bridges, 800m of newly cut canal and the creation of reedbeds, located nearby but away from the line of the canal, to replace those affected by the works. In addition 5km of new or upgraded towpaths will be provided.

Ultimately the project will result in the creation of 21 mile cruising ring which is unique in the UK in that it can be navigated in one weekend.

2.3 Case study objectives

The key objective of this case study is to assess the functionality and completeness of the benefits transfer framework and associated guidance by applying it to the estimation of the **marginal benefits** realised through the restoration works at the

Droitwich Canals. The benefits are calculated based on forecast data, not real data, as the scheme is only now being completed.

The three supplementary objectives of the case study are to:

1. Assess the **drainage benefits** provided by the restoration activities.

This assessment seeks to inform future research by providing an initial outline of how the potential drainage function and its associated benefits can be identified at a given site. This information may also be helpful to British Waterways in developing and refining their monitoring and evaluation programme at this site; however this is not an explicit objective of the case study. The assessment is presented in section 2.7.

2. Highlight the difference between a welfare assessment using the framework and an Economic Impact Assessment.

This analysis aims to highlight both the differences and similarities between a welfare assessment based on the benefits transfer framework and Economic Impact Assessments, using the Droitwich as a case study. This is discussed in further detail in section 2.8.

3. Investigate how the benefits listed in the framework might map on to both National Sustainable Development Indicators and Quality of Life Indicators used by British Waterways.

An ex-post evaluation of the Droitwich Canal restoration will be required to monitor and assess the economic, social and environmental impacts of the scheme. British Waterways have outlined a monitoring programme to fulfil this requirement. In seeking to deliver an exemplary project for sustainable development, the monitoring plan includes a number of Quality of Life Indicators. These are to be used in the delivery stage of restoration and in the future management of the canals. These indicators are linked to the UK Government's Quality of Life Counts (2004) as well as the 1999 Sustainable Development Strategy for the UK 'A better quality of life'. British Waterways have outlined the indicators, and their targets, proposed for monitoring purposes.

The case study is used to investigate how these Quality of Life Indicators, plus the National Sustainable Development Indicators used by Local Authorities, can be mapped onto the benefits listed in the framework to demonstrate how the framework can be used to enhance the current understanding of these indicators and to inform reporting on these indicators. Importantly, such an exercise hopes to make the framework more meaningful and useful to those responsible for demonstrating delivery of these indicators, including Local Authorities and British Waterways. This assessment is presented in Section 2.9.

2.4 Identification of key benefits

The benefits transfer framework provides a comprehensive list of potential benefits provided by inland waterways. These are categorised using an Ecosystem Services approach, which includes provisioning, regulating and cultural service categories. No supporting service category benefits are included as they are considered to be intermediate in nature, contributing therefore to the final benefits captured within the framework. Cross – cutting benefits are also listed in the framework. These are

benefits which are provided by a number of the other benefit categories and so when aggregating benefits their value should not be added to the value of the other benefits as this is likely to result in double counting.

Table 1 below presents the list of benefit categories provided within the framework. It also shows which benefits are considered to be currently present at Droitwich (the baseline), and those provided or enhanced by the restoration project.

The benefits for which monetary values are provided in Section 2.5 are highlighted in grey in the final column of the table.

Table 1 The benefits provided by the Droitwich Restoration project

Ecosystem Service Category	Benefit	Value provided in the framework	Present under the baseline	Provided by the restoration
Provisioning	Property price premiums	Yes	✓	✓
	Renewable energy generation	No	-	-
	Transport - Freight - Green transport	No No	-	✓
	Water provision	Yes	-	-
	Volunteering	Yes	-	✓
	Creation of business opportunities	No	✓	✓
Regulating	Climate regulation – Carbon savings, Renewable energy, and Transport	Yes Yes	-	-
	Drainage, water conveyance, flood protection and alleviation	Partially	✓	✓
	Water regulation and pollution dilution*	Partially	-	✓
	Water Quality*	Yes	-	✓
	Habitat provision	No	-	-
Cultural	Recreation, including informal visits, cycling, boating, canoeing, angling	Yes	✓	✓
	Bird watching	Yes	-	-
	Heritage values	Partially	✓	✓
	Visual amenity	Yes	-	-
	Education	No	-	✓
	Volunteering	No	-	✓
	Community benefits	No	-	✓
Non-use values	Yes	✓	✓	

*Water regulation and pollution dilution' and 'water quality' could not be appropriately disaggregated for Droitwich. See further comments below.

One of the purposes of the case studies is to review whether the list of benefits provided in the framework is representative of those realised in real situations and therefore likely to be encountered by users of the framework and guidance. Having reviewed the available information on the Droitwich scheme and the list of benefits in the framework, no additional benefits categories have been identified. That said,

the disaggregation of regulating benefits presented within the framework may not always be appropriate.

For Droitwich, 'water regulation and pollution dilution' and 'water quality' could not be appropriately disaggregated. This is due to the fact that in this case, the term 'pollution dilution' was linked to mercury contamination of the canal bed soils. The resulting benefits are in fact associated with 'water quality' services, rather than 'water regulation' services. However, in other cases, it will be the link between water regulation services and pollution dilution that delivers benefits.

It is recommended that the titles of these sections are changed to 'water quality and pollution dilution' in the guidance so that users are clear that pollution may be need to be considered under both categories of benefit (i.e. water quality and water regulation).

Section 2.5 below describes the nature of each of the benefits and provides valuations where possible.

2.5 Estimating the marginal values of the Droitwich Canal restoration project

The process outlined in the guidance document has been applied to value each of the benefits identified for the Droitwich canals, as indicated in Table 1.

For each benefit the following is provided:

- the details of a literature review;
- the unit values to be applied;
- the application of the unit values and any adjustments required; and
- the aggregation undertaken to estimate the value of the benefit.

Under each section any lessons learnt or recommendations identified are presented. These are also summarised in Section 5.

In undertaking this exercise a number of issues arose, discussed in turn below.

The guidance does not note the requirement to undertake a site specific literature or data review. This is important to assist the identification of relevant benefits, the physical quantification of those benefits – for instance the number of visitors, and any available monetary data. While the guidance provides some assistance in estimating physical data for some benefits (for instance for carbon savings associated with renewable energy generation), site-specific information is still required in every case. A recommendation to revise the guidance in light of this is provided in Section 5. Available site specific information for Droitwich is presented under each benefit discussed below, under the sub-section 'information review'.

In addition, it became clear while undertaking this case study that due to the level of assessment already undertaken on the benefits of the restoration scheme, unit values already exist for some benefits; for instance visitor expenditure. In such cases, the site specific values have been applied; however the default values provided in the framework are also documented. A discussion is provided below as to the likely cause for any significant variation in these unit values and the implications for the confidence we can place on the default values.

The guidance does not suggest an appraisal period over which benefits should be considered or provide guidance on discounting. As the costs for the Droitwich restoration scheme are likely to be incurred over a period of time and the benefits will accrue and potentially grow over time, the benefit estimates are best presented in present value terms. In line with an Economic Impact Assessment of the restoration of the Droitwich Canals, carried out by Ecotec³, an appraisal period of 20 years has been applied. A recommendation to update the guidance to highlight to users the possible need to consider appraisal periods and discounting is provided in Section 5. The GDP deflator estimates used for adjusting values to current prices has been updated since the guidance was produced. The revised GDP deflator is therefore used in the calculations presented here. A recommendation to update the GDP deflator in the guidance is provided in Section 5.

Table 2 below provides a summary of the values estimated for each of the benefits. These are provided as annual average raw values (undiscounted) and discounted at 3.5% over 20 years, following the approach outlined in the Treasury Green Book (2003)⁴. All present value estimates are calculated over an appraisal period of 20 years.

It can be seen from Table 2 above that the vast majority of the value of benefits arising from this restoration project are associated with cultural services. While the value of the property price premiums are significant, as they are one-off values (not annual values), their present value contributes just over 10% to the upper bound total present value estimate.

Overall the present value of the benefits is significant, and the range between upper and lower bound estimates is small. The Project Application Form estimates the cost of the restoration project to be £14m (NPV over 20 years). The welfare benefits estimated at £76.4 – 80.7 million, therefore significantly outweighing the costs. This remains true when only the use values are considered, amounting to a present value of between £32m and £38m; 2 to 3 times the costs.

³ Restoration of the Droitwich Canals – Appraisal of Economic Impacts. Ecotec (2005)

⁴ http://www.hm-treasury.gov.uk/data_greenbook_index.htm

Table 2 Summary of the marginal benefits at Droitwich (2009 prices)

	Benefit	Annual value (undiscounted) (£000)		Present Value (£000)		Note
Provisioning	Property price premium	5,338*	9,092*	5,187	8,941	Premiums are assumed to be realised in year 1 for existing properties and in year 2 for new properties. * Total one-off value, not annual value. Confidence: medium due to the variability which can be seen in the premium estimates from different sources.
	Green transport	0.3		5		Note these values are net of costs. Confidence: low due the uncertainty around the physical data and the assumption with regard to displacement of road traffic.
	Volunteering	41	81	605	1,195	Note these values are net of costs. Confidence: high due to the fact that the physical data is robust.
Regulating	Drainage, water conveyance, flood protection and alleviation	228		3,352		These values relate to flood protection benefits only. Confidence: medium as the physical data comes from modelling results, but the average annual value may be an overestimate for this situation.
	Water quality and pollution dilution	-		-		A discussion of qualitative information is provided in the analysis.
Cultural	Informal recreation – day visits	334		4,699		These values include expenditure and consumer surplus estimates where available. Confidence: low to medium due to the ages of the unit value data and uncertainties in the physical data.
	Informal recreation – overnight visits	458		6,303		
	Cycling	37		541		
	Canoeing	40		553		
	Boating	845		11,403		
	Angling	70		1,031		
	<i>Sub-total: Recreation</i>	<i>1,784</i>		<i>24,530</i>		
	Education	-		-		A discussion of qualitative information is provided in the analysis.
	Volunteering	-		-		
	Community benefits	-		-		
	Non-use values	2,904		42,724		Non use values account for a significant proportion of the total annual benefits between 26% and 40%. Confidence: low due to the uncertainty around the distance band and the fit of the valuation data.
TOTAL		10,296	14,090	76,403	80,746	

2.5.1 Provisioning benefits

(a) Property price premium

The available evidence suggests that properties located in close proximity to water command a property price premium. This case study explores the appropriate price premium to be applied to properties along or adjacent to the Droitwich Canals following the proposed restoration works.

Information review

The main source of information on property price premiums is the Economic Impact Assessment report carried out by Ecotec (2005). This study quantifies the impact the restoration is expected to have on house prices along the canal corridor.

The Droitwich Project Application Form⁵ provides a detailed account of the proposed restoration project. It gives an estimate of the number of new properties that are expected to be built in the initial years following restoration to which higher property prices would apply.

In addition, the Outline Business Plan for the Restoration of the Droitwich Barge and Junction Canals (2002) provides a forecast of the potential increase in canal-side property values.

Unit values

To estimate the impact of the canal restoration on house prices, Ecotec (2005) combined the number of residential properties located within 50 metres either side of the canal, estimated at 351 properties, with an average value per property, and assumed an uplift in price of 4%. The authors note that this uplift premium is conservative, for example it is half that estimated for existing waterside properties by Willis and Garrod (1993)⁶.

The guidance provides a range of 1.5% - 8% for properties within 25 meters of a waterway. The upper bound estimate of 8% comes from the Willis and Garrod work quoted in the Ecotec report.

Ecotec's analysis is based on existing properties adjacent to the canal; however any new residential properties would also benefit from the waterside premium. The Project Application Form estimates that 151 new residential properties will be built within the first 5 years of restoration. No percentage increase associated with these new properties is available from the information reviewed. The guidance however provides a premium ranging from 3%-20% for new properties by the canal side. The average recommended premium is close to the high end of the range, at 18%.

Finally, the Outline Business Plan estimates an increase in canal-side property values of 15%. It is assumed that this refers to existing properties and new properties as no distinction is made.

⁵ Project Application Form for the Restoration of the Droitwich Barge and Junction Canals. Submitted by British Waterways (for the Droitwich Canals Restoration Partnership), 2005.

⁶ Willis and Garrod (1993). The value of waterside properties, Countryside Change Unit, University of Newcastle Upon-Tyne.

Application of unit values

A range of property premiums have been applied to account for the potential effect of the restoration works on property values, taken from the site specific studies noted above and from the guidance.

Existing properties are valued using the site-specific premium of 4%, as applied by Ecotec, to provide a lower bound estimate of the value added to properties on or near the canal. This premium is in line with the value provided in the guidance (Table 9 in the guidance report) for a change from non-navigational waterway to a navigable waterway. The premium of 15%, as quoted in the Outline Business Plan for Droitwich, is taken as the upper bound estimate.

As no site-specific premium is available for new properties, the average value of 18% has been applied from the guidance, with the range of 3-20% used for sensitivity testing.

Aggregation

Data on average property values has been sourced from the Land Registry House Price Index⁷. This is a publicly available online resource.

The average property price in Worcestershire County Council area for the period October 2008 to September 2009 was approximately £165,000 (Land Registry). Ecotec used an average property value from 2004 which was considerably higher, at £220,000 per property. It is not clear what area this figure corresponds to, as it does not seem to correspond to either Worcestershire or the West Midlands areas. The premium is applied to the current average value (i.e. £165,000) and aggregated over the number of new and existing properties it applies to.

For existing housing stock it is assumed that the benefits (or increase in the value of the housing stock) will be realised in year 1. However the construction of new properties is assumed to take place in year 2. As these benefits are one-off values, not annual values, the present value calculation for new properties is based on the assumption that the total benefit (or increase in the value of stock) is realised in year 2.

The estimated property price premiums are provided in Table 3, below. Shown in bold italics are the values selected as the most appropriate for use in the assessment.

Table 3 Property values added on new and existing properties

	Price premium	One-off present value (£000)
Existing properties – site specific	4% - 15%	2,310 - 8,663
<i>Existing properties - guidance</i>	<i>1.5% - 8%</i>	<i>866 – 4,620</i>
<i>New properties -average(guidance)</i>	<i>18%</i>	<i>4,321</i>
New properties – range (guidance)	3% - 20%	720 – 4,801

⁷ Source: Land Registry: www.landregistry.gov.uk

Conclusion

The guidance on the estimation of property price premiums was found to work well and there is a high degree of confidence in the estimated values presented. The guidance provides estimated premiums for both new and existing properties, and these premiums are similar to those used in practice by Ecotec. The value range estimated using the guidance values includes the estimate presented by Ecotec. For this reason, this average figure of 18% is selected as the most appropriate to apply to new properties (as highlighted in Table 3 above).

The results however show that the range of premiums presented in the guidance and used here has a significant impact on the overall added value for *new* properties. However, given the nature of the housing market and the variability in this market over time, it is thought likely that these estimates will always contain a significant level of uncertainty. As highlighted within the guidance, this uncertainty should be noted alongside the results.

The average value of properties applied in this valuation (£165,000) is significantly lower than that used in the Ecotec report (£220,000). It would appear that average prices have fallen, however given that it is not clear what area the Ecotec prices correspond to, it is not possible to draw conclusions on the differences in these two value estimates. Ecotec estimated a one-off value for existing properties of £3.1m (in 2005 prices). Based on the average property prices used here, this falls to around £2.3m (2009 prices).

Recommendations

- Clarify that property premiums represent one-off benefits, not annual values, in the guidance.
- Highlight that the user needs to determine when these benefits will be realised; immediately in the case of existing housing stock, and once construction is completed for new housing stock.

(b) Green transport

The restoration of the Droitwich Canals is expected to provide commuters with an alternative to car travel and an incentive for cyclists to use the tow paths. The use of towpaths is to be promoted and access to be improved, thereby leading to an overall improvement of the local transport infrastructure and better linkages with the town centre. The benefits associated with a shift from road/car to towpath/ bicycle includes time savings, carbon savings and health benefits. Note that the valuation approach applied here provides a net benefit estimate, not a gross benefits estimate. It is therefore not directly comparable to the gross benefit estimates calculated for other benefit categories.

Information review

Information about the potential for displacing commuter related road traffic comes from a number of sources detailed below.

Ecotec (2005) notes that the network of cycle paths along waterways will encourage a reduction in journeys made by car, thus reducing the cost of travel and associated emissions, and that the canal towpath will create a safe route to school or work for cyclists.

The Advantage West Midlands Project Application Form states that the restoration scheme will provide 5km of shared use towpaths. It estimates an increase of 2,400 cycling trips per km, 40% of which are assumed to be commuter trips. Therefore the adjusted estimated number of commuters using the tow paths is 960 per km per year. No information is available on how these people would otherwise commute to work; they could cycle a different route, travel by car or travel by public transport.

The Droitwich Canals Restoration Monitoring Plan⁸ provides a target for sustainable transport modes of 250,000 additional visits per annum by walkers and cyclists (for all purposes). This provides quite a different picture from the Project Application Form, which predicts a total of 12,000 additional cycling visits along the 5 km stretch (2,400 trip * 5km), a proportion of which can be categorised as green transport (and a proportion to recreation).

However, as this is a target figure and not a prediction *per se* and because it has not been possible to disaggregate this figure between different types of cycling trips (commuting cyclists and recreational cyclists), the abovementioned density of 960 cyclists per km has been used for the purposes of this valuation. When summed over the 5 kilometres of new towpath, this equates to a total of 4,800 commuter cycling trips per year.

Unit values

The net benefit of displacing commuter journeys from cars to cycling on towpaths is presented in the guidance on a 'pence per kilometre' basis. This value includes the benefits and costs associated with the following impacts:

- net travel time costs;
- physical fitness benefits;
- congestion reduction benefits;
- greenhouse gas emissions savings;
- tax adjustments; and
- 'other' costs and benefits.

It is recommended in the guidance that in instances such as this where no information is available on the current congestion levels on the roads from which traffic will be displaced, a unit value of £0.07 per kilometre is used. It is considered appropriate to assume average congestion levels for Droitwich.

Application of unit values

Based on the guidance, no adjustment to the unit value is required.

It is assumed here that all additional commuters are displaced from road travel. To estimate the annual benefit of this change in travel patterns, the length of the additional cycle route (5km) is therefore multiplied by the expected number of users displaced from road to cycling per kilometre (960), and by the unit value of £0.07/km.

⁸ Droitwich Canals Restoration Monitoring Plan. British Waterways, June 2008 revision

Aggregation

According to Ecotec (2005), it is assumed that in year one the Droitwich Canals will be open to navigation along their full length and will therefore immediately attract visits from all types of users. The present value of the benefits related to road traffic displacement due to an increased number of commuters cycling to work have therefore been discounted over the full 20 year period, beginning in year one. They amount to a present value of £4,943, or an annual average value of £336.

Conclusion

The savings associated with road traffic displacement are minimal in this case. It is likely that green transport benefits will only contribute significantly to the total benefit of a scheme in locations where cars are displaced from heavily congested roads. Therefore location specific information is very important to ensure that appropriate assumptions are adopted.

Significant uncertainty surrounds the estimate presented here and therefore confidence in the aggregated value is low.

If these cycling trips in fact displace public transport trips and not private car travel, this figure would be an overestimate.

There is also some uncertainty around the estimated percentage of work or business travel (40%), as presented within the Project Application Form. This estimate is transferred from research on the impact of canal improvement schemes in London, which showed that 40% of visitors to improved waterways were using the route as a means of transport. See Box 2 for discussion on carbon value of green transport.

BOX 2 Carbon value of green transport

An alternative way to consider green transport benefits is to look at just the carbon saving they are likely to provide. The guidance discusses this approach under regulating services however in terms of the approach to estimating the benefits it refers to freight transport, not commuters. Valuing the carbon savings using the same valuation approach outlined in the guidance (as per DECC guidance) and an estimate of the physical data specific to commuter transport provides results which are very similar to those estimated using the methodology presented above.

In addition to the value of a tCO₂e, the approach applied requires data on the following parameters:

- Number of trips (site specific estimate),
- Estimated number of passengers per car (provided by Dft),
- Distance of each return trip (site specific estimate), and
- Estimated carbon emission per km car travel (provided by Defra).

It is assumed that each commuter trip displaces car travel. The number of trips is therefore multiplied by the average number of passengers per car to get the number of cars displaced by the commuters. The number of car kilometres is then estimated by multiplying the number of cars by the distance per return trip and subsequently by the carbon emissions per car kilometre, to provide an estimate of the tCO₂e avoided by the commuters travelling by bicycle, or by walking /jogging.

Completing this calculation for the case at Droitwich, results in an estimated annual value of just £363, and a PV of just over £5,000. It should be noted that this is a gross estimate of the carbon related benefits, but it does not include other benefits associated with the physical health and other benefits provided by green transport.

It is clear therefore that a gross estimate of the benefits of green transport is likely to be significantly more than presented above using the net valuation approach and could make a significant contribution to the total benefits provided by the restoration.

Given the significant uncertainty associated with regard to the assumptions needed to apply this approach, it is not recommended for inclusion within the guidance.

Recommendations

-Emphasise the potential uncertainties surrounding the approach to valuing green transport and in the default value estimates in the guidance to ensure they are taken into account by users.

(c) Volunteering

The development and execution of the restoration project has provided a wealth of opportunities for volunteers in the area. The use of volunteers over recent years has been significant and it is expected to continue, albeit to a lesser extent, following completion of the restoration project.

Information review

The project related reports and funding application forms provide a range of information about the potential use of volunteers during the restoration project. As the physical regeneration work will be combined with a continuing programme of community participation, volunteers will be given the opportunity to continue their involvement with the canals once restoration is complete.

British Waterways holds data on the actual number of volunteer days used on the restoration scheme to date and has plans set out for the use of volunteers over the coming years. This information has been used in the valuation exercise.

The methodology recommended in the guidance for valuing the contribution made by volunteers is the VIVA approach. The VIVA – the Volunteer Investment and Value Audit - is a measurement tool that assesses the ‘outputs’ of volunteer programmes (the value of volunteers’ time) in relation to the ‘inputs’ (the resources used to support the volunteers).

It should be noted that the VIVA approach is an economic one – focused purely on monetary values and does not include the associated benefits provided through volunteering. As outlined in the guidance, volunteers could further derive benefit from a sense of achievement, a ‘warm glow’ feeling reinforced by the notion of doing general good, physical and mental health gains, and the value associated with continued community engagement and awareness raising.

Unit values

In order to apply the methodology, the value of the volunteers’ time is required. The guidance provides estimates based on the type of labour used: unskilled, skilled and professional. The ‘per day’ values are £50, £150 and £350 respectively (2008 estimates).

Details of the costs associated with using volunteers have been provided by British Waterways. These amount to around £9,000 to date: £4,000 on incidentals (£1,000 per year) and £5,000 on training volunteers. This training budget has provided 190 training days. These costs have been incurred over a 4 year period (2005-2009).

In addition, a volunteer co-ordinator’s position will become available in 2010, at a cost of £18,000 per year. Currently funding is only in place for one year.

Application of unit values

British Waterways has provided data on volunteers from 2005 to 2009. This is presented by type of labour in Table 4 below.

Table 4 Volunteer data for the Droitwich, 2005-2009

Type of labour	No. of days	Value per day (£2009)	Sum
Unskilled	1,460	51	73,000
Skilled	846	152	126,900
Professional	111	355	38,850
<i>Sum</i>	<i>2,417</i>	<i>-</i>	<i>238,750</i>

Source: British Waterways

It was noted by British Waterways that the training provided to volunteers to date means that the existing pool of volunteers are well placed to continue their work over the coming years. It is estimated by British Waterways that between 12 and 20 person days per week will be required for physical maintenance work. This equates to around 600 – 1,000 volunteer days per year. The proportionate split between types of labour has been assumed to be the same going forward as it has been in the past.

Aggregation

To date, the volunteers involved in the Droitwich restoration scheme have provided outputs worth £238,750. The inputs required to achieve these outputs are estimated to be around £9,000. It is very likely however that some of the costs associated with the use of volunteers have not been accounted for. These might include volunteer related insurance and expenses or advertising and recruitment. Given the low value of the inputs, they have been inflated by 100% (totalling £18,000) to account for the cost elements which are likely to be missing.

The VIVA ratio is calculated by dividing the total volunteer value (outputs) by the total volunteer investment (inputs). For the use of volunteers to date, this equates to £238,750 divided by £18,000, giving a ratio of around 13. This means there is a 13 fold return on British Waterways’ investment in volunteering as part of this restoration scheme.

In the future, the use of volunteers is expected to provide an annual net return of between £40,000 and £80,000. Based on inputs costing around £19,000 per year, this equates to a VIVA ratio of between 3 and 5. This is calculated based on between 600 and 1,000 volunteer days per year providing outputs of between £60,000 and £100,000 per year and inputs of £18,000 for the volunteer co-ordinator, and £1,000 for incidentals per year. Obviously, if the volunteer co-ordinator position is not funded or required on an ongoing basis, the VIVA ratio will increase significantly.

The net present value (benefits minus costs) of the volunteer’s time in the future is estimated to be between £605K and £1.195m, depending on whether 600 or 1,000 volunteer days are required. A breakdown of costs and benefits for future volunteer use at the site is presented in Table 5, below.

Table 5 Annual and present value of volunteering benefits, 2010 onwards (£000)

	Annual (raw) values		Net Present Values	
	600 days	1000 days	600 days	1000 days
Benefits	41	81	885	1,475
Costs	19		280	

Conclusion

The VIVA methodology seems to work well in practice. It is straightforward to follow and data in this case was readily available. However, the full details of the methodology are not provided in the guidance and the user would have to consult the original source in order to apply the methodology correctly.

Also, in many cases it is likely that the real costs associated with using volunteers will not be known or not possible to disaggregate from other running costs. Ideally, the guidance would provide some advice on appropriate adjustments to account for these missing costs. However, without further consultation with a wide range of organisations that use volunteers, any adjustments would be arbitrary in nature. In this case, the original costs provided appear to be very low in relation to the benefits realised from the volunteers' time. When reviewed against the full list of likely costs as provided in the VIVA methodology, it was clear that costs under a number of categories are missing. A further data request was made to British Waterways in an attempt to fill these gaps however no new data has been provided to date; thus necessitating the arbitrary 100% inflation.

Note that the valuation approach applied here provides a net benefit estimate, not a gross benefits estimate. It is therefore not directly comparable to the gross benefit estimates calculated for other benefit categories.

Recommendations

-Provide further details on the VIVA methodology in the guidance and append the short VIVA report for easy reference.

(d) Creation of business opportunities

The guidance outlines that the primary indicators of this benefit are the expenditure associated with various activities and the estimated jobs created from that expenditure. Expenditure values from a range of recreational activities are discussed under Recreation in Section 2.5.3 below. Construction expenditure will also contribute to job creation.

The estimation of jobs created as a result of these expenditures is discussed further in Section 2.8, which compares welfare valuations and economic impact assessments.

2.5.2 Regulating benefits

(a) Drainage, water conveyance, flood protection and alleviation

Canalised waterways and inland waterways managed for navigation may provide flood protection and alleviation benefits through the drainage functions they provide.

The drainage function itself may also provide an on-going benefit in terms of removal of surface water which would otherwise cause land to be unusable. It has been estimated that canals under the management of British Waterways drain 30% of the total catchment area of England and Wales.

Due to data issues, it has not been possible to ascertain whether the drainage function currently provided at the site provides any on-going land drainage benefits. It is therefore not possible to determine if, post restoration, any such function is increased thereby providing a marginal benefit. See Section 2.6 for more on how on-going drainage benefits might be estimated. It is however expected that the restoration scheme will provide flood protection benefits to local properties. This might not however be typical under other restoration schemes as the Droitwich project involves the construction of a new stretch of canal linking two existing sites.

Information review

An estimate of the number of properties expected to benefit from flood protection is given in the Project Application Form. This information is sourced from modelling work undertaken for the canalised River Salwarpe using the proposed channel design.

The Multi-Coloured Manual (MCM) (2003)⁹ forms the standard approach to flood risk management appraisal in England and Wales. For strategy-level analyses, it provides sector average figures for annual average damages categorised by the level of intervention, the flood depth, the occurrence of flood events and whether or not properties would receive a flood warning. This level of analysis is recommended in instances such as Droitwich, where there is little or no understanding of flood depths and return periods of potential flood events.

Unit values

According to the Project Application Form, an initial flood risk modelling exercise for the canalised River Salwarpe using the proposed channel design estimated 30 properties would be alleviated from flooding.

According to the MCM, the weighted annual average damage to residential properties, assuming a zero standard of protection and no warning lead-time, is £6,027 (in 2005 prices). In addition, the MCM estimates that on top of the property damage costs, costs to emergency services, intangible cost to those households (covering stress and health impacts) and indirect costs (covering rental costs and dehumidifiers etc) are included in the analysis. These costs are as follows:

- Emergency services - 10.7% of the direct property costs;
- Intangible costs - £200 per household per year (2005 prices); and,
- Indirect costs – these are a function of the flood depths and so can't be included at this level of analysis.

Consultation of the MCM is recommended in the guidance.

⁹ FHRC. (2005). The Benefits of Flood and Coastal Risk Management: A Manual (and Handbook) of Assessment Techniques, known as The Multi-Coloured Handbook and Manual.

Application of unit values

The annual average damage per property (including direct costs, emergency costs and intangibles and uplifted to 2009 prices) is £6,662. This is multiplied by the number of properties benefiting from the flood alleviation effect of the restoration.

Aggregation

The average annual values of the damaged avoided is estimated to be £200k. This equates a present value over 20 years of £2.9m. This represents the residential property-related flood damage costs avoided due to the drainage function performed by the restoration and the management of the canal for navigation.

Conclusion

As detailed in Section 2.6, estimating the on-going drainage benefits provided by a waterway requires a reasonably detailed assessment and specific data on land use and topography. It was not possible with the available information to undertake such an assessment for the restored Droitwich. However, that is not to say that the Droitwich does not currently, or will not post restoration, provide a valuable drainage function.

In relation to the flood protection aspect of the drainage function, it has been possible to provide a valuation because some modelling work has been completed at the site. This modelling data will not always be available, and without it, it is not possible to generate an estimate of the physical data – number of properties protected – that is required to complete this valuation.

In addition, it should be noted that the property damage costs used here only represent a proportion of the full costs associated with flooding. Disruptions to travel and damage to infrastructure can be significant. These costs are estimated in flood risk planning and scheme development. However it is likely that the contribution that a waterway makes to avoiding these costs, on average, would be low.

The approach outlined in Section 2.6 on drainage should be considered when attempting to understand the possible significance of drainage benefits.

Recommendation

-Update the guidance to provide the estimated annual average costs for flood related property damages which can be used to estimate the flood protection related benefits provided by a waterway, where physical data is already known.

(b) Water quality and pollution dilution

An area of the Droitwich Canals was (prior to restoration) contaminated with mercury. Contaminated sediments tend to build up and act as an on-going sink for additional mercury deposits; however it does not necessarily affect water quality unless disturbed. It is hoped that after dredging, new sediment build up would be cleaner, supporting invertebrate communities and contributing to the overall better health of the previously contaminated stretch of canal.

The permanent removal of mercury is part of the restoration project. As there are no protected sites adjacent to the Canals and as the contaminated soils are unlikely to

be causing a significant impact on water quality at present, the benefit to water quality can be assumed to be minor (or possibly moderate). However more information would be required to support this assumption.

Any benefits realised by the removal of the contaminated soils are assumed to be captured within the non-use values, presented in Section 2.5.3 (g).

2.5.3 Cultural benefits

(a) Recreation

The restoration of the Droitwich Canals will provide or improve 12 canal access points and will promote usage of the canals in a number of ways. The 21 mile cruising ring will attract both in-water and land-based recreational users. This section presents an analysis of the marginal increase in recreation activities expected to take place in the Droitwich Canals post restoration. The categories of recreation covered are: informal recreation, cycling, canoeing, boating and angling.

(i) Informal recreation

Following restoration, the majority of users are expected to fall into the category of 'informal' users. This is due to improvements in access and the overall enhancement of the canal, as well as the increase of the variety and quality of waterway activities available. However, as there is no market for these benefits in the form of, for instance, a fee for the use of canals, the value of these benefits can be expressed in terms of an estimated willingness to pay (WTP) for visitors to use the canals.

Information review

The main source of information for this benefit is Ecotec (2005), which provides estimates of the number of informal visitors expected and their associated expenditure. It is assumed that expenditure is dependent on the canal visit, and therefore that it can be attributed in full to the presence of the canal. This assumption is applied throughout the analysis presented in this section.

The Project Application Form contains qualitative information about informal recreation expected to take place post restoration of the Droitwich Canals. The form quotes evidence of how improvements made to waterway environments, including access, safety and landscaping schemes significantly increase visitor use. The figures used in their analysis are drawn from the Ecotec report.

Unit values

Ecotec predicts 166,200 day visitors to the Droitwich Canals and 39,000 informal holiday visitors in year 1 after restoration. In year 5, these figures are predicted to rise to 202,600 informal day visitors and 47,500 informal holiday visitors. This is a year on year growth of 2.5%. It is noted that 31% (day) and 22% (holiday) visits are directly dependant of the restoration of the canal.

The expenditure for day visitors is expected to be £4.01 and £33.89 for holiday visitors (in 2005 prices).

In addition, Ecotec present an estimated average consumer surplus per trip, drawn from a study by Garrod and Willis¹⁰ of £0.507 (in 1989 prices). They note that this is consistent with work they carried out for the Environment Agency.

The guidance also provides expenditure values related to day and overnight visitors. These are similar at £3.84-£4.50 for day visitors and £55 for overnight visitors (2004 prices). It also provides a consumer surplus range for general visitors of £0.02-£0.09 (local visitors - <10miles) (1989).

Application of unit values

The expenditure values presented in Ecotec have all been uplifted to 2009 prices, such that the expenditure value is £4.43 for day visitors and £37.46 for holiday visitors per person per day.

The consumer surplus value from the Ecotec report is uplifted to 2009 prices and, in addition, adjusted to reflect changes in income levels, as specified in the guidance. The adjusted value is £1.04 per person per trip in 2009 prices.

The expenditure and consumer surplus can be combined to provide an estimate of the total WTP for informal recreation. This gives a total WTP of £5.47 for informal day visits and of £38.50 for overnight visits.

Similarly, the range of default expenditure values provided in the guidance for day visitors have been uplifted to £4.33-£5.07 and for overnight visitors to £62.03 (2009 prices). The average of the consumer surplus range has been used here, which, adjusted for changes in income elasticity and in prices, amounts to £0.11 per person per trip.

Aggregation

The aggregated annual value and present value for informal recreation are presented in Table 6 below using both the site specific expenditure values presented in Ecotec and those provided in the guidance. It is recommended that the site specific values are selected as the most appropriate here. These are highlighted in Table 6.

Table 6 The value of informal recreation visits (£000)

Informal recreation	Site-specific WTP		Guidance WTP	
	Average Annual Raw Value	PV	Average Annual Raw Value	PV
Day visits	282	5,386	229-267	4,371-5,103
Overnight visits	330	6,303	553	10,172
<i>Total</i>	612	11,689	781-820	14,543-15,275

Conclusion

The estimated benefits from informal day visits using the site-specific values is higher than the upper bound value calculated using guidance values, however as they are of a very similar order of magnitude, the difference is not considered to

¹⁰ Willis and Garrod (1990). Valuing open access recreation in inland waterways, Countryside Change Unit, University of Newcastle-Upon-Tyne.

have an impact on the confidence in these estimates. In fact, given the similarity between the estimates, the level of confidence that can be placed in the default guidance values is thought to be high.

The benefit from overnight visits is, however, higher using the guidance values than when using site-specific values. The differences in these estimates result from the fact that the expenditure unit value for overnight visitors provided in the guidance is some 30% greater than the site specific value applied. As the guidance value is based on a UK tourism survey, it is taken to be an average value. This means that for specific areas it may over or understate true expenditure related with overnight visits. As such, it should be considered a ball-park estimate and site specific values should be used where available.

(ii) Cycling

Information review

The restoration of the canals will link cycling routes on the river Severn with those on the Worcester & Birmingham canal. A 5km shared use cycle path along the Droitwich Canals towpath will be provided, which will form part of Sustrans National Cycle Network Route 45 and will link to Route 5 on the Worcester & Birmingham Canal. In addition, access to the site will be improved further attracting cyclists.

The Project Application Form presents a discussion on how the restoration will promote the use of canals for leisure and tourism activities. It notes that cycling has been in decline but is expected to receive a boost through the improvement in access, the linking of cycle paths and the creation of a new cycle path. In terms of the level of use, the report predicts a density estimate of 2,400 cyclists per kilometre per year, or 12,000 trips per year over the 5 kilometres of new towpath provided. However, 40% of these trips are assumed to be related to commuter cycling trips. The value of these trips is captured in the green transport benefit (Section 2.5.1). Therefore it is assumed that the remaining 60% of the expected cycling trips per kilometre (1,440) relate to recreational cycling and are realised post restoration.

Ecotec (2005) state that a good quality environment is a prerequisite for the development of activities, such as cycling. It is assumed that the Droitwich Canals will attract visits from cyclists from year 1, immediately after the restoration is complete. Further to the improvements brought about by the restoration, the report notes that there are plans for the creation of a 'green necklace' around the town, that would join woodlands, parks, footpaths, cycle ways and picnic areas.

The target for sustainable transport modes, presented in the Droitwich Canals Monitoring Plan, of 250,000 additional visits per annum by walkers and cyclists, is relevant here. However, as this is a target figure and not a prediction *per se*, and because it has not been possible to disaggregate this figure between different types of cycling trips (commuting cyclists and recreational cyclists), the abovementioned estimate of 1,440 cyclists per km has been used here. When summed over the 5 kilometres of new towpath, this equates to a total of 7,200 cycling trips per year.

Unit values

The guidance provides an expenditure value for cycling per person per trip of £4.40. This is sourced from the Inland Waterways Day Visitor Survey carried out in 2008.

To arrive at a WTP, this expenditure value is combined with the average consumer surplus value, estimated in the guidance as £0.31 per person per trip (1989 prices).

It should be noted that the consumer surplus value is based on an estimate made for a single canal site in the West Midlands and is only used to give an approximation of the potential consumer surplus for cycling. The confidence in the consumer surplus element of the total willingness-to-pay is therefore low.

Ecotec presents an average site-specific consumer surplus per person per trip, said to cover cycling trips, of £0.51 (1989 prices).

Application of unit values

The expenditure unit value provided in the guidance is uplifted to 2009 prices, to £4.47 per person per trip. The consumer surplus value is also uplifted to 2009 prices and adjusted to reflect changes in income levels resulting in an adjusted value of £0.64 per person per trip. The combined WTP is therefore £5.11 per person per trip.

The updated Ecotec consumer surplus equates to £1.04 per person per trip (2009 prices).

Aggregation

The present value of the benefit attributed to recreational cycling over the 20 year appraisal period using the default values in the guidance for consumer surplus and expenditure amounts to £540k. This equates to an annual value of £36.7k.

Conclusion

The results for cycling presented here are not directly comparable to the site-specific estimate provided by Ecotec, as the latter only relates to a consumer surplus value – typically the smaller element of the WTP. That said, where cyclists are local and have no expenditure, the consumer surplus value is a good representation of their willingness-to-pay.

Comparing just the consumer surplus estimates, applying the guidance value gives a present value equivalent to about 60% less than the site-specific value. In considering this difference, it should be taken into account that the Ecotec consumer surplus value is an average value relating mainly to informal users, anglers and cyclists, whereas the value provided in the guidance comes from a contingent valuation study and is cycling-specific.

(iii) Canoeing

Information review

Canoeing is generally a popular activity within inland waterways. At the moment, anecdotal evidence suggests that canoeing is not very prevalent in the Droitwich Canals; it is however expected that as the quality of the site improves high levels of activity will take place.

A new canoeing resource will be established on the Barge Canal, which will also be used by the adjacent Droitwich Sports College as well as other local schools and the

local community. This facility is expected to be popular among younger visitors and attract an increasing number of other canoeists.

Both the Project Application Form and Ecotec (2005) predict the number of canoeing visits to the Droitwich Canals. The number of additional visitors in Year 1 is predicted to be 4,700. This is estimated to grow to 9,500 by Year 5.

Unit values

According to Ecotec, the expenditure per person per day associated with canoeing amounts to £3.10 (in 2005 prices). The Ecotec average consumer surplus (for general users) of £1.04 (2009) is combined to expenditure value to provide a WTP estimate for use here.

The values in the guidance are similar to Ecotec's, ranging from £3.14 to £5 (2004 prices). No consumer surplus value for canoeing is presented in the guidance.

Application of unit values

The uplifted site-specific expenditure unit value is £3.43 per person per day (2009 prices). This is combined with the average consumer surplus of £1.04 to provide a willingness-to-pay of £4.47.

The Ecotec values are very similar to the guidance values in this case, so guidance values are not applied here.

Aggregation

The present value over 20 years using site-specific expenditure and consumer surplus values is £553k. This is based on the user numbers growing proportionally between years 1 and 5 and then remaining constant for the rest of the appraisal period. This equates to an average annual value of £39.8k.

Conclusion

The expenditure values presented in the guidance are very similar to those applied by Ecotec, and the Ecotec values fall within the range presented in the guidance. This lends confidence to the default values presented in the guidance.

(iv) Boating

Information review

At present there is little boating activity in the Droitwich corridor; therefore all predicted activity resulting from the restoration will be additional.

It is assumed that boating activity will start immediately, but that associated commercial activities will develop over time.

The main source of information used to assess the benefit arising for boating is Ecotec (2005, Table 4.4). They provide an estimate of boating activity in years 1 and 5 of the restoration and associated expenditure values as summarised in Table 7 below. These estimates are based on assumptions with regard to increased moorings and usage on adjacent canals. It does not appear from the Ecotec report that they are dependent specifically on the 'uniqueness' of the Droitwich scheme with regard to the weekend cruising loop. However, as they are based on local

information, it cannot be assumed that they are suitable to be transferred to other sites.

It has been assumed that by year 5, commercial companies have established a fleet of 20 hire boats, five day boats, three trip boats and a restaurant boat (a total of 29 vessels).

In year 5, the number of visiting private and hire boats is forecasted to be augmented by commercial ventures on the Droitwich Canals and the provision of local moorings for private boats.

Unit values

The estimated number of trips and associated expenditure values per trip as provided by Ecotec is presented in Table 7 below.

Table 7 The number of boating trips and associated expenditure by type, as provided by Ecotec

Type of boating trip	Number of trips	Expenditure (2005) (£/trip)	Expenditure (2009) (£/trip)
Private boats	4,700 visitor days (Y1) 12,800 (Y5)	9.11	10.07
Hire boats	8,800 visitor days (Y1) 16,300 (Y5)	13.17	14.56
Day boats – £ per day of boat hire	2,400 (Y5)	50.43	55.74
Trip boat	15,100 (Y5)	4.95	5.47
Restaurant boat	12,500 (Y5)	25	27.63

Source: Ecotec, 2005

The guidance provides a range of default expenditure and consumer surplus values for boating activities. Expenditure per person per trip for ‘hire boats’ is between £14.49 and £38 (2004) and £11 for ‘privately owned’ boats (2004). The default consumer surplus value per boat trip is £0.17 - £0.45 (1989).

The guidance provides default values for fewer types of boat trips than Ecotec.

Application of unit values

Site-specific expenditure values associated with each boat type are uplifted to 2009 prices, as presented in Table 7 above. The average consumer surplus value used for other recreational benefits within this section (£1.04, 2009 prices) is also applied here.

The values provided in the guidance are uplifted to 2009 prices (Table 8). The mid-point value of the range given for a consumer surplus value is used in the analysis.

Table 8 Default unit values for boating trips, as provided in the guidance.

Value type	Uplifted value (2009) (£)
Expenditure per person per trip – hired boats	12.41
Expenditure per person per trip – privately owned boats	16.34 – 42.85
Consumer surplus for boating – average	0.63

As noted above, Ecotec provides estimates for a number of boating categories which are not explicitly documented in the guidance i.e. day boats, trip boats and restaurant boats. The number of trips in these categories has been summed and added to the estimated number of private boat trips as shown in Table 7 above. This approach is thought likely to underestimate the true expenditure values.

Aggregation

Using site-specific valuation data, the present value of the benefit associated with the expected boating activity after restoration, discounted over 20 years, is estimated to be around £11.4m. The average annual value is £845k. This value is considered the most appropriate for use here, as it uses site specific data.

Using the guidance default values provides an estimated present value of between £9.6m and £14m. The average annual value is between £713k and £1,026k. As noted above, this is likely to be an underestimate.

As both estimates combine expenditure and consumer surplus values, the final estimates represent a total WTP for boaters.

Conclusion

The benefit range estimated based on site specific values is within the range estimated when applying the guidance values for all forecasted boating categories. Confidence can therefore be placed in using the default guidance values when estimating boating benefits generally.

(b) Angling

According to the Project Application Form prepared by British Waterways, angling activities on inland waters mainly consist of coarse fishing. It is expected that following restoration angling activity on the restored stretch will reach the same level as on adjacent canals. Angling activity is expected to increase as soon as restoration is complete, and will be further supported by the construction of a new fishery at Hanbury.

Information review

The two main sources of information on angling are the Project Application Form and the Ecotec economic impact assessment. These provide the expected number of angling visits as a result of restoration works; the latter also provides an expenditure value per person per visit.

With regard to the predicted number of angling visits, the two sources provide additional visit estimates of 3,500 (quoted in the Project Application Form) and 3,600 (quoted by Ecotec). The latter has been applied as it is the same source that provides the site-specific expenditure value. It is assumed that the additional number of trips remains static from Year 1 onwards.

Unit values

In terms of expenditure, Ecotec provides a unit value of £6.45 (2005 prices) per angling visit. This value is taken from British Waterway's data. The Ecotec general consumer surplus, covering informal users, anglers and cyclists, is used as an appropriate proxy for angler's consumer surplus to allow the estimation of a total WTP.

The guidance provides estimates of anglers' WTP to maintain the current state of the fishing at their regular site. Assuming that coarse fishing, as the main type of fishing in the area, will continue in the Droitwich Canals after restoration, the total WTP per angler per trip on a canal is £15.70 (in 2001 prices). This can be broken down to an expenditure of £13 and a consumer surplus value of £2.70 per trip. The expenditure value includes the cost of permits, food, accommodation and travel.

The guidance also provides an expenditure only value of £4.05 per trip based on the Inland Waterways day Visitor Survey (IWDVS) data provided by British Waterways (2008 prices). It is thought that this is the same source as used by Ecotec to estimate the £6.45 expenditure value mentioned above. However, the estimate presented in the guidance is averaged over 3 years of data (2006-2008) and appears to be skewed downwards by a very low 2008 estimate of just £1.13 per trip. This value is therefore not applied in the valuation presented here.

Application of unit values

All values have been uplifted to 2009 prices.

The site-specific expenditure value is equivalent to £7.13. When combined with the 'general user' consumer surplus estimate provided in Ecotec, this equates to a WTP of £8.17 per visit.

This is significantly lower to the WTP estimate provided in the guidance which equates to £19.48, following the appropriate adjustment.

Aggregation

The unit values have been aggregated based on an estimate of 3,600 additional angling trips per year presented in Ecotec, 2005. The aggregated annual values and present values, using both sites specific and default guidance unit values, are presented in Table 9. The guidance value is highlighted as the most suitable value for selection here.

Table 9 The value of angling visits (£000)

	Average annual value (raw)	Present value
Guidance values	70.1	1,031
Site specific values	25.6	377

Conclusion

A large difference in magnitude of the Ecotec and Guidance based value estimates is evident. Both sources are based on a combination of an expenditure estimate and a consumer surplus value. The consumer surplus values are of a similar order of magnitude; however the expenditure unit values are significantly different and are therefore driving the variation.

It is thought that the method of data gathering on expenditures is likely to be the cause of this variation. Within the WTP survey undertaken by Spurgeon *et al.* in 2001, and quoted in the guidance, respondents were explicitly asked to provide expenditure estimated for permits, food, accommodation and travel. Therefore this benefit estimate includes both spend on the day and periodic spend associated with the activity. The average for coarse anglers for each of these categories was found to be £5, £3, £2 and £7 per trip respectively. It is thought likely that if the IWDVS

just asks respondents how much they have spent that day, they are unlikely to include some cost categories, specifically periodic expenditure on permits.

Summary of recreation benefits

Table 10 below summarises the estimated value of recreational benefits as discussed above. In each case the source of the valuation data is noted; site specific or guidance values.

Table 10 Present values of recreation benefits (2009 prices) (£000)

Type of recreational activity	Present value benefits	Source of unit values
Informal recreation – day visits	4,699	Ecotec
Informal recreation – overnight visits	6,302	Ecotec
Cycling	541	Guidance
Canoeing	553	Ecotec
Boating	11,403	Ecotec
Angling	1,031	Guidance
<i>Sum</i>	<i>24,530</i>	-

It can be seen from Table 10 that boating followed by informal recreation contributes the most to the total recreational value of the site, post restoration.

In the case of boating, this is because of a large estimated increase in the number of visitors (85% for hired boat visits and 172% for private boat visits) combined with relatively high unit values. In the case of informal recreation visits, the increase in visitor numbers is estimated to be 22% for both day and overnight visitors; however the overall number of visits is much higher for this recreation category than any other.

(c) Heritage values

The Droitwich Canals constitute an important inland waterways heritage asset. The whole length of the Droitwich Canals has been classified as a Conservation Area on account of the canals’ special historical and architectural interest. Along the Canals, there are 45 heritage structures: 4 Grade II listed buildings, 21 of high heritage value and 20 of local importance. In addition, the canal runs through Vines Park, which is a Scheduled Ancient Monument. The first evidence of salt production in the area dates as back as far as the Iron Age.

Without the restoration scheme, it has been assessed that the many heritage features of the canals would deteriorate (Project Application Form).

The heritage-specific actions of the restoration programme include the improvement or restoration of 31 heritage structures, including 12 historic locks. A detailed heritage assessment has been undertaken by British Waterways to ensure that no heritage structures will be otherwise affected during restoration works.

The importance of the restoration programme for the maintenance and improvement of the heritage features of the Droitwich Canals are recognised by English Heritage, the Heritage Lottery Fund and the Town Council. The Heritage Lottery Fund supports the project through a grant.

The method outlined in the guidance to estimate the heritage value of waterways is based on either the number of heritage visits to a site or the non-use value of the heritage benefits. Unit values for heritage related visits are provided in the form of a willingness to pay per household per year of people who 'view canals as a heritage resource'. However, this value is recommended for use when assessing current benefits only. In addition, there are no data available on the extent to which additional visitors will view the canal as a heritage resource. This value is therefore not applicable in this case.

For some visits the main motivation may be the heritage function of a site. It can be assumed that part of the use value for heritage has been captured through the valuation of recreation activities. However, as heritage-related visits are not identified, the value cannot be disaggregated.

With regard to the non-use element of this benefit, the guidance provides values for the calculation of non-use values which reflects peoples' willingness to pay to maintain waterways for boating, heritage aspects and towpaths. As this value applies to the maintenance of the canal, rather than any improvement or restoration, it cannot be applied in the case of the Droitwich Canals. The non-use valuation presented in Section 2.5.3 (g) relates to improved ecological quality. It does not contain any heritage related non-use value explicitly, but could be considered to be a reasonable proxy for non-use heritage benefits.

(d) Education

The Droitwich Canals also have significant opportunities to become a valuable educational resource. According to the Project Application Form, the Droitwich area has two Super Output Areas (SOAs¹¹) among the top 10% most deprived in the country.

British Waterways intend to promote the Canals for educational use through the following actions:

- Publications of educational resources;
- Production of an Education Strategy to help guide the promotion of the canal corridor as a teaching aid;
- Outside of schools, British Waterways will organise a programme of community events, talks and guided walks along the canals in order to engage and educate all types of community groups about their local environment and heritage;
- The promotion of the British Waterways project called Wild Over Water (WOW), which is an educational initiative providing formal support for teachers and informal activities through the internet and through events;
- Heritage and countryside skills training courses through British Waterways Heritage Skills Centre in Hatton.

It is clear that there will be a significant increase in education related opportunities post-restoration. While it is not possible to provide a valuation of these benefits their significance should not be underestimated.

¹¹ Super Output Areas (SOAs) are a set of geographies developed after the 2001 census. The aim was to produce a set of areas of consistent size, whose boundaries would not change (unlike electoral wards). They are an aggregation of adjacent Output Areas with similar social characteristics.
(http://en.wikipedia.org/wiki/Super_output_area#Super_Output_Areas)

(e) Volunteering

A quantified estimate of the benefit arising from the use of volunteers in the restoration process of the Droitwich Canals is presented in section 2.5.1 (d). As noted there, this value only includes the economic benefits associated with the work provided by volunteers. It does not include the private benefits that volunteers themselves may derive, such as a sense of achievement, a 'warm glow' feeling reinforced by the notion of doing general good, physical and mental health gains, and the value associated with continued community engagement and awareness raising.

British Waterways note that many of the volunteers who have been involved in the restoration work to date, and who have received training, are expected to continue their involvement with the canal post restoration. This suggests that they must receive significant personal benefits from doing this. The quantification of this benefit is only really possible through primary research, as described in the guidance. The guidance notes that value of the volunteers' time could also be taken as a proxy of their WTP in order to participate and to receive the types of benefits noted above. However as this value is already captured as part of the organisations' benefits from volunteering, applying it again here, albeit to represent a different benefit, presents a significant risk of double counting. The guidance therefore recommends that these benefits are described in a qualitative manner only.

(f) Community benefits

Community benefits attributable to the restoration project are difficult to quantify and therefore value. However there is qualitative information that can depict its extent and magnitude. Information on community benefits is sourced mainly from Ecotec (2005) and the Project Application Form, while references to potential benefits are made in the British Waterways Droitwich Canal Supplementary Planning Guidance (2004) and the British Waterways Droitwich Canal Restoration Monitoring Plan (2008).

Both the process and the outcome of the restoration are predicted to contribute to the targets of a number of tourism strategies and community plans, such as the Wychavon Community Plan 2004-2006.

The provision of access to a calm physical environment, with visual amenity of high value, will add to the health and well-being of the local population. It will also attract other visitors to the area, thus creating an influx of expenditure for local shops and businesses.

The Canals will be part of the British Waterways general maintenance and management programme. Sensitive lighting will be used in urban parts of the Canals and there will be a general improvement of the more run-down parts. In this way, a sense of safety will be induced which in turn should encourage greater use of the area by the local community.

In addition, the restoration will bring together the public, private, voluntary and community sectors. During the restoration and through the volunteering schemes, knowledge and skills will be passed on to the people of the community that will choose to be involved. The physical regeneration work will be combined with a continuing programme of community involvement which will include educational activities and waterways events.

Finally, there is the potential for Community Project Managers to work together with the local community such that the community can participate actively in individual projects on the waterway. This process aims at instilling a sense of ownership and pride in the community and tackling, to the extent possible, associated social exclusion issues.

(g) Non-use values

Non-use values include existence, option and bequest values, i.e. the willingness of an individual to pay for the notion that a natural resource exists; that it exists such that the user may visit it at some point in the future; or that it exists for the good of future generations. These values can be significant for some sites and should always be considered for inclusion in any valuation task. It may be the case that in some locations, no significant non-use values are expected. In such case they can be excluded.

Information review

The Project Application Form provides an annual estimate of non-use values for Droitwich of £946,603 (estimated at £45,000 per mile or £28,160 per km of canal). No background information is provided explaining how this estimate has been derived. However it would appear that it relates to the full 21 mile navigational loop to be created through the restoration project.

The estimate is thought to come from Adamowicz *et al*¹². (1995). This study estimated a preservation value of Britain's canal network using the contingent valuation method (a survey approach) to establish respondents' WTP through a national tax for a maintenance and improvement programmes for canals.

The mean WTP value presented in the primary study for all responses was £8.77 per household (2004 prices). The authors multiplied this preservation value by the number of households in England and Wales (21.6m according to 2001 census) to arrive at a total value of £193m.

They then took the average WTP of £0.84 per visit from the Willis and Garrod (1991) study and multiplied it by the estimated number of visitors per annum to arrive at a total use value of £103m.

Subtracting this aggregate annual use value (£103m) from the aggregate annual preservation value (193m), suggests a non-use value of £90m per year. This was then divided by the approximate miles of canal (2,000) to arrive at a unit value per length - £45k / mile or £28,160 / km (2004 prices).

The Adamowicz study was reviewed during the development of the guidance; however it was not included in the framework on the basis that the assumption that all households in England and Wales have a non-use value for the canals is considered unlikely. It was also considered inappropriate to make the non use value proportionate to the length of improvement, as the value of a site is not solely dependant on the length over which the improvements take place.

¹² Adamowicz, W.L., Garrod, G.D., and Willis, K.G. (1995). Estimating the passive use benefits of Britain's Inland Waterways. Centre for Rural Economy Research Report.

Unit values

The guidance provides a range of values for the calculation of non-use value estimates. The unit value selected in this case is the mean WTP per household per year for improvements in the ecological condition of a canal (£6.00 in 2008 prices) from Msharafieh *et al.* (unpublished). This is considered an appropriate estimate to reflect combined marginal benefits associated with environmental improvement, sediment removal (and thus water quality) and associated biodiversity benefits which will result from the restoration project.

We are also assuming that it adequately takes account of the heritage related benefits which will be realised through this scheme. It would not be appropriate to estimate separately different types of non-use values (e.g. heritage and ecology) for the same sites as this is likely to result in an overestimate of the non use benefit.

Application of unit values

The unit WTP has been uplifted to 2009 prices, and is estimated to be £6.68 per household per year.

Sample data are not available in order to determine the population that is relevant for aggregation. The guidance recommends in this case that the approach described in the Environment Agency Benefit Assessment Guidelines¹³ is followed. According to this methodology, the distance band within which people hold a non-use value is determined around the site according to the degree of environmental change expected and the importance of the site in question.

A 30km distance band is assumed relevant for aggregation purposes in this case. This reflects a small degree of environmental quality change to a site of local importance.

The population density for Worcestershire, which is 320 people/km², is used in the calculation. This is selected on the basis that the majority of the area within the 30km radius falls within this county.

Aggregation

The raw annual value of non-use benefits is estimated to be £2.9m. Discounted over 20 years, this equates to a non-use value of £43m.

Conclusion

As is evident, the difference between the guidance-based estimate and the estimate provided in the Project Application Form is significant (3m versus <1m).

While the non-use value estimated using the guidance values appears high, it is in fact less than half of the use value estimate, which is between £7.4m and £11.2m per year. In addition a conservative approach, as recommended in the guidance, has been taken adopting the smallest distance band of 30km. While the context of the original study (Msharafieh *et al.*) might not be ideal for application here as it is

¹³ Environment Agency (2003). Assessment of Benefits for Water Quality and Water Resources Schemes in the PR04 Environment Programme: Part Two Rivers and Groundwaters.

based on a large heavily used waterway, the overall confidence in the values estimated is considered to be moderate when put in context with the use values.

It would appear that using the £45k per mile value in fact returns values that are likely to underestimate the non-use values, rather than overestimate them as previously thought. The Project Application Form aggregates over the full 21 miles of canal which will ultimately be created as a result of the restoration scheme, however as the expenditure for the scheme does not refer to the 21 miles of canal, but rather a much smaller section of 7.5 miles (or 12km), the aggregation of non use values should also be completed over this stretch. Using this adjusted length would therefore result in a lower non use value estimate. As noted above, this might be incorrect, as non-use values are not directly dependant on the length of the waterway in question.

The analysis shows that non-use values estimates can vary widely depending on the source of valuation data applied and the method used to undertake the original study. This can and does result in a high degree of uncertainty in the aggregated values of non-use benefits generally. However putting them into context with use values reduces this uncertainty somewhat.

Recommendations

- Include a further caution in the guidance regarding the careful selection of the distance band used in aggregating non-use values.
- Update the guidance to include a recommendation to present results with and without the non-use value component. Comparison with use values will provide some indication as to whether they are likely to be overestimated.

2.6 Case study conclusions

The key questions the case study sought to address are discussed in turn below.

1. Is the list of benefits in the framework comprehensive and accurate?

No gaps have been identified in the general list of benefits as presented within the framework. As noted however in Section 2.5, some confusion was encountered regarding the disaggregation of regulating services into benefit categories. This results from the inter-linkages that exist between these services and the difficulty in assigning benefits to just one service, when in some cases they are realised through a combination of services. It is considered that the guidance does the best it can in disaggregating these appropriately for application within the context of inland waterways, however it is recommended that additional clarification is provided in the guidance to assist the user should they face similar issues.

2. Are the monetary values provided in the framework in a form that is usable / compatible with available physical data?

Yes. The values are easily updated to current prices and are compatible with the available physical data.

When compared to the values applied within the Economic Impact Assessment report completed by Ecotec, the values appear very similar in many cases. Site specific values are recommended for use wherever these exist, however it is

thought likely in most cases they will not be available and the default values will be applied.

3. What level of confidence can be attached to the monetary values derived given the different types of contexts the transfer values could be applied in?

Generally speaking, the original context of the valuation study cited in the Guidance matched well with the Droitwich context.

The context of the source study used for the non-use value estimate is the Manchester Ship Canal. This is a heavily used waterway with some significant water quality issues. In applying the non-use value here, the lowest distance band was selected to ensure a conservative assessment was undertaken. This transfer issue is likely to be common as there are few waterways whose characteristics are identically matched with the Manchester Ship Canal. However, as no other non-use studies are currently available, the next best approach is to apply a conservative estimate and compare the resulting non-use value with the use value to provide a 'sense check'. It is also advisable to present the results with and without the non-use value estimate given the potential uncertainty around these values.

4. Is the guidance clear and does it cover the process required in practice?

The guidance was found to be clear in the vast majority of cases. Some issues arose where multiple unit values are presented in the guidance requiring the user to select the most appropriate one, for instance with property price premiums and angling related expenditures. Clarifications to the guidance have been recommended in these cases.

5. Does the guidance provide enough advice to the user on the physical data requirements and its availability?

The guidance provides a large number of potential data providers for each benefit. In practice, these provide sufficient guidance to the user as to where they should be looking for physical data. However, in addition to the standard source, reference should be made in the guidance to the use of local site specific reports or data sources, including local site managers from the Environment Agency or the navigation authorities. More emphasis should also be placed on gathering site specific data from local estate agents when estimating the value of property premiums along waterways.

2.7 Drainage benefits

There are significant uncertainties associated with the extent to which inland waterways provide a drainage function and the benefits associated with this function. The only valuation work on drainage benefits dates back a number of decades and is based on the replacement cost approach. It is therefore not considered appropriate to provide an indication of the significance of these benefits today.

This review investigates how we might go about firstly identifying cases where a drainage function is provided (screening) and secondly how we would then identify the benefits of this function and value them. This methodology applies to the benefits currently provided by waterways (baseline or existing value), and to the benefits provided by restoration schemes (marginal change).

The review presented here provides a step-wise process which can be applied to identify and define the value of any drainage function provided by a waterway.

The step-wise process is as follows, with Steps 1 and 2 making up the screening stage:

- Step 1 - Does the waterway provide a drainage function?
- Step 2 - Is that function significant?
- Step 3 - What benefits are provided?
- Step 4 - What is the value of the benefits realised?

Each of these steps is discussed in turn below, with reference to the Droitwich restoration scheme as a case study example.

Step 1 – Drainage Function

Within step 1, the presence or absence of a drainage function can be established. It is feasible that the asset (e.g. canal) will not provide any drainage function due to the existing characteristics of the waterway or that any such benefit could not be valued because the function of a restored waterway is not positively different from that of the previous waterway status.

Table 11 sets out the characteristics that can be used to define the drainage function of the waterway. These questions, whilst not exhaustive, can be applied when investigating the drainage benefits of a baseline asset or when comparing the benefits between assets (e.g. the marginal change).

Table 11 Waterway characteristics with regard drainage functions

Characteristic	Relevance	Assessment considerations
Location of the waterway in relation to the surrounding land	The primary function of waterways is to facilitate the transportation of goods along and across catchments. The location of the waterway within the catchment is important to the drainage contribution. A waterway located in the catchment headwaters may provide minimal drainage function compared to those within the floodplain.	This parameter will be the same irrespective of whether a baseline assessment (to identify current benefits) or a comparison assessment is being undertaken (to identify the marginal benefits). This information will provide an indication as to the drainage or storage contribution provided by the waterway.
Catchment terrain	In flat areas where drainage may otherwise be difficult, the waterway may provide an important drainage function. In areas of steep gradient run off rates will be flashier and the waterway may intercept natural flows or be protected by culverts. This information will be ascertainable from OS mapping or local site knowledge.	As above.
Formal discharge agreements	Formal discharge agreements with the waterway owner may be in place for both rural and urban runoff. Where these discharges are occurring we can conclude that some drainage function is being performed. This information should be available from the waterway owner.	In a baseline assessment where one or more formal discharge agreements are in place the assessment should proceed to Step 2. In a marginal assessment, if there has been no formal discharge or where formal discharge agreement was terminated with the restoration, the drainage would be reduced and you should continue with Step 1. Where a formal discharge can function properly or formal discharges increase because of restoration the assessment should proceed to Step 2.
Inflow discharge mechanism	This characteristic relates to where drainage is a designed or a consequential function. This can either be discharged in a controlled manner that was part of the design or by overland flow. This information should be available from British Waterways.	In a baseline assessment where drainage is within the design, the assessment should proceed to Step 2. Where there is only an overland flow potential continue with Step 1. In a marginal assessment where the inflow mechanism is functioning both before and after restoration, continue with Step 1. Where the designed discharge was not functioning before restoration or an overland flow mechanism is upgraded to a designed discharge, the assessment should proceed to Step 2.
Number of culverts and through-flow channels in the waterway	If the waterway is designed to be bypassed and allow through-flow through culverts it will not be providing an effective drainage function. Flooding may also occur where the design capacity is exceeded. Other structures (such as aqueducts) would have the same function and should be considered in the analysis. This information will be available from British Waterways or ascertainable from a site visit.	In a baseline assessment where there are no culverts proceed to Step 2. Where there are through-flow routes and other discharge points proceed to Step 2 and investigate local drainage benefits only. In a marginal assessment where there are no culverts before or after cease the assessment as no change in the drainage function will result. If culverts are blocked before and cleared after or where there are no culverts before but culverts are included in the restoration, the assessment should proceed to Step 2.

A review of the characteristics outlined in Table 11 should be used to determine if the waterway is likely to be providing a drainage function. Where it is, Step 2 should be undertaken.

When undertaking a marginal or comparative assessment (for example a restoration) the change in the drainage function will need to be considered. Where there is likely to be a positive change in the drainage function as a result of the restoration, Step 2 should be considered.

Droitwich Canal Restoration – STEP 1

Anecdotal evidence suggests there are many surface water discharges into the Droitwich canal. Within the urban section there are approximately eight discharge connections (mainly from highways). In addition, there are approximately twelve discharge connections from agricultural drains.

Currently discharge is to the local watercourses. It is expected that post restoration, discharge will be into the canal. It is therefore likely that the restoration will result in a marginal increase in the drainage function. It should be noted however that this case might not be typical across restoration schemes, as it involves the construction of a new link between two existing canals. It is recommended that Step 2 of the analysis is undertaken.

Step 2 – The Significance of the Drainage Function

The second step in the process identifies whether the drainage function provided by the waterway is likely to be significant or not. Table 12 outlines the factors to consider when investigating the significance of the drainage function in terms of the potential impact of that function.

These drainage impacts can either be on a catchment wide scale or a local scale. Furthermore the waterway could be providing a day-to-day function as well as providing a potential to reduce flooding during periods of heavy rainfall. These characteristics are further outlined in Table 12 overleaf. A review of the characteristics should be used to determine the likely significance of the drainage function.

Local information to inform this step should be used in the first instance; however it is recognised that it may not be possible to complete this step in the assessment without further investigation of the site and its hydrology. See Step 3 for a further discussion of the assessments which might be required.

Table 12 Significance of the drainage function

Characteristic	Relevance	Assessment considerations
Reach of the drainage function	Effective drainage of the land surrounding the waterways allows the land to be utilised for development or agriculture. Furthermore this will affect the natural hydrological process within the catchment having implications in areas away from the waterway.	Where both catchment wide and localised benefits are provided, the significance of the drainage function would be considered to be of high significance. Local or catchment wide benefits only would be considered to be of medium significance.
Localised drainage	The direct drainage function will allow land that would otherwise be saturated to be used. The use that this land is put to will affect the significance.	Where the released land has been used for developments or arable farming the affect is likely to be of high significance and worthy of further consideration. The capacity to be effective during a high rainfall event thereby minimising flood events should be investigated and after confirming the effectiveness during high order events, proceed to Step 3. Where the released land has been used for pastoral farming or left fallow the impact is likely to be of low significance and this assessment should not be continued. The high event capacity should still be investigated.
Capacity available to be effective during a high rainfall event	The waterway could be designed for regular drainage activities only or also incorporate a capacity to be utilised during high rainfall events. Although this is not the only focus of the drainage benefit assessment it should be considered a bonus that will maximize the potential benefits. This information should be available from the scheme promoter.	If there is no capacity within the waterway for additional storage during high order events, the significance of the benefits will be localized only (of medium significance) and should focus on this factor only. Where there is capacity to be effective during high order events, the significance of this function could be high and the assessment should proceed to Step 3.
Conveyance of flood water into other catchments	During a high rainfall event it is possible for flood water to be conveyed across a catchment watershed via the waterway. This can result in flooding in other areas. It needs to be known if the flood water is transferred and whether this is to an area of higher or lower consequence. This information can be gathered from historical flooding records, hydraulic modelling of the waterway or a review of the waterway layout and function.	Where there is no conveyance or the increased risk to assets elsewhere is not deemed significant, the assessment should proceed to Step 3. If the conveyance of flood water has increased the risk of flooding to properties elsewhere, the assessment should cease and the problem be brought to the attention of British Waterways. This would mean that a negative impact would be incurred, as opposed to a benefit.

Droitwich Canal Restoration – STEP 2

Anecdotal evidence indicates that drainage of local land into the canal is enabling it to be utilised for arable purposes. No further information is available however on the extent to which this is the case.

Anecdotal evidence also indicates that flow is intercepted during high rainfall events benefiting areas away from the canal. It is not known however whether the flow is conveyed to areas of higher consequence.

A modelling study would be required to define the extent to which this is the case.

Step 3 –The Benefits Provided by the Drainage Function

The third step in the process seeks to identify the benefits provided by the drainage function.

In order to do this, it will first be necessary to undertake a desk study to provide the local context, an understanding of the nature of the catchment and also information on the extent to which the canal or waterway serves as a drain. This could be informed by Ordnance Survey mapping, groundwater information, geology mapping, Flood Estimation Handbook (FEH) hydrology analysis, historical land use maps and archive flood records. Historical mapping and records will provide a timeline of how the use of the land and flooding probability has changed over time. In the case of a canal, ideally this should be from before it was constructed so the change could be fully understood. This could provide a simple before and after analysis.

A walk over survey would also be helpful to identify hydraulic interaction with other local watercourses. These activities would allow key features relating to the canal and surrounding landscape to be identified and the existing nature of the ground and rainfall runoff rates to be assessed.

Data are needed on the amount of water in the system, understanding where that water goes and analysing the implications of any change in that pattern, provided either by a restored canal or the loss of the an existing canal or waterway.

This is unlikely to be a small task and must be completed on a site-by-site basis as the drainage function and the resulting benefits will be very location specific.

Where it is possible to generate this required level of understanding with regard to the hydrology of the area (as it currently is or under a before-and-after scenario), it should also be possible to identify the resulting benefits and undertake a valuation exercise.

Table 13 outlines the types of benefits that could result from a drainage function provided by the waterways.

Table 13 Identifying the beneficiaries

Benefits	Assessment considerations
Properties	Benefit will be provided as a protection against direct surface water run-off into properties from overland flow and surcharging of either highways or drains. Furthermore without the waterway, water levels within the natural watercourse would be higher, increasing the probability of flooding occurring. This affect could result in damage to properties, loss of business, impact on health, burden to the emergency services, residents in temporary accommodation and a potential loss of life. Properties benefiting from localised drainage are likely to be located adjacent to the waterway in areas that would otherwise flood on a regular occurrence. Properties benefiting from catchment wide function will be located within the fluvial floodplain however the volume of water and its effect on flood levels would need to be determined.
Agriculture	Benefit is provided under the baseline where land is available for agricultural purposes due to the function of the waterway. Furthermore the waterway could stop agricultural land flooding. Without the drainage function there could be a loss of crops during an event and/or a reduction in the productivity of the land. Agricultural land benefiting from localised drainage is likely to be located adjacent to the waterway in areas that would otherwise flood on a regular occurrence. Agricultural land benefiting from a catchment wide function will be located within the fluvial floodplain however the volume of water and its effect on flood levels will need to be determined.

Where any of the above benefits are identified, these should be taken forward to valuation. It is however sometimes difficult to clearly identify how the drainage function provides benefits and to differentiate between flood risk reduction and drainage function benefits. It would appear that while the drainage function clearly provides some **flood risk reduction benefits** which result in reduced damages from flood events, it also provides an **on-going benefit of excess water removal**. Without this on-going benefit, over time the land may become saturated and any assets (land or property) written off.

The benefits associated with catchment wide and local scale impacts will need to be assessed separately. The catchment wide benefits assessment needs to focus on the holistic role of the waterway within the catchment area. It could be acting as storage and / or a flow channel providing flood protection to areas away from the waterway itself. On a more local level the waterway will be facilitating the drainage of adjacent urban and agricultural areas.

The likely significance of the drainage or storage function when considering a restoration scheme and the associated marginal benefits would be derived from the consequence of flooding if the asset was not restored. As such, information on flooding that has occurred whilst the waterway has not been functioning should be sought. This is thought likely to be available from British Waterways. In addition, benefits should also be considered where the un-restored waterway is providing a drainage benefit but this is likely to deteriorate over time as the waterway becomes further derelict.

The data available to quantify the number of properties or land benefiting from restoration may be limited or anecdotal. In this case the assessment can provide some context to the drainage benefits, which is probably sufficient for studies where drainage benefits are not considered to be significant and therefore their valuation is not of primary importance.

If the primary objective of the study is to use the drainage benefits for a comparative assessment, to provide context for a decision making process or to be used as a primary driver for funding then a more detailed assessment will be required.

If the assessment is required to secure funding, the method may need to be more detailed and will require some innovative hydraulic modelling techniques. This could be a costly option as data would not necessarily be readily available to undertake such modelling.

Droitwich Canal Restoration – STEP 3

No data (anecdotal or otherwise) is available on the potential extent of the arable land afforded protection by the drainage function provided by the Droitwich canal (pre or post restoration). Step 3 could therefore not be completed in this case. If it had been possible to undertake further analysis on the hydrology of the area before and after the restoration, then this step could have been completed.

In the case of properties afforded protection, an estimate of those expected to benefit from flood protection following the restoration scheme is given in the Project Application Form. According to this form, the initial flood risk modelling for the canalised River Salwarpe using proposed channel design estimated that 30 properties would benefit from flood alleviation. This does not account for any on-going drainage benefit the canal may also provide (pre or post restoration). It should be noted that it is considered unusual that this data is readily available in the Project Application Form.

Step 4 – Valuing the Benefits

As outlined in the framework, values are available for a range of the benefits provided by inland waterway. When completing a distinct drainage specific study, it is necessary to firstly review whether the final benefits identified in Step 3 above have already been accounted for within the valuation exercise. For instance, flood risk reduction related benefits are already listed within the framework and may already have been captured. A review at this point serves to avoid any risk of double counting benefits provided by the drainage function with those already identified within the framework. The most likely final benefit which may be identified through this process and which is not already in the framework is that of the provision of suitable land for agriculture or development purposes.

The drainage function provided by inland waterways can be seen to provide mainly flood risk reduction benefits and benefits to agricultural land. The scale of these benefit values depends on whether the benefits are catchment wide or localised.

Catchment wide benefits involve the alleviation of occasional impacts only as they are based on extreme weather events. This means that during heavy rainfall events assets (properties and agriculture) would be protected by storage or conveyance of the waterways. Average flood event damage values are available from existing datasets for both agricultural land and properties. Furthermore a bespoke assessment of the specific benefit can be undertaken by investigating the potential damage that could be (or could have been) caused by flooding.

Droitwich Canal Restoration – STEP 4

For the Droitwich Restoration project, data is only available on the number of properties protected from flooding as a result of the drainage function provided by the restored canal. This does not account for any benefits associated with potential write-offs of land or property which may result under the current conditions of the canal.

The Multi-Coloured Manual (MCM) (2005) forms the standard approach to flood risk management appraisal in England and Wales. For strategy-level analyses, it provides sector average figures on annual average damages. This approach is recommended in instances such as this one, where there is little or no understanding of flood depths and return periods associated with the circumstances at the Droitwich Canals. Consulting the MCM is also in line with what the valuation framework guidance recommends.

According to the MCM, the weighted annual average costs for direct damage to a property, assuming a zero standard of protection and no warning lead-time, is £6,662 (in 2009 prices). When emergency costs and intangibles are added to this, the annual average value increases to £7,595. This is multiplied by the number of properties benefiting from the flood alleviation effect of the restoration, to provide an annual value almost £200,000. This represents a rough estimate of the flood damage costs avoided due to the drainage function performed by the restoration and the management of the canal for navigation.

This value is already captured in Section 2.5.1 and is presented here only for illustrative purposes. As noted in Section 2.5.1, other impacts from flooding are excluded from this analysis, such as travel disruptions and damage to critical infrastructure. It is very likely to be an underestimate of the true drainage related benefits as there is no account made for damages avoided from write-offs of agricultural land or property.

The localised on-going benefit is the availability of land for development and agriculture due to the drainage function provided by the waterway. Therefore without the drainage function the assets could ultimately be lost and written off due to the regular occurrence of flooding or water logging. In this case the value of the

property and land would be an appropriate measure of the benefit. This information is readily available in existing datasets. Specific valuations of assets can be undertaken if required.

Valuations by Other Operating Authorities

The Environment Agency oversees the management of rivers within England and Wales. They investigate the direct damage that will occur as a result of flooding and consider the benefit of implementing infrastructure to avoid these damages. This includes a detailed assessment of damage to commercial and residential property, impacts to agriculture and the risk to human health and life. This detailed assessment cannot be undertaken with the existing available information.

Internal Drainage Board's (IDB) are established in areas where drainage is essential to maintain the function of the land. IDB's are funded by charging a Special Levy to the local authority for the drainage benefits they provide to property and agriculture. Each protected asset has an annual value set by the Valuation Office Agency, subsequently the IDB sets a rate to meet its estimated annual expenditure. These factors are multiplied to determine the Special Levy per property. This assessment could be used to estimate the drainage value at sites, where such assessments have been made by the IDB.

Conclusions

The step wise assessment process presented above can give an indication of the type and scale of the drainage function provided by a canal or waterway by assessing simple information such as the number of formal discharge consents or the discharge mechanism (whether drainage is a designed or consequential function). However as you move through the step-wise process, the data requirements increase and the identification of the extent of the benefits is typically difficult.

Anecdotal evidence was used to test the methodology on the Droitwich Canal Restoration example. Although this provides a reasonable evidence base for discussion or as a representation of the step-wise processes performance, it would be heavily scrutinized if used for funding purposes. It was also dependent on the availability of a study which estimated the number of properties which will be provided with flood protection as a result of the restoration. It cannot be assumed that this kind of information will be readily available in other cases.

If the primary objective of the study is to use the drainage benefits for a comparative assessment, to provide context for a decision making process or to be used as a primary driver for funding then a more detailed assessment will be required.

This could require some innovative, and potentially costly, hydraulic modelling techniques

2.8 Comparison of the Welfare Assessment and the Economic Impact Assessment

A **welfare assessment** aims to identify the benefits to society from, for instance, the natural environment or as a result of a canal restoration scheme, based on the wellbeing of individuals expressed directly or indirectly through their preferences. The objective of a welfare assessment is therefore to determine changes in

wellbeing. Welfare values are underpinned by individuals' preferences or WTP for a good or service. An **Economic Impact Assessment** is a different type of analysis tailored to answer a different type of question – it traces spending through an economy and measures the cumulative effects of the spending. The objective of an Economic Impact Assessment is to determine the impacts of a given intervention or programme on the economy. It typically assesses the impact of an activity on local or regional economies (e.g. in terms of increased sales, jobs created or household income).

While welfare assessments present net benefit estimates, Economic Impact Assessments present adjusted net values under each of the impact categories they consider, based on what is truly additional to the economy. For instance, with regard to job creation, the total estimated number of jobs created by a certain project will be adjusted down to account for leakage and displacement effects to provide an estimate of the net additional jobs to the region. Or, in the case of sales or expenditures arising from a project these will be multiplied to account for knock on expenditure created within the local or regional area.

The outputs of an Economic Impact Assessment can not be summed to provide an estimate of the impact, net value added, by a project. Welfare values, estimated for example using the framework, can be added together and used in cost benefit analysis.

Box 3 presents the results of a study that valued the contributions of inland fisheries in England and Wales (Environment Agency, 2008¹⁴). It estimated both the value of the 'activities supported by' these fisheries through a welfare assessment (with no consideration of substitution effects or alternatives) and the 'economic impact of' these fisheries using an Economic Impact Assessment approach. It shows that the estimate of economic impacts of this activity is significantly lower than the estimate of the welfare impacts arising from activities supported by inland fisheries. This is because Economic Impact Assessments consider only net additional impacts to the economy, while the activities supported by these fisheries are not adjusted in such a way.

¹⁴ Environment Agency (2008) Economic Evaluation of Inland Fisheries, The economic impact of freshwater angling in England and Wales. Jacobs and Glasgow Caledonian University.

BOX 3 Comparing the ‘activity support by’ and the ‘economic impact of’ an activity

A recent study for the Environment Agency on the value of inland fisheries reports both the welfare value and the economic impacts of freshwater angling across England and Wales. Analysis was carried out separately for each of the nine Government Office Regions, plus Wales. The report also attempts to assess the potential national impact of the loss of each of three freshwater fish species groupings (coarse; trout; salmon and sea trout). The study stops short of attempting to assess the national impact of the loss of *all* freshwater fish, but a rough estimate of this, which is highly likely to be a conservative underestimate, can be derived by summing together the values for each species. The table below shows summary results from each type of assessment, for the scenario where all freshwater angling disappeared across the whole of England and Wales.

Summary results for each assessment type.

	Activity supported	Net Economic impact*
Total employment (FTEs)	37,386	7,093
Total Gross Value Added	980,418	185,445

It can be seen that these two approaches give very different results as they are measuring different things. While many of the benefits considered by these two approaches might be similar, the treatment of those benefits to produce a final result is very different. In this case, the ‘net economic impact’ is a little under 20% of the ‘activity supported by’ fisheries. This suggests that the loss of the fisheries would result in the loss of around 7,000 FTEs and that the other ~30,000 FTE supported by the fisheries would in fact be retained elsewhere in the economy.

Despite their different focus Economic Impact Assessments can consider many of the same benefits as a welfare assessment. Furthermore, the scope of Economic Impact Assessments has widened over recent years, and many now include some qualitative or quantitative assessment of the benefits provided in the framework.

For instance, the Economic Impact Assessment completed for the Droitwich restoration in 2005 considers many of the same benefit categories listed within the framework and considered in a welfare assessment. The welfare assessment however covers additional categories of benefits, particularly relating to the provision of water and transport opportunities and the benefits provided to society by regulating services.

A key activity or benefit assessed by both approaches in the case of Droitwich is recreation and tourism, however the two assessments use the available information on expenditure in different ways. The welfare assessment adds the consumer surplus value to the expenditure value, to estimate WTP while the Economic Impact Assessment considers expenditure figures only, and uses them to estimate the number of jobs supported by this expenditure. It also adjusts the number of jobs created to take account of the fact that these new jobs might be displaced from somewhere else in the region and that they will not all be provided to local people (known as displacement and leakage).

Ecotec (2005) reports that the Droitwich project is expected to generate net additional expenditures of some £695,000 at the Droitwich level and £498,000 at the sub-regional level by one year after the scheme is put in place. This is estimated to result in 20 and 14 net additional FTE in the two areas respectively. The expenditure and FTE created are forecast to increase significantly by year 5, to

around 2.5m and 2.2m in expenditure at the Droitwich and sub-regional level respectively (presumed annually), resulting in the creation of 72 FTE at both levels.

The welfare assessment presented here estimates that the average annual value of the recreation related expenditure is £1,628,000 over the 20 year appraisal period. It does not however translate this into an estimate of FTE created. The value is not adjusted for net additionally either as is the case in the Economic Impact Assessment. Combined with the consumer surplus values, the welfare assessment presents a total annual WTP value of £1,784,000 for the additional recreation activities expected to be created on the Droitwich post restoration. This is of a similar order of magnitude to that estimated within the Economic Impact Assessment.

Because of the common desire to present employment related benefits explicitly, the guidance provides a multiplier which can be used to convert recreation expenditures into full time equivalents. Applying the approach outlined in the guidance, the annual recreational expenditure expected to be generated as a result of the restoration project at Droitwich, is estimated to support 40 FTE. These estimates are however not net additional, but gross.

2.9 Welfare benefits and sustainability indicators

Introduction

This section looks at how the framework benefits relate to the sustainable development indicators used to measure performance by British Waterways, Local Authorities and other Government Bodies. The objective is to illustrate how a welfare analysis can be used to inform these typically used indicators.

The welfare benefits identified in the framework represent the benefits to individuals and society from the presence and use of the waterways in economic terms. As discussed in the main project report, they cover provisioning services, regulating services and cultural services within an Ecosystems Approach framework. The framework categorises these benefits in a way that is compatible for economic analysis, based on welfare economics. These categories map well on to the economic, social and environmental impacts of the scheme monitored and evaluated by British Waterways as part of their monitoring activities.

There is a suite of sustainability type indicators used at a national level by a range of organisations and Government bodies. In contrast to welfare benefit estimates, these indicators, in most cases, report on non-monetary measures.

One such set is the **National Indicators for Sustainable Development** which is used by Local Authorities. This list of National Indicators is very long and has been categorised under a number of 'Outcomes' as follows:

- Stronger communities;
- Safer communities;
- Children and young people;
- Adult health and well being;
- Local economy; and
- Environmental Sustainability.

British Waterways have reviewed the National Indicators list and identified the indicators to which waterway activities can contribute, as listed in Table 14.

Within the Droitwich Canal Restoration Monitoring Plan, British Waterways uses **Quality of Life Indicators**. These are quite high level indicators and have been derived from the government's Quality of Life Counts to correspond to the various project funding and other monitoring requirements. They are organised under the following main areas:

- Maintaining high and stable levels of economic growth and employment;
- Social progress which recognises the needs of everyone;
- Effective protection of the environment;
- Prudent use of natural resources; and
- Other.

It should be noted that in the **Quality of Life** approach applied here, measures are used to look at the impact of the process (i.e. the restoration works) as well as the outcomes of the project. The former do not necessarily map so well against the welfare benefits listed in the framework as they may relate to how the work is carried out rather to the output of that work. They are included to allow British Waterways to demonstrate they are being sustainable and as well as delivering sustainable results. This is discussed further below.

Approach

Table 14 presents both the relevant National Indicators and the Quality of Life Indicators mapped on to the framework welfare benefits. The purpose of this table is to illustrate and provide an understanding of the overlaps between these three categorisations and to demonstrate how the framework benefits can inform many of the indicators used by Local Authorities, British Waterways and a range of funding organisations

The National Indicators are listed first in Table 14. As no more information on the metrics used to measure these indications has been provided, these have been mapped directly onto the relevant Quality of Life Indicators used by British Waterways. These indicators, in turn, have been mapped onto the benefits listed within the framework. A short discussion is then provided to explain the mapping process.

Discussion

As is evident from Table 14, there is a good overlap between the welfare benefits and a number of the indicators or metrics. The overlap is strongest in terms of physical data, which are required both to report on the indicators and to undertake the valuation exercise.

The analysis shows that a welfare assessment can contribute to, and in some instances provide additional information on, a number of indicators that organisations may report on.

Relating specifically to the Droitwich, the monitoring plan can be seen to cover many of the benefits valued within section 2.5 of this report, in one way or another. The only case where a gap exists is under waste disposal and safety measures. This is due to the fact that the Quality of Life approach addresses the costs and activities involved as well as the resulting outputs, while welfare measures are considered only in terms of outputs.

Surveying visitors and monitoring their activities on site provides evidence that many of these indicators have been achieved by the project. This links well to the conclusions of the valuation exercise presented in Section 2.2, which shows that that vast majority of the benefits expected from the restoration are centred on increased visitor activity. These can also be linked to the associated benefits they provide, such as knock on economic growth.

Table 14 Sustainable Development and Quality of Life Indicators and the framework benefits

National Indicator - Number and Name	Quality of Life indicator used by British Waterways	Appropriate framework benefit	Comment
Maintaining high and stable levels of economic growth and employment			
NI 167- Congestion – average journey time per mile during the morning peak (PSA 5)	Investment in physical assets	Recreation Green transport	The metrics used by British Waterways relate to km of canal and towpath created and moorings provided. These are directly related to physical data requirements for the valuation of recreation activities such as walking and boating, and to the provision of green transport routes for cyclists.
NI 171 - New business registration rate	Growth in the waterway-based economy	Creation of business opportunities Recreation	Measured best through employment creation, which is not explicitly defined in the framework but discussed in the guidance. Recreational expenditure is also relevant here. This is used to estimate visitor’s willingness-to-pay for the activity they are undertaking. Data collected for monitoring under this category can be used for valuation purposes.
NI 172 - Percentage of small businesses in an area showing employment growth	Maintaining high & stable levels of employment, so everyone can share greater job opportunities		As above
Social progress which recognises the needs of everyone			
NI 2 - % of people who feel that they belong to their neighbourhood (PSA 21) NI 3 - Civic participation in the local area (PSA 15) NI 5 - Overall/general satisfaction with local area	Tackling poverty & social exclusion	- Community benefits	This is measured by British Waterways using visitor numbers of various groups of people (e.g. disabled, elderly and ethnic minority groups). It is really about access improvements for these groups. The indicators relate to distributional or equity analysis which does not form part of the first stage of welfare assessment, as identified with the guidance. As a result no distinct welfare benefits maps on to this. However access can be considered to be captured within visitor numbers; as access improves, visitor number should increase. Measuring community interest and involvement is critical to monitoring under this indicator. This is address qualitatively in the framework as valuation is not possible due to a lack of quantitative data. The survey work undertaken as part of this monitoring could possibly be designed to provide information which would facilitate valuation in this case.

NI 6- Participation in regular volunteering NI 7 - Environment for a thriving third sector NI 45 - Young offenders' engagement in suitable education, training and employment	Equip people with the skills to fulfil their potential	Volunteering, Education, Community benefits	Volunteering days, training days and events all serve to demonstrate the achievement of this indicator. These are all aspects covered within the framework. The information collected as part of the monitoring exercise could be used to support the estimation of welfare benefits using the framework.
NI 8 - Adult participation in sport and active recreation NI 55 - Obesity in primary school age children in Reception (PSA 12) NI 56 - Obesity in primary school age children in Year 6 NI 57 - Children and young people's participation in high-quality PE and sport NI 121 - Mortality rate from all circulatory diseases at ages under 75	Improve overall health of the population	Recreation, Green transport, Volunteering (Health)	Health is considered a cross cutting benefit, in that it is provided by a number of benefits listed in the framework including recreation, green transport and volunteering.
NI 45 - Young offenders' engagement in suitable education, training and employment <i>(this indicator is also referred to above)</i>	Reduce both crime and fear of crime	Recreation, Community benefits	An increase in the general use of the waterways can demonstrate a reduced risk and fear of crime. This links to recreation and informal use of the waterways, and also to community benefits as demonstrated by people having a greater sense of place and reduced vandalism.
Effective protection of the environment			
NI 175 Access to services and facilities by public transport, walking and cycling	Improved choice in travel	Recreation, Green transport	The benefits associated with the displacement of road travel by those using the towpaths to walk or cycle is captured under Green Transport in the framework. Recreation, specifically informal recreation such as walking is also captured within the framework.
-NI 197 - Improved local biodiversity – proportion of local sites where positive conservation management has been or is being implemented <i>(this indicator is also referred to below)</i>	Improved river quality	Non-use values, Recreation	The benefits associated with improved water quality are often linked to improvements in biodiversity and the visual appeal of the area. These benefits are captured in the framework under non-use values where a number of water quality and biodiversity studies are presented, and through increased visitor numbers due to the improved appeal of the area.

NI 170 Previously developed land that has been vacant or derelict for more than 5 years	Re-using previously developed land	Property price premiums Non Use Values	The conversion on Brownfield sites can result in property premiums being realised on both adjacent properties and those developed on the site. If the site was restored to provide improved environmental qualities then non use values may also be realised.
NI 5 - Overall/general satisfaction with local area <i>(this indicator is also referred to above)</i>	Increasing satisfaction with quality of life	Recreation, Heritage Aspects, Non Use Values	The metric used relates to heritage assets, such as locks and buildings. The benefits associated with the restoration of these structures are captured in a number of places within the framework, depending on the nature of the benefit realised. Where visits to the canal are directly related to the presence of the structures, the value is captured within recreation. However, often it is difficult to know visitors' motivations for visiting so it may not be possible to explicitly define these benefits. This indicator also maps on the other cultural benefits listed in the framework, such as heritage aspects and non-use values.
NI 197 - Improved local biodiversity – proportion of local sites where positive conservation management has been or is being implemented	Development in rural areas	Non Use Values	The metrics used to monitor this indicator relate to environmental and biodiversity improvements. These are captured under non-use Values in the framework, however could serve to contribute towards other benefits too; such as water regulation and pollution dilution; visual amenity and recreation.
NI 186 -Per capita reduction in CO2 emissions in the LA area (PSA 27)	This National Indicator does not directly map on to the Quality of Life ones used in the Droitwich Monitoring Plan.	Renewable Energy	The framework covers CO ₂ related benefits resulting from the provision of renewable energy generation on waterways, such as hydropower or from the installation of heating and cooling systems in operation on some canals.
-	Prudent use of natural resources		
-	Move away from disposal of waste towards waste reduction, re-use, recycling and recovery	-	This indicator is not covered within any of the benefits listed in the framework, as it is related to behaviour changes rather than to a direct benefit provided by the waterways.
-	Other		
-	Improved safety	-	This relates directly to safety on site during the completion of the restoration works. This is not covered within the framework
NI 10 - Visits to museums and galleries	These National Indicators don't directly map on to the Quality of Life ones used in the Droitwich Monitoring Plan.	Heritage Aspects	The framework covers the valuation of heritage related trips which could be applied to visits to museums and galleries associated with the waterways.
NI 189 - Flood and coastal erosion risk management		Flood protection	The framework covers the valuation of benefits (property, social and environmental) provided by flood protection.

3 Case Study 2 – River Medway Navigation

3.1 Overview

Purpose of Case Study

This case study assesses how the valuation framework and associated guidance can be used to estimate the benefits currently provided (the baseline) by the River Medway between Tonbridge and Allington lock.

Key Findings

- No gaps have been identified in the general list of benefits presented in the framework.
- The guidance was found to be clear in the vast majority of cases. As is the case with Droitwich, some issues arose where the user is required to select from multiple unit values. Clarifications to the guidance have been recommended in these cases.
- Difficulty was encountered in estimating the current benefits provided by regulating services. It is generally a difficult task to establish the extent of regulating service benefits under the baseline (or currently provided) due to the complexity of the relationships and the lack of any logical alternative to base the estimation of these benefit against. The inter-linkages between, for instance, water regulation and water flow and the subsequent removal or redistribution of pollutants, makes apportionment of any resulting benefits to a specific service and function difficult. At the margin, the changes in services and functions as a result of a project or activity are more easily identified, allowing the benefits to be also identified.

3.2 Background and site information

The River Medway flows from Ashdown Forest in Sussex into the Thames Estuary at Sheerness through 70 miles of chalk downs, alluvial plains and sandstone uplands. The catchment area of the River Medway is one of the largest in England, extending over 930 square miles, with an extensive network of tributaries and streams feeding into the main river.

The stretch assessed here is the 19 mile (approx 31km) non-tidal section from Tonbridge to Allington lock below Maidstone, known as the ‘Medway Navigation’.

The River Medway was opened to navigation over 250 years ago and was mainly used to transport goods and people. Today a range of commercial and recreational activities take place along the river. It is understood that recently a lot of work has been put into improving the river to facilitate the development of these activities.

The river is marketed as one of Britain’s most important waters for leisure activities (River Medway marketing group¹⁵). It is popular for canoeing, angling and boating as well as for cycling, walking and dog walking. It offers beautiful views of the countryside, and the opportunity to visit historical buildings and locks.

Tours, events and festivals are also organised around the river, the most prominent being the Maidstone River Festival, held every July, which attracts between 25,000

¹⁵ www.medwayya.co.uk/images/guidetorivermedway.pdf

and 30,000 visitors. A number of marinas and riverside pubs are located along the stretch, primarily towards the upper end (Allington lock).

3.3 Case study objectives

This case study assesses the ability of the valuation framework and associated guidance to provide an estimate of the current (baseline) benefits provided at the site. A comprehensive understanding of the baseline benefits and their monetary value will inform and improve future decisions. For example, it can suggest priorities for current management aimed at maximising the economic worth of the area, and highlight possible development areas.

Key benefits are identified and where possible valued using the framework and guidance. The benefits identified are all currently realised, and under the baseline are expected to recur annually. In addition they are not compared to any costs, which could vary significantly over time. Therefore the benefit estimates are presented as annual values in 2009 prices, rather than present values.

3.4 Identification of key benefits

Presented in Table 15 is an identification of the benefits provided by the River Medway in line with those in the framework. This is based on the review of the available information. The benefits for which monetary values are provided in Section 3.5 are highlighted in grey in the final column of the table.

Table 15 The benefits provided by the Medway Navigation

Ecosystem Service Category	Benefit	Value provided in the framework	Present in the baseline for Medway River
Provisioning	Property price premiums	Yes	✓
	Renewable energy generation	No	
	Transport - Freight - Green transport	No No	✓
	Water provision	Yes	
	Volunteering	Yes	✓
	Creation of business opportunities	No	
Regulating	Climate regulation – Carbon savings, Renewable energy, and Transport	Yes Yes	
	Drainage, water conveyance, flood protection and alleviation	Partially	
	Water regulation and pollution dilution	Partially	
	Water Quality	Yes	
	Habitat provision	No	
	Recreation, including informal visits, cycling, boating, canoeing, angling	Yes	✓
	Bird watching	Yes	
	Heritage values	Partially	✓
	Visual amenity	Yes	✓
	Education	No	
	Volunteering	No	✓
	Community benefits	No	✓
	Non-use values	Yes	✓

The river stretch under study is popular for a large number of recreational activities, both in-stream and along the towpaths. The influx of participants undertaking these activities brings further opportunities for business development, such as shops, bars and restaurants. Properties adjacent to the waterway also carry a price premium as a result of the amenity and landscape values provided by the river. The river also provides heritage related benefits as it has been used as a crossing since Roman times and has subsequently formed a key transport route through the county of Kent. There are also a number of volunteering and education related opportunities associated with the river which provide welfare benefits. Furthermore, its structure has a positive effect on the area's flood protection, especially in the southern part of the stretch (Environment Agency, *pers. comm*).

The framework and guidance do not cover all the types of recreation undertaken on the River Medway as values were not available for inclusion. For instance, camping and rowing are not mentioned in the framework, but people are known to undertake these activities along the River Medway. Rowing is captured within the survey data collected by the Environment Agency and there are campsites along the Medway at Allington Lock and Marlin Canoe Club Camp site.

In this valuation it is assumed that the framework values for 'un-powered boats' are applicable to rowing activities. However no appropriate values are presented in the framework for camping expenditure or consumer surplus. It may be the case that campers are captured within the survey data while undertaking other activities on or along the river, such as walking, cycling or boating. If this is the case, including them under a separate category would result in double counting.

Reference and appropriate advice relating to addressing these possible gaps will be added to the guidance report.

3.5 Estimating the baseline benefits provided by the River Medway

This section presents an assessment of the baseline (or current) benefits provided by the Medway Navigation in one year. Where it is not possible to provide a monetary estimate, the available qualitative information is provided.

For each benefit the following is provided:

- the details of a literature review;
- the unit values to be applied;
- the application of the unit values and any adjustments required; and
- the aggregation undertaken to estimate the value of the benefit.

Information sources include communications with the Environment Agency and the Medway Valley Countryside Partnership and publicly available literature. Site-specific physical data have been used in order to complete the valuation exercise. These are discussed in the appropriate sections under each benefit.

In addition to issues identified in the Droitwich Case Study (see Section 2), an added difficulty for the Medway has been establishing current regulating benefits. The identification of the extent of these benefits is best completed at the margin, as a result of some change in the nature or structure of the river. This is discussed at length in O'Gorman and Bann (2008)¹⁶, and effectively arises due to the complex

¹⁶ O'Gorman, S and Bann, C. (2008). A Valuation of England's Terrestrial Ecosystem Services. Final Report NR0108 for Defra.

and dynamic nature of regulation services and functions preformed by the natural environment.

The inter-linkages between, for instance, water regulation and water flow and the subsequent removal or redistribution of pollutants, makes apportionment of any resulting benefits to a specific service and function difficult. In addition it is not considered feasible to complete this analysis within this type of assessment given the number of variables that need to be analysed in order to identify where the current operation of a river might provide such benefits. At the margin, the changes in services and functions as a result of a project or activity are more easily identified, facilitating the quantification of the benefits.

Table 16 below provides a list of the benefits where a quantitative assessment has been completed and a summary of the monetary values estimated for them (in 2009 prices). As the benefits have been valued based on total willingness to pay (WTP), they can be summed to provide a *lower bound* estimate of the benefits provided by the area. Provided alongside the annual raw values are the present value estimates for these benefits over a 20 year appraisal period. The present value estimates should be used to assess the relative importance of the different benefit categories rather than the annual values which include one-off values for property premiums.

Table 16 Summary of the current quantified benefits provided by on the Medway Navigation (2009 prices)

	Benefit	Annual value (undiscounted) (£000)	Present Value (£000)	Notes
Provisioning	Property price premium	3,550 – 5,325	3,550- 5,325	This is a one-off value range Confidence: medium due to the variability which can be seen in the premium estimates from different sources.
	Green transport	1	21.6	These are net benefits Confidence: low due the uncertainty around the physical data and the assumption with regard to displacement of road traffic.
	Volunteering	9	132	These are net benefits Confidence: high due to the fact that the physical data is robust.
Cultural	Informal recreation	377 - 397	7,297 - 7,687	Confidence: low to medium due to the ages of the unit value data and uncertainties in the physical data
	Walking	644	12,459	
	Cycling	77	1,494	
	Canoeing	39 - 62	753 -1,199	
	Boating	130 - 427	2,521- 8,244	
	Angling	89	1,714	
	Non-use values	996	19,277	Confidence: medium due to the uncertainty around the distance band and the ages of the unit value data.
TOTAL		5,912 – 8,026	49,200 -57,533	

3.5.1 Provisioning benefits

(a) Property price premium

In general, the presence of an attractive and navigable waterway adds value to the adjacent properties. This section estimates property price premiums attributable to the proximity to the River Medway. It uses both information provided in the guidance and anecdotal local information in estimating the value of the price premium.

Information review

From Allington Lock to Tonbridge the density of properties within 25 meters of the river varies dramatically. From Allington lock the Medway flows through Maidstone where its banks are developed for both resident and commercial use. Leaving Maidstone, the Medway runs through mainly rural areas until it reaches Tonbridge, with the exception of East Peckham which is semi rural in nature.

An attempt was made to establish the **number of properties** adjacent to the river through Google Earth¹⁷. However there is low confidence in the result of this exercise, as for a number of properties it is not immediately clear whether they are industrial/office properties, pubs, hotels or even boating and canoeing facilities. Other sources of property data do exist, such as the National Property dataset, used by the Environment Agency in flood risk planning. GIS analysis would be required to map this data set on to our area of interest. This is considered too specialist an activity for application here, however the approach may be valuable in refining the estimates for specific purposes.

As an alternative approach, three Maidstone based estate agents were contacted to gather local site specific property information. One estate agent estimated that there are approximately 200 flats with a river view in Maidstone.

To estimate the **average value of properties** in this area, the guidance recommends the use of the Land Registry data. This provides average property values at a number of geographical levels, including council area and post code level. This data suggests that the average property price for the Kent County Council area between the November 2008 and November 2009 was £175k (across all property types). For flats only, the average value drops to just under £104k.

As this is average over the whole county, it is unlikely to represent a true average for the properties along or near the Medway Navigation. Anecdotal evidence from the local estate agents suggests that the average value for the flats along the river front is between £175,000 and £180,000. This value is considered more appropriate than the average value from the Land Registry data for use here.

Site specific information on price premiums was also gathered. This is used to provide a comparison to the premiums presented in the guidance.

The information collated is presented in Table 17 below.

¹⁷ www.earth.google.co.uk

Table 17 Local property information

Estate Agent	Average property value (£000)	Estimated premium for river side location	Other comments
Bairstow Eves Estate Agent	120 -130	~4%	There are mainly flats/ apartments along the Medway. The average values correspond to repossessions only.
Geering & Colyer Country Wide	175	10%	Average values correspond to 2-bed river side apartments
Ward and Partners	180	10-15%	Average values correspond to 2-bed river side apartments. Estimated that there are about 200 flat with a river view in Maidstone

Unit values

The average price of riverfront properties is assumed to be £177,500 per property (the mid point between £175-180k) and the site specific premium is estimated at between 10-15%. The estimate provided by Bairstow Eves Estate Agents has been excluded from the analysis as it is derived from properties which have been repossessed and therefore would fetch a lower price on the market.

For existing residential properties within 25m of a canal, the guidance provides a property price premium range of 1.5%-8%. This range is derived from a number of site specific studies and may relate to whether a property has a view of the canal / waterway or is within a waterside development with no direct view.

As noted above, local site specific anecdotal evidence suggests a higher premium for existing properties adjacent to the waterways of between 10%-15%. While the reasons for this are not immediately clear, it may be related to the fact that the guidance premiums are taken from studies undertaken between 1994 and 2001. The preference for waterfront properties might have changed since then.

Application of unit values

Both the unit value range identified in the guidance and the site specific range are used to estimate property price premiums for the Medway.

Aggregation

To aggregate, the average current selling price of riverfront flats has been multiplied by the percentage price premium ranges, as described above.

The results are presented in Table 18 below. Shown in bold italics are the values selected as the most appropriate for use.

Table 18 Property values provided to existing properties

	Price premium applied	Range of benefits (one-off value) (£000)
Guidance based estimates	1.5-8%	532-2,840
Site specific estimates	10-15%	3,550-5,325

Both sets of results are based on the average current selling price of riverfront flats (£177,500) in the section of the river that goes through Maidstone. This is where the large majority of residential properties are located within the study area.

Conclusion

These values are only intended to give a reflection of the current benefit of properties price premiums along the Medway, principally in the area of Maidstone. As they refer only to an estimated number of flats within Maidstone based on anecdotal evidence, they constitute an underestimate of the benefits corresponding to all waterside properties along the full stretch of the Medway Navigation. The extent to which this is an underestimate is not clear at this point.

The two sources provide very different benefit estimates, creating some uncertainty around the values.

While it has been found to be easy to gather anecdotal evidence, the user of the guidance might find it difficult to identify the confidence around the data gathered, as has been the case here. However it is likely that site specific evidence, such as the anecdotal evidence gathered from estate agents, is more accurate and therefore should be applied where available. A more detailed assessment which gathered property information along the full length of the Medway Navigation would be necessary should these estimates be critical in decision making in relation to the Medway.

Recommendations

- Update the guidance to note that evidence can be gathered from estate agents on local property prices and premiums. This can be used instead of average price by area estimates provided by the Land Registry, as outlined in the guidance.
- Update the guidance to highlight that locally estimated premiums are likely to be more accurate and up-to-date than those presented in the guidance, but that the guidance values provide a conservative estimate where no local estimates are available.

(b) Green transport¹⁸

Information review

A number of people walk, jog or cycle along the river bank as a means of commuting to work. Information on user numbers is available from the Environment Agency report ‘Pilot Medway Visitor Survey Year 1 and 2 Report (September 2007 – August 2009)’. Visitor totals reported in this study are extrapolated from 3 honeypot sites along the Medway: Allington Lock, Yalding Sluice and Tonbridge Town Lock.

According to the Pilot Survey, 2,215 people (average for 2008-2009) commute by bicycle along the Medway per year. Most of those commute to and from Maidstone town centre and have been captured through the observations at Allington Lock. The cycle route to Maidstone town centre is attractive, reinforcing the health and fitness benefits associated with cycling. Were these commuters to use motor vehicles, they would have to enter the traffic one-way system in Maidstone, which can get highly congested.

¹⁸ Freight transport only takes place further downstream on the tidal stretch of the Medway, and is therefore not relevant to the section of the river examined here.

In order to complete a valuation of the benefits this activity provides, it is necessary to understand the proportion of commuting cyclists who would, in the absence of the (well maintained) towpaths, otherwise travel by car to work. It is not possible to estimate this proportion from the survey data available. Therefore, for the purposes of this valuation, it is assumed that all cyclists would otherwise travel by car to work. This provides a potential upper bound estimate of the associated benefits.

In addition, a total of 29,902 people are estimated to commute by walking or jogging. The majority of these have been identified by the survey as being located in the Tonbridge and Yalding areas.

There is a “Park and Sail” scheme which comprises a transport service by boat between Allington and Maidstone town centre. This is a seasonal transport service, facilitating Christmas shopping by dropping people off close to the Maidstone main shopping area. Commuters using this service are not included within the estimates presented below.

Unit values

The net benefits of displacing commuter journeys from motor vehicles to bicycles are presented in the guidance on a *pence per kilometre* basis. The range of benefits included in this value is associated with impacts such as physical fitness; greenhouse gas emissions savings and congestion reduction (see also Section 2.5.1 (c)).

It is assumed that most commuters would be working at Maidstone town centre where congestion levels can be high; however as a means of accounting for commuters that may have alternative destinations in the area and for adjusting for the fact that all cyclists are assumed to displace car travel (when this is unlikely), the lower bound unit value of £0.07/km (2009 prices) is used for traffic displaced by cycling. This is the unit value provided in the guidance for cycling journeys from roads with average levels of congestion. This unit value increases to £1.94/km for heavily congested roads.

The average value of traffic displaced by walking commuters is zero. The justification provided in the guidance as to why walkers provide no net benefit in terms of reducing congestion is that the any time delay costs experienced by commuters in cars are not significant enough to outweigh the physical fitness and other benefits gained by walking and jogging. For this reason, no benefits are estimated for walking or jogging related commuter trips.

Application of unit values

The *pence per kilometre* value for cycling commuters which is provided in the guidance is in 2009 prices so no adjustment is necessary.

The unit value is applied to the estimated number of cyclists using the river to commute to and from work, as provided by the Pilot Survey of Visitors.

Aggregation

The average commuting distance in and around Maidstone town centre assumed to be relevant for the green transport benefit is 2 miles, or 3.6km each way (Environment Agency *pers. comm.*). In order to estimate the benefit of commuting

by cycling, this was multiplied by the unit value of each trip (£0.07 pence per kilometre).

The estimated value for the net benefits of green transport is therefore £1.1k per year (2009 prices).

Note that this is a net benefit estimate, not a gross benefits estimate. It is therefore not directly comparable to the gross benefit estimates calculated for other benefit categories.

Conclusion

It is concluded that the guidance provides the appropriate support to users in estimating the value of green transport benefits. However the key factor contributing to a level of uncertainty around the estimates is the lack of information on the proportion of trips displaced from car travel.

It is clear from the results that the difference between the benefits provided by traffic displaced from heavily congested roads and roads with average levels of congestion is very significant and therefore getting an accurate picture of where the traffic is likely to be displaced from is important.

As discussed in Box 2, an alternative way to consider green transport benefits is to look at just the carbon saving they are likely to provide. As is the case under the Droitwich case study, the value of the carbon savings associated with commuters are very similar to those presented above using the net benefit estimate approach.

Recommendations

- Update the guidance to emphasise the need to gather the best available data on the level of congestion of the roads from which traffic is displaced, using local knowledge, average congestion levels on particular types of roads and available mapping data.
- The uncertainty that the lack of evidence on the level of traffic creates in the final valuation estimates should also be made clearer in the guidance.

(c) Water provision

With regard to **water provision**, the guidance sets out criteria for valuing the benefit of water abstraction by British Waterways for commercial purposes. However, in this case there are private abstractions along the river which are used to reinforce potable water supplies locally. Water is abstracted from the Medway at Springfield, upstream of Allington Lock; however it is also released from Bewl Reservoir, upstream. South East Water, who is responsible for the abstraction, is obliged under their licence to discharge 25% more water than they abstract. This therefore provides a benefit in terms of river flow, such that there are few or no low flows in the summer and clean water of good quality flows into the estuary. In addition, Southern Water has a winter abstraction allowance at Yalding. The Medway has very high flows in the winter therefore this additional winter abstraction can generally be sustained.

In order to estimate the value of this abstraction, a review of the cost of abstraction licences would be required along with some indication of the value of the water when sold on to customers (e.g. the sale price per mega litre). This information is not readily available and therefore no valuation is attempted here.

In a study recently undertaken by Jacobs for the Environment Agency¹⁹, the value of water abstracted from the Thames was estimated according to the average licensed (allowable) volume of water abstracted per activity type and the licence charges per mega litre. It should be noted, however, that the resulting figures are likely to be a significant underestimate of the true economic value which includes the social and environmental externalities associated with supplying potable water, as well as the scarcity value.

Recommendations

The guidance should be amended to include reference to the licensed abstraction and charges approach outlined above, should data be available to apply it.

(d) Volunteering

Information review

Information on volunteering was sought from the Medway Valley Countryside Partnership (MVCP).

MVCP offers the opportunity to volunteers to contribute their time to a number of activities, including practical work such as wildlife surveying and litter picking. The volunteering schemes encourage community involvement and provide the opportunity to learn new skills.

The MVCP provided information about the time and the expenditure associated with volunteers. This enabled the VIVA approach to be applied in order to value the net²⁰ current benefit of volunteering in relation to the Medway River.

There are two volunteering schemes in place related to the river: the Thursday Action Group (TAG) and River Wardens. Currently the Medway has 22 River Wardens volunteering on a regular basis between Tonbridge and Maidstone. Volunteers are encouraged to record wildlife on their walks along the river. Their observations feed into the Kent and Medway Biological Records Centre. It is estimated that River Wardens pick up litter for 90% of their volunteering time and record wildlife for the remaining 10%.

In addition, there are groups organised by the Environment Agency and Scout groups that occasionally get involved with spring clean weekends and other events.

In total, River Wardens and the other groups mentioned above work for approximately 40 hours per week. If we assume there are 48 working weeks in a year, this equates to 240 volunteer days per year.

The TAG volunteers are involved in a range of practical conservation projects that are not always specific to the river. In order to get an approximation of their potential annual involvement, their contribution to a 2008 project at the Yalding Fens of 65.5 days in the year has been applied here.

¹⁹ Jacobs (2009). Thames Weir Environmental Prioritisation - An Update of the 2004 Prioritisation Tool. Annex 1 of the Thames Weirs Capital Investment Plan (CIP) Project IMTH001484 Report by Halcrow and Jacobs.

²⁰ Note this is the only case in which net benefits are estimated in the analysis of the benefits provided by the Medway Navigation.

Table 19 presents information on the costs (expenditure) associated with engaging volunteers.

Table 19 Volunteer data for the Medway Navigation (per year)

Cost category	Detail	Cost – River Wardens	Cost - TAG
Managing TAG / River Warden Scheme	Staff time	£4,676	£800
Recruitment (advertising, interviewing, admin); Newsletters; Training	Through staff time	-	-
Travel /other expenses	Refreshments	£39	£242
Clothing (T shirts, jumpers and gloves), litter pickers	Cost	£1,500	Included in the River Warden cost
Postal costs	In kind via Kent County Council Post room - estimate	£100	£6
Materials (paper/photocopying/ printing costs)	From MVCP office stock - estimate	£154	-
Volunteer insurance	Covered by Kent County Council's overall staff and volunteering policy	-	-
TOTAL		£5,469	£1,048

Source: Medway Valley Countryside Partnership

Unit values

The labour type used for this volunteering work is assumed to be largely unskilled. The per day gross value estimate for unskilled volunteer labour based on British Waterways research is £50 (2008 prices).

Application of unit values

The value provided in the framework has been updated to 2009 prices, to £50.75 / day. The costs provided by MVCP have not been adjusted.

Aggregation

The updated value for volunteer labour has been multiplied by the number of volunteer days used in a year; 240 for River Wardens and 65.5 for TAG volunteers. This totals 305.5 days annually. The value of volunteer labour (referred to as 'outputs' in the VIVA methodology) is therefore estimated to be £15.5k per year.

The total volunteer expenditure in a year is £6.5k (referred to as 'inputs'), according to the information provided by MVCP. This gives an estimated net benefit per year of £9.1k, as shown in Table 20.

Table 20 Annual value of volunteering benefits

	Annual value
Days of volunteer time used	305.5 (days)
Benefits (outputs) per year	£15.6k
Costs (inputs) per year	£6.5k
Net benefits per year	£9.1k

The VIVA ratio is therefore 2.4 (where outputs are divided by inputs). This means that for every £1 spent on volunteers, they give back £2.40 in the value of the work they do.

It must be noted that this approach focuses only on monetary values and does not include any benefits individuals derive from volunteering. These are discussed further in section 3.5.3 (d).

Conclusion

This assessment suggests that organisations using a significant amount of volunteers are aware of the costs associated with using volunteers and are therefore likely to record the costs associated with this. This information was readily provided by the MVCP group. However in this case some costs are covered by other organisations and cannot be easily disaggregated to cover costs specific to the Medway Navigation.

Note that the valuation approach applied here provides a net benefit estimate, not a gross benefits estimate. It is therefore not directly comparable to the gross benefit estimates calculated for other benefit categories.

Recommendations for this category are provided under the Droitwich case study (see section 2.5.1 (d)).

(e) Creation of business opportunities

As noted in the guidance, the primary indicators of this benefit are the expenditure associated with the various activities undertaken on and alongside the waterway and the jobs created from this expenditure.

The expenditure values for a range of recreational activities have been estimated and are presented under the relevant sections below. To count them here again would result in double counting.

It should also be noted that employment creation figures are not economic values but serve as an indicator of the role of the inland waterway in terms of job creation. They would therefore normally be presented as part of an Economic Impact Assessment, but not as part of a welfare value assessment (see Section 2.2.5 for further discussion around the difference between Welfare Assessments and Economic Impact Assessments).

The estimated number of jobs supported by recreational expenditure along the Medway Navigation is presented here only for illustrative purposes and to test the approach defined in the guidance.

Annual expenditure on all recreational activities has been estimated to be between £1.2m and £1.5m. The guidance states that between £25k-£40k of 'general visitor' expenditure can be taken to support 1 full time equivalent (FTE). FTE assumes a permanent position, and differs from the 'jobs' indicator which may be short or long term in nature.

British Waterways recommend the use of the upper bound value to estimate the number of FTE positions supported by this expenditure. Using the £40k value and the annual expenditure estimates of £1.2m-£1.5m, it can be suggested that the

recreational activities along the Medway Navigation support 30-38 FTE positions annually.

It must be noted that this is *gross, not net, employment* as no account is taken of leakage and displacement effects within the area. Economic Impact Assessments adjust employment estimates to account for these factors and present the net gain resulting from some form of investment or expenditure.

3.5.2 Regulating benefits

It is generally a difficult task to establish the extent of regulating service benefits under the baseline (or currently provided) due to the complexity of the relationships at play and the lack of any logical alternative to base the estimation of these benefit against.

For instance, with regard to recreation it is easy to say that the river currently provides X number of recreational visits per year, as if it wasn't there, then these visits would not take place (considering also adjustments for substitute sites). However when it come to climate regulation, it is not easy to define what services would exist without the river in order to define the current provision of this service.

However, a quantification of these benefits can often be carried out at the margin, as it is more likely to be possible to say that with some form of change. For example additional Y litres of water will be transported, or drainage links will be provided to allow water to flow off the land thereby making the land more usable etc.

Therefore, presented here is a discussion only in relation to flooding, water quality and drainage services currently related to the Medway Navigation.

The area around the Medway Navigation, especially near Tonbridge, is susceptible to **flooding**. Flood defences are in place to protect people and property. The Leigh Barrier, the largest flood control reservoir in Europe, is made up of three vertical gates which hold back the river at high flows and allows water to be fed through at a controlled rate when flood events occur. This, in conjunction with the existing floodwall, has been designed to increase the flood threshold in the centre of Tonbridge from a 1 in 10 year event to between a 1 in 150 and 1 in 175 year event.

This information does not however assist in identifying the role the waterway itself, managed for navigation, plays in helping to reduce floods. It is this service that would be valued under the baseline.

In relation to **water quality**, evidence points to the Medway being a generally clean river; comprising a good fishery and free of any historic contamination issues. According to the Environment Agency, there has been no commercial traffic on the river since the 1960s, and therefore no pressures on water quality from this activity.

There are sites along the river that used to be industrial. For instance, there was a chemical manufacturing site at Yalding which produced pesticides. The factory is now closed and the site has been remediated. It is possible that there may have been historic contamination of the river sediments as a result of the activities; however no evidence currently exists to support such an assumption. A protective structure (a curtain wall) is currently in place at Yalding to prevent any potential leaching of historic contaminants.

The river is now considered to be of generally good quality, following any legacy of industrial development along its banks (Environment Agency, *pers. comm*). However, as with the case for flood protection above, the available information does not assist in identifying the role the waterway itself plays in ensuring good water quality. It is this service that would be valued under the baseline.

No information is available on the potential on-going **drainage services** provided by the river. As discussed in Section 2.6, where a drainage function is provided, it can mean that the adjacent land can be used for agricultural production or development, which would otherwise not be possible. Section 2.6 presents a step-wise methodology for assessing if a drainage function is provided and the significance of this. This should be consulted should further information on any potential drainage benefits be sought.

Obviously a healthy river system will generate benefits from the regulating functions and services it provides. These benefits may be significant and should not be discounted within an overall review of the benefits provided by the waterway. However it is not possible to estimate the extent to which they are currently provided and therefore neither is it possible to estimate a value for the benefits these services may generate.

3.5.3 Cultural benefits

(a) Recreation

The Medway River is a very popular destination for recreation activities, both land and water-based. This section presents a separate discussion on each recreation activity identified in the Pilot Medway Visitor Survey.

(i) Informal recreation: Playing, jogging, eating

Information review

The Medway visitor survey records categories of informal visitors visiting the river to either play, jog or eat, as presented in Table 21 below. Visitors should only be recorded under one category, relating to the main intention of their visit.

The highlight of the recreational calendar is the two-day Maidstone River Festival held annually at the end of July, which attracts between 25,000 and 30,000 people. This is a free event, organised by volunteers and funded by sponsorship from Maidstone Council with donation from local businesses. Activities typically include live music and dance stages, a raft race, the Forest Family Fun Fair, street entertainers, a French Market, a best dressed boat competition, an illuminated boat parade and a fireworks finale.

Table 21 Visitor numbers by intention of visit

Intention of visit	Number of visitors (average over 2008 and 2009 visitors)
Playing	2,027
Having a meal	23,327
Jogging	18,663
Attend the River Festival	25,000- 30,000

Unit values

The guidance provides expenditure values for day visits, pub visits and jogging on a *pounds per person per trip* basis. These are derived from the Inland Waterways Day Visitors Survey (IWDVS) and are presented in 2008 prices. It is assumed that those visiting with the intention of ‘playing’ have an expenditure value the same as any other day visitor and that they are not in fact children who have no expenditure value.

Many festival goers arrive by boat on average one week before the festival. These visitors are understood to be included in the estimated number of boating visits, sourced from the visitor survey, and applied under ‘boating’ in Section 3.5.3(a)(v) below.

However, others attending the festival are not captured anywhere else in the visitor survey data set. The average expenditure at the festival is thought likely to be significantly larger than the average expenditure for those visits undertaken when the festival is not on. Festival goers are likely to undertake a range of activities and their expenditure may include accommodation, eating, boating and other activities. It is therefore difficult to disaggregate festival goers by activity.

In order to account for at least part of festival visitors’ expenditure, the expenditure value for informal day visitors is applied here. This is thought likely to be an underestimate of actual visitor expenditure, even when the potential for double counting with boating visit expenditure is accounted for, as noted above.

The guidance provides expenditure values of £3.84 - £4.50 (day visitors), £8.25 (visitors to pubs) and £2.91 (joggers) per person per visit.

The guidance also provides a consumer surplus estimate for local visitors (visitors travelling a distance less than 10 miles) and non-locals (> 10 miles). The local visitor estimate has been selected here and is in the range of £0.02 and £0.09 (1989 prices). The mid-point of this range has been applied here and combined with the expenditure values to provide an estimate of the WTP per visit.

For visitors to the festival, the upper bound of the consumer surplus range has been selected, as a way of accounting for the fact that it is a very popular event in the South East and is bound to also attract people from further than 10 miles away, for which the consumer surplus values presented in the guidance is significantly higher (£0.22-£10.94)..

Application of unit values

The unit values are uplifted to 2009 prices and presented in Table 22 below. The consumer surplus values have also been adjusted to reflect the income elasticity of willingness to pay, as outlined in the guidance.

Table 22 Unit values per activity, uplifted to 2009 prices.

Intention of visit	Expenditure (£) (2009)	Consumer surplus (£) (2009)
Playing	4.33 – 5.07	0.11
Having a meal	8.37	0.11
Jogging	2.95	0.11
Attend the River Festival	4.33 – 5.07	0.19

Aggregation

The aggregated value summed over the range of visitors is estimated to be between £377k and £396k per year, as shown in Table 23. This is based on visitor data averaged over 2008 and 2009.

Table 23 Annual values for informal recreation benefits

Intention of visit	Annual value (£000) (2009 prices)
Playing	9 – 10.5
Having a meal	198
Jogging	57.2
Attend the River Festival	112.9 – 131.5
<i>Sum</i>	<i>377 – 397</i>

Conclusion

As noted above, it is thought likely that the estimate presented here underestimates the WTP for festival related visits. Part of the festival related values (for those arriving by boat and staying a number of days) are captured under ‘boating’ values as it is not possible to disaggregate these boaters from other ‘non-festival’ related boating visits. There may therefore be an element of double counting in the benefit estimates to festival goers who arrive by boat, as they may be captured under boating and as informal day visitors.

That said, as the informal visitors expenditure and consumer surplus values are low, it is very unlikely, even with a degree of double counting, that the benefits of the festival have been overestimated.

A similar problem in estimating the benefits associated with river or waterway based events and festivals was encountered during the completion of a project undertaken by Jacobs for the Environment Agency in 2009 (Jacobs 2009). A case study on the Henley Royal Regatta was presented based on the number of ticket sales and average price per ticket. This methodology could not be extended to other festivals and events on the Thames, however, due to lack of data on visitor numbers. Henley is also an especially prestigious event which commands high ticket prices and it was not deemed appropriate to apply these values in another context.

While the value of these events is potentially significant, they are likely to be very location specific. So while it would be helpful to undertake some research to help define average expenditure and consumer surplus values for those attending the events, given the difficulties of doing this it is unlikely to be worth prioritising over other more significant evidence needs. These difficulties are associated with the likelihood that a large (and costly) study would be required to derive meaningful results and the risk that having completed such a study, it is discovered that the variability by location is so high, that average estimates become meaningless due to the site specific nature of these events and their resulting benefits.

(ii) Walking

Information review

The towpath, which has been re-established by the Medway Valley Countryside Partnership as a river walk, is easily accessible and runs along the entire river from Allington to Leigh, west of Tonbridge (outside the case study area). The towpath

network is well maintained and signposted as it passes through stretches of beautiful countryside.

There are 5 circular walks of varying lengths to be enjoyed, including Teston, East Peckham, West Farleigh, Hadlow and Yalding. There is also a linear route along the banks of the River Medway, from Tonbridge, past the Allington lock, to the tidal part of the river reaching Rochester through picturesque villages and an Area of Outstanding Natural Beauty (AONB) – the Medway Valley Walk.

Unit values

The number of people walking for leisure activity is derived from the Pilot Medway Visitor Survey and is estimated to be around 151,700 per year, based on an average of the 2008 and 2009 visitor data.

The guidance provides an expenditure value for walking of £3.37 per person per trip (2008). In terms of a consumer surplus, three values are provided in the guidance depending on whether the walking route goes through a mainly rural, semi-rural or mainly urban area. As the river footpath meanders through different types of areas, the central value of £0.40 per person per visit (1989) is selected.

Application of unit values

Unit values have been uplifted, giving an expenditure value of £3.42. The consumer surplus value has been adjusted to current prices and to reflect the income elasticity of willingness to pay, as outlined in the guidance. In 2009 prices it is estimated to be £0.82 per person per trip. The latter has been adjusted for changes in income levels, as recommended in the guidance. These values combined provide a WTP estimate of £4.24 per person per trip.

Aggregation

The aggregated value of the benefit currently realised by walkers along this stretch of the river is estimated to be £644k per year.

Conclusion

This value is very large and may be an overestimate as some walkers will be local residents who in fact spend very little if anything while walking along the banks of the river. It is not possible to disaggregate the visitor survey data to provide an indication of how much of an overestimate this might be.

The guidance itself was found to work well here with a range of types of values presented allowing the user to select the most appropriate value for their site. No amendments to the guidance are recommended.

(iii) Cycling

Information review

There are no designated cycling routes running the whole length of the Medway, although National Cycle Routes 1 and 17 both have sections along the river. Most official cycling routes are located on the tidal part of the river; around the Estuary, Rochester and Medway town. However, within the case study area local cycle routes also exist and there is evidence of people cycling on the towpath, as presented below.

Information on the number of users was obtained from the Medway Pilot Visitor Survey. The average number of cycling visitors between 2008 and 2009 was found to be approximately 16,400. This number excludes commuters cycling along the Medway Navigation.

Unit values

The guidance provides a unit expenditure value for cycling of £4.40 per person per trip, quoted from the Inland Waterways Day Visitor Survey carried out in 2008. This value, combined with a consumer surplus value of £0.31 per person per trip (1989 prices) gives a WTP estimate for cyclists. This estimate is used to derive the benefit of cycling along the Medway Navigation. However, the confidence in the consumer surplus value is low due to the fact that it is an old estimate and based on a survey of just one site (for more details see section 2.5.3. (a) (ii), Cycling).

Application of unit values

The uplifted expenditure value in 2009 prices is £4.47 and the consumer surplus value is £0.64 per person per trip (which is also adjusted for income elasticity). This gives a total WTP of £5.11 per person per trip.

Aggregation

Aggregated over the number of cyclists using the study area, the benefit of cycling along the Medway Navigation is estimated to be £77.2k per year.

Conclusion

Notwithstanding the low confidence placed in the consumer surplus values used here, the guidance has been found to work well. No amendments to the guidance are recommended.

(iv) Canoeing

Information review

Canoeing is permitted on the River Medway along the navigable stretch of the river, which runs from the footbridge immediately below Leigh Sluice near Tonbridge, to the limit of non tidal waters at Allington Lock – in other words, along the full length of the case study site.

Canoeing is a particularly popular activity on the Medway Navigation and numerous canoeing clubs are located along the river. There are also touring events, a Medway Canoe trail (a canoeing route on the river), and a marathon race of approximately 18 miles organised on most weekends, from Maidstone to Tonbridge. Information on the number of canoeing visitors comes from the Pilot Medway Visitor Survey. The average number of users between 2008 and 2009 was 12,200. This estimate is weighted to take account of people attending canoeing events.

Unit values

The guidance provides expenditure values representing the average spend per visitor for canoeing/kayaking visits. The range given is between £3.14 and £5 in 2004 prices.

The valuation presented here is based solely on expenditure values as the guidance does not provide a consumer surplus for canoeing.

Application of unit values

The expenditure unit values have been uplifted, showing a range between £3.19 and £5.08 per visitor per canoeing trip in 2009 prices.

Aggregation

The benefit associated with canoeing, estimated in expenditure terms, is estimated at between £39k and £62k per year, in 2009 prices.

Conclusion

The visitor data has been adjusted by the Environment Agency to account for the fact that the surveying methods might have missed the additional visitors attending specific canoeing events. It is not clear what specific adjustments were undertaken.

The expenditure values on the other hand have not been adjusted to account for the fact that they are likely to be higher for those attending events, than for those whose purpose of visit is purely leisure. In addition, no consumer surplus value specific to canoeing is available in the guidance. The estimate presented here is therefore likely to be an underestimate of canoeing benefits.

(v) Boating

Information review

The Medway Navigation attracts many boating users of both powered and un-powered craft. A number of boating clubs, marinas and boatyards are established along the relevant stretch. Passenger boats operate on the river, which are also available for hire.

The Pilot Medway Visitor Survey provides estimates of boating and rowing users of around 9,700 and 885 per year, respectively (average number of visitors between 2008 and 2009). These are people visits, not boat visits.

A large number of boats travel to the Medway Navigation during the two-day Maidstone River Festival. Boats attending the festival usually arrive over the week preceding the festival. During the two years that the Visitor Survey was carried out, recorded boating activity was particularly high for 14 days of the year, mostly on account of the festival (Environment Agency, *pers. comm.*).

Unit values

The guidance provides a range of expenditure and consumer surplus values for boating.

Expenditure estimates are between £14.49 and £38 for hire boats and £11 for privately owned boats per person per trip (2004). As it has not been possible to establish the split between hired and privately owned boat use, a general boating expenditure value is calculated using a range of £11 to £38 per person per trip.

With regard to rowing, the expenditure value for unpowered boats of £3.46 per person per trip (IWDVS 2008) is used here.

According to the guidance, the consumer surplus for boating may range from £0.17 - £0.45 per visitor per trip (1989 prices). A central value of £0.31 is used as a suitable estimate which equates to £0.63 in 2009 prices.

Application of unit values

The unit values are uplifted to 2009 prices and presented in Table 24 below. The consumer surplus value has also been adjusted to reflect the income elasticity of willingness to pay, as outlined in the guidance.

Table 24 Unit values per person per trip, uplifted to 2009 prices

Type of boating visit	Annual visitor estimates	Expenditure unit values (£) (2009)	Consumer Surplus unit value (£) (2009)	Combined WTP (£)
General boating	9,712	12.41 - 42.85	0.63	13.04 - 43.48
Rowing	885	3.51	0.63	4.14

Aggregation

The annual benefits associated with general boating along the Medway Navigation are estimated to be between £126.6k and £422.3k. The benefit associated with rowing amounts to £3.7k per year. Combined, these activities are estimated to provide a benefit in the range of £130k - £426k.

Conclusion

In the case of boating visitors, the categories of values provided in the guidance are too specific for use with the data available on visitors, as the distinction between powered and unpowered boats users is not available for the Medway Navigation. The upper and lower bound estimates applied here were therefore taken from the combined range of values for these two categories.

No amendment is recommended for the guidance as it is considered appropriate for the guidance to provide disaggregated data wherever possible, rather than high level data, as this will provide more confidence in the estimates generated.

Site specific data on the cost of registering private boats on the river and hire costs per size of vessel are available for the Medway. In addition, the number of vessels registered on the Medway Navigation is available and is some 800 vessels of assorted sizes. In its current form however, it is not practicable to use this data to estimate expenditure for registered boats. In addition, using expenditure data from registered boats will result in some level of double counting with the expenditure data presented above for each boating visitor; as it is assumed that registered boat owners are captured within the visitor survey.

(vi) Angling

The River Medway is of angling interest over its entire length and attracts a large number of anglers. The framework provides detailed angling values, which account for the type of waterway and the type of angling taking place.

Information review

The Pilot River Medway Visitor Survey provides the number of people travelling to the Medway to fish in 2008 and 2009. Coarse angling is assumed to be practiced along the river as the species found in the river include chub, roach, barbel and grayling

Unit values

The average number of angling visitors over the two years of the survey was around 3,400.

The combined willingness to pay of anglers for coarse angling provided in the guidance is in the range of £21.10 per trip (2001 prices). This is split between expenditure, at £17 per trip, and consumer surplus, at £4.10 per trip.

The guidance also provides an alternative expenditure value for fishing of £4.05 per person per trip, derived from the 2008 Inland Waterways Day Visitor Survey. This value is not considered an appropriate reflection of the expenditure associated with the activity as it is unlikely to cover all cost categories likely to be incurred by anglers; permits, food, travel and accommodation. (See also section 2.5.3 (v) Angling for further discussion of these values).

A review of site-specific information demonstrates that for anglers using the stretches from East Farleigh Lock down to Unicomes Lane and from the Wharf Road footbridge to Allington, having a valid Environment Agency rod licence (costing £26 per year) means that they do not incur any additional costs for each angling trip they make to the river. However, additional expenditure is incurred to fish on other stretches of the river. Along the Medway Navigation there are angling clubs that sell day or seasonal tickets. For instance, the Tonbridge and District Angling and Fish Preservation Society, that cover a large section of the river, currently charge £45 for an adult annual membership. They also sell day tickets for £4 per rod per day. These costs are in addition to the Environment Agency rod licence fee.

The Environment Agency Benefit Assessment Guidelines (Environment Agency, 2003) provide estimates of the number of trips made per year to different fisheries. For a coarse fishery, these range from 17 to 32 trips per year. If we assume that each angler pays £26 for their rod licence fee (covering the season between April 2009 and March 2010) allowing the holder to fish for non-migratory trout, char, freshwater fish (coarse fish) and eels, the average expenditure per trip is between £0.81 and £1.53.

Adding on the costs of an annual subscription to the Tonbridge and District Angling and Fish Preservation Society (at £45 per season), the expenditure would be £1.41 per trip increasing to £2.22 for a frequent user, or £4.18 of a less frequent user on the Medway. This expenditure includes only the licence and angling club fees. It is concluded that if accommodation, food and travel costs are taken into account, and the associated consumer surplus for coarse angling of £4.10 per person per trip, the overall average willingness to pay would most likely reach at least the levels prescribed in the guidance.

Application of unit values

The expenditure and consumer surplus values provided in the guidance, uplifted to 2009 prices, are £22.11 and £4.03 per person per trip respectively. The consumer surplus value has also been adjusted to reflect the income elasticity of willingness to pay, as outlined in the guidance.

Aggregation

Based on the annual average number of trips and the uplifted WTP value, the annual value of angling trips along the Medway Navigation is estimated to be £88.6k per year.

Conclusion

Fishing visit estimates are generated by counters at three points: Allington, Tonbridge and Yalding. Fishing is prohibited at locks. As a result, only Yalding (no lock) shows significant fishing activity. This means that applying these visitor numbers is likely to underestimate the level of this activity along the full length of the river, between Tonbridge and Allington.

The confidence that can be placed in the aggregated value is considered therefore to be low. This is however a result of deficiencies in the physical data, not in the unit value data used.

The Environment Agency Benefit Assessment Guidance (2003) provides instructions on how to estimate the number of anglers or of angling trips. Site-specific data are obviously preferred or an estimate can be derived through consulting local angling clubs. In the case of the latter, day licences may give a reasonable approximation of trip numbers. Environment Agency rod licence data within the local area is another way of approximating visitor numbers.

Although the physical data for angler numbers estimated through the Medway visitor survey are recognised as likely to be an underestimate, it is thought that the accuracy would not be improved (and may indeed decline) were any of the other proposed approaches to be applied.

(vii) Bird watching

Bird watching is prominent on the estuary of the River Medway, which supports internationally important populations of 17 bird species as well as 8 bird species of national importance. No explicit evidence of bird watching activity has been identified on the non-tidal stretch. The nearest RSPB reserve is Tudeley Woods, located approximately 6km away from the river, South East of Tonbridge.

It is therefore assumed that the Medway Navigation considered here does not provide significant bird watching opportunities, or is not currently used as such.

Summary of recreation benefits

Table 25 summarises the estimated value of recreation benefits considered above.

Table 25 Annual values of recreation benefits (2009 prices) (£000)

Recreation activity	Benefit value estimates (£000)
	WTP (expenditure + consumer surplus)
Informal recreation – playing	9 – 10.5
Informal recreation – jogging	57.2
Informal recreation – eating	198
Informal recreation – Maidstone River Festival	112.9 – 132.5
Walking	643.8
Cycling	77.2
Canoeing	38.9 - 62
Boating	126.6 - 422
Rowing	3.7
Angling	88.6
<i>Sum</i>	<i>1,356 -1,695</i>

Table 25 shows that the largest contributing recreation type is walking. This value may in fact be a significant overestimate as it includes local residents who are visiting the waterway and whose expenditure is likely to be low or even zero.

Informal recreation and boating activities also generate significant benefits. The contribution shown from the Maidstone River Festival is likely to be an underestimate as it is based on average informal visitor expenditure and consumer surplus values. Festival goers are likely to have higher than average values.

Recommendations

- Undertake further research to help define average expenditure and consumer surplus values for festivals and events such as the Maidstone River Festival given the potentially significant value that these contribute.
- Update the guidance to address issues associated with the contrasting values presented for estimating angling benefits.
- Add expenditure values from Ecotec 2005 to cover additional boating related activities.

(b) Heritage values

The River Medway forms an area of historical significance and heritage value as it has played an important role in the lives of local people for centuries. It used to be a river crossing for Romans and subsequently formed a key transport route through the county of Kent. The river also has sustained local industries in the past, particularly iron production, paper making, brewing, brick works and cement works.

Along the river, there are picturesque villages interspersed with diverse landscapes and heritage structures. For example, heritage castles and stately homes, such as the Tonbridge Castle and the Allington Castle, as well as museums and other places of interest, such as the Yalding Organic Gardens, which continue the long-established heritage associated with the river.

The heritage function associated with the river is therefore considered to be of high significance. The method provided in the guidance to capture this benefit is based on the number of heritage visits to a site. This data is not explicitly available from the visitor survey and while it is likely that the heritage features of the waterway are the main driver for some visits, there is no information on the number of visits where

this is the case at present. The survey could be amended to include specific questioning on the motivations for the visits. That said, the expenditure values captured for recreation might include the use element of the heritage value where it is applicable.

The non-use element of this benefit can be captured within the non-use valuation estimate if the appropriate valuation study is applied. In this case, the non-use values estimated are based on people's WTP to maintain waterways for boating, heritage aspects and towpaths. See Section 3.5.3 (f) for this valuation.

(c) Education

The River Medway supports a range of activities of an educational nature, attracting the participation of both students and others.

The Riverside Communities Project, run by the MVCP is central to the organized educational provisions associated with the waterway. This project includes a host of events and activities including story telling, walks, photography workshops, art sessions and sculpture making which are all linked to the river. Information about the history of the river collected by volunteers is communicated to the public while materials such as recommended walk leaflets and wildlife and heritage spotter guides for children have been developed.

Local schools are actively involved with the river, linking educational activities with wildlife protection. These activities are also supported by MVCP. In addition, MVCP provides guided walks and talks along the waterway for people who want to enjoy the landscape and to learn more about local wildlife and heritage.

Generally the waterway is closely linked with the life of local people and there is a wealth of information available to educate visitors.

(d) Volunteering

An assessment of the financial benefits provided by volunteering labour is provided in Section 3.5.1(d); however this does not include a range of non-financial benefits individuals themselves realise from participating in the volunteering.

These benefits are associated with a sense of achievement, a 'warm glow' from the feeling that they are helping others or the environment and physical and mental health benefits. In this case, as volunteers mainly under take litter collection, it is unlikely that the benefit they realise extend to include the acquisition of new skills, however as both groups of volunteers (the Thursday Action Group and the River Wardens) work in teams the benefits might also include those associated with improved social integration.

In order to quantify these benefits a primary research would be required. This is discussed further in Section 2.5.1(d).

(e) Community benefits

The River Medway is in the centre of a number of community projects, mainly carried out or facilitated by MVCP.

As this benefit is not directly quantifiable, examples of community projects are mentioned here in order to illustrate how the river is interlinked with the community.

MVCP are actively involved with a range of local schools and local community groups. They have, for instance, administered the Free Tree Scheme, providing free trees to the areas of Maidstone and Tonbridge and Malling Boroughs. They also run or facilitate projects of landscape enhancement and organise access and footpath improvements.

A range of funding schemes also exist for the improvement or restoration of access, landscape, wildlife and heritage, which schools, parish councils and individuals can apply for.

The aim of these activities is to enable people to enjoy access to a calm, inviting and well-maintained physical environment, while encouraging the involvement of the local community, thereby installing a sense of responsibility and ownership for the river and surrounding area.

(f) Non-use values

Information review

The River Medway offers not only leisure activities, but natural environment, landscape, heritage and conservation benefits as well. In addition to the use values considered in the analysis presented under 'recreation' above, non-use values are held by people who do not use the site, but do however want to know that the river is in a good state, perhaps for them to visit in the future if they choose to do so, or so that it is conserved for future generations to enjoy.

While the River Medway does not run through any protected areas, it does run around the Kent Downs Area of Outstanding Natural Beauty (AONB). One of its tributaries, the River Len, runs through the AONB. This information helps to identify the distance bands from the river within which non-use values might be held.

Unit values

The guidance provides three valuation studies which can be used for the estimation of non-use values: values for the continued maintenance of the canal system for boating, heritage and tow paths; values associated with biodiversity improvements on a waterway; and values associated with water quality improvements on a waterway. The first of these studies (Adamowicz *et al.* (1995)) is most appropriate for use here as it is considered to adequately represent the type of non-use value which might be realised currently on the river and because the other studies relate to marginal changes rather than existing situations.

Specifically, the study reports the results of a survey to establish the WTP of non-visitors to maintain a canal system for boating, heritage and tow paths. The unit value recommended for application in the guidance is the median WTP of £0.75 (1995) per household per year. However, the average unit value is much higher than this, at £5.55 per household per year. This demonstrates a highly skewed distribution and reduces the certainty that can be placed in the final estimates. The median is applied as it represents the conservative approach.

The assumed population which might hold a non-use benefit, and therefore relevant for aggregation purposes, is estimated to be within a 60km radius of the river, at any point along the relevant stretch. This corresponds to a site of regional conservation importance. While the river does not run through any protected areas, it is close to an AONB and, given the level of use of the waterway, it is considered appropriate to use this distance band.

As the 60km radius stretches into a number of county areas, the population density for the South East of England, 419 people / km² is used to estimate the relevant number of households holding a non-use value.

Application of unit values

The unit value is uplifted to £1.17 per household per year, in 2009 prices.

The guidance recommends following the approach outlined in the Benefit Assessment Guidelines (Environment Agency, 2003) in order to establish the population that is relevant for aggregation, when sample data is not available. The area considered relevant here is based on the 30km radius of the river, at any point along the relevant stretch. This covered an area of 2,826km². This is multiplied by the population density for the South East of England and divided by 2.3, which is the assumed number of people per household. This gives approximately 850k households relevant for aggregation.

Aggregation

The number of relevant households is multiplied by the unit WTP per household per year. This results in an annual non-use value benefit for Medway Navigation of around £996k.

Conclusion

The critical aspect of a non-use valuation is the selection of an appropriate distance band (say 30 km) over which values are held. For a small site, it would be assumed that the radius extends out from one point only. However in the case of a linear site, such as a waterway, it must be assumed that the distance band is, say 30km, from any point only that waterway. This means the area within which households might have a non-use value is significantly larger for a linear site than a non-linear one, such as a park. The relevant area is therefore calculated as the area of the rectangle (length of waterway * distance band *2) plus the area of a circle (πr^2) (representing the two half circles at either end).

It is clear therefore, that while the unit non use value applied in this case is low, the total aggregated value is estimated to be significant. Putting it into context, it can be seen that total use value has been calculated at £4.9m - £7m, meaning the non-use value is less than 25% of the use value. However, the non-use value is between 60-70% when compare with the total value for recreation benefits (£1.36m - £1.69m).

Initially, a less conservative distance band was chosen (i.e. 60km which is the radius recommended in the Benefits Assessment Guidance for a 'moderate' change to a site of 'regional importance'). This same calculation produced an annual non-use value of £3.2m which was considered too high in relation to the total use values calculated. Non-use values would not be expected to total more than half (50%) of the use values with the exception of especially rare or spectacular locations / resources. Whereas in this case it would represent up to 65% of the use values and double the value of recreation benefits.

This exercise clearly highlights the need for a careful approach in choosing a distance band for aggregation.

The non-use estimate taken from this study seems to fit well with the situation presented here, as it includes a contribution for the heritage aspects of the

waterway. As is noted above, the other two studies which are presented in the guidance for estimating non-use values refer to a marginal change and the resulting improvements on the waterway. These are not applicable to estimating the existing benefits provided under the baseline at a given waterway site. This is clearly documented in the guidance so no amendments are necessary to clarify this.

That said, it is likely that the unit values we have applied here will be suitable to a large number of waterways where baseline benefits are being estimated. This is therefore not considered likely to cause a major gap for future baseline valuation studies.

3.6 Case study conclusions

The case study has been used to answer the following key questions posed by the project:

1. Is the list of benefits in the framework comprehensive and accurate?

No gaps have been identified in the general list of benefits presented in the framework. The only areas of note relate to recreation where rowing and camping were identified at the site, but were not listed within the framework. The significant of this is low, as a value is available within the framework which can be used as a proxy for the benefits provided by rowing. In addition, camping could be considered an 'accommodation' type rather than a 'recreation' type. Camping related benefits are therefore considered likely to be captured under other recreation categories.

It is clearly not possible for the framework to list all possible recreational activities that might be undertaken on or along side waterways. The list presented in the framework was driven by the availability of valuation data and is considered to cover most if not all activities commonly undertaken by visitors to waterways.

2. Are the monetary values provided in the framework in a form that is usable / compatible with available physical data?

Yes. The values are easily updated to current prices and match well with the units that physical data are presented in.

3. What level of confidence can be attached to the monetary values derived given the different types of contexts the transfer values could be applied in?

It was found that the original context of the valuation studies used in the framework matched well with the context for the Medway Navigation. The benefit category most likely to suffer from a context mis-matching is the non-use value. This is due mainly to the specific context within which primary studies are undertaken and the fact that only a small number of values are presented in the guidance (reflecting a small number of primary studies). However the context of the original study used to estimate non-use values for the Medway Navigation fits well, increasing confidence in this estimate.

4. Is the guidance clear and does it cover the process required in practice?

The guidance was found to be clear in the vast majority of cases. As is the case with Droitwich, some issues arose where the user is required to select from multiple unit values. Clarifications to the guidance have been recommended in these cases.

Some amendments to the assessment process have also been identified. These relate to a range of issues, from the need to undertake a data review to identify the benefits of relevance to a given situation, to the need to discount benefits if estimated over an appraisal period. All recommendations are summarised in Section 5.

5. Does the guidance provide enough advice to the user on the physical data requirements and its availability?

In addition to the issues in this regard presented in Section 2.6, it should be noted that there will be cases where no physical data or written documentation is available in order to facilitate the completion of the valuation. In these cases it is recommended that interviews with experts on the site or site managers are undertaken to get a feel for the area and to gather any anecdotal evidence available.

4 Case Study 3 – Limehouse Cut

4.1 Overview

Purpose of Case Study

The purpose of this case study is to test the guidance with regard to valuing small, marginal improvements to a waterway. In contrast to the Droitwich case study presented in Section 2, the benefits provided by small scale improvements to a canal may not be readily recognised or estimated. This case study aims to show that even small scale improvements can result in measurable welfare benefits. The assessment is based solely on information provided by British Waterways.

Key Findings

- The guidance can be used to provide a valuation of the marginal changes resulting from small improvements to a waterway when physical data on those marginal improvements is available. It is likely that in many cases, such data will not be available.
- The exercise has shown that even these small improvements can provide significant benefits over time for certain benefit categories.
- In comparing the value of recreation benefits to investment costs, there is a 'payback' period of approximately seven years.

4.2 Background and site information

Limehouse Cut is a 2km canal stretching from the River Lee navigation at Bow Locks to Limehouse Basin in East London. The canal runs through the London Borough of Tower Hamlets and is situated to the north of Canary Wharf and to the south west of the emerging Olympic Park in Stratford. This canal is the gateway from the River Thames to over 200 miles of canals.

The Limehouse Cut Regeneration Programme, led by British Waterways, spent £1.4m between 2001 and 2004 on a range of physical improvements to the canal and towpath. These included the creation of new moorings, enhanced towpaths, access improvements from the road, 'designing out crime' initiatives and a range of community initiatives.

Limehouse Cut is expected to receive additional funding from the Olympic Delivery Authority (ODA). The ODA plans to invest in upgrading eight routes leading to the Olympic Park from Central London, three of which use the towpath of the Limehouse Cut Canal. British Waterways is one of the partners in this initiative.

At the moment the towpath is not as intensively used as other canal towpaths in the area; however user numbers have risen as a result of the Limehouse Cut Regeneration Programme. They are expected to rise even further following the improvements planned in the lead up to the Olympic Games.

4.3 Case study objectives

The objective of this case study is to use the guidance to determine the value the benefits of the improvements carried out during 2001 and 2004 under the Limehouse Cut Regeneration Programme.

The case study has been conducted based solely on information provided by British Waterways. No further desktop or physical survey has been undertaken to determine the nature or use of the site, or the likelihood or magnitude of other marginal benefits that may have resulted from the physical improvements which have taken place.

4.4 Identification of key benefits

Quantified data has been provided for the increase in boating and informal recreation use on or along the canal as a result of the investment made under the regeneration programme. Applying an ecosystem services categorisation, these benefits fit within the 'cultural' services category.

In addition, it is likely that due to access improvements from local roads to the towpaths, the towpaths will be used more by cyclists. The investments aimed at reducing crime (providing better lighting, planting and the removal of hidden corners) and the community engagement initiatives will provide other benefits. Due to data limitations it is not possible to quantify these benefits at this time. These are discussed further, as appropriate, below.

4.5 Estimating the marginal benefits at Limehouse Cut

This section presents the assessment of the marginal benefits provided by the recent investment at Limehouse Cut. Where benefits have been quantified, results are presented as raw annual values (2009 price estimates) as well as present values, discounted over a 20 year horizon, assuming constant annual benefit each year over the period. This assumption does not include any additional benefits likely to be realised as a result of the planned ODA investment.

4.5.1 Provisioning benefits

Data has not been provided on any provisioning benefits which might have been realised as a result of the regeneration programme. Therefore, no benefits have been identified or valued here.

It is feasible however that increased visitor numbers could have created some business opportunities and improved access could have provided opportunities for cyclist to use the towpaths for commuting rather than travelling by car. Both of these potential benefits are however likely to be realised to a greater extent following ODA investment in the area.

4.5.2 Regulating benefits

The investment made under the Limehouse Cut Regeneration Programme is not expected to have resulted in any marginal increases in regulating services.

4.5.3 Cultural benefits

(a) Recreation

The review of the available information shows a limited number of different types of recreational activities currently taking place on the Limehouse Cut canal. Data provided by British Waterways relates to boating activities along the canal and to towpath use. It is assumed that the towpath use relates just to walkers.

(i) Informal recreation - Walking

Information review

People-counters have been installed mid-way along the Limehouse Cut since 2002. With appropriate adjustments made by British Waterways, these show that the towpath use has more than doubled since the investment made between 2001 and 2004. On average, an additional 51,000 visits per year have taken place as a result of the Limehouse Cut Regeneration Programme.

Unit values

The consumer surplus for walking ranges between £0.40 and £0.63 (1989 prices) per person per visit. The lower bound corresponds to mainly rural areas and the upper bound to mainly urban areas. The site in question is in an urban area, however, the guidance recommends that the range is used in the analysis as the values come from a dated study and only relate to a small number of sites.

The guidance recommends the use of an expenditure value of £3.37, as identified in the Inland Waterways Day Visitor Survey in 2008.

Application of unit values

Unit values (expenditure and consumer surplus) have been updated to 2009 prices using the GDP deflator. The consumer surplus values have also been adjusted to reflect the income elasticity of willingness to pay. The adjusted consumer surplus values are in the range of £0.82 - £1.30 and the expenditure value is £3.42 per person per visit, in 2009 prices.

Aggregation

The total annual value of the benefit associated with walking, based on 2009 estimates, is estimated to be £216k - £241k. Aggregated over 20 years, the present value of the marginal change in walker numbers is estimated to be in the order of £3.2m - £3.5m.

Conclusion

Confidence in the consumer surplus values is low, as these estimates come from a very old study.

If a large number of the additional visitors are local people taking short cuts or walking their dogs, it is likely that the use of an average expenditure value will result in an overestimate of the expenditure that is likely to have been generated by these new visitors. Data disaggregated by type of visitor would be required to provide further confidence in these values. This is not available from the people counters installed at this site.

However it can be said that the guidance provides the necessary information for the user to apply the framework to the estimate the marginal benefits associated with small waterways improvements, as these are the same irrespective of the size of the improvement made. It is the ability to measure the change in terms of physical data that is the limiting factor for such small marginal changes.

(ii) Boating

Information review

British Waterways have estimated the number of boating movements on the canal. As lock counter data are not available, estimates are based on traffic levels on nearby waterways. They have concluded that the canal has an approximate boat density of 2 - 3,000 boat movements annually.

As a result of improvement works undertaken as part of the regeneration programme, 8 additional moorings have been established at two locations. However as these are residential moorings, they would not add to the boat movements on the canal.

British Waterways have reviewed the pattern of boat movement on near by canals between 1991 and 2007; however no discernable pattern or growth in traffic was identified. Even though the change in boat traffic can not be pinpointed with a high degree of accuracy, anecdotal evidence from British Waterways staff in the area suggests that the canal is busier by about 250 additional boat movements per year.

As there is limited boat hire in the London area, these additional boats are assumed to be privately owned. Based on boat owner data held by British Waterway, the average crew size is estimated to be 3 people per boat.

Unit values

The expenditure value identified in the guidance per visitor per boating trip, in 2004 prices, for privately owned boats amounts to £11 per person per trip. The corresponding consumer surplus value ranges from £0.17 - £0.45 (1989 prices).

Application of unit values

The adjusted expenditure value, in 2009 prices, is £12.41 per person per trip, while the adjusted consumer surplus value is between £0.34 and £0.93.

Combined, these values represent a WTP of between £12.75 and £13.33 per person per trip.

Aggregation

The range of unit WTP values is multiplied by the additional estimated number of boating users attributable to the investment. The estimated value of these additional boat trips is approximately £3.2k per year. Over a 20 year time horizon, this equates to a present value of between £47k and £49k.

Conclusion

Confidence in the results presented here is low as a result of the significant level of uncertainty in the physical data available. Due to this uncertainty, it is not clear if the figures are likely to be an under- or over estimate of the marginal value of additional boating trips.

As is the case for walkers, the guidance provides the required values and direction to the user to facilitate the completion of a valuation exercise.

Summary of recreation benefits

Table 26, below, summarises the estimated value of recreation benefits identified for walking and boating activities.

Table 26 Annual and present value benefits provided by additional recreation (2009 prices)

	Raw annual value (£'000) (undiscounted)	Present value (£'000)
Walking	216 – 241	3,183 – 3,534
Boating	3.2	45 - 47
TOTAL	220 - 244	3,230 – 3,587

(b) Visual amenity

Significant improvements in visual amenity are not expected to have resulted from recent investment in the canal by British Waterways and partners.

The landscape surrounding Limehouse Cut is expected to undergo significant changes over the next 5 years as there are plans to demolish industrial buildings and replace them by residential housing schemes, a health care centre and community sporting facilities. These changes may be partially associated with the forthcoming Olympics however no information have been provided on the funding source for these developments, so this cannot be confirmed. Such changes are likely to result in significant visual amenity benefits for users of the canal.

(c) Community benefits

It is not possible to value the extent to which the community has benefited from the regeneration investment in the canal in monetary terms. That said, there is evidence that the investment in the canal to improve access and towpaths, reduce crime and provide community engagement initiatives has benefited the local community.

The outcomes of this investment, directly relevant to community benefits, have been categorised and recorded by British Waterways. The data provided notes the following as results of the programme:

- 2,154 young people benefited;
- 28,005 people benefited from community safety initiatives; 1,368 beneficiaries of community safety initiatives were over 60 years old and 3,705 were female;
- there were 28 community safety initiatives taking place; in addition 3 community organisations and 3 community groups were supported;
- 17 capacity building initiatives were carried out; and
- 6 "good news" stories were written about the area.

The benefits actually achieved surpassed the benefits forecasted by large percentages. For example, over double the forecasted number of community safety initiatives were realised, as a result of which the number of elderly and female beneficiaries was 31% and 73% higher respectively than expected.

(d) Non-use values

Information review

Limehouse Cut forms part of East London's historic canal network. Limehouse Basin, at the bottom of the canal stretch, has been transformed from a working dock to a marina. Along the Limehouse Cut towpath there are a number of historical buildings, some of which are being converted for residential use. The works associated with the Regeneration Programme in 2001 have improved the towpath in terms of, for instance, design and lighting. The townscape along the canal, although degraded at points, remains of significant conservation value for historical architecture.

Unit values

It is difficult to identify how non-use values might have been affected by the improvements provided under the regeneration programme. The questions that must be asked here are;

- Are more people likely to hold a non-use value for this area now as a result of recent investment? or
- Have households' non-use values likely to have grown as a result of the changes which have taken place and if so, by how much?

It is not possible to answer either of these questions based on the available data. That said, it is thought to be unlikely that these small changes would have elicited any significant change in non-use values, especially given that fact that further improvement are still required to the canal, which are expected to be funded by the ODA.

4.6 Case study conclusions

It is evident from the completion of this case study that the framework and guidance can, in theory, be used to estimate the welfare benefits from generally small marginal changes as in this case, or large changes as in the case of Droitwich. The critical issue is the ability to measure the change in the extent of the benefit (e.g. the increase in visitors) which results from the investment.

Confidence in the increase in boating activity at this site as a result of British Waterway's investment here is low as it is based on anecdotal evidence, which in this case amounts to a 'gut feel'. More confidence can be placed on the data on walkers, however, as this is taken from counters on site.

5 Recommendations

5.1 Introduction

A series of recommendations have been made following the completion of the three case studies.

The majority of these relate to changes to the guidance produced during the Phase 1 project. A recommendation is also made on future research needs to fill a gap in the valuation data.

The recommendations are presented in the Phase 2 Case Study Report, under the section they were identified. For instance, the recommendation relating to property premiums was highlighted within the Medway Navigation case study, and is presented as part of the write up of property premiums in Section 3 of the report.

Here we present all the recommendations together, grouped as follows:

- General process; relating to the overall valuation approach and steps outlined in the Phase 1 guidance report;
- Benefit specific; relating to a specific issue such as value selection or guidance on the availability of physical data for a specific benefit category; and
- Future research recommendations.

5.2 General process recommendations

5.2.1 The step wise valuation process

A number of gaps were identified within the guidance relating to the general valuation process outlined within the Phase 1 report. These are additional to the steps already outlined within the 4-step benefits transfer process. The 4-step benefits transfer process is presented here to clearly illustrate the recommended changes required to the guidance.

The results of the first three steps are presented in the framework. So while the user should be aware of how the benefits transfer process is undertaken, they only need to undertake step 4.

- Step 1 - Evaluation of the quality of the original study, based on a set of criteria.
- Step 2 - Preliminary assessment of 'Benefit Consistency'.
- Step 3 - Detailed assessment of study for benefits transfer purposes, and selection of appropriate studies for inclusion in the framework.
- Step 4 - Guidance on the adjustments required.

Not currently included in Section 5 of the guidance is a process to address the question "how do you estimate the value of benefits of your waterway?" This is however outlined in the brochure produced as part of Phase 1 as follow:

- Step 1 - Identify the benefits relevant to your waterway.
- Step 2 - Determine which benefits you would like to estimate a monetary value for. These are likely to be the benefits you think are the most significant.

- Step 3 - Select the appropriate monetary estimate (£/unit) from the valuation framework for the benefits of interest. The monetary values presented in the valuation tool are based on the best existing valuation studies suitable for transfer to inland waterway sites.
- Step 4 - Estimate the extent to which the benefits are provided. This is measured in terms of the unit adopted for the monetary value and varies across benefits. These unit values relate to the physical information that needs to be collated.
- Step 5 - Multiply the unit monetary value by the physical data you have collated. Accurate quantification of the physical units is important as it typically has a big influence on the final value derived

It is recommended that the guidance is updated to include this process. It will also be made clear that, while there is an overlap with these processes (at Step 4 of the benefits transfer process), they serve different purposes; the benefits transfer process helping to identify studies and values to transfer; the valuation process helping to apply these values to the case at hand.

The benefits transfer process is part of the Phase 1 methodology and outlines the steps needed to complete a benefits transfer task. However, as noted above only Step 4 in this process is relevant to the user of this guidance, as the other steps in the benefits transfer process have been completed and are embodied in the framework.

The user is best guided by the 5-step “how do you estimate the value of benefits of your waterway?” process outlined above. The requirement to make adjustments to the unit values presented in the framework (Step 4 in the benefits transfer process) will be integrated into this 5-step process.

In doing this, the need for the user to undertake a literature review to identify the relevant benefits for the site in question will be noted. This will include reference to the need to use local site specific reports or data sources where available, and liaise with local site managers from the Environment Agency or the navigation authorities, to generate physical data estimates.

5.2.2 The identification of an appraisal period

The guidance does not discuss the need to consider benefits over time. This was highlighted in the Droitwich case study where it was clear that the benefits from the restoration scheme would take some time to be realised, and would grow over time.

Guidance should be included to allow the user to appropriately identify the correct appraisal period and to discount the benefits over this period to provide present value estimates of the benefits in question.

5.2.3 Update the GDP deflator

Since the completion of the Phase 1 report, the GDP deflator used to inflate values to current prices has been updated. It is recommended that this is updated in the guidance.

5.3 Benefit specific recommendations

A number of benefits specific recommendations have been made, following the completion of the three case studies. These are summarised in Table 1, and discussed in more detail in the Phase 2 Case Study Report.

Table 27 Benefit specific recommendations

	Benefit	Recommendations
Provisioning	Property price premiums	<ul style="list-style-type: none"> Clarify that property premiums represent one-off benefits, not annual values. Highlight that the user needs to consider when these benefits will be realised. Update the guidance to note that evidence can be gathered from estate agent on local property prices and premiums. This can be used instead of average price by area estimates provided by the Land Registry, as outlined in the guidance. Highlight that locally estimated premiums (e.g. from Estate Agents) are likely to be more accurate and up-to-date than those presented in the guidance, but that the guidance values provide a conservative estimate where no local estimates are available.
	Renewable energy generation	No recommendations identified
	Transport - Freight - Green transport	Green transport <ul style="list-style-type: none"> Update the guidance to emphasise the need to gather data on the level of congestion of the roads from which traffic is expected to be displaced from, using local knowledge, average congestion levels on particular types of roads and available mapping data. The uncertainty created by the lack of information on traffic displaced in the final valuation estimates should be made clearer in the guidance.
	Water provision	-
	Volunteering	<ul style="list-style-type: none"> Provide further details on VIVA methodology in the guidance and append the short VIVA report for easy reference.
	Creation of business opportunities	No recommendations identified
Regulating	Climate regulation	No recommendations identified
	Drainage, water conveyance, flood protection and alleviation	<ul style="list-style-type: none"> Update the guidance to provide the estimated annual average costs for flood related property damages which can be used to estimate the flood protection related benefits provided by a waterway, where physical data is already known.
	Water regulation and pollution dilution	No recommendations identified
	Water Quality	<ul style="list-style-type: none"> Amend the titles of this benefit category to 'water quality and pollution dilution' so that users are clear that pollution may need to be considered under both water quality and water regulation benefit categories.
	Habitat provision	No recommendations identified
Cultural	Recreation	<ul style="list-style-type: none"> Update the guidance to address issues associated with having two very different unit values presented for valuing angling benefits. Add expenditure values from Ecotec, 2005, to cover additional boating activities.
	Bird watching	No recommendations identified
	Heritage values	
	Visual amenity	
	Education	
	Volunteering	
	Community benefits	
Non-use values	<ul style="list-style-type: none"> Include a further caution in the guidance regarding the careful selection of distance bands for use in aggregating non-use values. Highlight the need to put non use value estimates into context with use values as this can provide some indication of whether they are realistic. 	

5.4 Suggestions for future research

The Phase 1 report provided a set of recommendations for future research needs. These were as follows:

1. Testing the benefits transfer framework; to test and develop the benefits transfer framework as a tool for assessing the benefits of inland waterways.
2. Primary valuation work; to provide up-to-date welfare values for a selection of benefits provided by inland waterway and applicable across the UK.
3. Assessment of drainage benefits; to derive up to date values for the drainage benefits provided by inland waterways.
4. Centralised collation of physical data; to provide a centralised information point for the physical data required to undertake the monetary valuation of benefits.
5. Green transport; to provide evidence on the benefits of green transport routes as provided by tow paths.

The first of these recommendations has now been completed, through this Phase 2 project.

Following the review of drainage benefits as part of the Droitwich case study, it has been agreed that further large scale research on drainage benefits is not a priority for the Research and Development Programme at the moment.

As a result of the success of Phase 2, and the overall Research and Development Programme objective to ultimately produce a national value for inland waterways, it is suggested that further case study work is completed.

To inform case study selection the first task is to produce a **characterisation of inland waterway** sites to help to: understand the variability between sites; and, determine the types of sites likely to provide similar benefits. Based on this characterisation exercise a representative sample of valuation case studies will be selected, and their benefits aggregated where possible to a national scale. It might be possible to use one of these case studies to undertake a detailed assessment of drainage benefits at a given site.

There are a large number of theoretical difficulties and issues involved in attempting to complete such a task, many of which have been outlined in a previous Defra funded project on the value of ecosystem services (O’Gorman and Bann, 2008). Due to these difficulties it is likely that only a sub-set of the benefits will be aggregated to the national scale.

The bottom-up site specific case study approach may benefit from a parallel top-down national valuation exercise. Some benefit categories are more suited to a top-down approach than others, for instance recreation benefits. Regulating benefits on the other hand can only be reasonably estimated at the site specific scale looking at marginal changes. It is not proposed therefore that the national study covers all benefits. Where benefits can be estimated at both scales, the results can be used to derive confidence intervals around the national estimate. It may also be necessary to limit the assessment to canals (thereby excluding navigable rivers) where a logical counter-factual (or ‘with-out’ scenario) can be developed. This approach is likely to provide an indicative national value of inland waterways.

6 Discussion

This section provides a brief discussion of the lessons learnt in applying the guidance and the general effort required to complete a welfare assessment of the benefits provided by navigable waterways.

As noted above, overall the guidance was found to work well when applied to real case studies. However it became apparent during the analysis that there is a real need to understand the concepts and details presented within the guidance report in order to accurately carry out a valuation. This is particularly the case when choices need to be made, for instance in how to value certain benefits or which unit value to apply.

Section 5 of the guidance report, along with earlier sections have been written to assist the user in understanding the theory and practical application of the valuation framework. However it is considered likely that often the user may need to consult an economist to confirm the appropriate application of unit values or identification of certain benefits.

Depending on the use of the valuation outputs, it is thought likely that in many cases the results will be reviewed by an experienced economist; for instance if they form part of a project justification report. In other cases where the results are used for information purposes rather than decision making purposes, the requirements for robustness and accuracy would be somewhat lower.

In terms of the effort required to complete a valuation of the benefits provided by a waterway no standard estimate can be provided. The question being addressed through the valuation (for instance what are the marginal benefits of a scheme?) will dictate the type of information to be gathered. The location and current usage of the site is likely to dictate the availability of information at the site. The type of analysis and the extent of available information are key variables influencing the effort required to undertake a valuation task.

That said, depending on the requirements for accuracy and robustness, a valuation could be completed using anecdotal evidence to generate a high level estimate of benefits – this might take around 5 days of someone’s time. A combination of anecdotal and written evidence for a more detailed assessment might take 10-20 days, while a thorough review of all available information sources, in addition to the gathering of new data where required, for a more robust and accurate valuation might take a month or more.

As a result of the number of key variables and the flexibility with the approach applied, it is clear that the effort applied to complete the valuation can be targeted and varied depending on the scale of the site and the resources available.