B2. Putting a Value to Saltmarsh – Appraisal and Economics[1]

B2.1 The approach to appraisal

A method increasingly being used in project appraisal is the Appraisal Summary Table (AST). This provides a mechanism for recording all potential impacts (qualitative, quantitative and monetary estimates) side-by-side, such that the appraisal process is transparent and auditable, and it is easier to compare options.

This Appendix describes the processes required to undertake a project appraisal and provides guidance on how these processes can be used. Different processes are proposed for the different types of decision that are likely to be required, but in all cases the general approach is the same. The starting point is always to identify the objectives of the proposed actions, to define the baseline, to compare the alternative actions against the baseline and to select the action that will have the greatest benefit at the least cost.

B2.2 Describing the impacts

The first step in any project appraisal is to identify the impacts that are expected to occur against a pre-determined baseline. The baseline required is likely to differ according to the decision that is required.

In many management decisions, the current situation will form the most appropriate baseline, as the aim of management decisions would be to change the current situation. Thus, project appraisal of the expected conditions after the action has been taken can be compared to the current conditions. An AST can be used to keep a record of the assumptions made in estimating what the impacts of management decisions may be and can then be used to monitor whether the expected changes actually occur, once the action has been carried out. Such monitoring will provide useful information on how actions affect saltmarshes and could then be used to improve the future management of a site.

In flood defence, the baseline is taken as the do-nothing (or walk away) option. This is a zero cost option that literally involves no action on the site. The impacts (positive and negative) of undertaking various actions are then compared against this baseline. Such an appraisal will need to be undertaken if management is required for flood defence purposes (e.g. managed realignment).

For compensatory habitat, the aim usually is to identify the least-cost method of providing the benefits required. Here, the baseline may also need to relate to a do-nothing baseline. In many cases, this may be very similar to the current situation.

[1] This Appendix has been produced by Risk & Policy Analysts

B2.3 Appraisal of saltmarsh management options using ASTs

ASTs are tabular summaries of the main economic, environmental and social impacts of a proposed option, whether relating to a policy/programme, strategy or scheme. An AST is produced for each alternative option and sets out, simply and concisely, the key consequences of the different options for tackling a particular problem or achieving a specific objective.

The concept of an AST originated as a means of improving the approach taken to assessing the impacts of road construction schemes (namely *New Approach to Appraisal* (NATA)), in response to criticism that environmental and social issues were not adequately taken into account. Since then, more recent guidance developed by Defra, the Environment Agency and other governmental organisations have taken this concept on board, in particular in relation to water resource management, as a means of:

- Recording impact information in a consistent manner;
- Ensuring that a comprehensive range of impacts is considered within the assessment;
- Deciding which impacts are most important to the end decision and demonstrating how this was reached; and
- Providing a means for others to audit the assessment and accompanying decision making process.

The aim of the AST is to ensure transparency, i.e. to provide a structure in which all of the reasons for choosing a preferred option are set out in a clear and intelligible manner. In this way, the decision making process transforms from a 'black box' to a more auditable process. The use of ASTs means that all impacts can be taken into account in the decision-making process, regardless of whether or not they have been presented in monetary terms.

In the present appraisal context, many assessments are based on the principle of Cost-Benefit Analysis (CBA). Monetary valuations are provided for all impacts where this is feasible and robust. However, where monetary valuations are not appropriate, qualitative and quantitative descriptions of impacts are required (see B2.6 and Appendix B3). An AST (notionally) allows all of these ways of describing impacts to be brought together in order to give a fair and unbiased overall description, without giving prominence to any one type of impact or to the benefits expressed in monetary terms compared to those which cannot be expressed in his way.

Hence, the key components of an AST have to at least include cells for recording the following types of information:

- A description of the option being assessed and the area affected by it;
- A qualitative description of the effects of the option for a prescribed set of impact categories and sub-categories;

- A quantitative description in physical or natural units of measure of the effects of the option under each sub-category;
- The results of monetary valuation exercises, as appropriate, for each sub-category; and
- Any assumptions specific to the impact assessments or comments on their robustness and validity.

An AST for use when assessing different saltmarsh management techniques needs to be tailored so that appraisal is proportionate to the decision that is being made. Different types of decision are likely to require very different levels of appraisal (see Figure 5.1), and hence an appropriate AST, and can be summarised as:

- Management decisions: appraisal based on groups of functions and services.
- Restoration: appraisal based on more detailed consideration of key functions and services.
- Managed realignment: appraisal based on detailed consideration of key functions and services with monetary valuation of key impacts (as appropriate).
- Compensatory habitat: appraisal based on detailed consideration of key functions and services, with monetary valuation of key impacts (as appropriate).

The first step in development of the AST involves defining the impact types and categories that would form the framework for the appraisal process and tailoring these to the level of detail required for a decision to be made. The list of impact types and categories should be as comprehensive as possible, but should stay within the remit of saltmarsh functions and services and, most importantly, should be manageable not only for practitioners but also for stakeholders. In short, the list of impacts considered should strike a balance between completeness and workability. This means that a specific AST is likely to be required for each different decision, although the resulting ASTs will be very similar, with only the level of detail differing. ASTs are shown in Tables B2.1 to B2.3 (note that the same AST is used for decisions on managed realignment and compensatory habitat).

Also see http://www.defra.gov.uk/environ/fcd/pubs/pagn/fcdpag3/section3.pdf for details of cost-benefit analysis (i.e. Defra Flood and Coastal Defence: Project Appraisal Guidance 3).

Table B3.2 (Appendix B3) provides the results of a ranking exercise undertaken for three different types of restoration works.

Table B2.1 AST for MANAGEMENT DECISIONS (based on English Nature, 2002)			
Site under consideration:			
Objectives for the site:			
Option/action:			
Function	**Impact (Y/N)**	**Description of Impact**	**Notes and Assumptions**
Appreciation			
Living surroundings			
Resource for recreation			
Distant appreciation			
Cultural, spiritual and historic meanings			
Artistic inspiration			
Social development			
Knowledge			
Scientific discovery			
Historical analysis			
Environmental monitoring			
Educational resource			
Natural science research			
Products			
Food and drink			
Fuel, fibre and construction			
Medicinal and cosmetic products			
Ornamental and other products			
Ecosystem services			
Global life-support services			
Flood and erosion control			
Water quality and quantity			
Pollution control			
Soil provision			
Landscape formation			
Waste decomposition and disposal			
Pollination			
Biological control			

Table B2.2 AST for RESTORATION WORKS (based on English Nature, 2002)			
Site under consideration:			
Objectives for the site:			
Option/action:			
Function	**Impact (Y/N)**	**Description of Impact**	**Notes and Assumptions**
Appreciation			
Better living surroundings			
Resource for recreation			
Distant appreciation			
Cultural, spiritual and historic meanings			
Artistic inspiration			
Social development			
Knowledge			
Scientific discovery			
Historical analysis			
Environmental monitoring			
Educational resource			
Natural science research			
Products			
Food and drink			
Fuel, fibre and construction			
Medicinal and cosmetic products			
Ornamental and other products			
Ecosystem services			
Global life-support services			
Flood and erosion control			
Water quality and quantity			
Pollution control			
Soil provision			
Landscape formation			
Waste decomposition and disposal			
Pollination			
Biological control			

Table B2.3 AST for MANAGED REALIGNMENT and COMPENSATORY HABITAT					
Site under consideration:					
Objectives for the site:					
Option/action:					
Impact Category	**Impact? (Y/N)**	**Qualitative Description of Impacts**	**Quantitative Assessment of Impacts (no. units/ monetary)**	**Monetary value**	**Notes and Assumptions**
Appreciation					
Better living surroundings					
Resource for recreation					
Distant appreciation					
Cultural, spiritual and historic meanings					
Artistic inspiration					
Social development					
Knowledge					
Scientific discovery					
Historical analysis					
Environmental monitoring					
Educational resource					
Natural science research					
Products					
Food and drink					
Fuel, fibre and construction					
Medicinal and cosmetic products					
Ornamental and other products					
Ecosystem services					
Global life-support services					
Flood and erosion control					
Water quality and quantity					
Pollution control					
Soil provision					
Landscape formation					
Waste decomposition and disposal					
Pollination					
Biological control					
Habitat provision					

B2.4 Identifying the impacts

B2.4.1 Introduction

The ASTs give a comprehensive list of functions and services that could be affected by a decision to manage, restore or realign a site. Some of these functions and services will be directly affected (i.e. by one of the aims of the project) or indirectly affected (i.e. from secondary (knock-on) effects). It is unlikely, however, that all functions and services will be affected on any one site, although the number of functions and services affected is likely to increase from management actions through restoration actions, to managed realignment and the provision of compensatory habitat. The functions and services most likely to be affected by the different decisions are shown in Table B2.4. This table is designed to give an indication of the type of effects that may occur; site specific impacts should also be taken into consideration.

For management and restoration actions, four different approaches are given to reflect the different reasons why management and/or restoration actions may be taken. These are:

- Conservation: to maintain or improve the conservation value of the site.
- Amenity: to maintain or improve the appearance of the site and its human uses.
- Recreation: to maintain or improve recreational use of the site.
- Flood defence: to maintain or improve the site as part of the flood or coastal defences covering, for example wave attenuation.

These reasons are unlikely to be completely independent, such that a decision to manage a site for conservation purposes may also affect recreational use of the site. The impacts shown in Table B2.4 are, therefore, given as a guide only and consideration should be given to wider impacts, as appropriate.

B2.4.2 Steps in the appraisal process

The first step in the appraisal is to describe the baseline situation using the AST appropriate to the decision being made. This is an important step as description of the baseline can often highlight areas where action is required and identify where little is known about a site. Each of the options can then be readily compared against the baseline to determine if a change is likely to occur.

The second step is then to complete an AST for each option, beginning with whether the options would cause an impact to arise in the context of each of the functions and services. Where this is the case, a ‘Y’ should be entered into the appropriate column of the AST and the impacts described. The impacts should be described in words, supported by numbers, where available. These numbers may relate to area affected, numbers of species or individuals, etc. Any predictions and uncertainty associated with the impacts should also be recorded. Where the option would not result in any impacts, it is sufficient to enter ‘N’ into the appropriate column (explanation of why this is the case can be included if required).

Once all of the impacts have been described in words and numbers, there are three possible actions:

1. The AST is used to record the potential impacts of one proposed option, which can then proceed, with the completed AST used to monitor actual effects compared with predicted effects;
2. A decision can be made as to which is the preferred option or that the option can proceed (e.g. benefits outweigh the costs); or
3. Where it is not possible to make a decision as to the preferred option, or whether the benefits outweigh the costs, the appraisal should move onto monetary valuation of the impacts.

Table B2.4 SUMMARY OF VALUES FOR DIFFERENT WETLAND FUNCTIONS									
Function	**Management**				**Restoration**				**Managed Realignment/ Compensatory Habitat**
	Conservat'n	**Amenity**	**Recreation**	**Flood Defence**	**Conservat'n**	**Amenity**	**Recreation**	**Flood Defence**	
Appreciation									
Better living surroundings	√	√	√	√	√	√	√	√	√
Resource for recreation			√				√		√
Distant appreciation		√				√			√
Cultural, spiritual and historic meanings			√				√		√
Artistic inspiration		√				√			√
Social development			√	√			√	√	√
Knowledge									
Scientific discovery					√				√
Historical analysis									√
Environmental monitoring					√				√
Educational resource	√		√		√		√		√
Natural science research	√				√				√
Products									
Food and drink		√				√			√
Fuel, fibre and construction		√		√		√		√	√
Medicinal and cosmetic products		√				√			√
Ornamental and other products		√				√			√

Table B2.4 SUMMARY OF VALUES FOR DIFFERENT WETLAND FUNCTIONS									
Function	**Management**				**Restoration**				**Managed Realignment/ Compensatory Habitat**
	Conservat'n	**Amenity**	**Recreation**	**Flood Defence**	**Conservat'n**	**Amenity**	**Recreation**	**Flood Defence**	
Ecosystem services									
Global life-support services	√				√				√
Flood and erosion control				√				√	√
Water quality and quantity		√				√			√
Pollution control		√				√			√
Soil provision	√				√				√
Landscape formation		√	√			√	√		√
Waste decomposition and disposal		√				√			√
Pollination	√				√				√
Biological control	√				√				√
Habitat provision	√				√				√
Source: based on English Nature (2002)									

B2.5 Valuing the impacts

A number of techniques can be used where it is necessary to place a monetary value on impacts. These are summarised in Table B2.5 and vary in terms of the resource (both time and manpower) required to estimate the value. Monetary valuation of the impacts should always build upon a description (in words and numbers), thereby providing additional information on the likely value of a project. It is important that a full description of the impact is given, as this will help to determine which money value best reflects the type of impacts that are predicted to occur.

Table B2.5 Common Techniques for Valuing Impacts

Method	Applicable to	Description and Importance	Constraints
Market price method	Direct use values, especially wetland products	The value of wetland services and products is estimated from the prices in commercial markets	Market imperfections and policy failures distort market prices
Damage cost, avoided, replacement cost and substitute cost method	Indirect use values (particularly ecosystem services)	The value of flood control can be estimated from the damage that would occur as a result of flooding (damage cost avoided); the value of groundwater recharge can be estimated from the cost of obtaining water from another source (substitute costs)	It is assumed that the costs of avoided damage or substitutes match the original benefit. However, this match may not be accurate, which can lead to under- or over-estimates
Travel cost method	Recreation	The recreational value of a site is estimated from the amount of time and money that people spend on reaching the site	Over-estimates are easily made, as the site may not be the only reason for travelling to that area. The technique is data intensive
Hedonic pricing method	Aspects of indirect use, future use and non-use values (including appreciation)	This method can be used when wetland values influence the price of marketed goods. For example, clean air, presence of water and aesthetic views will increase the price of surrounding properties	The method only captures peoples' willingness to pay for perceived benefits. If people are not aware of the links between the environmental attribute and benefits to themselves, the value will not be reflected in the price. Very data intensive
Contingent valuation method	Recreation, non-use values (possibly covering appreciation and ecosystem services)	This method asks people directly how much they would be willing to pay for specific environmental services. It is often the only way to estimate non-use values	There are various sources of bias in the interview techniques. In addition, there is controversy over whether people would actually pay the amounts that they state in the interviews

Source: Based on Stuip *et al.* (2002)

Further information is available from:
http://www.englishnature.gov.uk/pubs/publication/PDF/valueofnat.pdf and Barbier *et al.* *http://www.ramsar.org/features/features_econ_val1.htm*

Numerous studies have already been undertaken that use one or more of the techniques. From these, a selection of the most appropriate values derived is provided in Table B2.6. It may be possible to use these readily available valuations to give an indication of the potential benefits of the functions of a saltmarsh. This can reduce the resources (time and money) required to undertake a project appraisal, which is particularly relevant for the hedonic pricing and contingent valuation methods (see Table B2.5). That is, *benefits transfer* can be used to provide a value obtained from other studies, providing the other studies are comparable.

Benefits transfer can be applied to the valuation of both 'use' related impacts and 'non-use' related impacts. In this context, use related impacts are those associated with the *direct* use of an environmental resource (e.g. recreation or boating), with its *indirect* use (for example, in providing an aquatic ecosystem that will support a fishery) and to the *option values* people hold in relation to being able to use a resource in the future. Some of these values (in particular *direct use values)* can be captured by actual markets, through fees paid to undertake an activity or through other expenditures. However, not all use values can be readily captured in existing markets.

Non-use values reflect the preferences of individuals which are unrelated to their current or potential future use of a resource, and which relate to their desire preserve or conserve it in its own right (*existence values*), to conserve a resource for future generations (*bequest values*) or to protect it for others within the current generation (*altruistic values*). None of these non-use values can be captured in actual markets, because the relevant markets either only capture the use values or the relevant markets do not exist.

The use of benefits transfer has been steadily increasing in recent years, the underlying assumption being that existing valuation studies can provide a reasonable indicator of the value of an environmental change for another site and decision context. FCDPAG3 identifies benefits transfer as a viable method[2] (MAFF, 1999), while the Green Book has acknowledged the increasing scope for using benefits transfer methods as databases expand (HM Treasury, 2003).

Most guidance involving the use of benefits transfer recommends an approach based on the following steps:

Step 1: Identification of the impact category of concern (this can be taken from the ASTs).

Step 2: Description of the nature of any impact in terms of the physical changes that will take place under a given option (again, this should be available from the ASTs).

[2] FCDPAG3 identifies benefits transfer as a viable option at the pre-feasibility stage of the appraisal of options. The purpose of the pre-feasibility study is to determine whether a scheme is likely to be justified, and whether it is worth investing in more detailed studies (MAFF, 1999).

Step 3: Selection of a relevant benefits transfer estimate by examining the set of available values for the type of change under consideration; this should take into account the applicability of the original study and, hence, value to the option being assessed.

Step 4: Adjustment of the benefit estimate(s) as appropriate to suit the decision context.

Step 5: Quantification of the affected population (user and/or non-user), where required.

Step 7: Calculation of the benefits by multiplying the transfer value by the affected population and aggregating.

Step 8: Undertaking a sensitivity analysis.

It is outside the scope of this Manual to provide a comprehensive list of all available values for the different types of impacts that may result from actions taken on saltmarshes. Furthermore, new studies are continually being undertaken that are likely to be more robust and more appropriate for benefits transfer. Therefore, a subset of the most appropriate values only are reported here, with links provided to databases that may contain additional values and which are regularly updated (such that new studies will be included). It should be noted, however, that many of these values will cover a number of the functions and services listed in the ASTs; that in many cases the exact coverage of the valuations is not known; and that most of the valuations relate to wetlands and not specifically to saltmarshes.

Those valuations considered most appropriate for application to saltmarshes are given in Table B2.6. The Defra web-site also holds a list of key valuation studies, although it is not clear how often this is updated. Other Internet sources that can be used to identify valuation studies include:

- http://ww.evri.ca: use of the database requires a subscription to be paid. It is believed that the Environment Agency subscribe to the service.

- http://ww2.epa.nsw.gov.au/envalue: an Australian database that does not require a subscription.

Table B2.6 SUMMARY OF MOST APPROPRIATE BENEFITS TRANSFER VALUES FOR APPLICATION TO SALTMARSHES					
Study	**Value**	**Change Valued**	**Functions/Services Covered**	**Comments**	**Reference and Source**
Brouwer *et al.* (1997)	£38.80 per household per year	From: no wetland or providing little value To: feature of value (marshes)	Cover use and non-use. Study focused on non-extractive uses, passive use and ecological function values for wetlands in temperate regions of developed countries. *Likely to cover appreciation and ecosystem services.*	2001 Not clear what population is relevant for aggregation Meta analysis of 30 different wetland studies Must be treated as indicative value only due to uncertainty surrounding application to any specific location	Brouwer R *et al.* (1997): A Meta-Analysis of Wetland Contingent Valuation Studies, *CSERGE Working Paper GEC 97-20*, University of East Anglia also in Environment Agency (2003): BAG
Brouwer *et al.* (1997)	£80.01 per household per year	From: no wetland or providing little value To: provision of biodiversity services	May include some aspect of use Study focused on non-extractive uses, passive use and ecological function values for wetlands in temperate regions of developed countries. *Likely to cover appreciation and ecosystem services.*	2001 Not clear what population is relevant for aggregation Meta analysis of 30 different wetland studies Must be treated as indicative value only due to uncertainty surrounding application to any specific location	Brouwer R *et al*. (1997): A Meta-Analysis of Wetland Contingent Valuation Studies, *CSERGE Working Paper GEC 97-20*, University of East Anglia also in Environment Agency (2003): BAG
Woodward & Wui (2001)	£944 per hectare per annum	From: no wetland or one providing little habitat of value To: wetland providing single function service as habitat	Single service value as habitat (values for recreation and amenity reported separately) *Likely to cover global life-support system and habitat provision functions of ecosystem services.*	2001 International value and must be treated as indicative only Meta analysis of 39 different studies from around the world Must be treated as indicative value only due to uncertainty surrounding application to any specific location	in Environment Agency (2003): BAG
East Midlands Environmental Consultants (1995) and NOAA (1997d) in Spurgeon J	US$2,000 to US$160,000 per ha	Habitat rehabilitation/creation costs. Low estimates relate to managed realignment in the UK where little human intervention is required other	Relates to re-creation of saltmarsh and likely to include re-creatable functions, such as those within knowledge, products and part of appreciation and	Care is always needed when using indicative values relating to the cost of creating a habitat due to large differences in approaches used to estimating costs and	Spurgeon J (1998): The Socio-Economic Costs and Benefits of Coastal Habitat Rehabilitation and Creation, Marine Pollution Bulletin, Vol 37, No8-12, pp373-382.

Table B2.6 SUMMARY OF MOST APPROPRIATE BENEFITS TRANSFER VALUES FOR APPLICATION TO SALTMARSHES					
Study	**Value**	**Change Valued**	**Functions/Services Covered**	**Comments**	**Reference and Source**
(1998)		than monitoring and minor maintenance. Revegetation is left to occur naturally. High estimate relates to a case study from the US where the rehabilitation work was primarily to restore tidal flows through the re-excavation of natural channels and installation of culverts	ecosystem services.	the types of cost elements that are included (or not). Land value is often the largest proportion of the cost and is also the most difficult to estimate. Such values should, therefore, only be considered to give an order of magnitude estimate.	
King & Lester (1995) in Spurgeon J (1998)	US$530,000 to US$1 million per hectare	Cost savings on the cost of artificial coastal defences for an 80m wide strip of saltmarsh	Likely to relate to flood and erosion control function. Other functions may be covered indirectly.	Care is always needed when using indicative values relating to the cost of creating a habitat due to large differences in approaches used to estimating costs and the types of cost elements that are included (or not). Land value is often the largest proportion of the cost and is also the most difficult to estimate. Such values should, therefore, only be considered to give an order of magnitude estimate.	Spurgeon J (1998): The Socio-Economic Costs and Benefits of Coastal Habitat Rehabilitation and Creation, Marine Pollution Bulletin, Vol 37, No8-12, pp373-382.
Posford Duvivier (1996b) in Spurgeon J (1998)	US$870 per hectare per year	Wildfowling	Likely to relate to recreational resource, but may only cover part of this. May also impact on the value of ecosystem services.	Care is always needed when using indicative values relating to the cost of creating a habitat due to large differences in approaches used to estimating costs and the types of cost elements that are included (or not). Land value is often the	Spurgeon J (1998): The Socio-Economic Costs and Benefits of Coastal Habitat Rehabilitation and Creation, Marine Pollution Bulletin, Vol 37, No8-12, pp373-382.

Table B2.6 SUMMARY OF MOST APPROPRIATE BENEFITS TRANSFER VALUES FOR APPLICATION TO SALTMARSHES					
Study	**Value**	**Change Valued**	**Functions/Services Covered**	**Comments**	**Reference and Source**
				largest proportion of the cost and is also the most difficult to estimate. Such values should, therefore, only be considered to give an order of magnitude estimate.	
Posford Duvivier (1996b) in Spurgeon J. (1998)	US$26 per hectare per year to US$200 per hectare per year	Agricultural grazing	Likely to relate to food and drink function of products. May also cover some aspects of ecosystem services and/or impact the value of these functions.	Care is always needed when using indicative values relating to the cost of creating a habitat due to large differences in approaches used to estimating costs and the types of cost elements that are included (or not). Land value is often the largest proportion of the cost and is also the most difficult to estimate. Such values should, therefore, only be considered to give an order of magnitude estimate.	Spurgeon J (1998): The Socio-Economic Costs and Benefits of Coastal Habitat Rehabilitation and Creation, Marine Pollution Bulletin, Vol 37, No8-12, pp373-382.

B2.6 Obtaining a new value

B2.6.1 Overview

There will be occasions when a monetary value for a saltmarsh is required, but the values available (including those summarised in Table B2.6) are not comparable or appropriate for the site being appraised. This means that an original value may need to be derived.

There are a number of methods available that can be used to obtain a (monetary) value for the impacts. It is important that the approach used is objective, consistent and robust if the values obtained are to be used in the decision-making process; otherwise, it is preferable to base the decision on qualitative and quantitative descriptions. Furthermore, the cost of the approach should also not exceed the benefits of including a monetary estimate. This is why Figure 5.1 suggests that only larger value projects are likely to require new values to be derived.

As many environmental and social costs (and benefits) frequently fall outside the marketplace and hence are not traded, the economic value of such impacts has to be obtained through some other means. A range of economic valuation survey techniques has been developed to assist in this valuation process. These techniques attempt to derive an individual's willingness to pay for environmental benefits (or willingness to be compensated for an environmental loss) as revealed in the marketplace, through individual's actions or as directly expressed in surveys. The approaches to obtaining new values can be divided into two groups:

- *Preference methods*: this refers to contingent valuation (CV), a valuation methodology which uses questionnaire techniques to create a hypothetical marketplace and attempts to elicit valuations via direct questioning of respondents' willingness to pay for an environmental improvement (WTP);

- *Indirect monetary methods*, including:

    - *Revealed preference methods:* under this group of techniques, people's preferences are inferred indirectly by examining their behaviour in markets that are linked to the environment. These include:

        - the travel cost method (time and costs incurred in visiting and enjoying a site as a proxy of its value);
        - avertive behaviour and defensive expenditure, i.e. expenditure against actual or potential decline in environmental quality;
        - the hedonic price method, which is based on the assumption that property prices reflect environmental conditions; and

    - *Avertive expenditure and replacement costs:* this method allows environmental changes to be valued based on the difference of the value of goods and services. It includes 'replacement costs', that is, the incurred costs when putting the harm right.

B2.6.2 Preference methods

Use of expressed preference methods (including Contingent Valuation) can be very expensive, as they require careful design to ensure that biases are not introduced and that the questions being asked are interpreted correctly by respondents. The environmental 'goods' being valued also need to be clearly specified and environmental 'goods' are always very difficult to specify, since they include a wide range of functions and services which cover indirect use and non-use values. Consideration of the functions and services included in Table B1.1 (or the ASTs) also reveals how many of these functions are not immediately visible and, hence, may not be covered by the study.

It is outside the scope of this document to provide a detailed description of how to undertake surveys to elicit the values that people may hold towards saltmarshes. However, there are many documents that can be referred to should it be considered necessary to obtain a new value. Key references include:

- Penning-Rowsell *et al.* (2003). **The Benefits of Flood and Coastal Defence: Techniques and Data for 2003** (**The Multi-Coloured Manual**), Flood Hazard Research Centre (FHRC), Middlesex University, Enfield. Chapter 3 provides an overview of the types of approaches that are available, while Chapter 10 briefly describes how the approaches can be tailored to valuing the environmental impacts of projects.

- Eftec (2000). **Guidance on Using Stated Preference Techniques for the Economic Valuation of Non-Market Effects**, report to the UK Department of the Environment, Transport and the Regions (DETR, later DLTR), London, Edward Elgar Publishing (not available online). Provides detailed information on how stated preference techniques should be used to elicit economic valuations and builds upon the guidance given in Arrow *et al.* (1993).

- Arrow *et al.* (1993). **Report on the NOAA Panel on Contingent Valuation**, available at http://www.darp.noaa.gov/library/pdf/cvblue.pdf. Standard reference document for undertaking contingent valuation studies.

- http://www.ecosystemvaluation.org provides good discussion on approaches to obtaining values and includes a number of case study examples.

B2.6.3 Indirect monetary methods

If it is assumed that the cost of providing an alternative means of achieving the same effect represents the benefit of that effect, then it can be assumed that the benefits can be estimated as the cost of providing the alternative. Thus, the value of a saltmarsh could be considered to be the cost of recreating a saltmarsh of the same size and type elsewhere.

A good reference document for deriving indirect monetary values is MAFF, now Defra (1999), **Flood and Coastal Defence Project Appraisal Guidance: Economic Appraisal (FCDPAG3)**. This provides guidance on the types of

approaches available to obtain values for recreational and environmental values. A decision tree is included (as Figure 4.1) to help determine the most appropriate approach for determining the minimum economic value of a site.