4.3 Monetary Assessment : Background

4.3.1 Introduction

The adoption of a CBA framework requires that as many of the costs and benefits as possible - including non-market effects such as those generally associated with environmental goods and services - are quantified in money terms. Costs and benefits which cannot be valued in money terms should nevertheless also be assessed.

Because costs and benefits occur at different times over the project lifetime, a discounting exercise is then undertaken to convert them into a comparable money value (a fuller discussion of discounting procedures is provided in Section 4.3.7). A project is deemed economically viable if its "Net Present Value" (NPV) is positive: that is if the discounted stream of benefits is greater than the discounted stream of costs.

The placing of money values on environmental "costs" and "benefits" is difficult in practice, however, because of their public good nature. They fall into a category of assets for which either no markets or only limited markets exist in which they can be bought or sold. The absence of efficient markets means that there are no common prices which can be relied on to indicate the value attached to the good or service in question, and no measure of economic value is therefore readily available.

4.3.2 The Valuation of Habitat Restoration and Creation Options

The decision on whether or not to pursue any particular managed retreat option involves determining if the benefits stemming from management, monitoring and/or engineering works outweigh the costs of those activities. Such benefits might accrue from the increased value of the resulting coastal habitat or from landscape and amenity features. In some cases, where it is felt that intervening and carrying out engineering works will produce a habitat of greater value than that which would result from adopting a non-intervention approach, the "benefit" of the former will be equal to the difference between the value attached to the habitat which would develop naturally following failure and that attached to the more heavily managed habitat. If, for example, the "value" placed on an area of sub-tidal habitat is £1 million and that on a (created) saltmarsh on the same site is £3 million, the benefits gained from the creation works would be £2 million. If the works necessary to create the saltmarsh would cost less than £2 million, the saltmarsh creation would be economically justified. Conversely, if the costs were greater than £2 million, saltmarsh creation would not be justified in economic terms.

Assuming that any management or engineering **costs** associated with the creation or restoration of a preferred habitat are known (see Section 3), the development of the cost side of the benefit cost equation should be fairly straightforward. In other cases, of course, the habitat which will develop naturally (i.e. with minimal intervention) could prove to be the most desirable at that particular site. Estimation of the **benefits** associated with either managed habitat creation/restoration initiatives or with natural habitat development will, however, be more complex than the estimation of costs because of the difficulties (discussed above) associated with the valuation of most environmental assets including coastal habitats.

4.3.3 Valuation Approaches

Two basic approaches towards the valuation of retreat options have been identified:-

- the first relies on using the values assigned to existing wetland and coastal habitat areas of a similar nature to provide, by **reference**, an estimate of the value that would derive from the restored or created resource;

- the second requires the derivation of values **specific** to the area of habitat to be created or restored.

There are advantages and disadvantages associated with both approaches. The first approach, which is referred to here as the "reference value" approach, has a number of limitations. These stem mainly from uncertainty surrounding the comparability of an existing area with a restored or created habitat. Comparability will depend on the location of the site and the type of functions and services actually provided (rather than just predicted) by the created or restored habitat. Variations between the existing area and a created or restored site may have significant impacts on its value as expressed, for example, through an individual's willingness to pay. In contrast, a number of techniques are available for determining the value of existing habitats and it may, therefore, be possible to use estimates of value which had previously been developed.

The second approach, which is referred to here as the "specific value" approach, has an advantage in that any values developed will relate directly to predictions made in respect of the characteristics of the habitat to be developed at a particular location. The main disadvantage of this second approach, however, is the limited number of valuation techniques which can be used. As discussed further in Section 4.4, the method which seems most suitable for developing specific values is contingent valuation, with other techniques being either not applicable or not recommended for other reasons.

4.3.4 Issues in the Valuation of Retreat

There are several issues associated with both of the valuation approaches outlined above. The three most important relate to identifying the types of economic values which are being estimated (use versus non-use values), the impact of variations in stock, and to the problems associated with the discounting of environmental costs and benefits.

- **Use versus Non-Use Values**

Wetlands and coastal habitats provide benefits which correspond to three different categories of value held by individuals towards environmental goods.

The first category is that of **use values**, those values associated with the benefits gained from use of the environmental resource. There are two types of use values: direct and option values. Direct values arise from the actual use of the good, and include recreation-related experiences, agricultural and commercial outputs, and aesthetic value. Option values relate to the desire of an individual to maintain the ability to use the resource in the future. They reflect an individual's willingness to pay to secure the future use of a good, and express the potential benefits of an environmental good as opposed to the benefits gained from actual use. Option values therefore indicate the preservation or conservation value attached to a good.

Related to option values are **bequest values**. These are the benefits attached to the preservation of the environment so that future generations may also have the option of use.

Existence values form the third category. These can be defined as the values which result from an individual's altruistic desire to assure the availability of a good or service. These values are not associated with actual or potential use, but solely with the fact that the good exists and should continue to do so. Similar to existence values are intrinsic values: these are said to reside in non-human biota and are not related to any sources of human satisfaction.

All three categories of value will be important in determining the potential benefits associated with the adoption of a retreat strategy. Table 4.3.1 presents a summary of the types of functions and services generally associated with British coastal habitats. Most of these functions and services will have associated use, option or bequest values (whether zero or positive for any given resource area).

Non-use values of wetland and coastal habitat areas are related to the flora and fauna and to landscape features which are recognised as important heritage assets. Non-use values related to migratory waders and waterfowl are, for example, likely to be of most significance in the UK.

Table 4.3.1 British Coastal Habitats : Functions and Services

Services	Functions
Recreation and amenity services	Habitat for wildlife
Agricultural (e.g. grazing, reeds, sedge and willow production).	Shoreline protection, flood protection and flood storage
Commercial outputs (e.g. medicines, dyes, etc.)	Aquifer recharge
	Water quality restoration (e.g. the use of reed beds for natural sewage treatment capabilities)

4.3.5 Any valuation of coastal habitat restoration and creation benefits will require some prediction of the type and level of functions and services that will arise under the various options. These predictions must be at a level of detail and resolution which will allow the assessment of differences, particularly in the economically important functions or services provided by alternative options. It is important that this "with and without" principle is followed if the assessment is being undertaken to compare the benefits which would occur without intervention following failure with those stemming from restoration or creation activities.

It is also important that both use and non-use values are taken into account in the assessment of any particular project, regardless of whether "reference" or "specific" values are used. If an analysis only assesses the values related to direct use, a gross underestimation of the total economic benefits to be gained from any restoration or creation activities could result. This point is well illustrated by studies carried out in the US which have found that option and existence values may be almost as great as (or even greater than) those related to direct use (Loomis and Walsh, 1986).

In some cases, proposed restoration or creation works might be justified on the value attached to one function alone. If analysts feel that this would be the case, then that function should be valued first. In others cases there may be a need to value a number of different functions or services. Care must be taken, however, to ensure that the double counting of benefits does not take place. This is particularly true when more than one method is used to estimate the values of use related benefits and where the functions providing the different benefits are interrelated. Care must also be taken to ensure that the benefits really do exist. The habitat must, now or at some time in the future, be likely to provide the service being valued. Water purification, for example, can only be a benefit of any value if the area in fact receives and processes waste water.

The analyst must also ensure, when including more than one service or function in the benefit estimates, that the services are not competitive. Taking water purification once again as an example, the benefits from this service and those from shellfish production functions are mutually exclusive. They are not additive as both cannot be provided at the same time.

Finally, when estimating use-related benefits stemming from a given function or service, not only must the measure of value associated directly with that function or service be considered, but also whether or not a substitute for the function or service exists. If a substitute exists, then the cost of using that substitute provides an alternative measure of value. The value of any given function or service will be the lesser of (a) the least-cost combination of substitutes or (b) the direct measure of value. Theoretically, individuals are not willing to pay any more for a use-related service than the lesser of the value of benefits it provides or the cost of replacing it through substitutes. Some recent studies have indicated that in the case of "environmentally friendly" goods, individuals may be willing to pay more, but this behaviour may stem from non-use related objectives.

4.3.6 ■ **Stock Effects**

As noted in Section 2.3, there has been a widespread loss of coastal habitats and, in the short-term at least, more losses are expected. A key question related to the valuation of retreat options, therefore, is how changes in the stock of coastal habitat will affect their importance and thus the values attached to different habitat types and particular sites.

If significant on-going losses of habitat occur, the value of remaining areas may increase over time. There may also be consequent changes in the priorities attached to the protection or creation of different types of habitat. If the increase in value attached to habitat type is great, then the benefits stemming from restoration or creation activities will also increase.

At the time when costs and benefits of different options are being evaluated, however, it will not be possible to predict whether and, if so, how values will change over time. In some cases this may lead to an underestimation of the benefits that would be gained through adopting a managed retreat option.

4.3.7 ■ **Discounting**

The application of a cost-benefit approach to the evaluation of retreat strategies requires that all the costs and benefits which have been valued in monetary terms, including environmental costs and benefits, are discounted. The object of discounting is to enable the adding together of costs and benefits which occur at different times throughout the project. The sum of the costs and benefits then provides the net present value of the option under consideration. If all of the costs and benefits can be valued, then the option with the highest net present value would generally be preferred (HMSO, 1991).

The discounting procedure is based on the principle that costs and benefits which occur now are more important that those occurring in the future. This is because people prefer money today rather than money tomorrow. For most government projects (including flood defence works), the Treasury require a time preference rate of 6% a year.

A number of issues arise over discounting and these are adequately discussed elsewhere. One issue of key concern to the evaluation of retreat strategies, however, is that any significant benefits to be gained from restoration or creation activities are likely to occur far into the future (see Section 3.5.2)

With the application of discounting, less weight is placed on these future benefits that the "costs" which would be incurred in the short term. The higher the discount rate used, the less the importance is placed on future benefits and costs. At a rate of 6%, for example, benefits occurring in 25 years time will have only 23% of their value today. At any positive discount rate, costs or benefits which accrue more than 50 years into the future will have a very small present value. Hence activities such as managed retreat with benefits occurring well into the future are less likely to be favoured than those with benefits in the shorter term (which may be the case with flood defence maintenance options). In other words, policies with high future costs but which yield short term benefits may be preferred to those with lower short term benefits and also lower future costs.

In the evaluation of retreat strategies, the problem is therefore one of costs incurred in the short term giving rise to benefits far into the future. The majority of costs associated with restoration or creation activities (e.g. the capital costs of engineering works) will occur in the first few years. Although some benefits may be realised in the early years, it is likely to take a long period of time for invertebrates, soil fauna and flora to become established and thus for the area to become valuable as a habitat for birds and other wildlife. The period before full (or even significant) benefits are achieved may be as long as 20 years.

Discounting this highly divided stream of costs and benefits puts far greater weight on the costs. Further, if more than one restoration or creation option is under consideration, the one which provides benefits in the shortest period of time may become favoured even though another option would eventually provide a habitat of greater overall signficance. It becomes important therefore that full consideration is given to the value of environmental costs and benefits over time, particularly if the value of coastal habitat is expected to increase (due to losses of habitat or changes in factors underlying society's willingness to pay).

The above discussion also raises the question of how to deal with residual benefits. These are the benefits that would be realised in years outside of the time frame used in the appraisal. For flood and coastal defence works the time frame adopted generally varies from 25 to 50 years. In some cases, the full benefits from habitat restoration or creation activities may not be achieved until more than 20 years after any works have been completed, yet they will continue in perpetuity. This on-going stream of benefits should be brought into the analysis either through the assumption of a residual value or by discounting to a period where the discounted value of additional benefits becomes insignificant.

4.4 Monetary Valuation Techniques

4.4.1 The considerable differences in the type of benefits associated with coastal habitat functions and services, means that a range of methods should be considered for the valuation process.

The techniques which have been identified as being the most applicable to the valuation of retreat options, and in particular to coastal habitat restoration and creation benefits, are summarised briefly below and discussed in more detail in Appendix A4.4. The Appendix covers the theory underlying each method, its relevance to managed retreat, past applications, and advantages and disadvantages of the technique.

The techniques discussed in Sections 4.4.2 to 4.4.7 below include some which could be employed to value both use and non-use related benefits. They could also be used under either or both of the "reference" or "specific" values approaches. Table 4.3.2 summarises some of the key aspects of each technique, indicating the basis for deriving values, the functions and services to which a given method is applicable, and some of the key assumptions and issues involved in application.

Tables 4.3.2 Summary of Valuation Methods

Method	Valuation Basis	Approach	Functions or Services	Comments (see also Appendix A4.3)
Change in productivity	Change in output and market prices.	Reference or specific values.	Agricultural production, fish and shellfish production, timber, other commercial goods, water supply.	Easily applied when markets exist. Values may be more acceptable than those derived through surrogate or hypothetical market techniques. System relationships and cause and effect must be properly understood. Measures use-related benefits only.

Method	Valuation Basis	Approach	Functions or Services	Comments (see also Appendix A4.3)
Preventative expenditure and replacement costs	Actual and potential expenditure on mitigating environmental effects or replacing damaged or lost goods and services.	Reference values only.	Flood protection, water supply, water quality enhancement, and habitat/ environmental quality.	Easily applied but provides a lower bound estimate. Cannot be used when secondary benefits exist. Assumes current system is optimal.
Damage-costs-avoided	Value of damage avoided as measured in market prices.	Reference or specific values.	Flood protection, water supply, sediment control, erosion, and shoreline protection.	Easily applied but measures use-related benefits only. Does not address question of optimality.
Travel Costs	Valuation based on determining costs incurred in visiting a site/ undertaking an activity.	Reference values only, unless parts of the site are currently being used for recreation when specific values might be estimated.	Recreation related activities, natural habitat areas.	Extensive application to valuation of recreation, but values use-related benefits only. Method is site-specific. Method does not reflect quality of experience. Several modelling concerns and large data requirements.

Method	Valuation Basis	Approach	Functions or Services	Comments (see also Appendix A4.3)
Contingent Valuation	Individuals are surveyed to determine their willingness to pay for a good or service.	Reference or specific values.	All functions and services.	Requires surveying of individuals to elicit values. Potential biases in results due to several factors including design of survey and hypothetical nature of questions.
Energy Analysis	Primary productivity converted into money terms using fossil fuel prices.	Reference or specific values.	Comprehensive value covering all functions and services.	Requires prediction of primary productivity. Debate over use of energy prices to reflect value of environmental goods and services.

4.4.2 **Change in Productivity**

Where there is a market for the good or service involved, estimates based on the value of given changes in productivity can be used to derive values representing the benefits (or costs) of restoring or creating a particular habitat. Impacts on productivity resulting from actions affecting the environment are determined and market prices are then used to value these changes.

This technique could therefore be used to value changes in agricultural productivity (including reed, sedge or willow production), effects on fisheries and shell-fisheries, and water purification/water supply capabilities. In this respect, it could be used to derive "specific values" by predicting the change in productivity that would occur from the various retreat options.

Because of the reliance on market prices, the changes in productivity technique could not easily be applied to the valuation of landscapes, wildlife or aesthetic benefits. Its application is therefore limited to the use-related services and functions provided by coastal habitats.

4.4.3 Preventative Expenditure and Replacement Costs

The preventative expenditure and replacement cost methods are related techniques for placing a value on a change in environmental quality or the loss of an environmental service.

The preventative (or defensive) expenditure approach is based on using actual expenditures incurred (or likely to be incurred) by individuals or a government body to determine the value or importance placed on a particular environmental good or service. In applying this approach, demand for environmental damage mitigation is viewed as a surrogate demand for environmental protection. A British example of where this type of approach has been applied involves using the payments made under the terms of the Environmentally Sensitive Areas policy as estimates of the value to society of the environmental benefits gained by maintaining the low intensity use of agricultural lands (Turner and Brooke, 1989).

The replacement cost approach is based on the principle that the work which would be required to restore or replace the total environmental resource to its original state, possibly in another location, provides an estimate of the value of the environmental good or service threatened with damage or loss. Through this approach, the potential expenditure on replacement serves as a means of placing a value on previously unvalued functions such as those provided by a wetland or other habitat area (see, however, Section 4.5.2).

These methods could be used to provide "reference values", using expenditure undertaken (or threatened) to prevent damage to existing wetlands or other coastal habitats elsewhere, as an estimate of the value of a similar site being restored or created. Values generated in this way would have to be used with care, and should be treated as rough guides or second best only.

4.4.4 Damage-Costs-Avoided

Related to the above methods is the use of damage-costs-avoided as a measure of the value of a given function or service provided by a natural system. The concept underlying this approach is that the value of an environmental good or service is equal to the costs of property or other damage which would occur if that good or service did not exist.

This approach is used extensively to value the costs and benefits associated with the decision on whether to improve, maintain, or abandon flood defence works. In the case of managed retreat, it could be used to develop "reference values" for different functions and services. For example, estimates of the damage costs associated with a loss of reed beds as developed for a previous study may provide an estimate of the value of created reed beds under a retreat strategy. Such valuations may also be possible for other physical functions and services such as flood protection, shoreline protection, sediment control and water quality enhancement.

Any "reference" valuations developed through this method should be used with caution. The original valuations are site-specific and care must be taken to ensure that the functions or services provided by the reference good will also be provided by the created or restored good. Similarly, "specific values" might be developed through this type of approach as long as the nature and types of functions that would result from different retreat options could be predicted with a good degree of reliability. The development of specific values is likely to be limited to those cases where management involves, for example, maintaining sand dunes as a habitat and thereby preventing the loss of assets in the area behind the dunes, which would have resulted if the do-nothing approach had been adopted.

4.4.5 Travel Cost Techniques

Travel cost techniques infer the value placed on an environmental resource by determining the amount of money spent to travel to that resource. In general, most applications are related to recreational use of the resource in question and involve determining how demand for recreation would be affected by changes in site characteristics.

These techniques could be applied to the valuation of changes in habitats, particularly where the latter would produce opportunities for recreation. Travel cost methods could be used to develop "reference values" using existing sites of similar characteristics to those proposed under the different retreat options. The reliability and validity of such "reference values" could, however, be questionable. Where the managed retreat option involves undertaking restoration or creation as an extension to existing nature reserves which currently receive visitors (for example, in an area adjacent to a RSPB reserve), "specific values" could also be derived using these methods.

4.4.6 Contingent Valuation Methods (CVM)

Contingent Valuation uses social survey techniques to develop direct valuations for a given environmental good or service. CVM involves asking individuals what they would be willing to pay (or willing to accept by way of compensation) for a specified change in the quality or quantity of the good or service in question.

Contingent Valuation methods are appealing because they can be applied to a wide range of valuation problems and can be used in almost any context. They are the only methods which can be used to derive estimates of option, bequest and existence values. Their potential for application to the valuation of retreat, therefore, is greater than that of any of the other methods. "Specific values" can be derived for different proposals to cover all of the functions and services to be provided by a particular wetland or coastal habitat.

Care should be taken, however, in the use of these methods to minimise potential biases in the results due to the nature and design of the survey instrument. Statistical analysis should also be used to validate the results of such studies.

4.4.7 Energy Analysis Approaches

The energy analysis approach is based on the principle that there is a fixed relationship between the energy embodied in a product and its market price. The method takes the total amount of energy captured by a system and uses this as an estimate of its potential to do useful work for the economy. For a wetland or other coastal habitat, Gross Primary Productivity (GPP) is used to provide an index of the energy captured by the system. It relates to the amount of solar energy taken in by the system which is used in primary production to form the life support mechanism for all plants and animals in that system. Once the level of embodied energy is determined (through GPP estimates), the energy measurement is translated into money terms using a conversion factor based on prices placed on fossil fuels.

The approach is attractive in that it produces a total value for coastal/wetland habitats (e.g. as systems), but there is considerable debate over the use of energy prices as the measure of economic value. A number of other considerations enter into the pricing of goods and these are neglected by estimating the good's value in terms of its energy content alone. Thus, although there have been several applications of energy analysis in the US (and to a lesser degree in the UK), this method is not recommended for use in the valuation of retreat options.

4.5 Acceptability of Different Valuation Techniques to Interested Agencies

4.5.1 National Rivers Authority/ Ministry of Agriculture, Fisheries and Food

The monetary valuation of environmental costs and benefits is generally accepted by the National Rivers Authority as being of particular use in the benefits assessment process, notably as a means of demonstrating economic viability to MAFF when applying for grant-aid funding. Several cases exist where one or more of the techniques outlined above have been used to assist in the evaluation of alternative engineering or management proposals and where these evaluations have subsequently been accepted by MAFF as providing an adequate assessment of the scheme's environmental or recreation benefits. One of the key projects in this respect was the benefits assessment carried out for the Aldeburgh Sea Defence Scheme (Turner et al., 1990).

4.5.2 Nature Conservancy Council

Qualitative techniques have been used extensively by the NCC, notably in their designation of Sites of Special Scientific Interest (SSSI). Qualitative and statistical data are similarly used in the identification and designation of other sites of nature conservation significance - Ramsar Convention Sites, Special Protection Areas (EC Birds Directive), National Nature Reserves, etc. These designations represent the most important current British use of such methods.

Overall, the NCC prefer the type of system which is based on qualitative methods and which grades sites simply, according to their international, national regional or local importance.

The NCC acknowledge, however, that there may be a need in some circumstances to further quantify the interest at, and in some cases (e.g. economic benefits assessment) place monetary values on, a particular site of nature conservation interest. In these cases, they stress that the limitations of such techniques should be recognised and acknowledged. This is especially important when the techniques are being used to place what is clearly a minimum value on a particular resource. Replacement costs, for example, will only evaluate the physical and biological components of a nature reserve - land purchase, vegetation planting, the provision of walkways and sluices, etc. The technique will not place an economic value on the species themselves, the complex interrelationships between species and the way in which the reserve functions.

4.5.3 Countryside Commission

The Countryside Commission does not support the use of quantitative evaluation techniques, preferring instead the flexibility of qualitative approaches (Turner and Brooke, 1989). The techniques most relevant to the Countryside Commission are those of landscape assessment which can be used to describe, analyse and evaluate landscapes. These methods are relevant to a wide range of planning, design and management issues and are of particular relevance to decision making on the creation and restoration of landscapes.

The document "Landscape Assessment : A Countryside Commission Approach" (1987) adopts a comprehensive and practical approach to landscape assessment based on aesthetic taste, operating within the context of informed opinion, the trained eye and common sense (CCD 18). Landscape assessment concerns not only the appearance of land, but also people's reactions to it and the pleasure which they gain from the landscape. The technique combines both objective and subjective variables, as both are significant in determining the value of an area.

Similarly, the Countryside Commission does not support, in general, the principle of monetary valuation, particularly when applied to landscape assets. They have examined both monetary and other quantitative methods and have concluded that it is very difficult to attach such values to a resource which is perceived so differently by different individuals. They argue, therefore, that assessment of landscape and amenity should be based on qualitative techniques.

4.5.4 Royal Society for the Protection of Birds

The Royal Society for the Protection of Birds uses both qualitative and quantitative techniques to aid in the designation of sites of particular importance for birds. The RSPB have produced a book entitled Red Data Birds in Britain (Batten et al., 1990) which, in conjunction with their Species Action Plans, provide guidance on the measures necessary to conserve rare bird species. These include protected area designation, and in certain cases, habitat creation.

The RSPB support the quantification of environmental costs and benefits, but question how far it might be possible to place money values on non-marketed and non-marketable goods (Turner and Brooke, 1989). In certain cases, however, monetary valuation might be of considerable use, for example in the application of willingness to pay methods.

The RSPB has some reservations about the implications of applying monetary valuation techniques and would urge caution in their use. In general, their preferred assessment and evaluation approach would involve the use of non-monetary techniques for differentiation between options, with monetary techniques only being introduced only when a preferred option has been identified and there is a need to provide a valuation of the resulting costs and benefits in economic terms.

4.6 Future Evaluation of the Retreat Option

4.6.1 The Current Decision-Making Process

In the preceding sections, criteria for identifying potential retreat strategies and techniques for evaluating those strategies were discussed. This discussion has largely been framed in terms of the current decision making process in respect of maintaining/improving or abandoning a flood defence. As noted earlier, this process has (historically) involved two stages of decision making. The first considers whether or not the proposed engineering works can be economically justified. If they cannot and the do-nothing approach is adopted, the possible environmental benefits of managing the retreat to maximise nature conservation benefits have occasionally been considered, albeit as one way of "making the best out of a bad job". More often however, as can be seen from the lack of data/monitoring discussed in Section 3.2, the defences have simply been abandoned and little thought has been given to what might happen in terms of ecological development.

4.6.2 Evaluation Options

There are two potential approaches which can be adopted for the economic evaluation of managed retreat options. The first is to adopt a cost-effectiveness approach, which involves comparing the performance of different options to pre-defined decision criteria. This type of approach provides an indication of value for money, but it does not establish whether or not the benefits of any engineering works, maintenance and/or management activities would be greater than their costs. Under a cost-effectiveness approach this is left to the subjective judgement of decision makers.

An approach using cost-benefit analysis (CBA) on the other hand, indicates whether or not benefits exceed costs and therefore whether or not any given set of management/engineering activities are worthwhile. As discussed in Section 4.3, there are considerable difficulties in applying monetary assessment techniques to the valuation of environmental assets such as habitat or landscape. This may limit the feasibility of valuing habitat creation/restoration initiatives and hence the reliability of any estimates generated through these techniques for input into CBA. This is discussed further in the following sections.

4.6.3 An Alternative Decision-Making Process

It could be argued, particularly in the light of NRAs duties under S.8 of the Water Act 1989 (discussed in Section 5.2), that the current decision-making process should be reduced to a single stage and that the managed retreat option should be considered earlier, at the same time as the maintain/improve options. This would involve undertaking a benefits assessment of maintain/improve, do-nothing and managed retreat at the same time. Such a framework would place managed retreat on equal grounds with the maintenance or improvement of flood defences, and would not treat managed retreat as a subsidiary or second level decision. It would therefore ensure that potential habitat restoration and creation activities are given full consideration in terms of both benefits and costs. In practical terms though, there are a number of issues which need to be addressed if such a framework is to be adopted.

In the evaluation of the costs and benefits associated with proposed flood defence engineering works, the costs side of the equation comprises the total expenditure on both capital works (including associated works such as landscaping) and anticipated maintenance requirements. The benefits side of the equation will include, for example, the value of the properties, infrastructure, and agricultural production to be protected, adjusted if appropriate to give a national value. These benefits, along with the current benefits associated with any existing environmental or recreation interest, would be expressed in the form of damage-costs-avoided.

The equation for the do-nothing strategy is roughly the converse of that for maintain/improve. In this case, however, what were benefits become costs: the "damages" are no longer avoided.

The costs and benefits associated with a managed retreat option will include elements of both of the above. As with the flood defence option, there may be some costs (i.e. a requirement for expenditure) associated with the management activities, engineering works or maintenance requirements needed to create or restore an environmentally desirable habitat. There will also be many of the "losses" associated with the do-nothing option in terms of lost agricultural production, etc. These are interpreted as being among the costs of achieving the desired outcome. The benefits side of the equation for the managed retreat option would comprise the economic value of the ecological, landscape and amenity gains, together with any other non-monetary environmental benefits which would result from the implementation of the managed retreat option.

For managed retreat to be the preferred strategy within this framework, the net benefits must be greater (or more positive) than those expected under both the maintain/improve and the do-nothing strategies. Take, for example, a case where the ecological benefits of undertaking management activities as part of a retreat strategy a) can be evaluated and b) are greater than the costs of those activities. Under the existing decision-making process, where the managed retreat option is not often considered until after the decision to do-nothing has been taken, such creation or restoration measures would be justified because the assets at risk from flooding were already effectively written off when the decision to do-nothing was taken (as discussed earlier, in this case managing the retreat is simply seen as making the best of a bad job). Under the alternative framework, however, the gains stemming from the management activities would also have to outweigh the damages resulting from abandonment of the defence, even in the case where it is known that the option of maintaining an effective flood defence is not economically viable. This would lead to a rejection of managed retreat unless it was found to have the "least negative" net present value of the three options.

4.6.4 The Way Forward

Although it may sometimes be difficult to apply a cost-benefit approach in practice due to valuation problems, it is recommended that this type of approach is nevertheless adopted towards the evaluation of coastal flood defence strategies including managed retreat. It is also recommended that retreat options are considered and evaluated earlier in the decision-making process, concurrently with the maintain/improve and do nothing options (see also Section 5.2.2).

These recommendations arise from the need, in practice, to bring together monetary, quantitative and qualitative information in order to provide an overall indication of the significance of the environmental costs and benefits of each option for consideration in the decision-making process.