

The Flood Risk Management (Scotland) Act 2009:

Sustainable flood risk management –
principles of appraisal: a policy statement



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This document is available from our website at www.scotland.gov.uk.

ISBN: 978-1-78045-276-0

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Edinburgh
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Produced for the Scottish Government by APS Group Scotland
DPPAS11815 (07/11)

Published by the Scottish Government, July 2011

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Sustainable flood risk management – principles of appraisal: a policy statement

1. Introduction

Effective appraisal will underpin decision-making at all levels of flood risk management planning, from the preparation of strategic flood risk management plans to the development of individual projects. This policy statement supplements ministerial guidance on [Delivering Sustainable Flood Risk Management](#), and sets out principles that should guide the appraisal of flood risk management actions in Scotland. The Scottish Government will issue further guidance on appraisal to support these aims; this will be developed with stakeholders.

2. Principles of appraisal

The flood risk management planning process can be viewed as a hierarchy of appraisal and decision-making, beginning with a high level assessment ([SEPA's National Flood Risk Assessment](#)) and becoming increasingly more detailed (from flood risk management plans to the selection of individual projects). As outlined in section 5 of [Delivering Sustainable Flood Risk Management](#), all appraisals should go through at least the three stages outlined in figure 1. Guidance on each stage is provided below.

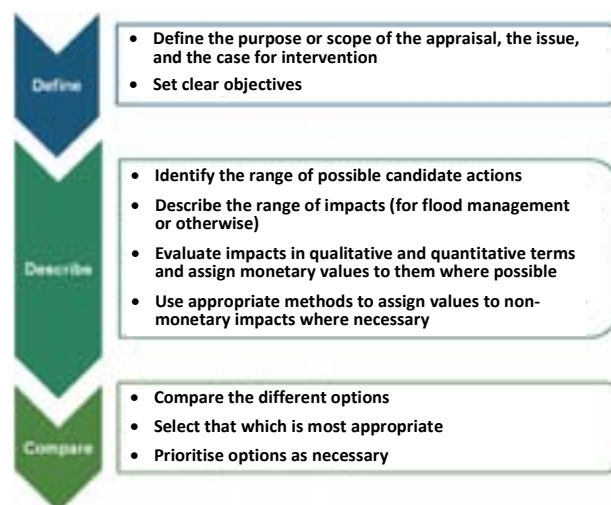


Figure 1 Stages in appraisal

3. Stage one: define issues and objectives

3.1 Defining the purpose

The first step in the appraisal process is to define the purpose of the appraisal, the issue and the case for intervention. This will involve defining a baseline based on existing flood risk and describing how risk changes over time (for example, due to changing climate) under a do-nothing approach. Appraisers should use the most up to date information available which may include information used to support SEPA's National Flood Risk Assessment, subsequent flood hazard and flood risk mapping and any further detailed flood risk studies carried out at the local or catchment scale.

3.2 Setting objectives

The appraisal process must define the objectives for a plan, strategy or project. The objectives should be in line with wider government policy and the [HM Treasury Green Book \(2003\)](#); be SMART (Specific, Measurable, Achievable, Relevant, Time-bound); and include a realistic timetable for delivery, which could include phasing over multiple flood risk management cycles.

There should be demonstrable links between objectives set out in a flood risk management plan and their contribution to tackling national, regional or local priorities, particularly in areas identified by SEPA as being potentially vulnerable to flooding.

All objectives should be established in dialogue with partners and stakeholders and should not be biased to favour or to marginalise any group.

When considering objectives for a plan or project, the opportunity for delivering multiple outcomes and attracting funding from private beneficiaries and other sources should be considered from the outset.

3.3 Statutory requirements

In a limited number of cases statutory requirements may give rise to the need for specific do-minimum options to be considered in a strategy or project. In such cases meeting the minimum legal requirement should be a primary objective of the project. However, any wider benefits associated with such projects should also be explored to see whether there is a case for doing more than the minimum legal requirement.

Meeting the requirements of environmental legislation, such as the EC Water Framework Directive and the Birds and Habitats Directives, will always be necessary and should be considered from the outset, both in terms of potential negative and positive contributions to delivering environmental targets and objectives. Options that do not meet these requirements should be screened out at the outset and excluded from further evaluation.

Any specific legal obligations that apply should be clarified early in the appraisal process including how such requirements can be met.

3.4 Strategic context

Objectives should be established with reference to government policy and plans, and other relevant strategies. At a project level, appraisal should clearly reflect the relevant flood risk management plan for the study area. Examples of relevant plans are outlined in section 3 of Delivering Sustainable Flood Risk Management.

Where there are opportunities and synergies with other government objectives, flood risk management plans, strategies and projects should aim to deliver multiple objectives. All opportunities to manage flood risk through projects that may have other primary aims, for instance through actions to protect the water environment or through urban regeneration initiatives, should be identified.

The management of flood risk will impact on many aspects of the social, natural and historic environment. Wherever possible, SEPA and the responsible authorities should manage flood risk in ways that will improve the social, natural and historic environment at the same time as reducing the risks to people and property. Opportunities to do more, while also cost-effectively reducing risk, should be promoted.

The potential negative impact of interventions to the environment, and in particular the water environment, should also be considered at all stages of the appraisal process. Wherever possible, these impacts should be minimised through the development of environmentally sensitive options.

4. Stage two: develop, describe and value

4.1 Identifying and short-listing a range of actions

At the early stages of appraisal a wide range and broad portfolio of structural and non structural options should be identified. These options should be appropriate to the scale and type of plan, strategy or project.

Considering a wide range of options will also be important in the context of legal requirements such as the EC Water Framework Directive and the Habitats Directive. In the event that the selected option runs counter to the objectives of these Directives, it will be important to demonstrate that reasonable alternatives have been considered and can be justifiably rejected.

A do-nothing or no active intervention option should always be considered so as to provide a consistent baseline against which to compare the benefits of possible interventions. Where there is any legal requirement to be met, then a do-minimum option should also be appraised. This option should set out the minimum actions necessary to meet the legal requirements.

The impact of the management intervention on flood risk must be estimated. When describing different options, a consistent and objective comparison of

different combinations of consequences and probability should be made. For example: a flood event causing low damages, but with a high probability of occurrence should be compared without bias to an event causing high damages, but with a low probability. There may be exceptions to this principle in limited cases such as those involving potentially very large losses or to provide greater consistency between different communities.

Screening exercises may be required to reduce a long list to a shorter list of options. However, potentially viable options should not be dismissed just because some of the benefits may be difficult to describe. The best available environmental option and those with strong sustainable social benefits should remain in the appraisal process unless they are manifestly unviable.

The sustainability of the options should be a key consideration throughout the appraisal process. Following the guidance set out in section 5 of *Delivering Sustainable Flood Risk Management*, actions that are quite clearly unsustainable should be rejected early.

The reasons for the rejection of options should be clearly stated and recorded. Care should be taken to not unnecessarily screen out non-structural or adaptable options, especially where other options may not be sustainable in the longer term. Options that would clearly not meet the minimum legal requirement should be screened out at an early stage.

A high level scoring or matrix analysis exercise is recommended to help short list options. There is also a key role for experience and judgment when eliminating options. The reasons for short-listing or rejecting measures should be documented to ensure transparency in the process.

In this analysis, individual actions (or simple combinations of actions) being considered can be scored against criteria and scores calculated. At this stage technical details are not necessary and impacts do not need to be valued; informed judgement is sufficient. The purpose is to rank individual measures to take forward a subset for more detailed appraisal.

The process of valuing options will provide important information on the sustainability of options; however, other strategic considerations should be brought to bear in considering and selecting options.

4.2 Assessing impacts

Having considered and short listed a wide range of possible solutions, the impacts (positive and negative) of each option should be clearly described, quantified and, where possible, valued (Figure 2). This should include an assessment of residual damages on property, infrastructure and businesses (including agriculture). To ensure selection of sustainable actions, this assessment should not be limited to impacts that can easily be measured in monetary terms. Other significant impacts such as on health and the environment must be described and valued.

An understanding of ecosystems and catchment characteristics and processes will help ensure that the impacts of different options are properly

appraised, multiple benefits are taken into account, and opportunities to apply adaptive strategies within the natural environment to reduce risk are identified.

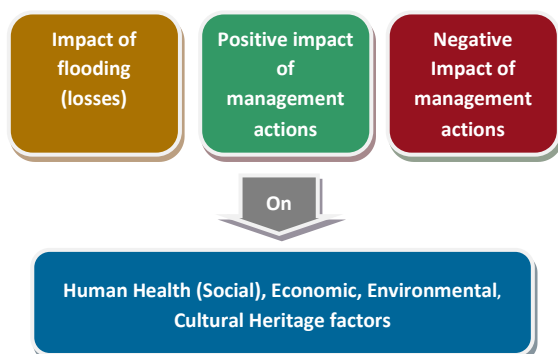


Figure 2 Range of impacts that should be considered in appraisal

It is very important that the analysis and information required to inform a decision is proportionate to the impact that the decision will have. If a decision cannot be easily agreed, if it is controversial, if it impacts on large or heavily populated areas, or if it is very costly it may be appropriate to spend more time quantifying, and where possible, monetising all the individual impacts.

4.3 Timescales and climate change

The appraisal process should seek to fully understand risk in a changing climate and should explore a broad suite of solutions that may give a range of longer-term benefits. Interventions and approaches that are not sustainable in the long-term should be avoided.

The impacts of the changing climate should be consistently taken into account in appraisals using up to date robust evidence and in accordance with the Scottish Government's guidance on [Public Bodies Climate Change Duties](#) and the objectives of the [Climate Change Adaptation Framework](#) and accompanying [Water Environment and Resources Action Plan](#).

To reflect the nature of long-term investment decisions, including the need for future maintenance and adaptation, the whole life costs of options should be included in appraisals. An understanding of the dominant physical processes and the design life of any measures proposed should be the basis for determining an appropriate timeframe for appraisal.

4.4 Appraisal summary tables

Appraisal summary tables should be used as a framework for systematically describing and valuing, and where possible monetising, the positive and negative impacts of options. The tables should provide a comprehensive assessment of the impacts of all options. They should also make transparent which impacts have been valued in monetary terms (and how these monetary values have been developed), and which have not, as well as revealing information about the distributions of costs and benefits of different options.

4.5 Valuing impacts

To support the selection of sustainable actions, SEPA and the responsible authorities will need to ensure that the full range of human health (social), economic, environmental and cultural heritage impacts, both positive and negative, of actions is considered in an equitable manner.

Impacts, both positive and negative, should be valued in monetary terms wherever possible. Values should be based on market prices and derived estimates for non-market values where feasible. This is to provide a consistent basis for comparing impacts of different options both at a plan and project level.

Impacts that cannot be valued in monetary terms should always be described, quantified and brought into the appraisal through appraisal summary tables. Understanding these impacts is critical to selecting sustainable actions, and they should not be ignored simply because they are difficult to quantify or value in monetary terms.

Furthermore, it is the impacts that are difficult to value in monetary terms that are often the most significant in terms of their effect on the natural environment and relevant local communities and stakeholders affected by flood management. Comprehensive appraisal will not always avoid conflicts but it does show how all concerns and issues have been considered and it can be explained why a decision has been made, even if it is not supported.

The effort invested in valuing impacts should be proportionate to the complexity of the problem and the information required to reach a robust decision. For example, non-monetised impacts may be appropriate to use when appraising flood risk management plans, as the time and effort required to assign monetary valuation may be disproportionate to the detail required for assessing and selecting strategic options. However, as monetised data becomes more readily available, it should be included in all levels of appraisal.

4.6 Approaches for assessing impacts

Wherever possible, standard approaches should be used for assessing impacts to ensure consistency within and across different appraisals.

Relevant sources of useful technical guidance include:

[The benefits of flood and coastal risk management; Flood Hazard Research Centre, Middlesex University \(2010\);](#)

[Flood and coastal defence project appraisal guidance - economic appraisal: appraisal of human related intangible impacts of flooding; Defra \(2004\);](#)

[Flood and coastal defence appraisal guidance - social appraisal: assessing and valuing the risk to life from flooding for use in appraisal of risk management measures; Defra \(2008\).](#)

The impact of the proposed option on the emission of greenhouse gases should be assessed and valued following the [Department of Energy and Climate Change guidance on valuation of energy use and greenhouse gas emissions for appraisal and evaluation \(2010\)](#).

Appraisal should draw upon the ecosystem services approach for considering the impact of proposed options (See section 3 of Delivering Sustainable Flood Risk Management and the [UK National Ecosystem Assessment \(2011\)](#)). This should include valuing the environment according to the range of goods and services it provides to people and how delivery of these benefits might be altered by different options under consideration. Where proposed interventions alter the quantity or quality of ecosystem services provided, the impact of the changes should be comprehensively assessed and where possible, quantified.

It is recognised that there is considerable complexity in understanding and assessing the causal links between a policy or intervention, its effects on ecosystems and related services and then valuing the effects both qualitatively and where possible, quantitatively. Integrated working with policy, science and economics disciplines will be essential in implementing this approach in practice. The critical importance of the links to scientific analysis, which form the basis for valuing ecosystem services, needs to be recognised.

A range of methods are available to consider changes in the value of ecosystem services. As many ecosystem services are not traded in markets, and therefore remain unpriced, it is necessary to assess the relative economic worth of these goods or services using either quantitative non-market valuation techniques if possible, or qualitative techniques.

The type of valuation technique chosen will depend on the purpose of the appraisal, the type of ecosystem service to be valued, as well as the quantity and quality of data available. Some valuation methods may be more suited to capturing the values of particular ecosystem services than others.

Where monetary valuation is not possible, for instance, when assessing a broad spectrum of environmental and social impacts, alternative non-monetised assessments should be used. There are a variety of techniques available that allow these impacts to be considered, typically by assigning qualitative or quantitative scores. One approach, a type of multi-criteria analysis referred to as 'scoring and weighting', is described in the [Environment Agency's guidance on applying the scoring and weighting methodology for flood and coastal erosion risk management \(2010\)](#).

Note that it is not the intention of this policy statement to set out specific methods in detail. SEPA and the responsible authorities should consider the approaches available and select the methods that are best suited to the purposes of the assessment. The Scottish Government will issue further guidance on these matters as necessary.

4.7 Valuing flood warning benefits

SEPA is Scotland's flood warning authority. Costs and benefits of flood warning can be difficult to disaggregate to specific locations although the following general principles should apply:

- an allowance for the benefits and costs of existing flood warning services should be included in appraisal;
- a flood warning service is unlikely to be effective or feasible in the case of rapid response catchments where less than two hours warning can be given. This may be taken into account in the appraisal process as part of evaluating the social impacts;
- where new flood warning services form part of a flood risk management option, the costs and additional benefits over existing services should be included in the appraisal. This might occur where flood warning and other measures are proposed to work together to reduce the consequences of flooding.

5. Stage three: compare and select

5.1 Transparent decision-making

Decisions that lead to sustainable actions will come from considering the economic, environmental, social and technical issues that affect the choice of the solution, together with proper consideration of risk and uncertainty. By balancing these issues, the most viable solution should be identified. Whatever the decision (do something new, sustain existing, change existing or do-nothing) it must be made in a clear, justifiable and transparent manner based on sufficient information, such that it can be understood by, if not accepted by, those affected.

Flood risk management has to compete with other areas of public expenditure, and individual projects may need to compete for funding with other possible flood management interventions. It is therefore important that the selection of the preferred option is informed by an appraisal that captures all relevant impacts and uncertainties that could affect the choice of option.

Uncertainties will exist at all stages of appraisal and these should be clearly presented in all appraisals. Section 1 of Delivering Sustainable Flood Risk Management provides more information on managing uncertainty.

Projects and strategies are only economically worthwhile if the benefits exceed the costs (the ratio of benefits to costs is greater than one). This should not be confused with the affordability of an option. Affordability is a separate matter relating to availability of funds; although in developing plans, strategies and projects, SEPA and the responsible authorities will clearly need to consider affordability and potential sources of funding.

The goal of investment in flood risk management is to maximise the total value of interventions in a sustainable manner whilst achieving any targets that may be set for the plan or programme as a whole. Cost-benefit analysis

will provide important information to support this goal. However, decision making should be balanced and should make use of an appropriate combination of approaches, including multi-criteria approaches or other similar or relevant methods, to arrive at a preferred option, and not necessarily depend on a single metric.

5.2 Tools to support selection of preferred options

The following types of analysis should be used as appropriate to compare and support the selection of the preferred option.

Cost-benefit analysis

If all significant impacts of options are satisfactorily expressed in monetary terms, the option with the highest benefit-cost ratio will usually be the most appropriate choice. Appraisal summary tables should still be used in such cases to add to the transparency of the decision making process (for example, to illustrate which impacts have been taken into account and how they have been described and valued in the cost-benefit analysis).

Multi-criteria approaches

There will however be cases where it is not practical or possible to assign monetary values to all significant impacts for a cost-benefit analysis. In such cases, multi-criteria approaches, which can include weighting and scoring, should be used to complement, or as an alternative to, the cost-benefit analysis.

When using cost-benefit analysis and multi-criteria approaches together in appraisal, it is important to ensure that they are robustly and consistently applied in order to: avoid double counting; make appropriate and consistent use of discounting; and ensure a common baseline.

Cost-effectiveness analysis

Cost-effectiveness analysis may be used to identify the lowest cost way of achieving a pre-set objective. It is likely to be used in a limited number of situations, for example, where:

- there is a legal requirement to achieve a certain outcome and that outcome cannot be met through a project with a positive benefit-cost ratio; or
- an option has been justified through the normal appraisal process and an intervention (such as investment in a like-for-like replacement of a sluice gate) is necessary to continue to deliver that option.

Monetised and non-monetised impacts still need to be taken into account in determining the options with least negative impacts (or lowest cost).

Incremental benefit-cost ratio

The incremental benefit-cost ratio may be used in the decision process. A key principle should be to retain a full understanding of the opportunity cost (where there is, at least, an extra pound of benefit for each additional pound of cost); and then ask whether greater benefits could be gained by investing the additional resources in an alternative project in another geographical area, for instance a project that delivers multiple objectives.

Thus, there may be a justifiable case for selecting a project which would provide a higher level of protection than that offered by the option with the highest benefit-cost ratio, *providing* that the overall ratio is adequate to represent good value for money, when compared with other investments. The Scottish Government will monitor and respond to any future need for guidance on such decision rules.

Where the decision process leads to a preferred option that is not the optimum in monetised benefit/cost terms, this should be clearly indicated in the appraisal report and a rationale given. In all cases, the distribution of the costs and benefits amongst different groups should be transparent.



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DPPAS11815 (07/11)

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