

---

**Report To:** Safe Sustainable Communities Committee  
**Report By:** Corporate Director Regeneration and Environment  
**Contact Officer:** David Greenslade  
**Subject:** Inverclyde Council's response to the Scottish Government's Consultation Document on Delivering Sustainable Flood Risk Management.

**Date:** 3 May 2011  
**Report No:** SSC/ENV/IM/11.81  
**Contact No:** 01475 714817

---

## **1.0 PURPOSE**

- 1.1 The purpose of this report is to advise Committee of Inverclyde Council's response to the Scottish Government's consultation document on Delivering Sustainable Flood Risk Management under the Flood Risk Management (Scotland) Act.

## **2.0 SUMMARY**

- 2.1 In January 2011 the Scottish Government published a document entitled The Flood Risk Management (Scotland) Act; Delivering Sustainable Flood Risk Management – a consultation.
- 2.2 The Scottish Government is sought to improve its understanding of the causes and consequences of flooding in order to deploy more sustainable approaches to tackling flood risk.
- 2.3 The consultation document called for views on the new Ministerial guidance on Delivering Sustainable Flood Risk Management. The views were to be expressed in the form of responses to 19 questions set out in the consultation document. These responses were submitted to the Scottish Government on 18 March 2011.

## **3.0 RECOMMENDATION**

- 3.1 That the Committee note the responses made to the questions in the consultation document.

**Ian Moffat**  
**Head of Environmental and Commercial Services**

## 4.0 BACKGROUND

- 4.1 The new Ministerial guidance is intended to ensure adoption of consistent principles and approaches based on good practice lessons in flood risk management.
- 4.2 The guidance establishes five overarching outcomes for Scotland:
- Public funds invested in actions that protect the most vulnerable and those areas at greatest risk from flooding;
  - Rural and urban landscapes with space to store water and slow down the progress of floods;
  - Integrated urban drainage that decreases burdens on the sewer system while also delivering reduced flood risk and an improved water environment;
  - A well informed public who understand flood risk and the actions they can take to protect themselves, their property and their businesses; and
  - Flood management actions that will stand the test of time and be adaptable to future changes in climate.
- 4.3 Guidance to support delivery of these outcomes is provided through seven themed sections that cover topics such as partnership working, catchment flood management and selecting sustainable actions. Technical guidance on appraising flood management options is also provided.

## 5.0 PROPOSALS

- 5.1 It is proposed that the committee notes the responses to the consultation document that were made in accordance with its required timescale. The consultation document can be viewed on the consultation pages of the Scottish Government's website at: <http://www.scotland.gov.uk/Publications/2011/01/14152758/0>

## 6.0 FINANCIAL IMPLICATIONS

- 6.1 Financial: there are no financial implications at this stage

Cost Centre	Budget Heading	Budget Year	Proposed Spend this Report	Virement From	Other Comments
N/A					

Financial Implications – Annually Recurring Costs/ (Savings)

Cost Centre	Budget Heading	With Effect from	Annual Net Impact	Virement From (If Applicable)	Other Comments
N/A					

## 7.0 LEGAL IMPLICATIONS

- 7.1 Legal: There are no legal implications at this stage.

## 8.0 CONSULTATION

- 8.1 None

## 9.0 EQUALITIES

- 9.1 This report has no impact on the Council's Equality Agenda

## **10.0 ATTACHMENTS**

- 10.1 The Flood Risk Management (Scotland) Act, Delivering Sustainable Flood Risk Management – a consultation
- 10.2 The Flood Risk Management (Scotland) Act, Delivering Sustainable Flood Risk Management – a consultation, list of consultation questions and answers

# The Flood Risk Management (Scotland) Act

## Delivering Sustainable Flood Risk Management – a consultation





**The Flood Risk Management  
(Scotland) Act**

**Delivering Sustainable Flood Risk  
Management – a consultation**

© Crown copyright 2011

ISBN: 978-0-7559-9927-9

Scottish Government  
St Andrew's House  
Edinburgh  
EH1 3DG

Produced for the Scottish Government by APS Group Scotland DPPAS11145

Published by the Scottish Government, January 2011

## CONSULTATION ARRANGEMENTS

### INFORMATION ON CONSULTATION/INVITATION TO RESPOND CONSULTATION ON DELIVERING SUSTAINABLE FLOOD RISK MANAGEMENT

Please send your views and comments on the proposals in this paper via e-mail, letter or fax to the address below by 18 March 2011.

**Email:** [EQCAT@scotland.gsi.gov.uk](mailto:EQCAT@scotland.gsi.gov.uk) or

**Letter:** **Flooding Policy Team**  
**Environmental Quality Division**  
**The Scottish Government**  
**1H North**  
**Victoria Quay**  
**Edinburgh**  
**EH6 6QQ**

**Fax:** **0131 244 0211**

This consultation can be viewed online on the consultation web pages of the Scottish Government website at:

<http://www.scotland.gov.uk/Publications/2011/01/14152758/0>

You can telephone Freephone 0800 77 1234 to find out where your nearest public internet access point is.

The Scottish Government now has an email alert system for consultations:

SEconsult: <http://www.scotland.gov.uk/consultations/seconsult.aspx>

This system allows stakeholder individuals and organisations to register and receive a weekly email containing details of all new consultations (including web links). SEconsult complements, but in no way replaces, SE distribution lists, and is designed to allow stakeholders to keep up to date with all SE consultation activity and be alerted at the earliest opportunity to those of most interest. We would encourage you to register.

### **Handling your response**

We need to know how you wish your response to be handled and, in particular, whether you are happy for your response to be made public. Please complete and return the **Respondent Information Form** which can be found on the consultation we page via the link above. If you ask for your response not to be published, we will regard it as confidential and we will treat

it accordingly. All respondents should be aware that the Scottish Government are subject to the provisions of the Freedom of Information (Scotland) Act 2002 and would therefore have to consider any request made to it under the Act for information relating to responses made to this consultation exercise.

#### **Next steps in the process**

Where respondents have given permission for their response to be made public (see the attached Respondent Information Form), these will be made available to the public in the Scottish Government Library within 20 working days of the consultation closing date and on the Scottish Government consultation web pages within 25 working days of the consultation closing date. We will check all responses where agreement to publish has been given for any potentially defamatory material before logging them in the library or placing them on the website. You can make arrangements to view responses by contacting the SE Library on 0131 244 4552. Responses can be copied and sent to you but a charge may be made for this service.

#### **What happens next?**

Following the closing date on 18 March 2011, all responses will be analysed and considered along with any other available evidence to help us reach a decision on guidance on Sustainable Flood Risk Management in Scotland.

#### **Comments and complaints**

If you have any comments about how this consultation exercise has been conducted, please send them to the contact details above.

Responses should reach us by **18 March 2011**. Earlier responses would be welcome.



## Ministerial foreword



Although flooding is a natural phenomenon that helps shape our landscape and resources, the impacts experienced by individuals, communities and businesses can be devastating and long lasting. Last year in my constituency of Perth, I once again witnessed the immediate and abiding effects of flooding.

Taking the Flood Risk Management (Scotland) Act through Parliament was one of my first responsibilities as Minister for Environment, and real progress has already been made to translate this legislation into actions to reduce the damage and distress caused by flooding.

Important milestones have included record levels of investment in flood protection by local authorities, creation of a new joint flood forecasting service for Scotland, and investment into research to improve our understanding of more natural approaches to tackling flooding. In the spring, a new approach to providing advance flood warnings to the public will go live.

This consultation is another important milestone in implementing the Act and improving how we cope with and manage floods. *Delivering sustainable flood risk management*, sets out statutory guidance to SEPA, local authorities and Scottish Water on fulfilling their responsibilities under the Act and, in particular, on the steps that should be taken to manage flooding in a sustainable manner.

The final version of this guidance will form the blueprint upon which SEPA, local authorities and Scottish Water will deliver their flood risk management responsibilities. But before this can happen, I would like to hear your views on this consultation.

I welcome any input you may have, and hope that you will take this opportunity to help shape the way in which floods and their impacts are managed across Scotland.

**Roseanna Cunningham MSP**  
Minister for Environment and Climate Change





## Statutory context

This guidance is issued by the Scottish Ministers to the Scottish Environment Protection Agency (SEPA) and the responsible authorities under section 2 (5) and section 29 of the Flood Risk Management (Scotland) Act 2009 (the Act). The responsible authorities are local authorities and Scottish Water, and any other public bodies and office-holders designated as such by the Scottish Ministers

Guidance is provided to SEPA and the responsible authorities on fulfilling their duties to:

- act in the way best calculated to manage flood risk in a sustainable way; and
- consider the social, environmental and economic impact of exercising flood risk management functions;

Initial guidance is also provided to SEPA on:

- setting objectives and identifying measures for inclusion in flood risk management plans prepared under Sections 27 and 28 of the Act. As required by Section 29 (2), the guidance addresses how the alteration and restoration of natural features and characteristics of the landscape should be considered.

The guidance will be reviewed every six years or earlier to ensure continual improvement, and to reflect the experience and needs of those involved.





## Summary

Climate change predictions suggest that the number and severity of storm events across Scotland is likely to increase. This could place pressure on our existing defences and reveal new areas at risk of flooding. To deal with these risks, we must continue to improve our understanding of the causes and consequences of flooding and deploy more sustainable approaches to tackling flood risk.

This consultation is seeking your views on new Ministerial guidance on *Delivering sustainable flood risk management*. This guidance complements the flooding legislation that was introduced in 2009, the Flood Risk Management Scotland Act (the Act). It sets out statutory guidance to SEPA, local authorities and Scottish Water on fulfilling their responsibilities under the Act, and in particular on the steps that should be taken to manage flooding in a sustainable manner. The guidance is intended to ensure adoption of consistent principles and approaches based on good practice lessons in flood risk management.

In promoting a more sustainable approach to flood risk management, the guidance establishes five overarching outcomes for Scotland:

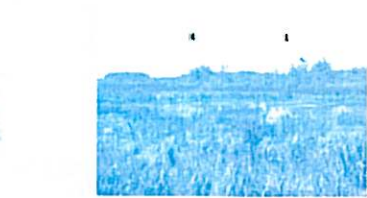
- Public funds invested in actions that protect the most vulnerable and those areas at greatest risk of flooding.
- Rural and urban landscapes with space to store water and slow down the progress of floods.
- Integrated urban drainage that decreases burdens on our sewer systems while also delivering reduced flood risk and an improved water environment.
- A well informed public who understand flood risk and the actions they can take to protect themselves, their property or their businesses.
- Flood management actions that will stand the test of time and be adaptable to future changes in the climate.

Guidance to support delivery of these outcomes is provided through seven themed sections, that cover topics like partnership working, catchment flood management and selecting sustainable actions. Technical guidance on appraising flood management options is also provided.

The guidance was developed in close collaboration with SEPA, local authorities, Scottish Water and a wide range of stakeholders representing Scotland's public bodies, flood risk management professionals and other interested parties.



<b>Content</b>	<b>Page</b>
Ministerial Foreword	1
Statutory Context	2
Summary	3
List of Consultation Questions	5 - 6
Introduction	7 - 8
<b>Section 1</b>	
An integrated approach to flood risk management	9 - 14
<b>Section 2</b>	
Delivering responsibilities collectively	15 - 18
<b>Section 3</b>	
Understanding flood risk	19 - 23
<b>Section 4</b>	
Understand and working with catchments	24 - 26
<b>Section 5</b>	
Integrated Urban drainage	27 - 29
<b>Section 6</b>	
Selecting sustainable actions	30 - 35
<b>Section 7</b>	
Engaging with the public	36 - 38
<b>Annex 1</b>	
Flood risk management milestones	39
<b>Annex 2</b>	
Guidance on the appraisal process	40 - 46
<b>Annex 3</b>	
Glossary of terms	47 - 49
<b>Annex 4</b>	
Acknowledgements	50



## List of Consultation Questions

1. Do you agree that the outcomes described in the introduction will support improvements to how floods are managed across Scotland? If not, please describe your concerns or alternative outcomes.

2. Do you agree that local authorities should lead on surface water management and that this work should form part of a local flood risk management plan? If not, please describe your concerns and alternative proposals.

3. Do you support the active role of stakeholders in flood management planning and do you have views on how to ensure stakeholders can become more involved in decision making?

4. Do you agree that the type of partnership working set out in this section will be necessary to deliver flood risk management plans and actions? Are there any alternative arrangements to partnership working that should be set out in the guidance?

5. Do you have views on barriers to partnership working and how these can be overcome?

6. Do you support the risk-based approach as set out and its importance to flood risk management? If not, please describe your concerns and alternative proposals.

7. Do you agree that SEPA should publish and maintain advice on assessing, modelling, mapping and sharing data? If not, please describe your concerns and alternative proposals to delivering consistent assessments of flood risk.

8. Do you have any other views on how to simplify the communication of flooding information to the public?

9. Do you agree that SEPA should take a lead role in assessing catchment characteristics and promoting a catchment approach to flood risk management?

10. Is there any further guidance needed at this stage on promoting the needs of the rural sector or other sectors?

11. Do you support the principles of integrated urban drainage set out in this section? If not, please provide views on alternative principles.

12. Do you have views on any alternative approaches to targeting effort to assess and manage surface water flooding?





13. Do you have any views on the potential role of a national flood management target, for instance to reduce all known flood risks to a medium or lower level of risk, to help focus efforts to manage flood risk?

14. Are there any aspects of selecting sustainable actions that have been omitted and should be added to the guidance?

15. Do you support the appraisal process set out in this Section and Annex 2? If not, please describe your concerns and alternative proposals.

16. Is there any further guidance that you would like to see set out at this time to support a fuller assessment of environmental and social impacts?

17. Do you agree that the steps outlined to support better access to information and public participation are needed?

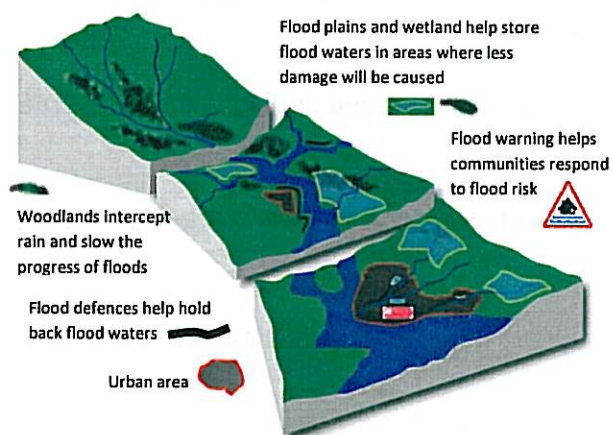
18. Are there any further steps that could be taken to improve participation and engagement with the public on flooding matters?

19. What additional topics do you feel should be covered by this guidance or subsequent guidance, and who should be responsible for that guidance?



## Introduction

Flooding can endanger lives and livelihoods, and disrupt the services that support our social and economic wellbeing. Although it will never be possible to eradicate flooding, a wide range of actions can be taken to reduce the likelihood and impacts of flooding (Figure 1).



**Figure 1** Examples of actions to tackle flood risk

The Flood Risk Management (Scotland) Act 2009 (the Act) has created a new framework for the assessment and management of flood risk, which is supported by new responsibilities on the Scottish Environment Protection Agency (SEPA), local authorities and Scottish Water.

*Delivering sustainable flood risk management* provides statutory guidance to these organisations on fulfilling their responsibilities under the Act. It also provides contextual information on how these responsibilities align with the Government's wider policy framework for improving how flood risk is managed.

## Why we need a new approach

In the past, development on flood plains and along coasts took place with less knowledge of the risks associated with such development than we have available to us today. In places, this has left us with a complex and difficult legacy to manage.

Some past interventions also mean that we have lost features of our natural landscape that

can help store and slow flood waters, including flood plains and wetlands. In urban settings, a similar trend has occurred as our towns have expanded and green spaces, gardens and other natural drainage features have been lost.

Climate change predictions suggest that the number and severity of storm events across Scotland could increase, placing pressure on our existing defences and potentially revealing new areas at risk of flooding.

To deal with current and future flood risk, we need to improve our understanding of flood risk and deploy more sustainable approaches to tackling these risks. This will mean managing whole flooding systems, be they catchments or coastlines, in a way that takes account of all interventions that can affect flood risk.

## Delivering change

This guidance is part of the Government's work to improve flood risk management across Scotland. The changes the Government wishes to bring about are embodied in the following five outcomes that should underpin the work of SEPA and the responsible authorities.

### Public funds invested in actions that protect the most vulnerable and those areas at greatest risk of flooding

The long-term aim must be to reduce the risk of flooding from all sources as far as is reasonable, taking full account of environmental, economic and social priorities. This means moving away from short-term reactive decisions and embracing proactive planning and investment decisions.

### Rural and urban landscapes with space to store water and slow down the progress of floods

Our urban and rural landscape can play an important role in storing and slowing flood waters. As far as possible, human interference into these processes should be prevented and reversed. This will not only help to reduce flood risk, it will promote the healthy





functioning of Scotland’s environment and the wildlife it supports.

**Integrated urban drainage that decreases burdens on our sewer systems while also delivering reduced flood risk and an improved water environment**

In urban areas, surface water run-off should be managed before it enters sewers and receiving watercourses by allowing for increased capture and reuse of water; increased absorption through the ground; and more above-ground storage and safe conveyance of flood waters.

**A well informed public who understand flood risk and the actions they can take to protect themselves, their property or their businesses**

Individuals, business and communities can play a role in helping to reduce the risks they face. This must be supported through improved awareness and access to information on flood risk and on simple actions individuals and businesses can take to protect themselves and others from the impacts of flooding.

**Flood management actions that will stand the test of time and be adaptable to future changes in the climate**

Decisions taken today will have a profound impact on the likely flood risks that future generations will need to manage. Our strategies to manage flood risk must reflect the needs of future generations and be adaptable to a changing climate.

**Purpose of the guidance**

Delivering sustainable flood risk management is statutory guidance issued under the Act. It explains to SEPA, local authorities, Scottish Water, and any other responsible authority designated by the Scottish Ministers, how they should fulfil their duty to:

*act in the way best calculated to manage flood risk in a sustainable way.*

Guidance is also provided on steps that should be taken to ensure full consideration of the

social, environmental and economic impact of actions taken to manage flood risk. Initial guidance is also provided to SEPA on setting objectives and identifying measures for inclusion in flood risk management plans.

Delivering sustainable flood risk management is not an operational manual and it is not intended to prescribe how SEPA and the responsible authorities should fulfil their duties. It is however intended to ensure adoption of consistent principles and approaches based on good practice lessons in flood risk management. The guidance is divided into the following topics:

1. An integrated approach to flood risk management
2. Delivering responsibilities collectively
3. Risk-based assessments and decisions
4. Understanding and working with catchments
5. An integrated approach to urban drainage
6. Selecting and implementing sustainable actions
7. Engaging with the public

As the performance of duties under the Act matures, the guidance will be updated to promote continuous improvement. Supplementary guidance notes may be published from time to time to further expand or update the guidance or related policy matters. These may address feedback on how policy is being implemented, or to reflect changes to wider policies, such as climate change adaptation or planning policy.

The guidance has been prepared for a professional audience with knowledge of the topics covered. Although its main users will be SEPA and the responsible authorities, aspects of the guidance will be relevant to other public, commercial and voluntary organisations, as well as the public.



# 1. An integrated approach to flood risk management

## Introduction

Flood risk management is the process of assessing, organising and implementing actions to deal with flood risk. The main outcome of the flood risk management planning process should be a set of sustainable actions to reduce overall flood risk across Scotland.

Multiple organisations are involved in managing flood risk. It is therefore essential that an integrated approach, that balances national consistency and strategic decisions with local knowledge and accountability, is adopted.

This section provides guidance on:

- principles that should be adopted to deliver an integrated approach to flood risk management;
- the interaction of flood management with other land and water management decisions;
- involving stakeholders in flood risk management.

## Flood risk management plans

The preparation and implementation of flood risk management plans will be at the heart of future efforts to tackle flooding. The Act sets out a flood risk management planning process that will ensure that long-term and nationally-focused objectives are balanced with local knowledge and priorities. Table 1 summarises the key steps in preparing these plans, and Annex 1 provides further information on key milestones. Once in place, the plans will be reviewed and updated every six years.

**Table 1 Key steps in preparing flood risk management plans**

**(National) Flood risk assessment – by 22<sup>nd</sup> December 2011**

The national flood risk assessment will create a broad-scale picture of the causes and impacts of flooding across Scotland. The assessment will lead to the identification of Potentially Vulnerable Areas that will be used to help target studies, action and investment to reduce flood risk.

**Flood hazard and flood risk maps – by 22<sup>nd</sup> December 2013**

Flood hazard and risk maps will show the likely extent of different flood events and summarise the potential impacts of those events. The maps will include information on all sources of flooding, including rivers, the sea, groundwater and surface water run-off. This information will improve our understanding of flooding problems and inform the selection of actions to manage flood risk.

**Flood risk management plans – by 22<sup>nd</sup> December 2015**

Building on flood risk assessment and mapping exercises, plans will be prepared to coordinate actions across catchments. Flood risk management plans will allow for targeted investments and better decisions to be made about actions to reduce flood risk.

The principal outcome of the planning process should be a set of sustainable actions to manage flood risk across Scotland. These actions should deal with all identified flood risks and should be selected following the guidance set out in this document.

The Act establishes lead roles for key steps in preparing and implementing flood risk management plans, although collaboration between SEPA and the responsible authorities will be required at all stages.

SEPA is responsible for ensuring that the most sustainable actions are identified and included within flood risk management plans. These plans, and the actions they set out, will be subject to approval by the Scottish Ministers. Once identified, these actions must be prioritised over 6 yearly cycles. These national priorities will drive investment decisions. SEPA is responsible for setting out these national priorities, which will be subject to approval by the Scottish Ministers.

Local authorities will lead on agreeing the funding routes and timetables by which actions will be taken forward locally. SEPA and the

responsible authorities are then responsible for implementing the agreed actions.

These steps can not be undertaken in isolation, and SEPA and the responsible authorities must ensure that systems are in place to manage all dependencies, while also ensuring that national exercises, such the national flood risk assessment, make space for local knowledge and priorities.

Although developed through an integrated process that will lead to a single set of objectives and measures for Scotland, information will need to be presented in two closely related sets of plans prepared by SEPA and local authorities (Figure 2).

The first set of plans will be prepared and published by SEPA. These plans will set the strategic direction of flood management across Scotland. They will also support national consultation exercises and fulfil the reporting requirements of the EC Floods Directive.

To promote consistency and integration with River Basin planning, SEPA is required to prepare a flood management plan for each river basin district defined under WFD – a Scotland flood risk management district (covering most of Scotland) and the Solway Tweed cross-border flood risk management district shared with England.

The second set of plans, termed local flood risk management plans, will be published by local authorities. In addition to providing a local expression of the strategic plans prepared by SEPA, these ‘tactical’ plans will include a summary of how actions will be implemented in each local plan area.

Local flood risk management plans will support engagement with local communities and local authorities should add any additional information that they believe is necessary to support this engagement or other local needs.



Figure 2 Roles and responsibilities in preparing flood risk management plans

SEPA and local authorities should integrate as far as practical the presentation, publication and consultation of their respective plans. To support integration of this work, the national plan prepared by SEPA should be comprised of chapters for each river basin in Scotland. This information should then be drawn upon by local authorities when preparing and presenting their local flood risk management plans.

In urban areas, the coordination of actions to tackle surface water flooding in urban areas presents a unique set of challenges. Local authorities will be expected to lead on the coordination of actions to deal with surface water flooding. This work should be coordinated and presented within Local flood risk management plans. These topics are examined further in Section 5.

## Delivering integrated FRM planning

Multiple organisations are involved in managing flood risk. It is therefore essential that a fully integrated approach, that balances the need for national consistency with local knowledge and accountability, is adopted. A top down approach that disengages local authorities and local communities from decision making must be avoided.

### *National consistency*

Adoption of consistent principles, approaches and methods at each step in the process of managing flood risk will ensure a nationally comparable risk-based approach informs management and investment decisions. Areas where consistency will be particularly important include methods adopted to assess flood risk, approaches to considering climate change, and techniques adopted to appraise management options (Table 2). SEPA should lead on ensuring the appropriate level of national consistency is delivered.

**Table 2 Areas where consistency should be promoted**

Assessing and quantifying flood risk
Considering the full range of social, economic, environmental impacts of floods
Examining current and future risk based on climate change scenarios and other long term trends
Promoting and adopting a source, pathway impact approach to assessing and managing flood waters
Considering a full range of actions, paying particular attention to those that restore a catchments ability to slow or store flood water
Communicating flood risk and engaging with the public

### *Balancing local and national needs*

A balance must be struck between national strategies and priorities and local decision making and accountability. This will require close collaboration and a structured planning process that creates the space and time needed to consider any competing needs and reach informed decisions.

Flood management plans should establish the overall strategies, for instance identify the need for particular combinations of actions or management response. Where these actions, for instance a flood protection scheme require significant public expenditure, more detailed design and appraisal work will be required to ensure that the best option and design is selected and tailored to local suit local needs.

### *Joint ownership of plans and actions*

The identification of sustainable flood management actions will require close collaboration between SEPA, local authorities, Scottish Water, and other stakeholders. Ultimately, there must be joint ownership of the plans and the actions set out therein.

Wherever necessary, SEPA should ensure that decisions on setting objectives and identifying measures are taken jointly with the responsible authorities, as well as with others who could contribute to delivering actions and could be affected by decisions. Where agreements on



objectives and measures cannot be reached, SEPA will be responsible for taking the final decision, and should report any difficulties in reaching these decisions to the Scottish Ministers at the earliest opportunity.

The same principles apply to local authorities when developing the implementation plans. Where agreements can not be reached on how actions will be implemented, the Scottish Ministers will determine the content of the implementation plans.

*Creating efficiencies in the development of flood protection schemes*

The promotion of joint working and sharing of skills and expertise should lead to efficiencies of time and resources between SEPA and the responsible authorities. Importantly, the process of preparing flood risk management plans should speed-up the process of taking forward and implementing a flood protection scheme. For example, the information generated by SEPA should fulfil, at least in part, early option appraisal stages of scheme development, while also supporting subsequent, more detailed assessments and appraisals.

Interactions with other aspects of flood management

There will need to be close coordination of flood risk management planning with other aspects of flood management, including the planning system and emergency response (Figure 3).

Planning decisions are one of the most powerful tools available to manage flood risk. This concept is set out in Scottish Planning Policy, which states that development which would have a significant probability of being affected by flooding or would increase the probability of flooding elsewhere should not be permitted. Where redevelopment occurs, the planning system can identify opportunities to build integrated urban drainage and flood

management actions into the fabric of our urban landscapes.

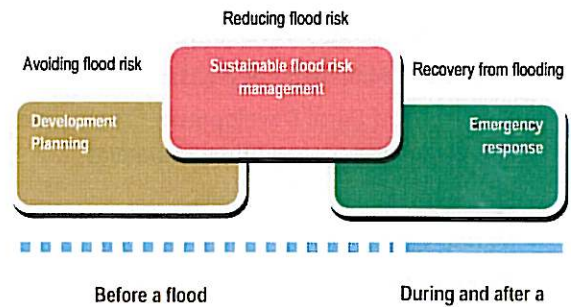



Figure 3 Three elements of flood management

Flood risk assessments and plans produced under the Act will provide additional information that will enable the planning authorities to plan and consider future development with a more complete picture of current and future flood risk.

Scottish emergency planning and response is founded on the concept of Integrated Emergency Management (IEM). Under IEM, preparation and response to emergencies focus on the effects of events rather than their causes. Close ties between Scottish emergency planning and flood risk management planning will need to be established so as to coordinate actions to reduce flood risk with existing work to manage the effects of flooding.

Integrated land and water management

As far as is practicable, an integrated approach to land and water management should be pursued. When developing flood management plans, early links must be made with other relevant aspects of water and land management. In turn the findings from flood management plans should influence other planning initiatives in an interactive and iterative cycle. By making these links, opportunities to deliver multiple benefits should be revealed.



Examples of relevant policy areas include:

- National planning framework;
- Local and strategic development plan;
- River Basin Management Plans;
- The Scotland Rural Development Programme and other land management initiatives;
- Shoreline management plans;
- Marine spatial plans;
- Green Networks;
- Emergency response;
- Economic development plans;
- Asset management and investment plans;
- Climate change adaptation and mitigation.

This is not an exhaustive list. The important point is that connections and dependencies should be considered early so as to allow links and synergies to be established.

The ecosystem services approach (BOX 1) should be used to help create a common framework upon which flood management decisions can be balanced with other environmental decisions, for instance, land management, spatial planning, environmental regulations and river basin management.

River Basin Management Planning, which is led by SEPA, takes a source-to-sea approach to integrating land and water management to improve the quality of Scotland's Waters. The FRM Act requires consistency and coordination between River Basin Planning and flood management. Examples of where SEPA should ensure consistency and coordination include:

- where possible, promoting restoration measures that deliver coincident flooding and environmental benefits, as well as demonstration projects on natural flood management techniques;
- operating its monitoring regime so as to provide information about flooding;
- managing the membership and functions of advisory groups and consultation activities, so as to reduce consultation fatigue.

A key aim of river basin management is striking the right balance between protecting and improving the environment and supporting the social and economic needs of those who depend upon or are affected by water. SEPA must strike this balance when operating its regulatory regimes. Areas of particular importance to flood management include the operation of reservoirs, CAR licensing of flood protection schemes, land drainage and the maintenance of watercourses and flood defences.

#### BOX 1 Ecosystem services


Our natural environment contains stocks of natural capital that underpin our economic activity, our well being and the earth's life support systems. The food we eat, the water we drink and the air we breathe are only available to us because the natural environment cycles nutrients, purifies water and generates oxygen.

This natural capital is locked within a series of living, interacting systems – ecosystems – of which people are a part. A river system and the land around it could be described as an ecosystem, as could an upland landscape of forests and moorlands, or the agricultural lowlands. In these systems, people, other living things and the environment all interact. These and other ecosystems provide the natural services (often termed ecosystem services) that we need. Well-functioning ecosystems provide these services very cost-effectively compared with other alternatives.

The ecosystem approach offers a powerful framework to better understand, value and account for the physical, biological and chemical interactions/ interdependences within and flowing from ecosystems.

The information, knowledge and structures created to support flood risk management should also be used to support continued improvements to River Basin Planning. The greatest opportunities are likely be in the





areas of diffuse pollution, water resources and hydromorphology, all of which should benefit significantly from the information, tools and knowledge that will be generated through the preparation of flood risk management plans.

Longer term, SEPA should work towards a more complete integration of River Basin Planning and Flood Risk Management Planning so as to develop a unified approach to protecting and managing Scotland's water resources.

## Involving stakeholders

SEPA and the responsible authorities will need to work in partnership with communities to help them understand flood risk, while encouraging them become involved in decision-making and flood management actions. This will include giving communities a bigger say in what action is taken and a more active role in decisions on local funding priorities. Ultimately, SEPA and the responsible authorities should be accountable for the decisions they take.

Opportunities for stakeholder participation should be incorporated at all stage of flood risk management, from the preparation of flood risk management plans through to schemes and projects. Engagement with interested parties should aim to gain a sound understanding of local issues and an appreciation of the concerns of individuals, communities and businesses potentially affected, as well as more strategic and national perspectives.

Information should be conveyed to stakeholders in a transparent way, using plain language to enable stakeholders to gain a better understanding of the appraisal decisions that affect them.

To support the preparation of flood risk management plans, the Act provides for creation of advisory groups. The groups, which must include representation from a wide

range of interests, will provide an important forum for discussing flood management and engaging with the stakeholder community. SEPA and the responsible authorities will need to consider how best to engage with existing stakeholder forums and whether further fora will need to be established.

### Consultation questions

1. Do you agree that the outcomes described in the introduction will support improvements to how floods are managed across Scotland? If not, please describe your concerns or alternative outcomes.
2. Do you agree that local authorities should lead on surface water management and that this work should form part of a local flood risk management plan? If not, please describe your concerns and alternative proposals.
3. Do you support the active role of stakeholders in flood management planning and do you have views on how to ensure stakeholders can be become more involved in decision making?



## 2. Delivering responsibilities collectively

### Introduction

Responsibilities for flood risk management are divided between different organisations. Strong partnerships, founded on common aspirations, will be needed to deliver coordinated or joint actions, aligned investment planning and efficient use of resources. Finding new ways to share skills, expertise and services will be important to delivering partnership working.

This section provides guidance on:

- the statutory framework for partnership working;
- what it means to adopt a partnership approach to flood risk management;
- building the right kind of partnerships;
- governance and resourcing arrangements.

### General duties on the Scottish Ministers and public bodies

Section 1 of the Act places a set of general duties on the Scottish Ministers, SEPA, and the responsible authorities (Table 3). SEPA and the responsible authorities must embrace and build on these statutory responsibilities to create a framework for partnership working that is underpinned by a common set of goals and responsibilities.

This will, at times, mean rethinking traditional responsibilities built around individual organisations. This will involve promoting joint working practices and initiatives; ultimately leading to greater consistency in the way flooding is managed.

Table 3 General duties on SEPA and the responsible authorities (based on Section 1 of the Act)

Exercise functions to reduce overall flood risk
Exercise functions to secure compliance with the Floods Directive
Act with a view to achieving objectives set out in flood risk management plans
Have regard to the social, environmental and economic impact of exercising functions
Act in the way best calculated to manage flood risk in a sustainable way
Promote sustainable flood management
Act with a view to raising public awareness of flood risk
Act in the way best calculated to contribute to sustainable development
So far as practicable, adopt an integrated approach by cooperating with each other

### A partnership approach to flood management

Many public bodies have already recognised the benefits of working in partnership, either on an informal or a more formal basis. If approached effectively and in a focussed way, joint working can yield a range of benefits:

- by identifying and removing duplication of effort and by sharing resources and information efficiencies can be found;
- sharing of expertise allowing each organisation to focus on its strengths and avoid the need to develop/maintain expertise where it exists elsewhere;
- building relationships to help deliver in one area of work can lead to benefits and improvements in other common areas;
- partners can often add value by tapping into a wider pool of resources and expertise.

SEPA and the responsible authorities must work across traditional institutional boundaries to deliver an integrated approach to flood management. This will require adoption of partnership working at all levels of flood management, from national strategic partnerships through to local/operational





partnerships that deliver coordinated actions on the ground. This is not to say that everything must be delivered in partnership; and SEPA and responsible authorities should identify areas where it would not be realistic to deliver their responsibilities collectively, this should include areas where it is clear that they can achieve more working alone.

A wide range of powers exists in statute to support partnership work and joint delivery of projects and services. SEPA and the responsible authorities should draw on these powers and arrangements to support their work to manage flood risk.

## Building the right type of partnership

When developing flood risk management plans, SEPA and the responsible authorities should work in partnerships founded on collaboration and co ownership of issues and actions (Table 3). These partnerships should be formed around the key units of management for preparing flood risk management plans, as described in Section 1.

To support operational work (which could include implementing changes to SEPA's flood warning service, implementing flood protection schemes, asset management, awareness raising campaigns, or integrated urban drainage projects) a wide range of partnership models will need to be adopted depending on particular circumstance and aims (Table 4).

In some cases a less formalised arrangement may be suitable, with the partnership consisting largely of a steering group whose aim is to improve co-ordination of day-to day service delivery. Conversely, integrated drainage projects may require a partnership based on full co-ownership of work and deliverables, supported by joint funding arrangements. Funding arrangements are discussed further below.

Table 4 Common types of partnership arrangements

Degree of Partnership	Characterised by...
<i>Co-existence</i>	<b>"You stay on your turf and I'll stay on mine"</b> (May be a rational solution - where clarity is brought to who does what and with whom)
<i>Co-operation</i>	<b>"I'll lend you a hand when my work is done"</b> (Often a pre-requisite of further degrees of partnership, where there is early recognition of mutual benefits and opportunities to work together)
<i>Co-ordination</i>	<b>"We need to adjust what we do to avoid overlap and confusion"</b> (Where the partners accept the need to make some changes to improve services/activities from a user/customer/community perspective and make better use of their own resources)
<i>Collaboration</i>	<b>"Let's work on this together"</b> (Where the partners agree to work together on strategies or projects, where each contributes to achieve a shared goal)
<i>Co-ownership</i>	<b>"We feel totally responsible"</b> (Where the parties commit themselves wholly to achieving a common vision, making significant changes in what they do and how they do it)

Whatever partnership model is being adopted, careful consideration should be given to whether the partnership should be formed through informal working relationships or be bound by legal agreements.

Consideration will also need to be given to who should be represented. Partnerships typically encompass members with three distinct roles:

**Decision makers** – the organisations that need to be involved in decisions and investment;

**Consultees** – the organisations or individuals who should be consulted for their advice or views but do not necessarily need to be regularly involved in all decision-making;

**Informed parties** – the organisations or individuals which may be interested in the outcomes of the partnership and should be kept informed but who are unlikely to have strong views about the decisions being made.





## Governance arrangements

It is important that the partnerships are underpinned by a clear governance and decision making forum. These arrangements should promote accountability among the partners, and with those affected by decisions: shared responsibility should not mean diminished accountability.

Flood management plans cannot be completed until agreements over funding and implementation timetables are reached. Delays in reaching agreements could affect delivery and approval of the plans and result failure to meet statutory deadlines. It is important therefore that arrangements are in place within each organisation to secure agreements on flood management objectives and measures and their implementation.

To help ensure agreements can be reached, SEPA and the responsible authorities must establish the necessary forums, advisory groups and governance arrangements to support their flood management work. This could include the creation of boards to oversee the work of individual partnerships.

## Managing partnerships

It is unusual to find a successful partnership that does not have some dedicated administrative and programme/project support, or at least a firm commitment from members' organisations to the significance of the partnership and to the importance of time devoted to it by members.

SEPA and the responsible authorities should examine the need for dedicated staff to support the management of the partnerships formed to develop and implement flood risk management plans.

More generally, each organisation will need to ensure that:

- they have the time to contribute effectively at meetings, operate on behalf of the partnership between meetings and

implement appropriate actions within or on behalf of their organisation;

- partnership skills and behaviours are embedded throughout the organisation so 'partnership behaviour' is not limited to those who sit round partnership tables;
- key members of the partnership are given guidance on delegated authority and support to fast-track decisions that it is not possible to make round the partnership table.

## Sharing services

Shared services is the convergence and streamlining of similar functions within an organisation, or across organisations, to ensure that they are delivered more efficiently than working alone, for instance, through economies of scale, access to specialised skill-sets and expertise.

SEPA and the responsible authorities should challenge themselves to collaborate, and engage in sharing services as an integral part of the partnerships formed to deliver flood risk management. This should include considering joint initiatives and consolidation of services that can be shared with others.

Examples of area where there may be benefits to be gained from a shared service approach include:

- establishment and procurement of 3rd party projects;
- creation and sharing of flood risk management data, information and knowledge;
- awareness raising exercises, web tools to access to flooding information and other communications work;
- training and building of skills and expertise;
- programme and project management.

Formal agreements such as service level agreements or memoranda of understanding should be established to manage the interdependencies and resource implications of



sharing services. In all cases, these arrangements should be used to promote innovation and improvement.

## Resourcing

Delivering the actions set in flood management plans will require significant investment of public funds. SEPA and the responsible authorities should investigate and apply different forms of joint resourcing (Table 4).

As a minimum, all resource commitments must be aligned. However, in many instances, joint funding commitments or pooling of resources may be necessary. For instance, between local authorities working to deliver coordinated actions across a catchment, or between local authorities and Scottish Water when coordinating their respective work to deliver integrated urban drainage.

Type	Examples
Aligning resources	<ul style="list-style-type: none"> <li>- Co-ordination of planning across partner organisations</li> <li>- Targeting funding from different agencies in the same areas</li> <li>- Lead or joint commissioning of related services</li> </ul>
Pooling non-financial resources	<ul style="list-style-type: none"> <li>- Time spent on partnership or inter-agency groups</li> <li>- Information generation and sharing</li> <li>- Different partners providing different elements in combination to provide a service (e.g. awareness raising campaigns)</li> <li>- Secondment of staff with specialist skills to projects or multi-disciplinary teams</li> <li>- Shared use of facilities or equipment</li> </ul>
Joint funding	<ul style="list-style-type: none"> <li>- Joint funded posts</li> <li>- Jointly funded data, tools or models</li> <li>- Contributions to specific activities -- with funds managed by one agency</li> </ul>
Pooling budgets	<ul style="list-style-type: none"> <li>- To deliver coordinate drainage works or other projects</li> <li>- Creating centres of excellence or expertise in flood management</li> </ul>

## Consultation questions

4. Do you agree that the type of partnership working set out in this section will be necessary to deliver flood risk management plans and actions? Are there any alternative arrangements to partnership working that should be set out in the guidance?

5. Do you have views on barriers to partnership working and how these can be overcome?



# 3. Understanding flood risk

## Introduction

Flood risk is a measure of the likelihood that an event will happen and of the potential consequences of that event. The long-term aim of all flood management decisions is to reduce these risks.

Robust and reliable information on the causes and consequences of flooding will be needed to promote well informed decisions on how to tackle flooding risk.

This section sets out guidance on:

- understanding flood risk;
- considering the affects of climate change and other long term trends;
- dealing with uncertainty.

## Sources of flooding

There are many potential sources of flooding. In fulfilling their flood risk management responsibilities, SEPA and the responsible authorities should focus on those sources of greatest risk, which should include the following primary sources of flooding.

- *River flooding* that occurs when the water draining from the surrounding land exceeds the capacity of the watercourse.
- *Coastal flooding* caused by a combination of high tides and stormy conditions.
- *Surface water (pluvial) flooding* caused when rainfall water ponds or flows over the ground before it enters a natural or man-made drainage system or watercourse, or when it cannot enter because the system is already full to capacity.
- *Sewer flooding* that occurs when combined sewers are overwhelmed by heavy rainfall.

Sewer flooding is often closely linked to surface water flooding, and may contain untreated foul water.

- *Groundwater flooding* that occurs when water levels in the ground rise above surface levels.
- *Reservoir flooding and flooding from other infrastructure.* Some infrastructure, including dams and canals hold large volumes of water above ground level. Although unlikely, infrastructure failure could result in a large volume of water being released very quickly.

Scottish Water already has statutory responsibilities for maintaining the sewerage network. Floods caused solely by a failure in or blockage of a sewerage system should be dealt with through these existing channels.

## Analysing flood risk

### *An integrated approach to assessing risk*

Many of the assessments undertaken by SEPA will be strategic level assessments that will support the preparation of flood management plans. In some cases, these assessments will identify where more targeted or detailed assessment should be carried out, potentially by local authorities or Scottish Water.

Ultimately this should form a cyclic process where information and knowledge is built up over planning cycles (Figure 4).

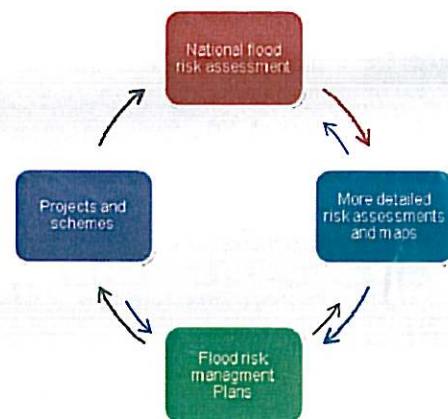


Figure 4 Cycle of information and knowledge growth

To support the delivery of this integrated approach to assessing and managing flood risk, SEPA should:

- publish and maintain advice on assessing, modelling, mapping and sharing data. In doing so, SEPA should work alongside the responsible authorities and other organisations to ensure that the information meets the needs of all relevant organisations.
- take all practicable steps to ensure that national assessments, including the national flood risk assessment and national flood maps, thoroughly consider and reflect local risks and issues.
- ensure that information generated on flood risk can be used in a consistent way at all stages of the flood risk management planning process, and in particular in the appraisal of options to manage flood risk.
- create and manage a repository of information on flooding and its impacts that can be shared with the responsible authorities and other interested parties.

The responsible authorities should provide active support and information to help SEPA in this work. The Act provides SEPA and local authorities with information request powers and powers to seek assistance. These powers should only be exercised after all efforts to obtain information in a cooperative manner have been pursued.

#### *Likelihood of flooding*

For flood mapping purposes, the Act requires three flood scenarios to be assessed: high, medium and low probability floods. The Scottish Government will issue regulations defining the flood probabilities that should be applied to each scenario.

A variety of methods can be used to estimate the probability of flooding. SEPA should take a lead role in developing and disseminating guidance on the analysis of flood probabilities, including techniques to examine multiple or combined sources of flooding.

In many instances, different sources of flooding can combine to intensify flooding. For instance, high tides in estuaries can occur simultaneously with high river levels. Understanding these interactions (including their likelihood) will be an important part of understanding and managing flood risk.

#### *Characteristics of a flood*

The causes and consequences of flooding can only be fully understood when the characteristics of a flood are examined. The Act specifies particular flood hazard characteristics that must be assessed and mapped, which are described in more detail in Table 5. Where necessary, additional factors should be considered to give a full picture of the likely impacts resulting from a flood.

Table 5 Flood characteristics	
Characteristic	Significance
Extent	Helps show where flood waters will penetrate and what may be affected.
Depth	Helps understand the potential impacts of a flood. For instance, extensive shallow water flooding is likely to be less damaging than more localised areas of deeper water
Duration	The duration of a flood can have an impact on the damage caused, for long duration flooding can increase impacts to crops and services.
Velocity/flow	High velocity flood waters can increase risk to health and safety and cause greater damage.
Water quality	Flood that carry pollutants, for instance where sewer flooding occurs often carry a greater risk to health and safety as well as the potential to cause greater economic damage.
Sediment content	Flood waters with a high sediment or debris content can create additional risks to health and safety, and may increase the risk of damage to infrastructure (e.g. bridges).

#### *Assessing the impacts of flooding*

A wide range of impacts to society, the economy, the environment and cultural heritage should be assessed, including those set out in Table 6.





**Table 6 Measuring the impacts of flooding**

Impact	Categories and descriptions
Human Health (Social)	<i>Human Health:</i> Includes immediate or consequential impacts
	<i>Community:</i> Impacts to emergency response, education, health and social work facilities
Environment	<i>Waterbody Status:</i> permanent or long-term impacts to ecological or chemical status of surface water bodies including those caused by hydromorphological impacts of flooding.
	<i>Protected Areas:</i> adverse permanent or long-term impacts to protected areas or waterbodies.
	<i>Pollution Sources:</i> sources of potential pollution in the event of a flood, such as IPPC and Seveso installations, or point or diffuse sources.
	<i>Other:</i> Other potential permanent or long-term environmental impacts, such as those on soil, biodiversity, flora and fauna, etc.
Cultural Heritage	<i>Cultural Assets:</i> permanent or long-term impacts to cultural heritage, which could include archaeological sites / monuments, and architectural sites.
Economic	<i>Property:</i> impacts to property, which could include homes
	<i>Infrastructure:</i> impacts to infrastructural assets such as utilities, power generation, transport, storage and communication.
	<i>Rural Land Use:</i> impacts to uses of the land, such as agricultural activity (livestock, arable and horticulture), forestry, mineral extraction and fishing.
	<i>Economic Activity:</i> impacts to sectors of economic activity, such as manufacturing, construction, retail, services and other sources of employment.

To gain a fuller appreciation of the impacts of flooding, SEPA and the responsible authorities should also consider the following factors:

- what will be exposed to the flood;
- the vulnerability of those things that are exposed to the hazard;
- the value of things exposed to the hazard.

Wherever possible, two aspects of vulnerability should be considered – susceptibility and resilience. Susceptibility is a measure of how prone to impacts particular elements will be during a flood event. For instance, the elderly, frail or sick can be more susceptible to injuries

or loss of life. Resilience is a measure of the ability of something to recover from a flood. For instance, properties can be designed to be more resilient to flooding through the use of water resilient materials.

Measuring impacts to environmental factors poses significant challenges, and concepts like ecosystem services should be used to help assess these impacts.

Flooding can also cause a wide range of indirect impacts, for instance, the costs of transport disruption or the costs to emergency services. It is important that these impacts are included wherever practical to do so.

#### *Residual risk and the effectiveness of actions*

Residual risk is the risk that remains after management actions have been taken. Residual risks often have a low probability of occurrence, although the impacts can be severe. Residual risk should be considered in flood management decisions, and all actions to manage flooding should include arrangements to deal with residual risks.

Understanding the effectiveness of existing actions and residual risk is an important step in identifying management actions. For instance:

- How well are flood defence structures performing against their initial design standard?
- What difference does flood warning make to public safety?
- What are the consequences of an event exceeding the design standard?

It is important that existing actions to manage flooding and their effectiveness are taken into account wherever it is practical to do so, particularly when undertaking work that will influence investment decisions, e.g. assessing areas vulnerable to flooding or preparing flood risk management plans.





## Source–pathway–receptor– impact model

A good understanding of the links between the sources and impacts of flooding can help identify the right combination of measures to tackle particular flooding problems. For instance, where high rates of run-off in upland areas is contributing to flooding problems, measures to store or slow run-off could be considered, including re-vegetating a hill slope to increase the interception of rainfall and increase the roughness of the land surface, thereby slowing runoff.

The same principles apply in urban areas, where an understanding the sources and pathways of flood waters can help identify where features to store or divert flood waters, including detention ponds and other Sustainable Urban Drainage System should be located. Urban drainage is discussed in more detail in section 5.

To help understand the interaction of different actions across catchments and coastlines, SEPA and the responsible authorities should adopt what is commonly referred to as source – pathway– receptor –impact approach.

The approach is a well-established framework in flood risk management. It provides a basis for understanding the causal links between the source of flooding, the route by which it is transmitted and the receptor, which suffers some impact:

- *Sources* are the weather events or conditions that result in flooding (e.g. heavy rainfall, rising sea level, waves, river flows etc);
- *Pathways* are routes between the source of flood waters and the receptor. These include surface and subsurface flow across the landscape, urban drainage systems. The hydrological cycle can provide valuable insights into the pathways of flood waters;

- *Receptors* are the people, industries and built and natural environments that can be impacted upon by flooding;
- *Impacts* are the effects on receptors. The severity of any impact will vary depending on the vulnerability of the receptor

## Quantifying flood risk

Risks are evaluated by combining likelihood and impact. This can be achieved in a variety of ways, and the approach adopted should reflect the purpose of the assessment, the scale of the assessment and the data available.

There will be times where risk thresholds will need to be set, for instance, when undertaking the national flood risk assessment. Risk thresholds are highly subjective and can be influenced by societal preferences, values and opinions of acceptability. SEPA and the responsible authorities should maintain a steady opinion of flood risk and its significance or acceptability. This must be done within the context of Government guidance and policy on these matters.

## Climate change and other long term trends

Testing flood management actions against long term trends is essential to selecting sustainable actions that will stand the test of time. SEPA and the responsible authorities should work to establish approaches to examining future scenarios that can be applied consistently across flood risk assessments and management decisions. Wherever possible, a range of future scenarios should be examined, including a 'worst case' scenario.

Climate change is likely to have the most substantial impact of flooding. SEPA in collaboration with the responsible authorities should work to improve information on the affects of climate change on flood risk. This should include using information gathered over implementation cycles to detect changes



in flood patterns, and developing new methods to detect and assess trends.

Other long term trends that could have a measurable impact on flood risk should also be considered, including urban creep, changes in land-use and societal changes.

## Dealing with uncertainty

Floods are infrequent phenomena for which it is difficult to establish the exact assessments. Uncertainties can be divided into three main areas:

- natural variability, which can be subdivided into natural variability in time and natural variability in space;
- knowledge uncertainties that come from a lack of knowledge, for example about the behaviour of defences or climate change;
- modelling and data uncertainties in the quality of models or data that supports assessments, design and appraisal.
- fundamental uncertainties about things we cannot know, for example the distant future.

Uncertainty should be clearly presented in flood risk assessments showing what approaches have been used and how decisions have been influenced.

## Communicating flood risk

It is important that the public understand the flood risk that they face. These can be complex concepts to explain. This means that special attention must be given to how information on flooding is conveyed to the public. Experience suggests that simply stating 'return periods' or probabilities for particular events can be very confusing, particularly to communities who have recently experienced flooding.

SEPA and the responsible authorities must investigate a range of options for expressing flood probabilities and risk to the public. This should include providing information on the

chance that an individual or community could be affected by a flood, rather than information on the likelihood of particular flood occurring. Comparisons to other risks people face in daily life could also be used to help explain flooding issues. As no comparison is perfect, this approach should not be relied upon in isolation.

Where risk thresholds have been used, for instance when identifying areas potentially vulnerable to flooding, they must be accompanied by clear explanations of the criteria used, how risks were calculated or estimated, and how thresholds have been set.

### Consultation questions

6. Do you support the risk-based approach as set out and its importance to flood risk management? If not, please describe your concerns and alternative proposals.

7. Do you agree that SEPA should publish and maintain advice on assessing, modelling, mapping and sharing data? If not, please describe your concerns and alternative proposals to delivering consistent assessments of flood risk.

8. Do you have any other views on how to simplify the communication of flooding information to the public?





## 4. Understanding and working with catchments

### Introduction

Actions that affect one part of a river or coastline can have consequences elsewhere. This means that flood management measures are most effective when they are coordinated across catchments and along coastlines in a way that is uninhibited by administrative boundaries.

Adopting a catchment approach to flood risk management requires an appreciation of catchment and coastal processes, and an understanding of how best to manage the sources and pathways of flood water. This includes looking at how the timing, magnitude and duration of a flood event can be altered by reinstating natural features and characteristics of the landscape, including wetlands, vegetation and functional flood plains.

This section provides guidance on:

- setting appropriate units of management;
- the application of a source–pathway–impact approach flood management;
- the role of land use and restoration in managing flood risk;
- promoting and balancing the needs of the rural sector.

### Catchment management units

SEPA and the responsible authorities must coordinate their actions to tackle flood risk across catchments. In most cases this will require coordination of actions at the scale of the river basin– i.e. a catchment that drains to the sea (Figure 5).

In some cases it may be appropriate to sub-divide river basins into smaller catchments (also referred to as sub-basins) to allow for more detailed assessment and analysis of management options. When assessing options to tackle urban surface water flooding, small urban drainage catchments should be defined to promote detailed analysis of the urban landscape.

Where river basins are separated into smaller catchments, all the interactions, physical and ecological, with the larger river basin in which they are located must be understood.

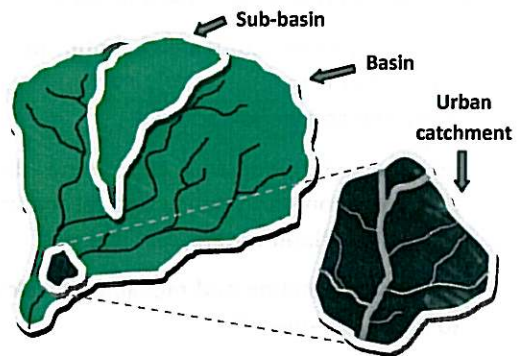


Figure 5 Basins, sub-basins and urban catchments

SEPA should work closely with the other responsible authorities to identify the appropriate spatial scales and catchments around which flood risk management efforts should be targeted.

Many of the principles that apply to catchments also apply to coastal areas, with actions in one place potentially affecting other areas of the coastline. In identifying appropriate management units for coastal areas, SEPA should give careful consideration to coastal and estuarine processes and interactions between coastal areas and catchments.

### Understanding catchments

Our natural landscape can play an important role in managing flood risk. Over time, human activities have altered the character of our



landscape and affected the timing, magnitude and duration of flood events. For instance compacted soils, changes in land cover and increased field drainage can all increase run-off and peak flood flows.

Restoration of natural features of the landscape (e.g. flood plains, wetlands and forests etc) can help to restore more natural run-off patterns and reduce flood risk;

These more natural techniques typically protect, emulate or restore the natural processes which regulate flooding and erosion, often by keeping water in areas where it will cause less damage. Examples include:

- improving water storage and capturing run-off by restoring, protecting or enhancing soil condition and woodland areas;
- reconnecting floodplains, restoring wetlands or creating on-farm ponds and reservoirs to help store flood waters;
- planting vegetation and managing hillslopes to help slow run-off;
- restoring watercourses to a more natural channel form by removing culverts and other structures that constrain channels and contribute to flooding during high flows;
- reducing the pressure of sea level rise and coastal erosion through managed realignment or regulated tidal exchange.

In urban areas, green roofs, permeable paving, surface water attenuation ponds, opening up and realigning watercourses, and establishing blue corridors are equivalent examples.

To provide insights into the causes of flooding and the types of management options available SEPA, in close collaboration with the responsible authorities other organisations with an interest in catchment management, should work to develop an improved understanding of the hydrological, ecological and geomorphological condition and functioning of Scotland's catchment. This should include assessments of the effects of human interventions on flooding processes.

The condition of our soils, our water resources and the health of our ecosystems are all influenced by processes that occur within and across catchments and coastlines.

Understanding and managing these interactions will create opportunities to invest in actions that can simultaneously reduce the risk of flooding, while also improving the quality of our natural environment. SEPA should ensure that information generated on catchment characteristics and natural features can be used to support other work areas, including River Basin Planning and the selection and design of environmentally sensitive engineered defences.

SEPA is also responsible for assessing how the restoration or enhancement of natural features and characteristics of catchments could contribute to managing flood risk. In preparing these assessments, SEPA should work to create information that can be used in the appraisal of flood management options. SEPA should also work to identify any additional benefits that can be delivered from these actions, thus ensuring that the full value of these options can be considered.

## State of knowledge and using reliable science

The state of knowledge on these natural techniques is still evolving. Robust and reliable science must be applied at all stages of flood risk management. SEPA should draw on its environmental and hydrological expertise so as to advise its partners and the wider stakeholder community on the benefits and role of these techniques. This should include supporting research and promoting demonstration projects.

The uncertainties associated with using more natural approaches are greater than those for more traditional engineering. It is expected that these uncertainties will diminish as the evidence base expands, and these uncertainties should not be seen as a barrier to adopting these techniques.





SEPA and the responsible authorities must ensure that these uncertainties are examined and communicated to those who may benefit or be affected by the use of these techniques.

## Promoting and balancing the needs of the rural sector

Rural land use is important to the Scottish economy. A large proportion of Scotland's land is under agricultural production and the sector is responsible for much of Scotland's domestic food supplies and exports. Rural land use also creates many wider economic, environmental and social benefits, with a large number of people directly employed in this sector.

Some of the greatest opportunities to restore our landscapes natural capacity to cope with floods are in rural areas. However, compromising important areas of agricultural production or forestry could have serious impacts on rural economies and food production. In preparing flood risk management plans, SEPA and local authorities should carefully consider the views and needs of land owners so that the correct balance is struck between all competing demands on the rural sector.

Funds are also available to support voluntary action, including the Scotland Rural Development Programme (SRDP) and SEPA's restoration fund. The SRDP supports sympathetic management of land by promoting actions that reduce the effects of pollution, deliver biodiversity benefit, flood management and other societal and environmental benefits.

SEPA and responsible authorities should carefully consider how the range of existing funding routes and instruments can be used to support flood management and wider restoration initiatives. For example, in allocating funding for environmental improvements SEPA should promote projects

that deliver coincident flooding and environmental benefits.

Where land management and restoration forms part of a flood protection scheme, local authorities have a wide range of powers to compensate land owners/managers. Options include one off payments, service agreements and compulsory land purchase. In all cases voluntary action or voluntary agreements should be pursued ahead of other options.

The Scottish Government will continue to work with stakeholders and local authorities to ensure that local authorities have access to a wide range of instruments to compensate those who could contribute to, or be affected by, flood management decisions. Particular attention will be paid to any limitations of current instruments and to instruments that encourage land owners to participate through voluntary actions.

### Consultation questions

9. Do you agree that SEPA should take a lead role in assessing catchment characteristics and promoting a catchment approach to flood risk management?

10. Is there any further guidance needed at this stage on promoting the needs of the rural sector or other sectors?





## 5. Integrated urban drainage

### Introduction

Urban drainage is a complex interaction of piped systems, watercourses, and other features of the urban landscape, like roads and paths, that by design or otherwise perform a drainage function.

It is widely recognised that an integrated approach to urban drainage, that ensures that above and below ground parts of the drainage system work in concert to deliver benefits for flood risk management, the environment and water treatment.

This section provides guidance on:

- delivering an integrated approach to urban drainage;
- inclusion of surface water management within the preparation of flood risk management plans;
- interactions with River Basin Management.

### Urban drainage and flooding

Urban drainage involves the interaction of many different components of above-ground and below-ground drainage. Following a rainfall event, surface water runoff will normally flow above-ground until it reaches a receiving body (storage pond, stream or low point in the catchment), or it enters the below-ground piped drainage system, typically through a series of gullies, eventually making its way to a receiving body of water or a wastewater treatment works.

These systems are not designed to deal with severe storms and can never be built large enough to accommodate the most extreme rainfall events. This means heavy rainfall events can cause flooding when the capacity of

part or all of the drainage system is exceeded, which can include when:

- capacity of the below-ground system is overwhelmed by the rate of flow;
- surface runoff cannot enter the below-ground drainage system due to limited capacity of drainage inlets (by design or through poor maintenance);
- systems cannot drain effectively because of they cannot discharge at their downstream outfall, possibly due to high levels in receiving waters.

Where run-off is conveyed through combined sewers, as is the case in older developments, a mixture of surface water and untreated discharges can spill out from the system if it becomes overwhelmed.

Potentially hazardous contaminants can also enter the system at several points and lead to pollution of land and receiving watercourses. Under the Controlled Activities Regulations, all new developments must drain surface water through Sustainable Urban Drainage systems (SUDs) before it enters receiving watercourses.

A number of factors can, if uncontrolled, place additional pressure on urban drainage, potentially resulting in increased flood risk and pollution. For instance increases in the proportion of impermeable ground in existing developments as people pave over gardens;. Likewise climate change is likely to place pressure on existing drainage systems.

### An integrated approach to urban drainage

The long term answer to urban water management cannot be continual upgrading of sewerage infrastructure, for instance by creating ever larger pipes and subsurface storage, as this would be impractical and prohibitively expensive.

Instead, an integrated approach to urban drainage that takes account of all aspects of



the urban drainage systems and produces long term and sustainable actions must be deployed. This requires examination of the sources, pathways and receptors of flood waters to ensure that during any event the flows created can be managed in a way that will cause minimum harm to people, buildings, the environment and business.

A key component of this approach is to manage surface water before it enters the sewer system or receiving watercourse by allowing for the increased capture and reuse of water; increased absorption through the ground; and more above-ground storage and routing of surface water separate from foul sewer system.

This approach will not only help reduce surface water flooding, it will also help to reduce pollutant inputs to watercourses and reduce the reliance on infrastructure, e.g. culverts that can damage the water environment. It can also create other recreational, amenity and economic benefits through the creation of green spaces and opportunities for urban regeneration.

Good surface water management will involve increased use of SUDS and creation of surface water flow routes that divert floods to areas where impacts will be minimised. The best solutions will be achieved when the full drainage system, from source to receiving water, is designed from the outset. This allows the optimum balance between source, site and regional controls to be achieved.

To deliver these changes, integrated urban drainage must be a key consideration in planning decisions, so that sustainable drainage is embedded into the fabric of our urban landscapes.

The principles set out in BOX 2 should be adopted by SEPA and the responsible authorities to support the delivery of integrated urban drainage.

#### BOX 2 Principles to support integrated urban drainage

- increase the percentage of new surfaces that are permeable;
- aim to deal with storm water runoff from impermeable surfaces as close to source as possible;
- minimise the amount of drainage going underground as this is often an inflexible solution that cannot deliver wider benefits or be easily adapted to future conditions;
- maximise opportunities to manage surface water before it enters the sewer system;
- design for exceedence by ensuring that the development has flood plains and safe flow paths.

## Flood risk management plans and integrated urban drainage

Local authorities will be expected to lead on the coordination of actions to deal with surface water flooding, and to do so in a way that respects the principles of integrated urban drainage (BOX 2). This work should be undertaken as part of the process of preparing a local flood risk management plan. This will ensure that surface water management decisions are undertaken in consideration of other flood management actions and interactions with the wider catchment.

In taking this work forward, careful consideration will need to be given to responsibilities for delivering and maintaining all parts of the drainage system, with particular attention given to responsibilities where the system, or parts of the system, performs more than one function. The aim should be to find a fair and practical way to share costs and responsibilities for the whole drainage system.

SEPA and Scottish Water will need to engage proactively in this work, offering support,



expertise, data and models to local authorities. This should include drainage studies and, wherever possible, contributions to overland flow modelling and mapping.

SEPA should also provide guidance to support the development of integrated modelling, both above and below ground and with the wider catchment. This could be delivered through the provision of advice or the establishment of guidance standards for modelling.

## Prioritising effort

The level of effort invested in understanding and tackling surface water and drainage flooding problems must be proportionate to the risks they present. In complex urban settings where the risk of surface water flooding is significant, detailed urban studies and planning is likely to be required.

In determining the level on the effort needed to investigate and manage surface water flooding, consideration should be given to:

- future urbanisation/redevelopment –urban expansion or regeneration presents a challenge to existing drainage systems but can also become an opportunity to address long-standing problems;
- evidence of surface water and sewer flooding– past flooding is a reliable indicator of future flooding.
- asset knowledge– where there are complex drainage systems, solutions are more likely to require detailed studies and a partnership approach.

SEPA and the responsible authorities will need to decide early in the first planning cycle where detailed studies and planning will be necessary to tackle surface water flooding. The national flood risk assessment prepared by SEPA should provide information to help target effort in the first planning cycle. Longer term needs should then be coordinated through flood risk management plans, for instance by identifying where detailed drainage studies are required.

## Interactions with River Basin Management

By adopting a source to sea approach that recognising interaction across catchment and coastlines, river basin management provides for an integrated approach to protecting and improving the water environment.

Water quality problems can occur where surface water and sewage are transported in the same pipes. The overflows that are designed into these systems to help protect properties during periods of heavy rainfall can significantly increase pollution to receiving watercourses. Contaminants can also enter the system at several points and lead to pollution of watercourses.

Man made changes to the morphology of urban watercourses can also cause widespread environmental damage. River straightening, realignment, culverting and alterations to bank side vegetation can damage important habitats. These actions can also lower the natural resilience of water courses to erosion which can cause sediments to accumulate leading to increased flood risk.

Integrated urban drainage and better management of surface water should be used to drive improvements to the water environment. SEPA must work closely with Scottish Water and local authorities to ensure that opportunities to deliver improvements to the quality of Scotland's water environment are exploited. This will require close coordination with River Basin Management Plans.

### Consultation questions

11. Do you support the principles of integrated urban drainage set out in this section? If not, please provide views on alternative principles.

12. Do you have views on any alternative approaches to targeting effort to assess and manage surface water flooding?





## 6. Selecting sustainable actions

### Introduction

**The main outcome of the flood risk management planning process should be a set of sustainable actions to reduce overall flood risk across Scotland.**

Flood risk management plans will incorporate a wide spectrum of actions, ranging from national policies to flood protection schemes to awareness raising activities. All options must be identified and considered within a structured appraisal process. This will ensure that options are considered in a consistent way, that alternative options are properly considered and that investment decisions are justified.

Where significant investment of public funds is being proposed, actions should be appraised in a manner that is consistent with the guidelines in HM Treasury's Green Book.

This section provides guidance on:

- principles to support the selection of sustainable actions;
- the hierarchy and interaction of different forms of appraisal;
- the key steps that should be followed in performing an appraisal.

Detailed guidance on the appraisal process is set out in Annex 2. The intention is to include this supplementary guidance in a policy statement to accompany this Ministerial Guidance. The Scottish Government will issue further guidance on the appraisal process as necessary.

### A sustainable approach

In appraising options for inclusion in flood risk management plans, the Act requires that SEPA:

*identify measures to achieve objectives in a way which it considers is most sustainable.*

Flood management actions that don't respect the three pillars of sustainability—social, economic and environmental, and the need to protect our natural resources for future generations, will not accord with the principles of sustainable development. Guidance on selecting sustainable actions is set out below.

#### Risk-based decisions

The Act places a duty on SEPA and the responsible authorities to: *act with a view to reducing overall flood risk*

Actions should target those areas where flood risk can be reduced, while also taking steps to maintain existing levels of risk in locations where it would not be feasible or practicable to substantially reduce risk. The long-term aim must be to reduce the risk of flooding across Scotland as far as is reasonable, taking full account of environmental, economic and social priorities and needs.

These options should cover the three main ways in which risk can be reduced (Figure 6): avoiding risk, reducing the likelihood of flooding, reducing the impacts of flooding.



Figure 6 Approaches to reducing flood risk





Decisions on tackling risk should focus on addressing national priorities, however, flexibility must be maintained to allow local priorities to be addressed, particularly where relatively small investment can address important local priorities

It is not realistic to expect all flood risk to be or eliminated, and areas where it is not feasible to reduce risk or where current risk are believed to be acceptable should be clearly identified. In all cases, risk management measures should include arrangements to deal with residual risks (for example, if design limits are exceeded by flood events). This could include promoting actions by individuals, local communities or business and raising awareness of flooding issues.

***Adopt a long term planning horizon***

Actions to tackle flood risk should be planned over a long time horizon (50- 100 years) with a view to retaining flexibility to manage changing risks over that period.

Testing flood management actions against long term trends will be essential to selecting sustainable actions that will stand the test of time. SEPA and the responsible authorities should work to establish approaches to examining future scenarios that can be applied consistently across flood risk assessments and management decisions. Wherever possible, a range of future scenarios should be examined, including a 'worst case' scenario.

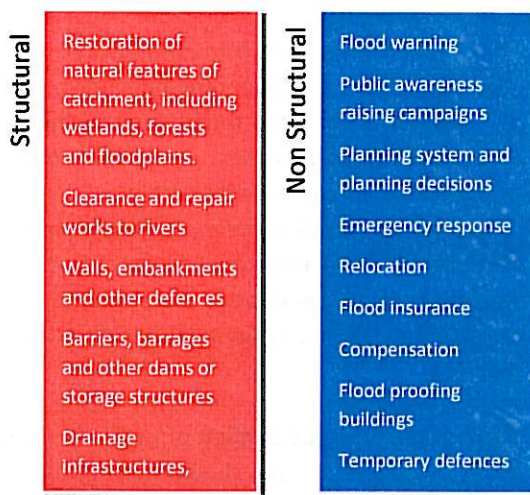
The impacts of climate change should be consistently taken into account when assessing management options and in accordance with the most up to date guidance, including guidance from Defra and other Government departments.

***Consider a broad and adaptable range of actions***

Consideration must be given to a broad range of structural and non structural options (Figure 7), both individually and in combination across

a catchment. In identifying options, careful consideration should be given to:

- options that prevent sudden catastrophes and enhance recovery;
- actions that can cope with natural variability and unexpected events;
- temporary as well as permanent options should be considered, for instance demountable defences.



**Figure 7** Examples of structural and non structural actions to manage flood risk

SEPA and the responsible authorities should avoid making decisions that will make it more difficult to manage the effects of climate change. This will involve not locking in options that limit further adaptation in the future.

Wherever possible, SEPA and the responsible authorities should use flexible or adaptive management options. These are typically options that can be implemented incrementally or as small steps over time, responding to new information and adjusting management gradually, rather than acting in one step.

Being flexible may mean that actions are not implemented at a single time. Instead, implementation could be phased and accompanied by monitoring to provide evidence on when or whether further action is needed.

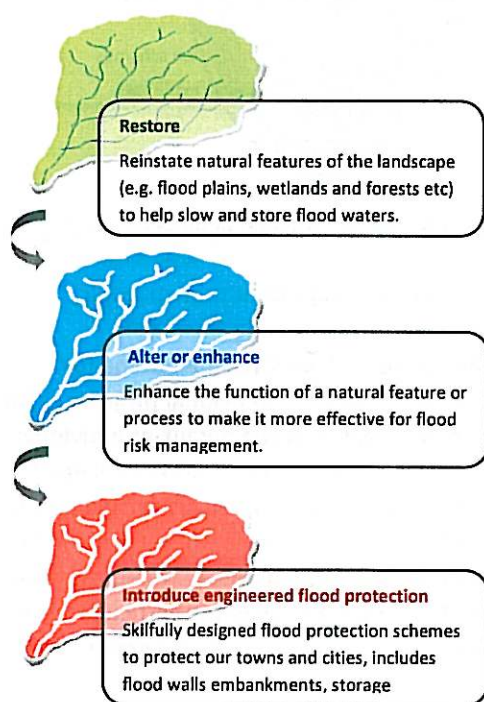




### Working with and restoring catchments

As described in Section 4, all options should be developed in consideration of catchment processes and characteristics, including consideration of how different interventions interact across a catchment.

In recognition of the range of potential benefits that can be obtained from restoring our natural landscape, all reasonable and practical efforts should be made to restore or enhance the (urban and rural) landscapes natural ability to slow and store flood waters before investing on other structural actions (Figure 8).



**Figure 8** Working to restore catchments

There is unlikely to be a simple line between restoration actions and more traditional engineering, and in many cases options will need to be considered in combination. However, the overriding principle should be to examine and identify opportunities to restore our natural landscape before further interventions are considered or introduced.

As the evidence base for some of these actions is still evolving, wherever possible, monitoring

should be undertaken to promote growth of the evidence base. Monitoring will also allow actions to be adapted or refined as evidence on their effectiveness is obtained. Actions where the benefits to flooding are uncertain but where other benefits will be delivered, for instance environmental benefits or contributions to climate change adaption, should be promoted wherever possible.

### Moving beyond design standards

Simple consideration of design standards can limit consideration of how factors other than geometry affect the effectiveness of the defence—such as manually operated flood gates, which depend on accurate, timely flood warnings and operational response. More broadly, the design standard, for instance to contain a flood with a 100 year return period (an event that has a 1% probability of occurring in any given year), has become a default flood management objective, which can limit decisions on how to optimise investment and protect those at greatest risk.

Although there are some benefits to be gained from adopting a common standard of protection for all flood protection work, not least of which is simplicity of communication and simplification of investment planning; this approach would mean that all works would be constructed without due regard to the value or importance of the assets being protected, whether they be people, property or the environment.

This guidance does not specify certain design standards. Instead, the approach adopted should be entirely risk based; linking benefits to costs, with the aim of maximising the reduction in overall risk. This approach requires management options to be compared on the basis of the effect that they are expected to have on the frequency and impact of flooding in a specified area. This requires information to predict where flooding will occur (now and in the future) for a range of event probabilities. Estimates of the impacts of this flooding and mitigation options can





then tested to find to identify the most cost beneficial option(s).

In practice, it is recognised that design standards act as useful benchmarks. As an option we expect actions that protect to a 1% exceedance probability plus allowances for climate change to be included in all appraisals. Where other design standards are considered, a clear justification must be provided, for instance, where a scheme to protect to a lesser standard is the only technically viable option.

In many cases, particularly when tackling surface water flooding, a combination of actions will need to be brought together (above and below ground) to reduce flood risk. In these cases, the emphasis should be on examining the benefits and costs of combinations of actions against a range of flooding scenarios. For instance, the costs and benefits of upsizing sewers compared to the costs of actions to create above ground storage.

## An integrated approach to appraisal

Appraisal has an important role to play at all levels of flood risk management, from the preparation of flood risk management plans that set out the strategic direction of flood management, through to specific projects or schemes (Figure 9).

It is important that appraisal is viewed as part of the process of developing and implementing flood risk management plans and the actions set out therein: it should not be viewed or undertaken as a separate process or exercise.

The Act requires close interaction between the preparation of flood risk management plans and the implementation of actions. For instance, the power conferred on local authorities to undertake flood protection work, including schemes, can only be exercised where it will contribute to delivering the measures in a flood management plan or not

impair delivery of actions set out in plans. Similarly, investment by SEPA in flood warning schemes is expected to be based upon needs identified in flood management plans.

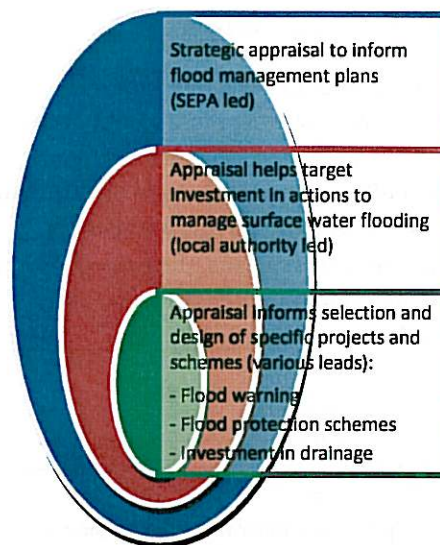


Figure 9 Roles of appraisal in flood risk management

It is therefore important that strategic appraisals underpinning flood risk management plans form the outline for appraisals made for individual projects. This does not mean that the details of individual schemes will be set out in flood management plans. Instead, the appraisals carried out in flood management plans will set out catchment focused flood management strategies, which should identify the need for particular types of local actions or management response. Where these actions, for instance flood protection schemes, require significant public expenditure, more detailed appraisal work will be required to ensure that options and designs reflect local needs.

As discussed in Section 1, the process of preparing flood risk management should speed-up the process of taking forward and implementing a flood protection scheme. For example, the information generated by SEPA should fulfil, at least in part, early optioneering stages of scheme development, while also supporting subsequent, more detailed assessments and appraisals.





Local scale assessments will need to be consistent with those at a higher level, taking forward the assumptions and principles already agreed on. For example, ensuring that appraisal of shorter-term activity, such as the maintenance of defences, is undertaken in the context of wider strategic objectives as set out in flood risk management plans.

Throughout the appraisal process:

- the degree of detail considered should be proportionate to the complexity of the problem and the information required to reach and demonstrate a robust decision;
- the cost of the appraisal stage should be proportionate to the overall costs and factors associated with delivering the plan, policy or project;
- the sensitivity of options to changes in cost and benefit assumptions should be tested at different stages of appraisal, to fully understand the uncertainties that exist in the analysis of options.

## The appraisal process

All appraisals should go through at least the following three stages. Additional stages may be added as necessary depending on the purpose of the appraisal and information available.

1. **Define** the purpose of the appraisal, the issue and the case for intervention and set clear objectives for the appraisal.
2. **Describe** the impacts (positive and negative) associated with a wide range of possible options. As necessary and appropriate, evaluate impacts in qualitative and quantitative terms and assigning monetary values to them where possible.
3. **Compare** different options and selecting that which is most appropriate and deliverable and prioritise between actions as necessary.

Details of the appraisal process that should be followed are set out in Annex 1.

## Valuing impacts

To support selection of sustainable actions, SEPA and the responsible authorities will need to ensure that the full range of positive and negative impacts of actions is considered in an equitable manner.

Wherever possible, impacts (positive and negative) should be valued in monetary terms. 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.

The effort invested in valuing impacts should be proportionate to the complexity of the problem and the information required to reach a robust decision. Wherever possible, standard approaches should be used for assessing impacts to ensure consistency within and across different appraisals.

## Involving stakeholders

Community and stakeholder participation should be used to help identify and develop management options and to gain an understanding of local people's views and needs. Appraisal summary tables are a useful means of capturing this information to support appraisal. Involvement of individuals and communities in taking forward actions should be promoted wherever possible.

Formal and informal consultation should be undertaken in the development of plans and projects. This should enable stakeholders affected, including the community and



statutory consultees to make a meaningful contribution to the appraisal processes. Consultation should be coordinated and structured to enable interested parties to understand the decision making process. Statutory consultation requirements, to do with the EU Environmental Impact Assessment and Strategic Environment Assessment Directives and the Floods Directive, should be used to inform policy and projects appraisal.

From the outset, it should be explained to communities and other beneficiaries that the availability of public funds for delivering flood management may be dependent on national priorities for investment and how the project compares with the benefits achievable by investment in other parts of the country. However, it is equally important that people understand that constraints on public funds shouldn't prevent beneficial local projects being developed, partly or wholly funded by local beneficiaries. This is subject to the impacts being acceptable to the whole community and such projects complying with any relevant legislation.

As part of the consultation process, the potential benefits and the beneficiaries should be clearly identified. This should enable stakeholders to understand the relevance of costs and benefits. It may also encourage contributions towards projects which could enable measures to be promoted that otherwise might not be afforded or allowed to proceed sooner. Such contributions should allow public funding to go further and deliver improved risk management in areas that otherwise would not benefit. Section 7 provides further guidance on engaging with the public.

## Scrutiny

SEPA and the responsible authorities should undertake in-house quality assurance checks of all proposals and post project evaluation, to create a cycle of continuous learning and to understand where policy and delivery can

improve. The Scottish Government may review a sample of appraisals after they have been approved. This will help determine how the principles in this guidance are being applied and whether further guidance is necessary.

## Implementing actions

Consideration of sustainability does not end when the best options have been selected. It is also important that actions are implemented in a sustainable manner. It is not the purpose of this guidance to set out how this can best be achieved, but the following principles should be applied.

- aim to minimise on-site and construction waste;
- maximise the reuse of materials;
- adopt low carbon construction strategies;
- ensure designs support the principle of adaptive management wherever possible.

## Consultation questions

13. Do you have any views on the potential role of a national flood management target, for instance to reduce all known flood risks to a medium or lower level of risk, to help focus efforts to manage flood risk?

14. Are there any aspects of selecting sustainable actions that have been omitted and should be added to the guidance?

15. Do you support the appraisal process set out in this Section and Annex 2? If not, please describe your concerns and alternative proposals.

16. Is there any further guidance that you would like to see set out at this time to support a fuller assessment of environmental and social impacts?





## 7. Engaging with the public

### Introduction

Public awareness, participation and community support are essential components of sustainable flood risk management. Public participation can not only raise awareness of flood risk, it can also inform decisions and contribute to the successful implementation of actions.

Individuals, businesses and communities can play an important local role in flood management by acting as their own first line of defence against flooding. These actions can play an important role in complementing and supporting the work undertaken by SEPA and the responsible authorities.



When the residents of Waulkmill near Langholm wanted advance warning of flooding and river heights, they built their own early warning system

This section provides guidance on:

- improving access to information on flood risk, including flood warning, flood maps and other resources;
- improving access to information on the steps that individuals can take to protect their families, homes and businesses from flooding;
- improving awareness of actions that can increase flood risk and alternative options, for instance using permeable paving.

### Improving access to information

Public engagement and participation needs to be ongoing and regularly refreshed, seeking to attract attention and changes in behaviour without causing undue alarm. At all times, it must be based on clear, accurate information, and presented in simple and engaging language.

In collaboration with the Scottish Flood Forum, SEPA, and the responsible authorities should help local community groups take some responsibility for their own awareness campaigns and flood preparation.

#### *Using flood maps*

Flood maps are a powerful tool for communicating complex flooding information. For instance flood outlines can show predictions of where flood waters would go under different flooding scenarios.

The flood risk management planning process will generate a deep resource of information on flooding and its impacts. It is important that the public are given appropriate access to relevant information. Care must be taken to ensure that the information available to the public is of value and suited to their needs.

As flood maps and other similar resources become more sophisticated, for example, through consideration of multiple sources of flooding and their impacts. SEPA and the responsible authorities will need to ensure that information is presented in a way which is clear and understandable for a non-technical user.

#### *Flood warning*

SEPA is Scotland's flood warning authority with responsibility for warning and informing the public and strategic partners on the threat of flooding through the Floodline service.

There should be continued emphasis on improving this flood warning service, and this





should include maintaining and improving links to other awareness raising initiatives.

### *Perceptions and attitudes to flood risk*

To help target awareness raising work, SEPA should work to develop a more comprehensive understanding of public perceptions and attitudes to flood risk. In undertaking this work, particular attention should be given to understanding how past experiences colour perceptions of flood risk.

Information on perceptions and attitudes to flood risk should be reviewed periodically to test the performance and success of awareness raising and other campaigns.

## An active and planned approach to public participation

Public engagement and participation in flood management decisions will help ensure that sustainable actions are selected. In taking forward public engagement and participation, SEPA and the responsible authorities should focus on:

- building understanding and trust locally, particularly through inclusive decision making;
- involving local residents and key community representatives in a service or planning issue;
- clarifying the responsibilities on public bodies and the role of voluntary organisations and residents; and
- agreeing priorities and setting realistic expectations – to best achieve the needs of those with different interests.

To support this work, SEPA and the responsible authorities, in liaison with the Scottish government, the Scottish Flood Forum and other relevant organisations, should develop and begin application of a national engagement and communication strategy.



A meeting in Moffat gives local residents an opportunity to discuss flood management actions.

The strategy should support the adoption of clear and consistent messages at a national and local level, be pro-active and encourage greater public involvement. The strategy should not be viewed as a one off exercise, instead it is about creating an ongoing process of engagement that can be applied in all areas of flood risk management.

The strategy should help ensure that the public:

- are provided with accessible and comprehensible information on flood risk and flood risk management;
- are aware of actions being taken by SEPA and the responsible authorities to manage flood risk
- have appropriate expectations for the level of flood protection that can be provided;
- have access to information on the consequences of key flood risk management decisions;
- have clear opportunities to communicate their views and priorities for flood risk management;
- have confidence that their views and priorities are fully considered in decision-making processes;
- understand the basis on which decisions have been made.



## Promoting and supporting actions by individuals and communities

Investing in flood protection schemes and other actions to reduce flood risk is an important part of protecting Scotland's communities and businesses from the impacts of flooding. However, it will never be possible to eliminate flood risk. Actions by individuals, business and communities will play an important role in complementing and supporting the work undertaken by SEPA and the responsible authorities.

Individuals already take responsibility for managing many risks they face in their day to day lives, for example, promoting fire safety by using smoke detectors, fire blankets and fire extinguishers. A similar approach should be encouraged for flood risk, with individuals acting as their own first line of defence against flooding.

Simple steps include keeping abreast of flood warning information, checking flood maps to see whether homes are in flood risk areas, making a plan of actions that should be taken in the event of a flood. Steps can also be taken to reduce the damage caused by flood waters, for instance by installing flood proofing products to homes and businesses.

SEPA and the responsible authorities need to support actions by individuals by improving access to information on the steps that individuals can take to protect their family's homes and businesses from flooding. This could include promoting self help guides, particularly amongst those who have not experienced a significant flood event.

In promoting these messages and actions, the aim should be to minimise the damages caused by flooding and while also improving the ability of individuals, businesses and communities to recover quickly and fully from an incident of flooding.

## Improving awareness of actions that can increase flood risk

Small changes to how land within and around properties, and businesses is managed could, over time, make a substantial contribution to lower flood risk. In urban areas, simple actions like paving over gardens can have a major cumulative impact on flooding. Similarly, actions in rural areas, which include actions to maintain watercourses, can cause problems elsewhere.

SEPA and the responsible authorities should promote awareness of the cumulative impact that individuals and business can have on flooding and the positive actions that can be taken to reduce these effects.

### Consultation questions

17. Do you agree that the steps outlined to support better access to information and public participation are needed?

18. Are there any further steps that could be taken to improve participation and engagement with the public on flooding matters?

19. What additional topics do you feel should be covered by this guidance or subsequent guidance, and who should be responsible for that guidance?





## Annex 1

### Flood risk management milestones

Deadline	Lead authority	FRM Act requirement
May 2011	Scottish Government	Publish guidance on sustainable flood management.
January 2011	SEPA	Establish advisory groups.
December 2011	SEPA	Produce an assessment of flood risks across Scotland leading to identification of areas most vulnerable to flooding.
	SEPA	Identify local plan areas.
March 2012	SEPA	Establish local plan advisory groups.
No statutory deadline	Local authorities	Prepare a schedule of clearance and repair works.
Timescales to be set by Scottish Ministers	Local authorities	Prepare maps of water bodies and Sustainable Urban Drainage Systems (SUDS).
Timescales to be set by Scottish Ministers	SEPA	Prepare maps of artificial structures and natural features.
Timescales to be set by Scottish Ministers	Scottish Water	Publish an assessment of flood risk from sewerage systems.
December 2013	SEPA	Publish an assessment of opportunities for restoration of natural features and characteristics to reduce flood risk.
	SEPA	Publish flood hazard maps and flood risk maps.
	SEPA	Publish a statement of consultation actions.
December 2014	SEPA and lead local authorities	Publish draft national and local flood risk management plans for consultation.
December 2015	SEPA and lead local authorities	Publish flood risk management plans.
June 2016	Lead local authorities	Publish implementation parts of local flood risk management plans.
Cycle repeated every 6 years thereafter		





## Annex 2

# Guidance on the appraisal process

As outline in Section 6, all appraisals should go through at least the three stages outlined in Figure A1. Guidance on each stage is provided below.

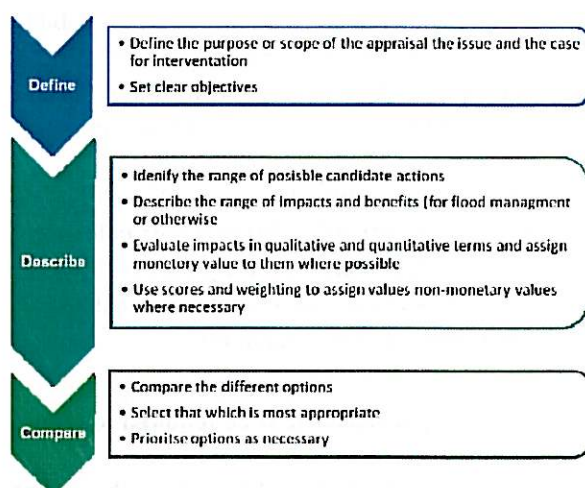


Figure A1 Stages in appraisal

## Stage 1 Define issues and objectives

### Setting objectives

The first step in the appraisal process is to define the objectives for a plan, strategy or project. These objectives should be in line with wider government policy and the HM Treasury Green Book; be SMART; and include a realistic timetable for delivery, which could include phasing over multiple flood risk management cycles.

There should be demonstrable links between objectives and their contribution to tackling national, regional or local priorities, including 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.

### Statutory requirements

In a limited number of cases statutory requirements may give rise to the need for 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 European 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 or whether they can be rescinded.

### Strategic context

Objectives should be established with reference to Government policy and plans, and other relevant strategies, and plans. 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 1.

Where there are opportunities and synergies with other government objectives, flood risk



management plans and projects/schemes 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, wherever possible. 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.

## Stage 2: Develop, describe and value

### *Identify and short list 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 project being undertaken: strategy (plan) or scheme/project.

Considering a wide range of options will also be important in the context of legal requirements such as the Water Framework Directive and the Habitats Regulations. 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. A do minimum option should also be appraised. Where there is a legal requirement, the do minimum option will be the option that does the minimum that is necessary to meet the legal requirements.

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 7, 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.

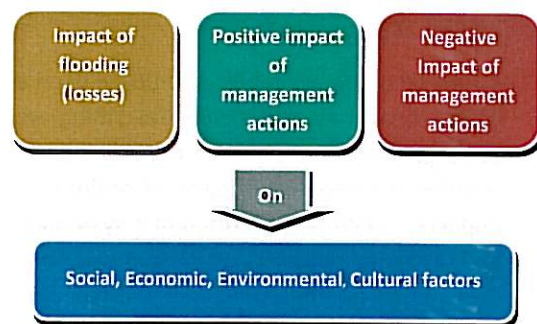
In this analysis, individual actions (or simple combinations of actions) being considered can be scored against criteria and scores calculated. At this stage technical details are not necessary and impacts do not need to be valued; informed judgement is sufficient. The purpose is to rank individual measures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

#### *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 A2). 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 (Section 4) 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 A2** Range of impacts and benefits that should be considered in appraisal

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

#### *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 climate change should be consistently taken into account in appraisals and in accordance with the most up to date guidance, including guidance from Defra and other Government departments.

To reflect the nature of long-term investment decisions, including the need for future maintenance and adaptations, 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.



### *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. Impacts should be described in a systematic and, as far as possible, consistent way so that they can be quantified, valued and compared. Spurious accuracy should be avoided in favour of a consistent risk-based approach. A framework for disaggregating the impacts should be considered at this stage, as should application of the source pathway receptor model described in Section 4.

## Valuing impacts

### *General*

Impacts (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 term 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.

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

- 'The Benefits of Flood and Coastal Risk Management Manual'; FHRC, 2005;
- Flood and Coastal Erosion Risk Management, Economic Valuation of Environmental Effects Handbook; Eftec, 2007;
- Defra guidance on the appraisal of human related intangible impacts of flooding and distributional impacts; Defra, 2004;
- Assessing and valuing the risk to life from flooding for use in appraisal of risk management measures; Defra, 2008;
- The valuation of agricultural land and output for appraisal purposes; Defra, 2008;

The impact of greenhouse gas emissions should be valued according to Government guidance.

Where practical and relevant, the ecosystem services approach should be used as a framework for considering the impact of proposed options and the valuation methods that can be practically applied (See Section 1). 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 methodologies 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 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.

The Environmental valuation handbook (published by the Environment Agency) focuses specifically on monetised values of environmental effects associated with flood protection schemes.

#### *Monetised methods of valuation*

A variety of monetised valuations methods area available and the main ones are described below.

**Contingent valuation** involves directly asking people, in a survey, how much they would be willing to pay for particular environmental services. It is called "contingent" valuation, because people are asked to state their willingness to pay, contingent on a specific hypothetical scenario and description of the environmental service.

**Value transfer (also known as benefits transfer)** allows existing economic value evidence to be used to estimate the monetary value of the environmental effects associated actions being

examined. Although value transfer is used extensively and is a valuable input to appraisal, it is subject to limitations. Its robustness depends on statistically 'matching' suitable existing valuation evidence to the context of the appraisal case at hand. For instance, there may be regional difference in value of particular environmental effects or services.

#### *Non-monetised valuations*

Where monetary valuation is not possible, for instance, when assessing a broad spectrum of environmental and social impacts, alternative non-monetised valuations should be applied. These approaches typically focus on assigning qualitative or quantitative scores to the impacts being considered.

Non-monetised valuations may be appropriate when developing flood management plans, as the time and effort required to assign monetary valuation may disproportionate to the detail required in assesses strategic options. As monetised data becomes more readily available, it should be included in all levels of appraisal.

There are a variety of techniques available to allow these impacts to be considered including a type of Multi-Criteria Analysis referred to as 'scoring and weighting' described below.

**Scoring and weighting** is a hybrid research method (can be qualitative and quantitative) for appraising the significance of impacts of any proposed option where this cannot be measured directly in monetary terms. Scores and weights, based on a subjective assessment, are assigned to impacts to reflect their relative significance. If desired, inferred monetary values can also be assigned to impacts, thereby allowing these impacts to be considered within a more traditional costs benefit framework. Details of this approach can be found in the Environmental valuation handbook (published by the Environment Agency).



This approach can be used as an alternative to cost benefit analysis and as extension to it, to ensure that non-monetised impacts are adequately considered in the appraisal processes.

It is not the intention of this guidance 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 appraisal guidance on these matters as necessary.

#### *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 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.

### Stage 3: Compare and select

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.

The information set out in the appraisal summary tables, should provide a comprehensive assessment of the positive and negative impacts of all options. It should also make transparent which impacts have been valued in monetary terms (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.

Uncertainties will exist at all stages of appraisal and these should be clearly presented in all appraisal. Section 3 provides more information on managing uncertainty.

#### *Transparent decision-making*

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 (costs and benefits) and uncertainties that could affect the choice of option.

Projects and strategies are only economically worthwhile if the benefits exceed the costs (for instance the ratio of benefits to costs is greater than 1). This should not to 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.

### *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 (BCR) 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.

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** 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 cost benefit 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 multi–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 may publish 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.



## Annex 3

# Glossary of terms

### **Cost/Benefit Analysis**

Comparison of present value scheme benefits and costs as part of an economic appraisal. The benefit–cost ratio is the total present value benefits divided by the total present value costs.

### **Catchment or Catchment Area**

The specific land area that drains into a watercourse.

### **Civil Contingencies**

The Civil Contingencies Act 2004 establishes a framework for emergency planning and response at both a local and a national level.

### **Climate Change**

Long-term changes in climate, either through natural variability or human intervention.

### **Coastal Flooding**

Flooding that results from a combination of high tides and stormy conditions.

### **Consequence**

An impact such as economic, social or environmental damage/improvement. May be expressed quantitatively (e.g. monetary value), by category (e.g. High, Medium, Low) or descriptively.

### **Controlled Activities Regulations (CAR)**

A reference to The Water Environment (Controlled Activities) (Scotland) Regulations 2005. All engineering works in or in the vicinity of rivers, lochs and wetlands now require authorisation under the CAR Regulations.

### **Culvert**

A closed conduit used for the conveyance of surface drainage water under a roadway, railroad, canal, or other impediment.

### **DEFRA**

DEFRA (Department for Environment, Food and Rural Affairs) is a UK Government Department.

### **Diffuse Pollution**

Pollution which originates from various activities and which cannot be traced to a single source e.g. contaminated run off from built up areas.

### **Do–Nothing Scenario**

An option used in benefit/cost analysis to act as a baseline against which all other options are tested. It assumes no active intervention.

### **EC Floods Directive**

The EC Directive on the Assessment and Management of Flood Risks or *EC Floods Directive* builds on and is closely related to the Water Framework Directive.

### **Embankment**

Artificial raising of the natural bank height of a waterway.

### **Environment**

Where environmental issues are referred to in this document, this term is used to encompass landscape and visual, flora, fauna, geological or geomorphological features and buildings, air, water, sites and objects of archaeological, architectural or historical interest. (It is recognised that in other contexts the environment has much wider implications).



## **Environmental Impact Assessment (EIA)**

Environmental Impact Assessment (EIA) is a process which identifies the potential environmental effects (both negative and positive) of a proposal.

## **Flood Risk Management Plans (FRMP)**

High-level plans prepared by SEPA that set out the strategic direction of flood management, through to specific projects or schemes.

## **Floodplains**

Floodplains are land areas adjacent to rivers and streams that are subject to recurring inundation.

## **Greenhouse Gases**

Naturally occurring gases, such as carbon dioxide, nitrous oxide, methane and ozone, and man-made gases like chlorofluorocarbons, which absorb some of the sun's radiation and convert it into heat.

## **Groundwater Flooding**

Flooding that occurs when water levels in the ground rise above surface levels. It is most likely to occur in areas underlain by permeable rocks, called aquifers.

## **Hazard**

A situation with the potential to result in harm. A hazard does not necessarily lead to harm.

## **Impermeable Surface**

A surface that does not permit the infiltration of water and, therefore, generates surface water runoff during periods of rainfall.

## **Local Flood Management Plans**

Plan prepared by local authorities that provide a local expression of the strategic plans prepared by SEPA. Include a summary of how actions will be implemented in each local plan area.

## **Pluvial flooding**

Flooding that results from overland flow which has been generated by rainfall before the

runoff enters any watercourse or sewer. This is also referred to as surface water flooding.

## **Post project evaluation**

A procedure to review the performance of a project with respect to its original objectives and the manner in which the project was carried out.

## **Preparedness**

Informing the population about flood risks and what to do in the event of a flood.

## **Probability**

The probability of an outcome is the relative proportion or frequency of events leading to that outcome, out of all possible events.

## **Qualitative Methods**

Approaches which use descriptive rather than numerical values for assessment and decision making.

## **Residual risk**

The risk which remains after risk management and mitigation. May include, for example, risk due to very severe (above design standard) storms, or risks from unforeseen hazards.

## **Resilience**

Resilience is a measure of the ability of something to recover from a flood.

## **Return Period**


The flood return period is a measure of the rarity of an event – the longer the return period, the rarer the event. It is the average length of time (usually in years) separating flood events of a similar magnitude.

## **Risk**

A combination of the likelihood and consequences of an event.

## **River Basin District**

Geographic areas over which River Basin Management plans are prepared. In Scotland there are 2 River Basin Districts identified under the 2003 Act – one for the



Solway/Tweed area and one covering the rest of Scotland.

#### **River Basin Management Planning**

River basin planning is a strategic decision-making process introduced by the Water Framework Directive (WFD) which integrates the management of land and water within river basin districts (RBDs).

#### **Scottish Water**

Scottish Water is a publicly owned business, answerable to the Scottish Parliament and the people of Scotland. Its key duties are providing clean, safe drinking water and disposing of waste water from homes and businesses across Scotland.

#### **Sensitivity testing**

Method in which the impact on the output of an analysis is assessed by systematically changing the input values

#### **SEPA**

Scottish Environment Protection Agency. SEPA is the public body responsible for environmental protection in Scotland.

#### **Sewer Flooding**

Flooding caused by a blockage or overflowing in a sewer or urban drainage system.

#### **Sustainability**

Actions taken now to manage the risk of flooding that are robust enough to stand the test of time. There are three pillars of sustainability that must be considered – environmental, social and economic.

#### **Sustainable Development**

Sustainable development is an approach to resource use that aims to meet human needs, while preserving the environment so that these needs can be met not only in the present, but also for future generations. The delivery of sustainable development is generally recognised to require reconciliation of three pillars of sustainability – environmental, social and economic.

#### **Sustainable Urban Drainage Systems (SUDS)**

A set of techniques designed to slow the flow of water, can contribute to reducing flood risk by absorbing some of the initial rainfall, and then releasing it gradually, thereby reducing the flood peak and helping to mitigate downstream problems, and make a useful contribution to flood management.

#### **Vulnerability**

Vulnerability is defined as a combination of susceptibility and resilience.

#### **Water Framework Directive (WFD)**

The WFD establishes integrated river basin management for Europe. It requires all inland and coastal waters to reach "good status" by 2015, or an alternative or delayed objective.

#### **Whole Life Costs**

The total costs associated with a scheme for its full design and potential residual life span, taking proper account of all aspects of design, construction, maintenance and external impacts. A particularly useful approach in helping to determine economic sustainability when used to compare the relative costs of long-life schemes such as flood defences and where decisions between short-term capital costs and long-term maintenance costs need to be made.





## Annex 4

# Acknowledgements

The Scottish Government would like to extend a special thanks to a number of organisations who have contributed to this consultation through their involvement in the Scottish Advisory Forum for Flooding (SAIFF).

Aberdeenshire Council

Association of British Insurers

British Waterways

Cairngorms National Park Authority

City of Edinburgh Council

Clackmannanshire Council

Environment Link

Forestry Commission

Glasgow City Council

Tingle Consulting

Tweed Forum

University of Dundee

Halcrow

Jacobs

JBA Consulting

John Riddle

Met Office

Mike Donaghy Associates

Moray Council

MWH

RSPB

Perth & Kinross Council

SCOTS

Scottish Borders Council

Scottish Flood Forum

Scottish Rural Property and Business Association

Scottish Water

SEPA

SNH



**The Scottish  
Government**

© Crown copyright 2011

ISBN: 978-0-7559-9927-9

This document is also available on the Scottish Government website:  
[www.scotland.gov.uk](http://www.scotland.gov.uk)

APS Group Scotland  
DPPAS11145 (01/11)

[www.scotland.gov.uk](http://www.scotland.gov.uk)



# The Flood Risk Management (Scotland) Act

## Delivering Sustainable Flood Risk Management – a consultation

### List of Consultation Questions

1. Do you agree that the outcomes described in the introduction will support improvements to how floods are managed across Scotland? If not, please describe your concerns or alternative outcomes.

Yes

2. Do you agree that local authorities should lead on surface water management and that this work should form part of a local flood risk management plan? If not, please describe your concerns and alternative proposals.

Yes

3. Do you support the active role of stakeholders in flood management planning and do you have views on how to ensure stakeholders can become more involved in decision making?

Yes

Establish flood action groups with all stakeholders. Inverclyde Council has successfully set up a flood action group with Transport Scotland, Strathclyde Police, Amey plc, Network Rail, SEPA, Scottish Water, SNH and land owners who have contributed to dealing with the flooding issues within Inverclyde.

4. Do you agree that the type of partnership working set out in this section will be necessary to deliver flood risk management plans and actions? Are there any alternative arrangements to partnership working that should be set out in the guidance?

Yes, there are many benefits for agencies working together to develop flood risk management plans.

It is our recommendation that lead partners are established when setting up these working groups.

5. Do you have views on barriers to partnership working and how these can be overcome?

There may be a need to appoint a czar who is empowered to deal with potential barriers which would include a mechanism for resolving deadlocks that may arise in a partnership.

6. Do you support the risk-based approach as set out and its importance to flood risk management? If not, please describe your concerns and alternative proposals.

Yes however this needs to be targeted at a regional and local level.

7. Do you agree that SEPA should publish and maintain advice on assessing, modelling, mapping and sharing data? If not, please describe your concerns and alternative proposals to delivering consistent assessments of flood risk.

Yes. This information should be readily and easily available to Local Authorities through a web based portal or other suitable medium.

8. Do you have any other views on how to simplify the communication of flooding information to the public?

Local and national media should form part of the communication process. Local Authorities could hold information on all areas prone to flooding which in turn would be available to the general public.

9. Do you agree that SEPA should take a lead role in assessing catchment characteristics and promoting a catchment approach to flood risk management?

Yes.

Local Authorities can assist with this as they are to have more detailed local knowledge.

10. Is there any further guidance needed at this stage on promoting the needs of the rural sector or other sectors?

More guidance on how to inform the rural sector in terms of how flood risk management may affect them.

11. Do you support the principles of integrated urban drainage set out in this section? If not, please provide views on alternative principles.

Yes

12. Do you have views on any alternative approaches to targeting effort to assess and manage surface water flooding?

Effects should be based on catchment basis rather than Local Authority boundaries

13. Do you have any views on the potential role of a national flood management target, for instance to reduce all known flood risks to a medium or lower level of risk, to help focus efforts to manage flood risk?

Agree that a national flood management target should be set to reduce all known flood risks to a medium or lower level of risk however this needs to be based on the flood risk management criteria.

14. Are there any aspects of selecting sustainable actions that have been omitted and should be added to the guidance?

Maintenance liabilities of sustainable actions should be defined and determined through an options appraisal when assessing sustainable schemes.

15. Do you support the appraisal process set out in this Section and Annex2? If not, please describe your concerns and alternative proposals.

Emphasis should be on cost benefit analysis including long term maintenance liability.

16. Is there any further guidance that you would like to see set out at this time to support a fuller assessment of environmental and social impacts?

Consultation with insurance companies may provide further guidance in terms of environmental and social impacts associated with flood risk management.

17. Do you agree that the steps outlined to support better access to information and public participation are needed?

Yes



Information should be non-technical and factual.

18. Are there any further steps that could be taken to improve participation and engagement with the public on flooding matters?

There are benefits in Public Awareness campaigns and seminars aimed at engaging with the public and encouraging participation in terms of dealing with flooding problems particular to them.

19. What additional topics do you feel should be covered by this guidance or subsequent guidance, and who should be responsible for that guidance?

Maintenance responsibility should be clearly defined and emphasised.