Scottish Environment LINK

Scottish Environment LINK is the forum for Scotland's voluntary environment organisations representing a broad spectrum of environmental interests with the common goal of contributing to a more environmentally sustainable society

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Flood Risk Management (Scotland) Bill: Financial Memorandum

Written submission by the Freshwater Taskforce of Scottish Environment LINK on the financial implications and the costs and benefits of the Bill

***Scottish Environment LINK*-**

- is the liaison body for Scotland's environmental organisations, the members of which are supported by around 500,000 people. LINK member organisations have been actively involved in work on water issues and have worked in partnership with the Scottish Government in the lead up to the Flood Risk Management (Scotland) Bill 2008, they;

- Were actively involved in the transposition of the Water Framework Directive into Scots law, and instrumental to introducing a duty on Scottish Ministers and Responsible Authorities to 'promote sustainable flood management'.
- Have been active members of the National Technical Advisory Group on flooding (NTAG) and the Flooding Issues Advisory Committee (FIAC) and instrumental in producing the definition of sustainable flood management
- Are active members of the Flooding Bill Advisory Group, and the Natural Flood Management sub-group
- Have been instrumental in improving the understanding and the benefits of natural flood management
- Have provided written and oral evidence to the Environment and Rural Affairs Committee on its Flooding Inquiry
- Held a number of events for MSPs and other stakeholders on the issue of flooding.

All the previous submissions, briefings, reports and consultation responses can be on the LINK website

www.scotlink.org

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1. Introduction

The Freshwater Taskforce of the Scottish Environment LINK welcomes the opportunity to provide written evidence to the Finance Committee on the Flood Risk Management (Scotland) Bill 2008. The Bill aims to introduce a modern approach to the management of flood risk in Scotland, making it suitable for the communities and pressures of the 21st century.

A critical part of introducing the new Bill is estimating and evaluating the costs and the benefits of the new approach to be introduced under the Bill. The new approach aims to implement a system by which multiple objectives can be achieved from flood risk management whilst offering reliable and effective protection to communities at risk. This means moving away from reactive, single-purpose flood control solutions, towards catchment based, multi-purpose proposals that also aim to deliver environmental and other benefits.

For some objectives, such as flood damage reduction, the economic evaluation should be relatively straightforward, requiring the analysis of hydrological, hydraulic and economic data. Despite this, it is difficult to find examples of cost-benefit analyses on a range of different flood options at one site. This is because, traditionally, only the cost-benefit of hard engineering option was considered, and not the cost-benefit analysis of a range of different options. In addition, the cost-benefit analysis was also only carried out for easy-to-quantify monetary values as this provides for a direct comparison of costs and quantifiable benefits. As environmental and social benefits cannot be easily converted into monetary terms, these aspects are often underrepresented in such analyses.

The real benefit in introducing the new framework for flood risk management is in the assessment of a variety of options, delivery of multiple benefits and the provision of long-term solutions. In this submission we would like to highlight the multiple benefits that would result from the new framework for flood management, in particularly looking at the benefits of natural approaches to flood management and long-term planning. Where Scottish data are not available, figures from England or other countries are used as indicated.

2. Benefits of long term planning

Strategic planning for flood defence allows for the most cost effective solutions for each catchment to be found. It also helps identify areas where flood mitigation is difficult and where development should be avoided. Planning is particularly important given that flooding is likely to increase in frequency due to climate change. By linking flood risk management with land use planning, it will be possible to avoid new development in areas at high risk of flooding, and so reducing the need for expensive flood protection measures. Avoiding building on floodplains and high flood risk areas remains the cheapest, long-term option for flood management.

Climate change

The UK Climate Impacts Programme[1] (CIP) predicts how climate might change over time, and concludes that winters will become wetter, and summers drier, but the intensity and frequency of summer storms may increase. For example, a medium-emission climate change scenario predicts that a 1 in 100 chance flood in any year is expected to become a 1 in 70 chance flood in any year by the 2020s,

[1] UK CIP 2002 - Climate Change Scenarios for the United Kingdom, Tyndall Centre for Climate Change Research, 2002

and to a 1 in 40-60 chance flood in any year by the 2080s[2]. Therefore floods, which are currently considered 'extreme', will become more frequent in future. The sustainable approach to flood risk management provides effective means of planning for these changes and a framework for sustainable adaptation.

The costs of setting up the new framework for flood management
The current estimate of setting up a framework for the sustainable management of flood risk has been estimated at £76 million. It is worth bearing in mind that **the cost of sustainable flood management planning is dwarfed by the cost of some individual flood defence schemes**. For example, the Elgin flood defence scheme is estimated to cost in the region of £98 million to protect one small town.

Although we cannot calculate the potential cost saving from sound planning for the future, there are many examples of the costs of the lack of integrated flood management planning, especially in areas where development was allowed to take place on floodplains and now they must be defended at very high cost.

3. Costs and benefits of traditional hard defences

Costs of hard defences
Traditional flood defence measures are very expensive. The present value of Scotland's current flood defences is £1.3 million/kilometre.[3]

Maintenance and replacement costs are also high for hard defences. Around 38% of the annual capital cost is required to maintain the defences, which is a very large additional expense.[4] This is reflected by the Environment Agency (EA), in England, spending more of its flood risk management budget on maintenance in 2006-07 (38% of the budget) than on flood defence construction and replacement (36% of the budget).[5] Additionally, hard defences generally need to be replaced after fifty - sixty years.[6]

With the anticipated changes in climate and the frequency and severity of flooding events, these costs are likely to increase in future.

Benefits of traditional hard defences
The benefits of traditional hard defences are likely to be limited to the single purpose, which is flood defence. The evaluation is usually based on the analysis of the number of homes/businesses protected from flooding.

4. Multiple benefits of natural flood management

There are multiple benefits that result from the habitat creation that accompanies many forms of sustainable flood management, and in particular through natural flood management. These can be categorised as ecosystem services – aspects of

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[2] Foresight report, 2002
[3] JBA Consulting, 2007, *Scottish flood defence asset database*, Scottish Government, Edinburgh. This figure is based on £82 million in costs for 61km of defence. Costs and benefits are best assessed over a long time frame, so that the relevant maintenance and replacement costs can be taken into account. The best way to do this is to use present value, which is the total value of the future benefit stream in present day terms - this allows costs and benefits to be compared more easily. The present values used in this submission use the Treasury's Green Book's declining discount rate over 100 years.
[4] Halcrow Maritime, HR Wallingford and John Chatterton Associates, 2001, *National Appraisal of Assets at Risk from Flooding and Coastal Defence*. Defra, London.
[5] National Audit Office, 2007, *Building and maintaining river and coastal defences in England,* London
[6] Halcrow Maritime *et. al.* 2001., *National Appraisal of Assets at Risk from Flooding and Coastal Defence.*

ecosystems that can be consumed and/or utilised to produce human well-being. The four main categories of ecosystem services, and examples of the types of services that would arise from an increase in habitats and biodiversity are:

- Provisioning (fresh water, food)
- Regulating (water purification)
- Supporting (nutrient cycling)
- Cultural (tourism/recreation, aesthetic, sense of place)

These benefits are summarised in Table 2 at the end of this document. The value of these services is usually very site specific, and dependent on variables such as the availability of other sites providing similar services and the population that enjoys the services. Because they are difficult to value they are often neglected in traditional cost-benefit analyses. This is because traditionally, the cost-benefit analysis only assesses monetary values as this provides for a direct comparison of costs and quantifiable benefits. As environmental and social benefits cannot be easily converted into monetary terms, these aspects are often underrepresented in such analysis. We are therefore concerned that the current cost benefit analysis is insufficient to provide the relative economic costs and benefits of different flood management options.

5. Costs and benefits of natural flood management

It is difficult to generalise about the cost of sustainable and in particular natural flood management measures as the measures vary widely. It is also worth noting that this is a new area of economic research, with a number of European research projects due to report shortly. Some of these research projects are particularly relevant, and include the economic assessment of the benefits of flood warning, and the evaluation of multiple benefits/ecosystem services in cost-benefit analysis.

Despite this, it is clear that sustainable flood management measures are likely to be cheaper as they are far less expensive to maintain in the long term. Even when used in combination with hard defences, sustainable measures are likely to help reduce the overall flood management cost by reducing flood peaks and erosive pressure. Some examples of the lower cost of sustainable defences are given here.

Managed realignment

Managed realignment is widely practiced as a coastal flood management measure in England by the Environment Agency (EA) and elsewhere in Europe, and is still a new concept in Scotland. The costs provided in this submission are therefore largely based on research carried out in England.

Managed realignment schemes are often less costly over time than hard defences as they require less maintenance.[7] The height needed for embankments is generally lower due to the retreat inland, and erosive pressure is lessened due to the buffering action of the intertidal habitat created in front of the embankment. No defences might be required at all if the retreat is to a contour. In 1998 the EA estimated that the difference in costs, for building new seawalls, with 30 metres of saltmarsh in front of the seawall cost £800 per metre as opposed to £5,000 per metre without saltmarsh.[8]

[7] Environmental Futures, 2006, *Economics of managed realignment in the UK*, Coastal Futures.
[8] Empson, B. *et al.*, 1997, "Sustainable flood defence and habitat conservation in estuaries – a strategic framework", *Proceedings of 32nd MAFF Conference of River and Coastal Engineers*.

Freiston Shore is an example of the potential benefits to be gained from managed realignment. The realignment of the flood defence walls saved almost half a million pounds in costs – the cost was £2 million compared to the £2.47 million estimated for maintenance/replacement of the walls.[9] This greater cost effectiveness was achieved without even taking into account the significant environmental benefits gained from creating 65 hectares of intertidal habitat. Another additional benefit was the improved recreation value of the site. By 2008 almost 60,000 people were visiting Freiston Shore each year compared with approximately 11,000 people before the realignment. The nature reserve on the site supports an estimated 6 full time equivalent jobs in the local community and also provides a valuable place for local people to exercise and relax.

The use of wetlands

Often sustainable flood management includes restoration of wetland to store or slow water flow. The Scottish Rural Development Plan indicates the likely costs of wetland creation and management. Table 1 displays the rates landholders are paid for creating and/or managing wetlands.

Table 1	**Annual payment**	**Present value[10]**
Management of open grazed or wet grassland for wildlife	£111.00/ha	£2,043/ha
Management of Wetland	£90.00/ha	£1,656/ha
Creation, restoration and management of wetland	£227.00/ha	£4,178/ha
Management/restoration of lowland raised bogs	General Mgt. £40.00/ha Grazing Mgt. £83.00/ha	£736/ha £1,528/ha
Creation and management of water margins and enhanced riparian buffer areas)	£294.00/ha	£5,491/ha
Management of flood plain	£39.00/ha	£718/ha

These wetlands are being created or managed for wildlife benefits, and as such are likely to cost more than wetlands that are created simply for flood management. This means they wetlands created and managed for biodiversity are likely to be more expensive than a less managed wetland. However, these costs are still lower than the cost of hard flood defences.

Estimating the value of natural flood management

Whilst this area of economics is relatively new, some research exists that helps to clarify some of the benefits offered by natural solutions to flooding. As a general guideline, Defra flood appraisal guidance recommends the use of £175 or £300/ha per year for the environmental benefits of managing water levels. This gives a present value of £3,221 to £5,521 per hectare. Other figures, derived from "meta-analyses" of the economics valuation literature, suggest that benefits from grazing marsh is likely to be even higher, around £290-360/ha per year, or a present value of £4,785 - £7,177/ha.[11]

[9] Environmental Futures, 2006, *Economics of managed realignment in the UK*.
[10] Present value is the total value of the future benefit stream in present day terms
[11] Eftec, 2007, *Policy appraisal and the environment: an introduction to the valuation of ecosystem services. Wareham managed realignment case study.* Defra, London.

To minimise the risk of double counting, generally ecosystem services are estimated together in one benefit valuation. One exception might be carbon storage, which is a service with a global impact. The UK government's shadow price of carbon is currently £26.52/t, and increases each year. The value of carbon sequestration over time is potentially high. A recent analysis of the proposed Wallasea Island realignment assumed that one tonne of carbon was sequestered per hectare of intertidal habitat created.[12]

In light of the multiple benefits it will probably be appropriate to seek funding from more than the traditional flood defence sources. Scottish Ministers have a role to play in ensuring that adequate funding is made available to deliver SFM on the ground, and to reward farmers and foresters for managing their land for the benefit of flood management and climate change adaptation. This may require integrated funding streams.

6. Conclusions

The benefits of sustainable flood management, and in particular the natural component of flood management are many fold. We believe that sustainable flood management provides cost-effective means of protecting communities from flooding, whilst also providing additional benefits for the environment and the society. It therefore makes an economic sense to invest now on implementing a framework for the management of flood risk that will provide long-term solutions and ultimately reduce the future costs of flood protection. This is particularly important in the light of changes in weather and the predicted increases in flooding associated with climate change.

For further information please contact:

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ANNEX 1

Table 2: Natural Floodplain Functions and Societical values, (Department of Water Recourses California, May 2005)

Natural Floodplain Functions	**Human Services and Values**
Maintain Natural Channel Processes	
Maintain natural dynamic channel processes and equilibrium	All of below
Manage Flows	
Conduit for water, nutrients and organisms	Protection of life and property • Avoided structure and content losses • Avoided crop losses • Avoided income losses • Avoided damage to public infrastructure and services • Avoided emergency response and recovery costs • Avoided flood insurance administration costs • Avoided hospitalization and related health care costs • Avoided physical, financial and emotional disruption of lives • Avoided loss of life Avoided flood/sediment control infrastructure costs Value of flow-related goods and services • Recreational boating • Commercial navigation Avoided habitat enhancement/replacement costs
Spread and retain surface and subsurface water	
Moderate speed, force, depth and timing of flows	
Maintain base flows	
Reduce frequency and duration of low surface flows	
Maintain sediment balance	
Maintain connectivity between channel and floodplain	
Maintain Water Supply	
Increase surface water storage	Value of goods and services produced with additional water supplies • Agricultural • Municipal and industrial • Environmental Avoided water supply infrastructure costs Avoided habitat enhancement/replacement costs
Promote groundwater recharge and storage	
Natural Floodplain Functions	**Human Services and Values**
Maintain Water Quality	
Filter nutrients and impurities from runoff	Value of goods and services produced with improved water quality • Agricultural • Municipal and industrial • Environmental Avoided water treatment infrastructure costs Avoided damage to plumbing, fixtures and appliances Avoided habitat enhancement/replacement costs
Process organic wastes	
Moderate water temperature fluctuations	

Maintain Soil Quality	
Detention of particulates, compounds and elements	Value of goods and services produced with improved soil quality Avoided soil treatment costs Avoided habitat enhancement/replacement costs
Maintain Air Quality	
Carbon sequestration (removal of atmospheric carbon by vegetation)	Value of goods and services produced with improved air quality Improved property values Value of improved health and comfort Avoided damage caused by poor air quality Avoided habitat enhancement/replacement costs
Vegetation humidifies atmosphere and moderates air temperatures	
Maintain Plant and Animal Habitats	
Maintain characteristic and diverse plant and animal communities	Value of goods and services associated with habitats • Natural products • Aquaculture • Recreation • Hunting and fishing (sport and commercial) • Open space/aesthetics • Environmental studies • Cultural resources Improved property values Enhanced economic development Preservation values (existence, option and bequest) Avoided habitat enhancement/replacement costs
Provide habitat interspersion and connectivity	
Provide breeding and feeding grounds	
Protect habitat for species of special concern	
Maintain ecological succession	