



for a living planet



SLOWING a natural solution to flooding problems **THE FLOW**

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For more information contact:

WWF Scotland
Little Dunkeld
Dunkeld
Perthshire PH8 0AD

t: 01350 728200

f: 01350 728201

wwf.org.uk/scotland

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EXECUTIVE SUMMARY

FLOODING is one of the most challenging and costly realities of life in the 21st century.

The natural behaviour of rivers is becoming an increasingly unnatural force in villages, towns and cities across Europe and wider. As climate change combines with human pressures on the land, floods occur more often and leave greater damage when they have gone.

Building large concrete barricades is no longer considered the most effective defence against rising floodwaters. With climate change bringing increased rainfall to Scotland, concrete defences will be unable to cope with the quantities of water flowing downstream. Concrete flood defence systems are extremely costly to design, build and maintain, and singularly concentrate on the *symptoms* of flooding, not the *causes*.

By restoring the river's natural capacity to cope with floods via its wetlands, floodplains and riparian woodlands, the risk of flooding downstream is lowered and the need for costly concrete defences dramatically reduced

The European Water Framework Directive (WFD) has shifted focus from single remedies to a whole river catchment (or river basin) approach to the water environment. Member States must 'mitigate the effects of droughts and floods' and achieve ecological status for the whole river catchment area by 2015. Scotland was the first UK country to

transpose the European Directive into law through the Water Environment Water Services (Scotland) Act (2003), which also sets a duty on local authorities to promote sustainable flood management.

A truly *sustainable* approach to flood management is extremely cost-effective. By restoring the river's natural capacity to cope with floods via its wetlands, floodplains and riverbank (riparian) woodlands, the risk of flooding to settlements downstream is lowered and the need for building costly concrete defences dramatically reduced. Initial estimates show that a sustainable flood management

scheme can cost a tenth of the price of an engineered concrete flood defence scheme.

The fundamental properties of concrete flood defences mean that their effectiveness will inevitably deteriorate over time with the pressures of water impact, while the costs of repairing the concrete defences will concurrently rise. With sustainable flood management the opposite is true. As the riparian and gully native woodlands grow and wetlands mature, their effectiveness actually increases over time. Once the riparian trees are planted and natural elements of the river's flood defence system restored, the costs involved in maintaining them are negligible.

The essence of sustainable flood management on a river catchment lies in achieving a truly integrated approach. In Scotland, a National Flood Liaison Advisory Group with eight area Flood Liaison Advisory Groups (FLAGS) should be linked into the WFD River Basin Management Planning Process. With appropriate representation, these area FLAGS will produce Catchment Flood Management Plans allowing an integrated response to flood management.

Scotland led the way towards sustainable flood management in terms of putting progressive legislation in place, but implementation has been slow. Changes are needed, for example to the agricultural and forestry grant systems, to encourage farmers and foresters to lower flood risk for villages, towns and cities downstream.

The River Devon Natural Flood Management Demonstration Site shows how a whole catchment approach to sustainable flood management is achieved and how these principles can be applied to any river in Scotland.

Sustainable flood management enables communities to adapt to the realities of climate change. Restoring a river's natural defences against flooding brings social, economic and environmental benefits to the whole community.



UNDERSTANDING FLOODING

Costs and Consequences of Flooding

SCOTLAND is already feeling the consequences of climate change through fiercer and more frequent flooding. The highest flow ever measured on a UK river was recorded on the Tay in 1993 with floods causing damages estimated at £30 million. Since then record-breaking events have made regular headline news. In 1994, floods caused £100 million worth of damage in Strathclyde. In 1997, 2000 and 2002 record flood levels inundated Elgin's businesses and homes. In April 2000, Edinburgh floods caused an estimated £25 million worth of damage.

family life. Evacuation fragments communities and the stressful effects of anxiety and insecurity may remain long after the water has subsided. Studies have shown that stress related conditions increase significantly in the period following a flood; higher than normal levels of mental illness were registered locally after the Perth flood.

Social and economic costs are likely to increase with climate change. Overall rainfall is expected to rise above the present average by 10 per cent in Scotland by the 2020s, 15 per cent by the 2050s and, by the 2080s, rain along the east coast could increase by as much as 30 per cent. In Scotland, the most damaging effects of flooding will continue to affect life in towns and cities. Some studies suggest that by the 2080s, Edinburgh is 60 per cent more likely to experience extreme two-hour downpours, overwhelming the current urban drainage system.

The cost of building and maintaining a system of ever-higher concrete defences in Scottish towns that are at risk of flooding places an increasing burden on local authorities. No council can afford to divert spending from

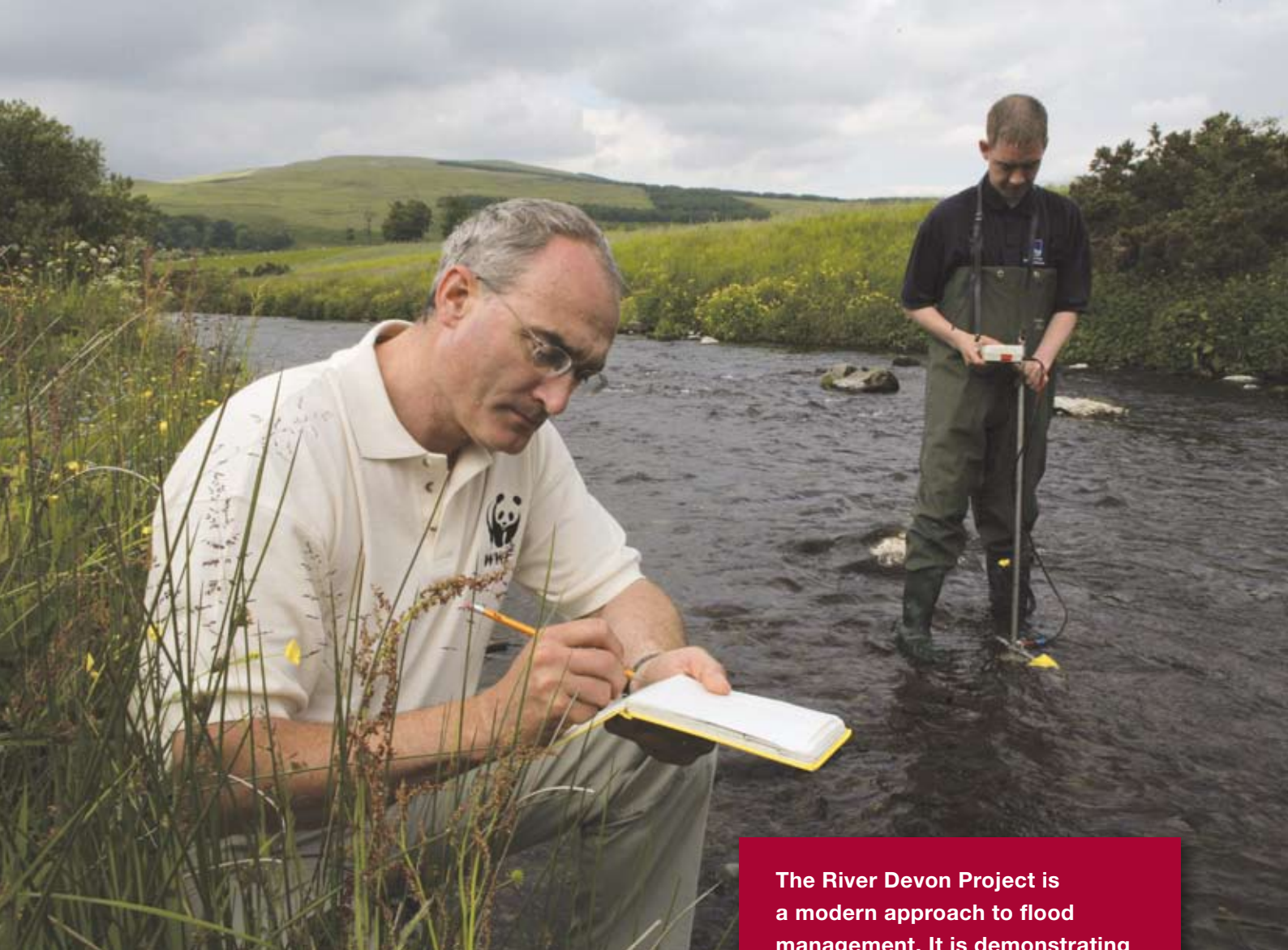


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Around 85,000 Scottish homes are currently at risk from river flooding. Average annual flood losses are estimated at £31.5 million and (on present evidence) these losses will rise to £40 million by the 2020s, £53 million by the 2050s and £68 million by the 2080s. It is more difficult to measure social and emotional costs suffered when flooding disrupts business, destroys farmland, and disturbs

priorities like education and health to pay for and maintain concrete flood defences, which may simply send the problem further downstream. As rainfall increases and flooding incidents rise in severity and frequency, so do the costs and scale of engineered concrete flood defences, creating an ever-increasing unsustainable cycle. But what is the sustainable alternative?





Sustainable Flood Management

IN JANUARY 2003, the Scottish Parliament became the first in the UK to transpose the European Water Framework Directive into statute as the Water Environment Water Services (Scotland) Act (2003). The Act imposes a new duty for local and central government to promote 'sustainable flood management'.

A truly sustainable plan for flood management must recognise the needs of people. People have always settled along the banks of rivers, making the most of the fertile environment and speeding trade between towns and countries. Even so, for thousands of years human settlements avoided building on natural floodplains and marshes allowing the rain to soak into wetlands that acted like sponges and the river to spill onto this unoccupied land during times of heavy rainfall or melting snow.

Growing populations, combined with a demand for intensive agriculture, began to interrupt the natural courses of rivers. Wetlands were drained for housing and farming, and hard engineering was introduced to keep floods from invading buildings. For around 200 years, the built

The River Devon Project is a modern approach to flood management. It is demonstrating that although the symptoms of flooding are felt downstream in streets, businesses and houses, the actual causes begin upstream among fields, forests and gullies

environment withstood the average high water mark of the river and people lived with the knowledge that extreme events would happen only every few decades.

However, the reality today is that increasingly frequent flooding now requires a modern and more sustainable approach. Building on floodplains prevents the river overflowing where and when it needs to and draining wetlands simply speeds the water on downstream. During flash floods, hard surfaces propel rainfall run-off into concrete-lined drains and culverts, which were not designed for such high volumes of water.

Insurance premiums rise as flood risk increases and in some areas flood cover is no longer guaranteed. In high-risk areas (where flood hazard exceeds the 75 year return period) the Association of British Insurers (ABI) estimates 350,000 UK households will become uninsurable. So far the ABI evaluates the UK as a whole, but some insurance companies are more sympathetic towards Scotland, especially in areas with active plans for sustainable flood management.

The River Devon Project is a modern approach to flood management. It is demonstrating that although the symptoms of flooding are felt downstream in streets, businesses and houses, the actual causes begin upstream among fields, forests and gullies. Sustainable flood management is based on an understanding that there will always be a need for a range of approaches to lowering flood risk in built up areas. Yet for roughly a tenth of the cost of extensive hard engineering, flood risk can be reduced if the river is allowed to behave more naturally.

Sustainable flood management will bring social, economic and environmental benefits to the whole community.



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MAPPING PRESSURES ON THE RIVER

- A river is a dynamic force, constantly changing and adapting to new circumstances as it moves through the catchment area.
- Pressure on any part of the catchment area can have unintended consequences further downstream.
- While most of the destructive symptoms of flooding are felt in urban areas downstream, the causes are mainly linked to land-use practices much further upstream.
- This map of the River Devon shows pressure points which could be found along any river in Scotland, and most in the UK.



water flows off too fast

In gully woodlands, overgrazing removes the natural woodland buffer zones, rainfall drains too fast and destabilises soil. Storms clear natural 'dams' of debris deepening channels and accelerating flows



rapid run-off

Clearing native hillside woodlands for sheep grazing causes rapid run-off from rain and melting snow. Without trees and shrubs to take up water and add roughness to slopes they are unable to slow the passage of excess rainfall



blocked water courses

Debris and sediment in water courses near towns and villages lead to floods



© R. Johnson / WWF Scotland

clear felling forestry

Clear felling of forestry exposes old drains and can speed run-off while brashing can block manmade culverts



© R. Johnson / WWF Scotland

erosion

Riverbank erosion is increased with livestock grazing. Large deposits of sediment build up in the channel reducing the river's ability to carry floodwaters and the river floods more easily



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natural sponges drained

Draining floodplain wetlands for livestock grazing and crops removes essential water storage areas for the river



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floodplain is disconnected from the river

Flood banks designed to protect fields and properties simply pass the problem downstream because they prevent floodplains acting as natural storage areas during a flood

SUSTAINABLE FLOOD MANAGEMENT IN ACTION

Slowing the Flow of the River Devon

LIKE MOST of Scotland's rivers, the River Devon seems in a hurry to reach the sea. Burns gathering high in the Ochils rush off steep slopes as they join the Devon's twisting course down through Clackmannanshire on its way to the Forth. Centuries of human activities have combined to speed the flow of water off the land. Deforestation, drainage, grazing and erosion all helped to create the bare 'slippery slopes' which hasten the river's journey to villages and towns in the floodplains.

Each river has its own character evolved over thousands of years. Yet all rivers – from the Devon to the Danube – tend to behave the same under the same human pressures. Displaying most of the features defining Scotland's rivers, the River Devon provides an ideal site to demonstrate how slowing the flow of the river upstream can reduce flooding downstream – and bring the benefits of an enriched natural environment for the whole community.

Almost half of Clackmannanshire, Scotland's smallest mainland county, occupies floodplain. Severe localised flooding is already a persistent problem for the old mill towns downstream and that is likely to get worse with climate change.

In a pioneering approach to flood management, the River Devon Project set out to demonstrate how sustainable flood management could protect people and property from flooding at a fraction of the cost of more conventional concrete flood-walls. Research studies show how deforestation, erosion and drainage influence flooding but very few people understand how to rehabilitate and develop effective natural barriers by restoring wetlands and

woodlands. The WWF Scotland Project, funded by HSBC, in partnership with Clackmannanshire Council, is managed by Dr Richard Johnson, a hydrologist with Mountain Environments, based in Callander.

Sustainable flood management begins with detective work. Understanding the causes of flooding downstream means taking a detailed look at the way land is being used upstream. Close analysis of maps and careful exploration on the ground is backed up by face-to-face meetings with farmers and local residents to discover how land use had changed in their lifetime. Map names – like Maddy Moss – provide other clues to areas of natural wetland with potential to act like a sponge.

Information is fed into a computer programme allowing the hydrologist to chart different peaks of flow along the river and measure the effects of slowing the flow at selected sites. Painstaking work at this stage can significantly reduce the cost of designing a flood prevention scheme: the more water that can be stored in wetlands or woodlands upstream, the less money needs to be spent on creating or raising flood-walls downstream.

For the most part, sustainable flood management works by restoring natural pressures, allowing natural storage areas to hold more water upstream and release it slowly downstream. But once the river reaches towns and villages, sustainable flood management deliberately changes tack to speed the flow away from potential hazards.



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Bringing Benefits to the Community

SUSTAINABLE flood management does not take immediate effect any more than concrete constructions appear overnight. In many river catchment areas, a sustainable management plan is likely to involve a mixture of innovative natural strategies and conventional small-scale built defences. However, there are striking differences between the maintenance costs of each system - by the time concrete walls need to be replaced, wetlands and woodlands are able to look after themselves at virtually no cost.



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Natural Solutions

● restoring natural dams

In the uplands, gully woodlands should provide a buffer between surface run-off and natural watercourses. Woodlands filter the rain and provide a series of dams over steep ground, slowing the rush downstream. Woody debris builds up creating pools to slow flood water and trap sediment.

Instead, in many places, decades of overgrazing have prevented woodland regenerating round the headwaters; unstable waters wash downstream, deepening the gullies and speeding rapid run-off.

The first step to resolve this is to secure a stock fence round the upper gully. Planting native trees and managing woodland in upland gullies encourages woody debris to build up and restore the natural dams and ponds.

● restoring natural sponges

Wetlands are natural sponges that hold immense amounts of water and play a vital role in flood management. But draining them to provide grazing land increases run-off with a cumulative effect as the former small wetlands now discharge rapidly into the water-course.

Blocking drains and planting trees can slow the water flow in selected areas. Straw bales provide a temporary dam until trees and bushes can grow substantial enough to create woody debris and restore an upland habitat rich in wildlife.

● replanting woodland protection

Woodlands can dramatically reduce storm water run-off and snow melt. Trees intercept both rain and snow but they also absorb moisture from the ground enabling the soil to hold more water during heavy downpours. However, most UK uplands have been cleared of woodland cover to make way for grazing sheep – creating the slippery slopes, which speed run-off.

A new area of upland native woodland planting can reduce storm water run-off and snow melt

● managing forestry drains

Throughout the UK, old forest drains are exposed by forestry clear felling. At present there are no guidelines on how forest managers should cope with the drains, which soon become active once tree cover is gone – speeding a greater flow of water into the river.

By blocking drains, re-creating wetlands, restoring natural watercourses and managing road drains, the River Devon Project demonstrates techniques for best practice in forestry plantations.

● soft engineering downstream

Banks erode when the river slows down to a meandering course through the floodplain. The natural process of erosion becomes destructive under pressure. Grazing along riverbanks increases erosion and coarse sediments build up in the river reducing the channel's ability to cope with heavy flows during floods – the floodplain fills before the peak of the storm.

Sustainable, living walls stabilise the banking and are more flexible than any hard engineering. Green willow woven into areas of the bank demonstrates how the willow quickly grows into a green barrier, creating a new source of food and shelter for wildlife – good for birds, fish and people.

● reconnecting rivers with their floodplains

Floodplains are where the river naturally stores water during a flood. They can hold colossal volumes of water and release them slowly as the river falls back to normal height. But they provide another benefit. When water slows down on floodplains it deposits sediment on the land. This naturally fertilises the soils and prevents a build up of sediment in the river channel, increasing its capacity to hold water.

● replanting natural barriers

Riverbank (or riparian) woodland provides one of nature's most valuable flood defences. In the fertile soil of the floodplain, native woodlands create a rich habitat full of wildlife. During storms, trees trap water then release it slowly through a leaky barrier of woody debris filtering out pollutants in the process.

Most of the UK's riparian woodland no longer exists. Instead, the natural habitat has given way to drainage, embankments, roads and bridges.

Restoring riparian woodland will reduce the impact downstream. A new plantation of 5000 mixed native trees shows how floodwater can inundate the floodplain upstream until it is trapped by the woodland barrier and released slowly downstream.

● speeding the flow through town

Blockages in urban drains and channels can cause sudden local flooding. A build up of sediment, fallen trees and human rubbish can change the flow of water along river channels. Here sustainable flood management aims to increase the capacity of the channel and speed the flow of water by removing sediment at key points.

Computer analysis can be used to calculate how much sediment should be removed to reduce flood levels. This clearing needs to be done annually until river flows become self-managing.

MAPPING NATURAL SOLUTIONS ON THE RIVER

● Without human intervention, a river is a naturally self-regulating system that uses floodplains, wetlands and woodlands to maintain a steady flow of water along the channel.

● Like a living being, a healthy river depends on a clear circulation through the streams and channels that form the arteries, veins and capillaries of the system.

● Wetlands and floodplains (the 'kidneys' of the river body) allow flooding to become a cleansing process, filtering pollutants out of the water before it returns to the river.

● This map of the River Devon shows how flooding risk to communities is reduced by enabling the river to function naturally.



slow the flow

Use stock fencing to stop overgrazing in gully woodlands. Plant native trees to filter rain and stabilise soils

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replace woodland storage

Plant mixed native trees. Trees take up water and the added roughness of the ground slows heavy rainfall

© S. Morgan / WWF-UK



restore wetlands

Block drains on selected wetlands with straw bales and tree debris. Plant trees and bushes to increase water storage

© S. Morgan / WWF-UK



reduce erosion

Planting green willow creates a living wall to hold the bank in place – reducing erosion and increasing the river's capacity to cope with floodwater



© J. Grant / WWF Scotland

restore natural balance

Reduce run-off on forestry clear fell sites - rehabilitate old drains, re-create wetlands, restore natural watercourses and manage road drains and culverts



© R. Johnson / WWF Scotland

add more storage

Control release of water from reservoirs and quarries during extreme weather



© R. Johnson / WWF Scotland

restore floodplains and plant 'leaky barriers'

Floodplains are vital storage areas. Remove flood banks and plant native trees on the riverbank. Riparian woodlands provide a first line of defence on floodplains above urban settlements, absorbing storm water overflowing from the river channel and releasing it slowly through a 'leaky barrier' of vegetation thickened by flood debris



© M. Donaghy / WWF Scotland

remove sediment

Checking and clearing burns in sensitive areas near human settlements helps to reduce risk of flooding

PROGRESS TOWARDS SUSTAINABLE FLOOD MANAGEMENT IN SCOTLAND

Maintaining Scotland's Lead

IT IS to be commended that the Scottish Parliament, with support from Scotland's environmental organisations, took the opportunity to put in place pioneering legislation on flood management.

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A growing sense of urgency – increased by the widespread flooding of 2002 – initially helped to stimulate decisive steps taken by the Scottish Parliament and the Scottish Executive. Since then government implementation of the sustainable flood management duty in the Act has not progressed as effectively as would have been hoped.

Scotland's early approach with the legislation is now influencing the development of flood management policy in Europe. The River Devon Project, set up by WWF

Scotland with HSBC funding, is attracting policy makers from the rest of the UK and other European countries, to explore what sustainable flood management means in practice. At the same time, Scotland is discovering the barriers which must be overcome before opportunities become reality.

Integrating rural policies and incentives, ensuring that public monies are redirected to achieve sustainable flood management rather than maintain business as usual, and coordinating work across the country and government to be most effective are some of the administrative hurdles.

The opportunities are exciting but challenging. Many different and often competing human interests exist along the course of any river. Sustainable flood management reduces the risk of flooding by shifting resources away from building concrete defences downstream towards finding

natural ways of storing or slowing the flow of the river upstream. However, getting that message across means raising new awareness among a wide range of people in river catchment areas where key stakeholders include engineers, planners, local authorities, river managers, farmers and foresters.

Successful implementation of sustainable flood management is likely to depend on finding the most widely acceptable answers to important questions: who should be responsible for sustainable flood management; how can it be coordinated and where will the funding come from?

Integrating the Whole River Catchment into Sustainable Flood Management

IN PRACTICE, as the River Devon Project demonstrates, sustainable flood management means taking a catchment approach and, working with stakeholders, increasing the storage capacity of rivers in wetlands and floodplains upstream instead of spending entire budgets on building flood walls through towns and cities.

The current working definition produced by the Flooding Issues Advisory Committee in 2005 stresses the importance of 'resilience'.

Sustainable Flood Management provides the maximum possible social and economic resilience against flooding by protecting and working with the environment in a way which is fair and affordable both now and in the future.

In this definition, 'resilience' means the ability for community, economy and environment to recover easily and quickly.

Scotland's approach is now influencing the development of flood management policy in Europe

Flood Planner

***Flood Planner* is a technical tool for local authorities with detailed practical information on how to create and maintain sustainable flood management schemes. *Flood Planner* is available from WWF Scotland.**

Key Steps Towards Sustainable Flood Management

1961 Local authorities gain powers to manage or repair watercourses using hard engineering options, such as concrete barriers, under Flood Prevention (Scotland) Act.

1997 Local authorities are charged with a duty to reduce risk of watercourses flooding through Flood Prevention and Land Drainage (Scotland) Act.

2000 The European Water Framework Directive requires Member States to achieve 'ecological standards' on rivers and prevent flooding but 'flood management' is not included in the Directive.

2003 Scotland becomes the first country in the UK and Europe to transpose the European Water Framework Directive into domestic legislation. Encouraged by WWF Scotland and other Scottish Environment Link members, the Scottish Parliament takes the opportunity to add a statutory duty for sustainable flood management. It also ensures that the legislation requires integrated working across government to promote sustainable flood management. Scottish legislation now leads the way in Europe. The Scottish Executive forms the National Technical Advisory Group (NTAG) on flooding to provide guidance on sustainable flood management strategy.

2003 WWF Scotland launches the River Devon Natural Flood Management demonstration site in Clackmannanshire, the only one of its kind in the UK, working in the whole river catchment area, or river basin.

2004 Scottish Planning Policy 7 (SPP7) is published. One of the guidelines is the prevention of new building on floodplains. The consultation on sustainable flood management is expected.

2005 Replacing the technical advisory group, NTAG, a Flooding Issues Advisory Committee (FIAC) is set up to develop the National Flooding Framework and to give advice on sustainable flood management. Members bring environmental, insurance, local government, academic, engineering, farming, forestry and planning expertise.

2006 From 1 January, flood insurance is no longer guaranteed for business and households in high-risk areas in the UK. Scottish properties are already treated slightly differently because of the initial progressive approach to sustainable flood management. It could be in a better position, but progress on implementing the duty has slowed. There is no evidence of implementation on the ground and funding streams are still being allocated on the basis of the 1961 Act rather than the new Scottish legislation. The consultation on flood management has still not been published.

2006 The Environment and Rural Development Committee question the Deputy Minister for the Environment and Rural Development on the lack of progress on implementation of the sustainable flood management duty.

2009 The date required by the European Commission for production of River Basin Management Plans coordinated by SEPA.

Who Does What?

THE STATUTORY responsibility for flood prevention in Scotland is divided into key areas:

- **Scottish Executive** is responsible for producing the national flooding policy and providing local authorities with funding for flood prevention schemes
- **SEPA** is responsible for warning the public about flood risks in their area and advising local authorities on flood protection schemes
- **Local authorities** are responsible for flood protection on non-agricultural land.

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Scotland needs a representative National Flood Liaison Advisory Group with responsibility for coordinating flood management planning through eight Area Flood Liaison Groups

Ultimately local authorities carry the greatest burden of responsibility, as they must coordinate planning control with flood protection and prevention schemes as well as maintaining watercourses and coordinating services during a flood. In Scotland, local authorities are democratically accountable if they fail to adequately protect properties from flooding.

The Coordination Challenge

SUSTAINABLE flood management can work only with cooperation from stakeholders in the whole river catchment area. One of the greatest challenges is to integrate the many different measures that are used: from restoring and creating wetlands and planting riverbank woodlands to opening town culverts and stopping development on floodplains.

For that reason, almost all local authorities in Scotland have now set up **Flood Liaison Advisory Groups** which meet regularly to discuss policy on drainage and



© R. Johnson / WWF Scotland

flood prevention and to share information and technical expertise on managing the catchment area.

Yet currently, there are no consistent guidelines for these groups. Councils can choose from a range of options, which may include combining with other councils in the river catchment area, or setting up a flooding sub-committee. Their membership also varies widely. Typically, the groups include relevant council officials, representatives from SNH, SEPA, Scottish Water, and building and development industries. Currently there is no requirement to include landowners even though the majority of the downstream symptoms of urban flooding can be traced to the use of land upstream.

The departments, particularly those responsible for agriculture, forestry, planning and flooding, within the Scottish Executive should work together in a coordinated way to manage the production of a flood management process more in keeping with the sustainable approach. Land users have a fundamental role to play in lowering flood risk to communities downstream and encouraging them to play this role will require modernisation of existing laws and guidelines. For example, flood management responsibility should broaden beyond local authorities out to representative Flood Liaison Advisory Groups.

The ongoing **River Basin Management Planning Process**, initiated by the Water Framework Directive, offers a unique opportunity to bring flood management together with catchment management to achieve change. A representative **National Flood Liaison Advisory Group** with responsibility for coordinating flood management planning through eight Area Flood Liaison Groups could link the duty for sustainable flood management to the River Basin Management Process.



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Investing in Town and Country

SUSTAINABLE flood management offers an exciting opportunity to create a new relationship between town and country.

Although most flood damage occurs in towns and villages downstream, most floods begin upstream in rural countryside.

Sustainable flood management could provide the structure to stimulate a constructive new connection between landowners and town-dwellers by linking agri-environmental schemes with land and sustainable flood management.

WWF Scotland suggests re-directing flood scheme funds away from hard engineering projects and revising the present agricultural grant system, initially through Land Management Contracts. This would enable farmers, identified as possessing land in priority areas of the catchment, to benefit from allowing their land, for example, to revert to wetland or riverbank woodland. In effect, those farmers would be rewarded for 'farming water'; reducing the risk of flooding in towns and cities by allowing the river to flow more slowly through their land. They should also be compensated for any loss of resource. This will require planning and a long-term approach to agreements and funding.

Environmental benefits of restoring a more natural river course might also allow sustainable flood management schemes to tap into funding available for local Biodiversity Action Plans.

There are other powerful incentives. With increasing flood risks, insurance premiums are rising and may

no longer be available to new business in high-risk urban floodplains. Some insurance companies take a more sympathetic view of Scotland especially in areas where FLAGs are actively working on sustainable flood management but so far there is no official recognition that Scotland is different from the rest of the UK.

The need to adapt to climate change underlines Scotland's approach to flooding and the new legislation. Wetlands are extremely good at mitigating the effects of rainstorms. Although grant aid has been increased to 80 per cent to encourage flood defence projects in Scotland, councils are now under a duty to promote sustainable flood management. Invariably, the most cost-effective solution will focus on increasing the storage capacity of rivers and lakes upstream instead of building higher floodwalls downstream. Moray Council's £95 million concrete flood defence plan for Elgin is more than the total £89 million grant funding pledged by the Scottish Executive for local authority flood prevention schemes in the whole of Scotland from 2005-2008. Yet no action has been taken to date that makes the community any less vulnerable. In the time it has taken to develop this as yet unstarted scheme the Elgin community could have had some protection from sustainable flood management measures at a fraction of the proposed cost.

Can Scotland Maintain the Lead?

CLIMATE CHANGE and the law are combining to create an urgency for finding an innovative and sustainable approach to flood management. There are legislative and policy obstacles to overcome and gaps in human skills to fill, but with investment in the training and resources needed to drive the changes forward, Scotland can lead the way in world-class river management.



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BOLD SOLUTIONS

SCOTLAND is committed to making vital steps forward on sustainable flood management in the water environment legislation. In order to capitalise on this, for example by securing better insurance conditions across the country, there are some key actions that the Scottish Executive could take now that would ensure that the wellbeing of our rivers and everyday lives benefit from this good start.

● **Implement the duty on sustainable flood management.** If there are obstacles to doing so, these need to be identified and fixed. It is not good enough to rely on 1961 legislation while new legislation from the Scottish Parliament sits redundant.

● **Lead by example** and enact the statutory requirement for integration across government. This means coordination on policy and funding streams required in order to achieve effective and integrated catchment flood management. Currently some key departments are not getting involved. The mechanism to ensure such integration must be established.

● **Provide adequate resources to move forward.** Despite lack of progress on delivering the duty, the capacity within government to implement it is currently under-resourced and reducing rather than increasing. This needs fixed to enable long-term solutions to be implemented.

● **Establish one national advisory group for flooding.** A national group should coordinate the work of the eight flood liaison advisory groups – linked to Scotland's eight River Basin Area Advisory Groups ensuring a smart, coordinated approach.

● **Inform, encourage and reward land managers to 'farm water'** where catchment flood management plans have identified effective action could be taken. More targeted and sympathetic land use will lower flood risk to communities further downstream so this needs to be properly integrated into rural funding policies and plans.

● **Invest in Scottish higher education courses** in integrated river basin management to produce the river basin and flood managers of the future.

● **Invest in solutions on the ground.** Public monies are still going to hard engineering flood management projects. The Scottish Executive needs to invest in sustainable solutions on the ground, including demonstration sites, to benefit more communities across the country.



Working in Partnership

THE RIVER DEVON PROJECT was funded by HSBC

as part of its Investing in Nature programme, which was launched in 2002. Through this partnership HSBC is investing £12.7 million in WWF's worldwide freshwater programme, which will help rejuvenate at least two million hectares of river basin habitats in the Amazon in Brazil, the Yangtze in China and the Rio Grande on the US/Mexico border. The programme aims include returning the natural flow of rivers, helping to secure fresh drinking water for millions of people, and protecting habitats for freshwater species. The programme has also tackled key freshwater issues in Scotland, England and Northern Ireland - such as flooding, water quality and wetland restoration.



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HSBC volunteers

Staff from HSBC offices around Scotland also rolled up their sleeves and got involved with practical work on the ground at the River Devon by volunteering for a day in June 2006. Employees cleared brash from a hillside burn, which had been left from recent tree felling operations, to prevent the debris being washed downstream and potentially blocking the river in times of heavy rain.

This relationship demonstrates the truly global nature of freshwater issues and a shared responsibility in seeking solutions. Sir John Bond, former Chairman of HSBC, stated "Companies as well as individuals have a responsibility for the stewardship of this planet, which we hold in trust for the future...If we don't act now, by 2025 over 60 per cent of the world's population could face water shortage."

If you would like to find out more about working in partnership with WWF Scotland please contact scotland@wwf.org.uk or Judy Hills on 01350 728 200.

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WWF Scotland, part of the global environment network, took a leading role in helping to influence Scottish legislation for sustainable flood management.

WWF Scotland represents Scottish Environment LINK on the Flooding Issues Advisory Committee.

www.wwf.org.uk/scotland

WWF Scotland's **Freshwater Policy Officer, Mike Donaghy** continues to lead development of the solutions based approach of sustainable flood management. He has spoken on Scotland's progressive legislation internationally, sits on government advisory groups on behalf of Scottish Environment LINK and oversees the ground-breaking River Devon project.

Scottish Environment LINK is the network of voluntary organisations in Scotland working to care for the natural and cultural heritage. It has a membership of 36 organisations supported by around 500,000 members. www.scotlink.org

The River Devon Project is managed by Dr Richard Johnson, a hydrologist who has worked in the Antarctic, Middle East, Nepal, India and China. Dr Johnson, founded Mountain Environments in 1998, a Scotland-based environmental consultancy specialising in river gauging, flood management and river restoration. Mountain Environments, Stirling Road, Callander FK17 8LE info@mountain-environments.co.uk www.mountain-environments.co.uk

Clackmannanshire Council The River Devon Project would not have been possible without the support of Clackmannanshire Council which saw the value of sustainable flood management from the beginning. www.clacksweb.org.uk

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WWF-UK's Natural Rivers Programme is funded by HSBC as part of its £35 million global Investing in Nature programme. For more information visit the Corporate Social Responsibility section at www.hsbc.com

Flood Planner is a technical tool for local authorities with detailed practical information on how to create and maintain sustainable flood management schemes. *Flood Planner* is available from Mike Donaghy at WWF Scotland, from Mountain Environments, and from www.wwf.org.uk/betterriverbasins

SEPA Water Framework Directive information: www.sepa.org.uk/wfd

Flooding Issues Advisory Committee
www.scotland.gov.uk/Topics/Environment/Water/Flooding/16919/FIAC



The River Devon Project is part of WWF-UK's Natural Rivers Programme. This programme is developing innovative techniques for the management and restoration of rivers and wetlands for the benefit of people and nature.

The mission of WWF is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature by:

- conserving the world's biological diversity
- ensuring that the use of renewable natural resources is sustainable
- reducing pollution and wasteful consumption

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For more information contact:
WWF Scotland
Little Dunkeld
Dunkeld
Perthshire PH8 0AD

t: 01350 728200
f: 01350 728201

wwf.org.uk/scotland



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