# THE FLOOD AND COASTAL DEFENCE FUNDING REVIEW

# A DISCUSSION OF FUNDING OPTIONS

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Report submitted by OXERA to the project steering group comprising:
the Department for Environment, Food and Rural Affairs; HM Treasury;
the Department for Transport, Local Government and the Regions;
the Environment Agency; and the National Assembly for Wales

# EXECUTIVE SUMMARY

## Introduction

This summary briefly describes the existing flood-defence funding arrangements in England and Wales and the institutions collecting, dispensing and using the funds. It also considers a range of alternatives, from small modifications and complementary options, to radical substitutes.

Economic tests are used in the study to compare the alternative methods of funding. Its main findings are outlined below.

## Conclusions on the current arrangements

The current funding arrangements provide a reasonably stable flow of finance to support expenditure. They are capable of sustaining the recent pattern of expenditure in the future, and supporting the activities of the Environment Agency, local authorities and internal drainage boards. Also, they offer a mixture of local accountability and central control—the funding arrangements partly determine the locus of accountability, the transparency of responsibility, and the ease of governance.

Central government does not completely determine how much to spend on flood defence, but instead sets high-level service targets and the conditions under which the Exchequer makes contributions to local flood-defence expenditure.

There are two main funding arrangements:

- the Exchequer provides grants to local authorities or the Environment Agency for capital projects that meet national criteria; and
- local authorities can undertake capital or operating expenditure funded by the Exchequer (but with a lag) and by local Council Tax.

The bulk of current funding originates from the Exchequer, with the exception of a relatively small amount of money raised directly by internal drainage boards. The Exchequer should continue to contribute to funding because it provides an efficient means of spreading the burden of funding across society; supplies funds to purchase services of public benefit and for the poor; and can meet the unrecoverable and unattributable costs of flooding caused by the general drainage of land and property.

The funding mechanisms have three main potential drawbacks.

1. Because of the time lag in recovering spending from the Exchequer, local authorities can be faced with a temporary shortfall in funding in any year when they increase expenditure. This effect helps to discourage an escalation of local authority expenditure, but could also be a barrier to increases in expenditure. For example, if local authorities were asked to make a significant increase in expenditure, they could have difficulty managing the temporary shortfall in funding. The effect might be modified by a change to the formula for local government finance, or to local authority borrowing rules, both of which might be

considered as part of the ongoing review of local government finance being conducted by the DTLR.

2. The second potential drawback is a distortion between expenditure on capital projects and operational expenditure to reduce flood risk. Ideally the choice of type of expenditure should be made solely on life-cycle cost grounds. However, the largely separate and dissimilar treatment of capital and operating expenditure funding for flood defence could result in the choice of expenditure type being driven by the relative ease of access to different types of fund. This is likely to be inefficient. In particular, some capital expenditure (CAPEX) receives grant support, but operating expenditure does not; operating authorities may therefore be inclined to promote capital solutions when other solutions would have been cheaper.

   A more harmonised system of funding for operating and CAPEX could be devised, while retaining some of the benefits of the current arrangements. It would necessitate changes to local government finance (some are already under consideration), and changes in the exercise of control (perhaps within the scope of DEFRA's five-yearly review of the Environment Agency). These changes might deliver cost savings from the selection of more efficient solutions on a whole-life cost basis, programme efficiencies from the organisation of portfolios of projects, and opportunities for benchmarking and performance measurement to raise the quality of accountability and governance.

   Such changes might facilitate the resolution of other issues. These include greater coordination and timeliness in the preparation of budgets and planning of future investment, where central government, local government and Environment Agency planning is not yet synchronised. They might also offer more accountability for outputs delivered where the current arrangements are weak—perhaps through new contracts between local authorities, central government and the Environment Agency.

3. The third potential drawback is that the overall level of funding is not directly linked to minimising the *total* costs of flooding. Defences are provided at public expense, and private damages insured at private expense, albeit not fully reflective of the actual risk. Consequently, there is little incentive for the private provision of defences, since affordable flood-damage insurance is available, and defences are built and maintained at public expense. As a result some economically efficient flood defences may not be built, and society spends more on insurance, replacement of damaged goods and other costs of flooding than the defences would cost to build and operate. This issue is dealt with below.

**Supplementary and alternative funding arrangements**

The value protected and risk avoided by flood defences remain far above the annual cost of maintaining defences, and there are many opportunities to invest in defences where the savings would outweigh the costs. This means that it might be in the public interest to increase the funding available for flood defences. Thus, it is appropriate to consider new sources of funding.

If those who would benefit from flood defences appreciate the value of defences, it should be possible to collect contributions from them—ie, those who live or run businesses on the flood plain. The flood plain could be defined by maps similar to those used by the Environment Agency to indicate properties at risk of flooding, and those available to insurers to assess the risk premium for property insurance. The maps might even show bands of risk so that properties at high risk could be distinguished from those at low risk. The developers, owners or occupiers of property within the boundary could then be made liable for one of two types of charge, with payments linked to their ability to pay, the cost of providing defences, and the level of benefit they receive.

1. The first type of charge would be on the development of new property on the flood plain. It would be similar to the capital contributions raised by internal drainage boards, and the planning gain that can be demanded by local authorities from property developers. A developer would pay a capital contribution under the planning gain arrangements of the Town and Country Planning Act, Section 106, following a national tariff *structure*, at a level determined by the local authority. The funds could be used to support enhanced defences for areas that are poorly defended. The charge would discourage development in poorly defended areas, complementing the government's planning guidance (PPG 25).

2. The second charge would be payable by all households and businesses on the flood plain that are protected. It would be collected through the Council Tax and National Non-Domestic Rates, and could be related to local programmes of defence improvement, so that a rise in the level of the charge would reflect the benefits to those paying it.

**Complementary measures to facilitate an efficient and equitable outcome**

A collective insurance scheme could be used to bring the costs of damage and defence under joint management and to mitigate the impact of a rise in the premiums for flood cover. Such a scheme would spread the cost of insuring flood damage across properties on, or close to, a flood plain. Similar schemes operate in other countries, particularly where flood damage is catastrophic. A scheme would be feasible in England and Wales, and, for locations where it is suitable, could be offered to local authorities as an option.

There would probably have been more public pressure to improve defences following floods over the last three years if it were not for insurers continuing to offer flood-damage cover to high-risk properties at prices close to the average for other properties. Insurers used to be unable to identify property at risk of flooding. However, recent technology may allow them to assess the risk and set a premium to match it. Although insurers may now be able to identify properties at risk, so far they have chosen not to do so. If they had, then the insurance premiums for properties at greatest risk could have increased substantially, and the owners might have pressed for enhanced defences. Willingness to pay for flood defences is likely to be related to insurance premiums in the same way that willingness to install vehicle security could be related to the cost of vehicle insurance.

**An option considered but rejected**

An option to seek funding from those whose drainage causes flood risk was rejected, for two reasons.

1. No feasible charging basis was found that linked drainage and flood risk, since the characteristics of drainage are complex and costly to measure.

2. The behaviour of polluters would be unlikely to change because the charge would be too low to influence their choice of drainage, and therefore would not reduce the need for defences.

The report provides a range of more detailed measures, complementary to the current and alternative options.

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*The draft report was presented in July 2001 to the inter-departmental steering group comprising DEFRA, HM Treasury, the DTLR, the Environment Agency, and the National Assembly for Wales, to feed into that group's preparation of the report '[title to be announced', [date to be announced].*

*This study was commissioned as part of the government's wider Review of Flood Defence Funding, announced in 2000, and conducted by OXERA (Oxford Economic Research Associates), with the assistance of Halcrow Maritime, J.B. Chatterton & Associates, Professor Joe Morris of Cranfield University, Stephen Tromans of Lionel Read's Chambers, and Professor Edmund Penning-Rowsell and Colin Green of the Flood Hazard Research Centre at Middlesex University.*

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## Abbreviations

| | |
|---|---|
| AAD | annual average damage |
| ABI | Association of British Insurers |
| CAPEX | capital expenditure |
| DEFRA | Department for Environment, Food and Rural Affairs |
| DETR | Department of Transport, Environment and the Regions |
| DfEE | Department for Education and Employment |
| DTLR | Department for Transport, Local Government and the Regions |
| EA | Environment Agency |
| EPCS | Environmental Protection and Cultural Services (a classification of local government expenditure) |
| FDC | flood defence committee |
| GREA | Grant-Related Earnings Assessment |
| HMT | Her Majesty's Treasury |
| IDB | internal drainage board |
| LA | local authority |
| LFDC | local flood defence committee |
| LGA | Local Government Association |
| MAFF | Ministry of Agriculture, Fisheries and Food |
| NAAR | 'National Appraisal of Assets at Risk from Flooding and Coastal Erosion' (a study published by MAFF in 2000) |
| NAO | National Audit Office |
| NAW | National Assembly for Wales |
| NFIP | National Flood Insurance Program |
| NNDR | National Non-Domestic Rate |
| PFI | Private Finance Initiative |
| PPG 25 | Planning Policy Guidance 25 |
| RFDC | regional flood defence committee |
| RPI | retail price index |
| RSG | Revenue Support Grant |
| RV | rateable value |
| SCA | Supplementary Credit Approval |
| SSA | Standard Spending Assessment |

# INTRODUCTION

## Terms of reference

1. The UK government is conducting a wide-ranging review of the funding mechanisms for flood and coastal defence in England and Wales. The review will assess opportunities for streamlining the current process, while ensuring that:

> the burden of financing defences is rationally and fairly distributed;
>
> sustainable and coherent priorities for investment and maintenance are identified and expenditure is directed accordingly; and
>
> administrative arrangements fit well with current funding mechanisms.[1]

2. This study is part of that review process. It aims to analyse current and possible future financial and statutory policy instruments for funding flood and coastal defence works, including fluvial flooding, sea flooding and coastal erosion.

3. The objective is to identify all significant funding options and to assess the merits, disadvantages and barriers associated with each option. The study covers the responsibilities of all the strategic and operating authorities:

- Department for Environment, Food and Rural Affairs (DEFRA);
- National Assembly for Wales (NAW);
- Environment Agency (EA);
- local authorities (LAs); and
- internal drainage boards (IDBs).

4. The main objectives are to:

- review current funding arrangements and identify opportunities for streamlining;
- identify and analyse options for amending current defence funding arrangements, including the assessment of issues such as:
  - the overall level of flood-defence expenditure;
  - the overall efficiency in gaining the maximum benefit from expenditure on flood defences;
  - the distribution of the financial burden;
  - social equity in the provision of defences;
  - the feasibility of implementation.

5. The analysis eliminates some funding options as impractical (eg, administratively difficult), or undesirable (eg, high burden of financing on low-income groups). The outcome is a set of options to be considered for implementation. The results from this study will feed into the wider government review of flood and coastal defence funding arrangements and provision in England and Wales.

6. In this report, unless stated otherwise, flood defence and flooding are used to refer to fluvial and coastal flooding, and sometimes also to protection of the coast from erosion.

## Policy reviews from 1997 to 2001

7. The following paragraphs summarise in chronological order the main policy reviews of flood defence between 1997 and 2001.

8. In 1997, a review was initiated of the formula used in the local government funding mechanism, the Standard Spending Assessment (SSA). A paper, 'Briefing Paper on Flood Defence & Coast Protection SSAs', was commissioned by a group of LAs from Rita Hale & Associates.[2]

9. Just a few months later, in spring 1998, the severe flooding which took place in Britain precipitated a thorough review of flood defences, funding and warning systems throughout the country. The independent review team, set up to assess the performance of the EA during the floods, published its final report (the 'Bye Report') in September 1998.[3] It concluded that existing defences were generally in good working order at the time of the event, and that most of the flooding resulted from conditions that were more extreme than the systems were designed to meet. Many of the team's concerns related to practical issues, such as imprudent development on flood plains and weaknesses of the flood-warning systems. However, it also

[1] Tender specification for the Flood and Coastal Defence Funding Review, MAFF.

[2] Rita Hale & Associates (1997).

[3] Bye and Horner (1998).

commented on funding and administrative arrangements, advocating the rationalisation of the flood-defence committee structure, and the replacement of MAFF's (now DEFRA's) scheme-specific grant aid with block grants.

10. In July 1998 the Agricultural Select Committee of the House of Commons published its Sixth Report, 'Flood and Coastal Defence'.[4] This examined policy, and paid attention to existing and planned funding arrangements. It stressed the need to ensure that LAs were not prejudiced against the maintenance of existing infrastructure in favour of constructing new works, and called for the evaluation of the SSA in this respect. It also urged the government 'radically to simplify the existing funding procedures for flood and coastal defence activities, with the aim of achieving measurable improvements in policy efficiency through cutting out unnecessary bureaucracy and administration'.

11. In a report published in January 2001, the Agriculture Select Committee reiterated its recommendation of fundamental institutional reform, with the overall aim of streamlining existing arrangements, which it described as 'Byzantine'.[5] It suggested a greater devolution of responsibility to the regional level, and distinguished clearly between inland and coastal issues, advocating an integrated management approach to each. The report also expressed the Committee's concern about the timescale of the review process and the low level of extra funding (an additional £51m over four years) that was announced, compared to a MAFF-commissioned study that concluded that an extra £100m per annum was necessary to provide the target standard of protection.[6] The findings of the Environment, Transport and Regional Affairs Select Committee report 'Development On, Or Affecting, the Flood Plain' and Planning Policy Guidance 25 (PPG 25), 'Development and Flood Risk' were also reinforced, with a recommendation that only 'very exceptional' development should be permitted on the flood plain.[7]

12. A range of initiatives was taken to address inadequacies across the existing flood-defence system, resulting in the publication of high-level targets for operating authorities, which took effect from April 2000, and the ongoing development of a database of assets at risk from flooding and coastal erosion.[8]

13. In autumn and winter 2000/01, widespread flooding caused damage and disruption once more in England and Wales. There were demands for a radical increase in expenditure on the repair and strengthening of existing flood defences, and the construction of new works. These demands could only be met if the funding mechanism were capable of delivering an increase in spending above current levels.

14. After the major floods in 2000/01, the EA produced a report on the lessons learned.[9] In general, this found that the emergency response to the floods was much better than the response to the 1998 Easter floods. It highlighted some issues, including public confusion over responsibilities for flood defence and provisions for funding of emergency works. The recommendations included a 'one-stop-shop' information service, improved flood awareness and warning, and an assessment of existing defences.

15. Most recently, the National Audit Office (NAO) published a review of inland flood defence.[10] It noted, as others had done before, that the sheer number of bodies involved leads to confusion, and some resources may be being used to overcome these difficulties rather than directly on flood defence. It also questioned the classification of watercourses, recommending clearer principles for its basis. Four findings were accorded the highest priority:

- development of strategic plans for all river catchments;
- completion of flood-risk mapping;
- improvement and monitoring of the condition of assets in response to survey findings;
- benchmarking and economic evaluation of maintenance activities.

[4] Agriculture Committee (1998).
[5] Agriculture Committee (2001).
[6] HR Wallingford (2000), 'National Appraisal of Assets at Risk from Flooding and Coastal Erosion', Technical Report Vol I' (henceforth referred to as the NAAR study).
[7] Environment, Transport and Regional Affairs Select Committee (2000), DETR (2001a).
[8] Environment Agency (1998a).
[9] Environment Agency (2001a).
[10] National Audit Office (2001).

16. Each of these activities is under way in the EA, and will inform flood management in the future.

## Current reviews

17. The five-year Financial, Management and Policy Review of the EA is in progress.[11] It includes an assessment of the flood-defence function of the EA, covering issues such as: whether it would be appropriate for flood defence to become the responsibility of a separate agency; and how the financing and management arrangements fit with the rest of the Agency. Flood defence is funded in a different manner to the EA's other functions, through locally raised levies rather than charges and grant in aid. The executive powers are devolved to regional and local flood-defence committees. The Financial, Management and Policy Review will include an assessment of a number of options, such as the formation of a separate agency with flood-defence responsibility; internal reorganisation to make the flood-defence function more separate; and the consolidation of the funding arrangements.

18. At the same time, the DTLR is conducting a review of local government finance, examining possible reforms of the Revenue Support Grant (RSG, the main central government contribution to local government finance), and funding of CAPEX.[12] There is a window of opportunity to make adjustments to the finance of the local government element of flood defence.

## Future funding requirement

19. At present, and for the foreseeable future, the scale of expenditure on flood defences that can be justified by reference to cost–benefit analysis seems likely to exceed the Exchequer budget.[13] Moreover, given the plans for further urban development, the demand for new infrastructure is likely to increase further the demand for flood-defence expenditure. At the same time, the continuing effects of climate change may be begun to be felt, with extreme events occurring at slightly higher frequency in the future.

20. The following figures illustrate the picture. The total expenditure in England and Wales on flood and coastal defence capital and maintenance works is approximately £335m per annum. The NAAR study estimated that expenditure would need to increase by £100m–£150m per annum on capital works and by £10m–£20m on maintenance in order to achieve the national target standards of defence.[14] If the CAPEX is funded by borrowing with a term of 25 years (consistent with the current local government capital finance arrangements) and a 6% interest rate, the loan repayments would cost £10m–£15m in the first year, rising by approximately £10m–£15m every subsequent year. The additional funding required to achieve these targets, including maintenance, is therefore roughly £20m–£30m in the first year, rising to approximately £60m–£90m in year five and approximately £100m–£165m in year ten. The NAAR report deliberately does not present such a calculation, but it is essential to the objectives of this study to appreciate the rough magnitude of the estimate, in order to ascertain whether the additional funding options being considered would be sufficient.

21. An expanded programme of investment would be expected to reduce the damage from flooding from the NAAR current 'economic' estimate of £640m per annum, to around £190m per annum. These figures may be converted into insurance costs by multiplying by a factor of between two and three.[15]

[11] DETR (2000a).
[12] DETR (2000b); DETR and LGA (undated); LGA (2000).
[13] This is because the cost–benefit analysis does not include the capital constraint. It could be made to do so by the use of a shadow price of capital, which would make a material difference to the cost–benefit ratio.

[14] MAFF (1999a and 2000a). Note that the NAAR figure of 2m properties at risk differs from the figure of 0.95–1.2m properties in Finlinson (2000).
[15] Taken by inspection from charts in Black (1999).

## GUIDE TO THE REPORT

22. The next section of this report, **Current Arrangements**, describes the present arrangements and explains their function, providing a summary of the financial figures.

23. It is not possible to draw conclusions about the current arrangements without a detailed examination of their mechanics. Since the mechanics are complex, this review has been placed in the appendices

24. **Appendix 1** describes the powers of the operational and strategic authorities and their constitutional duties. It comments upon the effectiveness of these arrangements, and suggests improvements that are not discussed elsewhere in the report, but the most important of which are noted in the **Conclusions** section.

25. **Appendix 2** presents a guide to funding arrangements, and, as far as it is possible to determine from spending statistics, the patterns of funding over recent years. It also contains a discussion of local government finance arrangements, and potential revisions. These are also reported briefly in the **Conclusions** section, but not elsewhere.

26. The section entitled '**Additional and Alternative Funding**' introduces and evaluates the main funding options for England and Wales. It examines in turn four options for financing that could be used either to replace the current arrangements, or to provide supplementary finance. It gives an indication of the revenue that could be raised from each source. This section forms the core discussion of the report.

27. The subsequent section discusses the provision of insurance services, collective insurance, and payments of compensation for managed retreat and flood-storage services. These may be affected by the choice of funding mechanism or the level of funding, and so form an important component of the discussion.

28. The main findings from all these sections are summarised in the **Conclusions**.

# CURRENT FUNDING ARRANGEMENTS

## Summary of current arrangements

29. Flood defence and coast protection are funded by local and central taxation, and, in some areas, through charges for local drainage and flood-defence works.

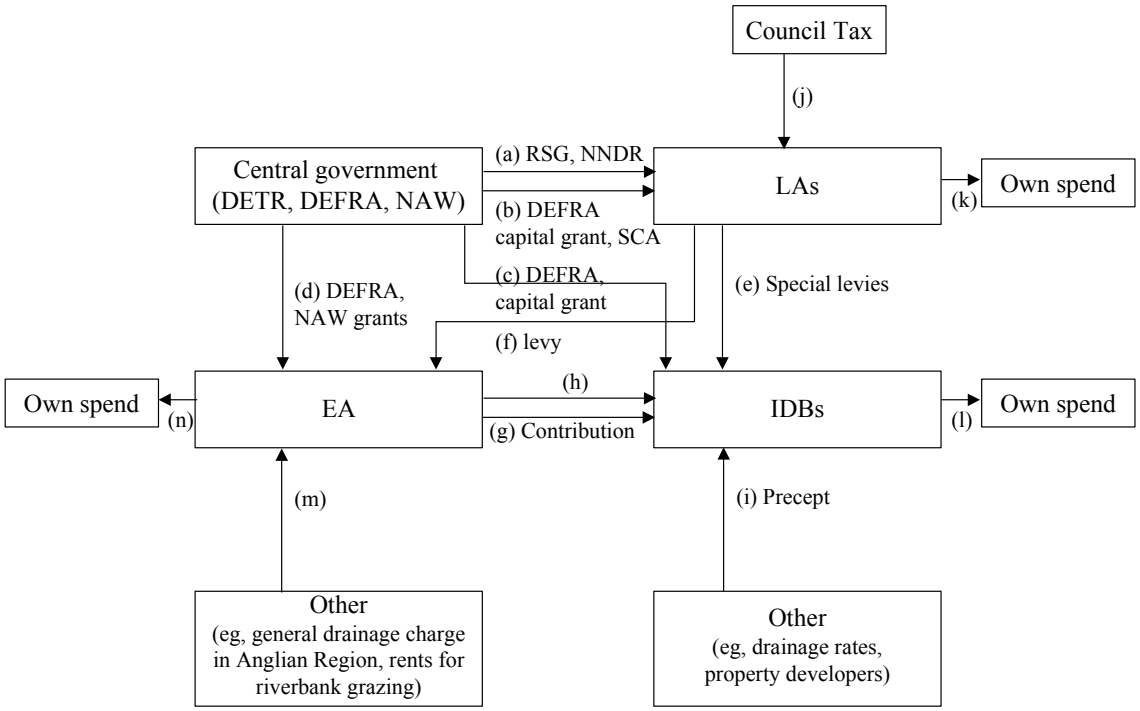
30. The system for flood-defence finance has evolved over several decades, reflecting reforms in the financing of agricultural drainage, local government finance, and environmental regulation. Partly as a consequence of the *process* of evolution, the current structures are not founded on a clearly articulated underlying code of principles.

31. Nevertheless, four principles emerge from policy documents, reports and interviews:

- *local decision-making*;
- *public access* to local decisions;
- *centralised supervision of priorities* and total expenditure; and
- *an equitable distribution* of the burden of funding.

32. Figure 1 summarises the funding arrangements and the attached notes refer to the arrows in the figure.

**Figure 1: Funding arrangements**




(a) RSG and National Non-Domestic Rate (NNDR) redistribution to LAs—the RSG is the grant paid to LAs to supplement their Council Tax income and the income they receive from the redistribution of NNDR, which is collected centrally.
(b) DEFRA and NAW capital grants and Supplementary Credit Approval (SCA) to LAs—these are the project-specific grants for which LAs may apply to fund capital schemes. The grants provide only part-finance for a project; the rest may be financed through SCAs issued by DEFRA, and allow the LA to borrow and receive income through the RSG to cover its interest and repayments.
(c) DEFRA and NAW capital grants to IDBs—these are project-specific grants for which IDBs may apply to fund capital schemes. The grants provide only part-finance for a project; the rest must be financed from other IDB income.
(d) DEFRA and NAW grants to the EA—in a similar fashion to (b) and (c), DEFRA and the NAW issue grants to the EA for specific capital projects. The EA must meet part of the cost of the projects from its other income.
(e) Special levies—IDBs may raise special levies from LAs in return for the provision of drainage and flood-defence services.
(f) LA levies—the EA may raise levies from LAs in return for the provision of drainage and flood-defence services. The levies are set by the flood-defence committees.
(g) Contributions—the EA may make contributions to IDBs for works undertaken by the IDBs on river stretches for which the EA is responsible.
(h) Precepts—the EA may issue precepts on the IDBs, raising income to pay for main river flood-defence services in IDB areas. Further details are given in Appendices 1 and 2.

33. The powers and duties of the operating authorities (LAs, EA and IDBs), and the mechanics of the funding mechanisms are extremely complex. They are explained in detail in Appendices 1 and 2.

34. Briefly, most of the funding is provided through the local government finance mechanism—based on local government taxation revenues, topped up by the Exchequer. The top-up is administered through the RSG so that the total finance available to the LA meets an assessment of need—the SSA. The majority of this funding is passed on to the EA through the EA levy.

35. About one-sixth of the funding is direct central government grant, distributed by DEFRA as project-specific grants. The majority of these go to the EA, and to maritime LAs for coast protection.

36. There are separate arrangements for IDBs, although they do not account for much of the total expenditure or funding. The drainage boards can raise special levies against LAs, seek contributions from the EA for work on main rivers, and receive charges paid by local landowners.

37. The funding sources are summarised for each organisation in Table 1.

**Table 1: Summary of funding sources[1]**

| Operating authority | Sources of funding | Amount in 1999/2000 (£m) |
|---|---|---|
| EA (with functions carried out by flood defence committees, FDCs) | Constituent LAs (through EA levy) | 216.6 |
| | DEFRA (grants to FDCs in England) | 32.0 |
| | NAW (grants to FDCs in Wales) | not available |
| | IDBs | 7.2 |
| | General drainage charge (Anglian Region only) | 2.9 |
| | Other sources (eg, rents for riverbank grazing, consents, third parties, etc.) | ~11.9 |
| | **Sub-total** | **270.6** |
| IDBs | Special levies (LAs) | 18.3 |
| | Drainage rates (owners of agricultural land) | 10.9[2] |
| | DEFRA grants for capital works | 1.0 |
| | Contributions from the EA | 2.5 |
| | Other sources (eg, private developers whose work has an adverse impact on the drainage system) | not available |
| | **Sub-total** | **32.7** |
| LAs | DTLR (RSG) | 240.6 (SSA total) |
| | NNDRs | |
| | Council Tax | |
| | DEFRA SCAs | 10.9 |
| | DEFRA grants for capital works on flood defence | 1.0 |
| | **Sub-total** | **252.5** |
| Maritime LAs | Contribution from county councils for coast protection works | not available |
| | DEFRA grants for capital works on coast protection | 25 |
| | **Sub-total** | **25** |

*Notes*: [1] The total funding sums to less than the sum of the sub-totals since the EA levies and IDB special levies would be counted twice if the sub-totals were added together. [2] This is the figure for 1996/97 from Rita Hale & Associates (1997). Source: Environment Agency annual reports and accounts (various years), data provided by the Environment Agency and DEFRA.

## SUPPLEMENTARY AND ALTERNATIVE FUNDING ARRANGEMENTS

38. Supplementary and additional sources of funding are considered in this section, against principles of good policy design, which are describe in the paragraphs that follow. The principles are based on:

- *efficiency*—the management of flood risk at least-cost over time; and
- *equity*—a fair and equal distribution of the burden of the costs of flooding.

### Efficiency

39. The dimensions of efficiency are as follows.

- *Feasibility*: the arrangements must be sensible politically and legally (eg, the contractual arrangements must be straightforward).
- *Administrative efficiency*: the administrative cost of the arrangements should not be excessive.
- *The polluter pays*: those whose actions increase the risk of flood damage should, as far as possible, cover the costs they impose on others.
- *The beneficiary pays*: the recipients of benefits from expenditure on flood protection may be asked to pay for that protection.
- *Incentives to deliver an efficient development path*: the financial arrangements should, as far as possible, signal the future costs of any chosen path of economic development.

40. In practice, there are convincing reasons to seek to introduce, through the financing mechanism, incentives for efficiency with regard to decisions:

- about the right levels of defence—ie, the optimal level of flood damage, given the costs of defences and damage; and
- that exacerbate flood risk, such as drainage of land, where there is a possibility that total costs could outweigh the total benefits.

41. The public sector could continue to make all major choices about flood defences and flood risks, ideally on the basis of full cost–benefit analyses. However, since these expenditures and choices have, in part, private costs and benefits, and given the object of establishing whether new approaches are possible, this study considers mechanisms which allow private preferences a greater role in decision-making.

### Equity

42. The dimensions of equity are as follows.

- *Inclusivity*: everyone should bear a part of the burden of funding, so that there are no 'free-riders'.
- *Subsidiarity*: the locus of decision-making should be appropriate to the issue at hand (levels could be local, regional and national).
- *Intergenerational equity*: today's population should not pay for benefits received by future populations; nor should it impose costs on them without bestowing compensatory benefits.
- *Social inclusion*: the benefits of flood-defence services should be available to all households with similar circumstances and needs, regardless of ability to pay.
- *Transparency*: it should be clear what is being bought, why, and by whom.
- *Accountability*: responsibilities and duties should be clearly specified and allocated to authorities, which should have the requisite powers to deliver them.
- *Compensation for damage*: in some circumstances, those whose property is damaged by floods may have the right to receive compensation.
- *The provision of public goods*: where there is a wider public interest in a particular location or property, the value of this public good should be recognised, and its protection funded from public sources of finance.
- *The provision of private goods*: where there is a private interest in a particular location or property, the value of this private good should be recognised, and its protection funded by private individuals.

43. The equity aims are twofold:

- to find an equitable distribution of the financial burden; and
- to determine how best to administer the spending.

It is not only a matter of fairness, the distribution will affect the total amount of expenditure that can be raised.

## Funding options

44. Apart from general public finance, there are two sources of finance: the polluters and the beneficiaries.

45. Of the revenue-raising instruments listed and examined below, the polluters pay in the first, and the beneficiaries in the second and third. Everybody pays in the fourth option:

- a surface-water drainage charge;
- a defence development charge;
- a flood-plain levy;
- Exchequer finance.

## The polluter pays: a surface-water drainage charge

### Introduction

46. A polluter-pays regime works in two stages: polluters are liable for the damage caused by their pollution; and, as a result, may decide that it would be cheaper to pay for flood defences than to bear the cost of compensation payments.

47. There is a requirement for good information, and for a means of payment that allows the sufferers to claim from the polluters. (In principle, the sufferers could 'buy off' the polluters—although such a solution would be inequitable.)

48. The identification of these polluters will, in practice, be much more difficult than it is, for example, in the case of industrial pollution. Where there is flooding, it is extremely difficult to identify those responsible. Flooding is the result both of multiple present-day causes, and of an historical sequence of decisions and events that have built to the present-day position. The conclusion is that it is not appropriate to introduce a polluter-pays regime.

49. There is, however, still a strong case for an economic incentive which steers the course of present, and future, land-use development and flood-plain management. Without an economic incentive, the planning system alone may be hard pressed to deliver a satisfactory outcome, given the amount of information that would have to be processed in order to reach a balanced judgement.

50. It may be concluded that it is not realistic to require current 'polluters' to pay for current 'pollution'. Nevertheless, although it might not increase efficiency, a polluter-pays charge might be an additional source of funding.

### Identifying the polluter

51. Any activity that increases run-off and hence peak flow in the watercourse increases the flood risk to people living on the flood plain. In general, changes in land use that reduce the permeability of the land will cause the hydrograph for the watercourse to become more peaky. The peak flow in the river is increased and the level of water in the watercourse rises more rapidly, reducing the time available to issue and react to flood warnings. Both of these changes are likely to increase the damage caused by flooding. The higher peak level means that flooding is likely to be more widespread, affecting more properties and causing more damage.

52. It is well established that urbanisation can increase flood peaks.[16] The effect of agricultural practice is more ambiguous. The impact of the use of artificial drainage depends on the natural drainage characteristics of the soil; the artificial drainage of clay soils prone to saturation can decrease peak flows.[17] Similarly, the effects of afforestation and reforestation are ambiguous, with factors such as species and age of tree, and local climate conditions also influencing the impact of peak flows.[18] Quantifying the increased risk for specific developments in a catchment area would require a detailed study of the hydrology of the area.

53. The location of the land within the catchment is an important determinant of the expected damage from run-off at peak flow. Land upstream of highly populated flood plains will give the greatest impact, and that in the fringe of an estuary will have little impact.

54. Without a good understanding of the catchment hydrology and the location within the catchment, it will be difficult to assess the impact of polluters.

### Practicalities

55. A charge could be viewed either as a payment by the polluter for the mitigation of the effects of the pollution (run-off), as

[16] See, for example, Ward and Robinson (1990).
[17] Robinson (1990).
[18] Calder (2000).

payment for drainage services, or as a licence fee for a surface-water discharge consent.

56. The levy might be differentiated by land use—area of agricultural land drained, area of buildings drained and area of road drained. The totals for these areas are shown in Table 2, together with the levy rates for several levels of revenue collected.

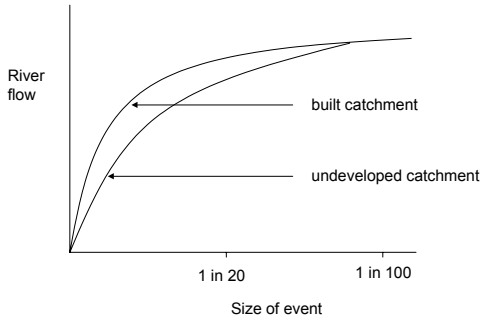
**Table 2: Amount raised (£m) from a general drainage charge**

| | England | Wales | Total |
|---|---|---|---|
| **Rate (£/ha)** | | **Agricultural land** | |
| 2 | 23 | 4 | 27 |
| 5 | 57 | 10 | 67 |
| 10 | 114 | 20 | 134 |
| **Rate (£/km)** | | **All roads** | |
| 1 | 0.3 | 0.03 | 0.33 |
| 5 | 1.5 | 0.15 | 1.65 |
| 25 | 7.5 | 0.75 | 8.25 |
| 100 | 30 | 3.0 | 33 |
| **Rate (£/band D-equivalent property)** | | **Residential properties** | |
| 5 | 97 | 6 | 103 |
| 10 | 194 | 12 | 206 |
| 25 | 45 | 30 | 515 |
| **Rate (£/property)** | | **Commercial properties** | |
| 50 | 60 | 4 | 64 |
| 100 | 120 | 8 | 128 |
| 250 | 300 | 20 | 320 |

*Source*: OXERA.

57. To determine the relative rates of the levy by land use, hydrographic evidence might be used. It is known that catchments generally exhibit a behaviour of the form shown in Figure 2. The figure compares two hydrographs for the same catchment. Both plots show how the flow in the river varies with precipitation events of different frequency. One shows this relationship for a catchment which is undeveloped—ie, made up of undrained agricultural land and woodland. The other plot shows the relationship for a developed catchment—with some drained agricultural land and urban areas.

**Figure 2: Typical hydrograph of river catchment**



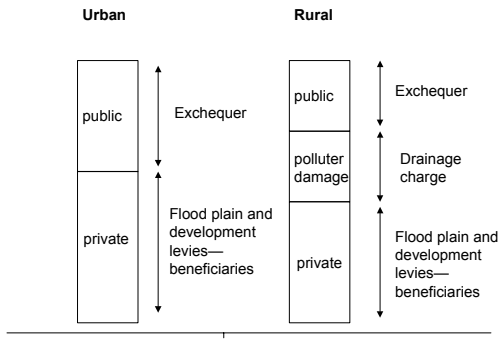

58. Drainage modifies the river flow under frequent precipitation events, but not under rare precipitation events. This is because run-off depends upon antecedent conditions—ie, if the soil is already saturated, an undeveloped catchment will behave similarly to a developed catchment. For events of low frequency, such as 1 in every 100 years, development outside the flood plain has little effect on the level of flood damage.

59. Thus, if the behaviour of polluters were to change and reduce run-off, then there would be a reduction in damage caused by frequent precipitation events, but little or no change in the damage from extreme events. Since the focus of policy is to reduce damage in extreme events, then changing the polluters' behaviour will be of little value.

60. Given that rural areas and agricultural land are protected to a lower standard than urban areas, it is more reasonable to suggest that the polluters provide some compensation to these areas.

61. Figure 3 shows how the polluters may make a contribution to rural areas but not to urban areas.

**Figure 3: Contributions from 'polluters'**




*Source*: OXERA.

62. There is evidence that the cost of drainage attenuation is very high. In IDB areas, developers typically prefer to pay a standard one-off development charge equivalent to about £2,000/impermeable hectare per year rather than attenuate their run-off.[19] This evidence suggests that it is likely to be cheaper to provide flood defences than to attenuate run-off from existing property.

63. These conclusions do not detract from the argument that water management is an integrated issue in so far as run-off carries a major part of the pollutants of surface waters, and water-level management has impacts on water supply and habitat, so there may be several benefits from changes in drainage practice.

## Design

64. Even though a polluter-pays charge may not reduce flood risk, it could still be an attractive source of revenue. The following discussion explores whether it would be.

65. Polluter-pays drainage charges are not novel. A general drainage charge of £2/ha is collected from farmers by the EA in the Anglian Region. A provision exists for similar charges to be raised by the EA across all its regions. However, the drainage charge is payable on agricultural land only, and the general drainage charge raised by the EA only applies outside IDB districts. It might be possible to use the existing provisions, and agree a national schedule of rates for all agricultural land. IDBs currently charge £3–£33/ha per annum.

66. The cost of collecting the Anglian Region general drainage charge is quite high. It is said to cost £0.25m per annum to collect £3m per annum.[20]

67. It would be preferable to set up a drainage charge that applied to all drained land, not just agricultural land.

68. A key question is the availability of information on run-off by property. These data are not available for most residential or commercial properties, so a proxy would have to be used.

69. The closest proxy to run-off from frequent events would be area of impermeable or drained surface. This would be easy to calculate for roads. For buildings, the calculation would be more complicated, and, for agricultural land, it might be necessary to classify drained areas (which might be difficult). One advantage of a charge related to run-off is that, as land use changes, the revenue collected might stay in line with the cost of the pollution caused. Thus, as new roads, housing and commercial buildings are built, the flood-defence funding revenues would rise in line with development.

70. The cost of collecting information suitable as a proxy for run-off property by property is likely to be high. Instead, a simpler tax base is needed.

71. One option is to use local taxation vehicles, combined with incentives to reduce run-off—through the use of discounts for soak-aways, rainwater storage, and permeable surfaces. A discount could also be provided for agricultural land demonstrating water-retention best practice. However, the cost of collecting information would still be high, and abuse of the system could be difficult to control.

72. Alternatively, the drainage charge could be collected by water and sewerage companies. This is divided into two parts: highway drainage (roads), and surface-water drainage (property). For roads, the charge is collected from LAs. For property, the drainage component of sewerage charges is collected as part of the water and sewerage bill. It is distinguishable from foul water charges in so far as discounts to sewerage charges are given to properties not connected to mains drainage. A supplement to these drainage charges could be raised. Although property and local roads would contribute, a small number of mostly rural properties which are not on mains sewerage, commercial properties that discharge directly to surface waters under an EA consent, and major highways would be omitted. The collection cost would be small since it would add little to water and sewerage companies' billing costs.

73. The supplement could either be levied at a flat rate or in proportion to the bill. The flat rate is likely to be preferable because there are substantial incidence effects on vulnerable groups (particularly low-income households with young families) from increasing the cost of water consumption.

74. Water companies are likely to oppose the piggy-backing of any tax on their customers' bills. The use of a utility bill to collect revenues

[19] Association of Drainage Authorities (2001).
[20] Information provided to OXERA by the EA on March 22nd 2001.

for services not provided by that utility might confuse the consumer into thinking that the utility was responsible for flood defence. There would also be a problem from the charging of value added tax (VAT).

75. Whether or not the sewerage bill is used for a drainage charge for built properties, the highway drainage charge could easily be used to collect a contribution from roads. It would only cover some roads, since many larger roads will have separate storm water drainage which is not operated by the water and sewerage company. Many of these larger roads will be managed by the Highways Agency, which could be asked to make an appropriate contribution. The same formula could be used to calculate the charge for both classes of road.

76. A simpler alternative for built property is a supplement on local taxes, which could accommodate a more progressive design, placing a lower charge on lower-value properties. The administrative costs would be similar. There is further discussion of the local tax base in the paragraphs on the flood-plain levy.

77. One option for the charge is as follows:

- an area-based charge for roads, collected through the highway drainage charge and from the Highways Agency;
- a charge based on a percentage of Council Tax for domestic property;
- a charge based on a percentage of NNDRs for commercial property;
- the option of an area-based charge for agricultural land.

## The beneficiary pays: a defence development charge

### Introduction

78. It would be possible to change the decisions taken about flood defence if beneficiaries were made to pay (as opposed to funding schemes from public finances).

79. The main beneficiaries of flood defences are those who live or work on the flood plain and face the threat of damage to property as a result of flooding. They include:

- home owners whose property is at risk;
- business and industry whose premises are at risk;
- farmers whose crops or livestock are at risk;
- other landowners; and
- property developers.

80. However, the benefits of flood defences are not restricted to those on the flood plain. Other beneficiaries include:

- LAs (less maintenance required on infrastructure, such as roads);
- other infrastructure providers (eg, Railtrack, electricity transmission or distribution companies, gas distribution companies, telecoms companies, hospitals);
- local businesses (reduced employee lost time);
- emergency services (reduced pressure on resources); and
- wider public (reduced disruption of travel, recreation and other services).

81. Society as a whole may also be a beneficiary since defences protect public goods, such as rare habitats and other sites of environmental, recreational or cultural interest. There is evidence from attitude surveys that people are willing to pay to protect goods that they do not use themselves (known as non-use value). For example, there are studies that show that there is significant non-use value attached to the protection of coastline from erosion.

82. It is already possible for some property owners to build their own flood defences. However, in most cases, they rely on a collective decision. Communal defence is not uncommon, for example, it is practised in the Netherlands *Watershappen* and USA 'levee' districts.

83. There are already some communal defences in place, and some individuals will have chosen to invest in private defences. Further, most householders have some form of insurance. Even so, the choices are the same: whether to increase protection against flooding and whether to sustain the existing level of defence.

84. Before turning to the design of a scheme, it is convenient to introduce one further issue. It is particularly important that beneficiary-pays schemes deal fairly *between generations*, since the costs are borne locally, and may not be smoothed over time through a portfolio of projects. Fairness can be achieved by financing the expenditure through a programme of loans, which have terms of many years, thereby drawing on contributions

from more than one generation. This is common for public utility services, notably the water companies. [ref. paying for water]

85. While the primary purpose of the charge is to collect contributions from beneficiaries, it would be complementary to planning policy guidance, PPG25, which discourages development on the flood plain. A standard scale of charges would provide a transparent and reliable method of raising contributions. It could outperform S.106 planning gain agreements which are rarely used to raise flood-defence contributions, and are not set on the basis of a transparent process.[21]

86. The contribution could be placed in reserve to cover *future* expenditure on defences. These funds could be held in trust for a fixed period, say ten years, before being returned to the owner of the title to the property if the expenditure has not been made. The lesson from experience of these funds is that the articles of the trust fund must be formulated carefully so that the release of the funds is automatic, and the decision to release funds is entrusted in an appropriate authority. The test for the release of funds would preferably involve reference to a standard of service which could not be disputed, although this may be difficult to arrange.

87. On the other hand, there is a prospect that developers might seek to influence the choice of defence, for example, so that a low-capital-cost, high-operating-cost scheme is chosen. If the receipts are paid into a locally-held fund that is not specific to the development, then undue influence might be prevented. This argument supports the immediate payment of contributions into a general fund rather than the establishment of numerous property-specific trust funds.

88. If payments are made into a general fund, a rule could then be introduced to provide developers with some comfort of fair treatment. The rule could guarantee that defences would be provided wherever their cost is less than the cumulative tax receipts received from developments in the poorly defended area.

## Design

89. All new development on specified flood plains would be liable for an initial capital contribution—on the basis of a broad assessment of the associated public and private costs resulting from the development. The contribution should reflect the long-run costs of flood management attributable to the development. If these are difficult to calculate, an average-cost approach could be used (because it can be calculated easily from historical accounts). If the development is within a defended area, the costs may be low or even zero. Some remission of charges might be appropriate in the case of developments which provide their own flood protection.

90. It may be difficult to distinguish between defended and undefended areas, and to determine the level of defence in an area. A sliding scale of charges might be based on an approximate assessment of the likelihood of flooding, and the magnitude of the consequences. While this might seem onerous, it would only have to be assessed for new developments, and the cost of the assessment could be recovered through a standard fee.

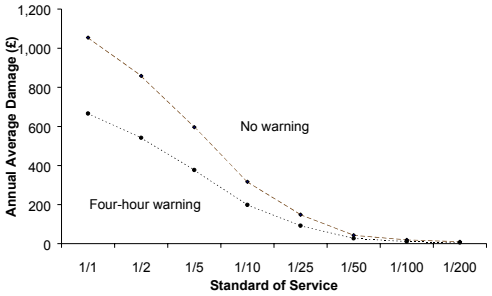
## Practicalities

91. It would be reasonable to allow the developer to choose between paying a standard rate of levy, and funding a new defence directly. The standard rate would be the ceiling for the amount to be paid by the developer. At present, the IDBs' standard rate is £33,000/hectare of impermeable surface that is not drained to sewer. This level of charge does not in general provoke refusals to pay. The IDB rate might be reviewed and perhaps used as the ceiling for a standard schedule of charges.

92. The discount for areas of flood plain that receive higher levels of protection, could be based on models of frequency of flooding and damage. The output from this model, used in the NAAR study, is shown in Figure 4. Assuming that flood warning is provided, the average annual damage per property protected to a 1 in 20 standard of service is approximately 20% of the damage per unprotected property. In comparison, a property protected to a 1 in 100 standard of service suffers negligible damage. This is the basis for the rates of discount in Tables 3 and 4.

[21] Town and Country Planning Act 1990, s. 106.

**Figure 4: Annual average damage for residential and retail properties over a range of standards of defence, with and without flood warning**




*Source*: NAAR.

**Table 3: Proposed schedule of discounts**

| Discount element | Discount | Charge per impermeable hectare based on IDB standard rate (£/ha) |
|---|---|---|
| Defended flood plain (1 in 100) | 100 | 0 |
| Defended flood plain (1 in 20) | 80 | 6,600 |
| Undefended flood plain | None | 33,000 |

*Source*: OXERA and Association of Drainage Authorities (2001).

93. There is a question of whether the charge should be paid by the landowner or the developer. If the charge is to be based on the characteristics of the development then it could not be paid by the landowner, who would not have sufficient information about the future use of the land. There are two possible bases for the charge: area and property value.

- The advantage of payment by **area** is that it reflects the area protected by defences. If the charge is based on area alone, or area and class of development, then the landowner or developer could be made the liable party, and could be charged at the time of seeking planning permission.

- If the charge is to be based on the **value of the property** then the developer would pay. A disadvantage with payments by property value is that multi-storey developments with higher values face higher charges, despite the lower proportion of value at risk. Also, the payments would vary regionally with property and land prices.

94. Both charging bases discourage low-value development in flood plains, thereby supporting the policy to restrict development in flood plains. The area-based charge probably offers the best incentive in this respect, and could be calculated and levied easily.

95. The charge could be raised under the provisions in s. 106 of the Town and Country Planning Act for contributions to local infrastructure and amenities; through separate arrangements being considered for 'impact fees'; or through specific new primary legislation granting LAs powers to raise levies, similar to those granted under the Transport Act 2000 to introduce congestion charging on roads. The LA would be in a strong position to enforce payment by withholding planning permission until payment had been received.

96. The EA has collected data on planning applications for residential development on flood plains. Applications were made in 2000 for 20,000 units, up from 10,000 in 1998 and 4,000 in 1996.

### Examples of use

97. It is common for developers to pay charges for the provision of services such as roads, gas, electricity, water and sewerage. They pay a connection charge, and the purchasers of the property pay ongoing charges.

98. It is also common practice for IDBs to obtain capital contributions from developers. The IDB contribution system works in two ways. First, it recovers any costs specific to the development concerned, such as reinforcement of the drainage system—the 'surface water infrastructure charge'. Second, it recovers general costs that are not attributable to an individual development, but accumulate from development in general—the 'development improvement charge'.

99. The Association of Drainage Authorities has developed a set of charging guidelines that are used by IDBs. In this way, individual IDB charges are coordinated, and national developers can expect a common framework of charging in any IDB area.

## The beneficiary pays: a flood-plain levy

### Introduction

100. A levy could be raised annually from beneficiaries of defences who own property, run businesses, or live on the flood plain.

101. Close attention would need to be given to the public-sector obligations associated with such a levy. Some property would enjoy better communal defences than others, yet both would be asked to make contributions. The result would be that those who are least well defended might press for defensive expenditure that would benefit them, although the expenditure might be inefficient, rather than bear the costs of damage. The Human Rights Act 1998 sets out obligations on authorities to provide means of appeal, and to demonstrate proportionality of the decisions, which makes the threat of appeal greater than before (see Appendix 1).

102. Since flood-defence protection is not provided uniformly, then it would not be possible to argue that a uniform tax is proportionate to the benefits received. This may matter politically, but may not legally: the Human Rights Act only requires that the decisions to build defences are proportionate to the costs and benefits.

103. If the charges are set in line with the benefits accruing from flood defences, and a single authority receives all revenues from the charge, then tiered charges provide appropriate incentive signals to the authority.

104. It might be thought that the local provision of defences and the local collection of charges could lead to the over-provision of defences, where schemes are also partly justified on benefits to the local economy. The argument is that the benefits to the local economy may be exaggerated because they do not recognise the substitutability of one location for another. However, if the investment is funded locally then it is appropriate for local decisions to reflect the local interest. If it is being funded nationally then an assessment of the national benefits is more appropriate.

## Design

105. The charge could be tiered to reflect the standard of defence. The banding of the charge would enhance public awareness of the local level of flood risk, which might encourage property owners to take defensive measures, and increase willingness to pay for enhancements to defences. An illustrative banding system is shown in Table 4.

**Table 4: Proposed schedule of charges for Council Tax or NNDR supplement**

| Discount element | Discount |
|---|---|
| Defended flood plain (1 in 100) | None |
| Defended flood plain (1 in 20) | 80% |
| Undefended flood plain | 100% |

*Source*: OXERA.

106. The discounts are designed to leave the householder indifferent between being defended or undefended, so long as they can obtain insurance cover.

107. The revenue that could be raised is potentially equivalent to current annual expenditure, see Table 5.

**Table 5: Flood-plain levy on residential and commercial properties on the flood plain**

| Rate (£/ property) | Amount raised (£m) | | |
|---|---|---|---|
| | England | Wales | Total |
| | **Residential** | | |
| 10 | 16 | 0.89 | 17 |
| 25 | 39 | 2.2 | 42 |
| 50 | 79 | 4.4 | 83 |
| 100 | 160 | 8.9 | 170 |
| 200 | 310 | 18 | 330 |
| | **Commercial** | | |
| | **England** | **Wales** | **Total** |
| 10 | 13 | 0.96 | 14 |
| 25 | 32 | 2.4 | 34 |
| 50 | 63 | 4.8 | 68 |
| 100 | 130 | 9.6 | 140 |
| 200 | 250 | 19 | 270 |

*Note*: The calculations assume no discounts.
*Source*: OXERA, from data provided by Halcrow Maritime.

108. There is an important question of as to whether property owners with more valuable property should be asked to pay more. A levy that is raised as a supplement to Council Tax could be applied at a flat rate per property, and per square metre of commercial property, or could be applied as a percentage of current Council Tax and NNDRs. Other tariffs related to Council Tax band could be devised, but these are the simplest. The percentage supplement has the advantage that it results in a more progressive distribution of the burden.

109. While a percentage supplement to Council Tax is both simple and progressive, it will generate incentives to provide defences that are different from those under a flat-rate

supplement. Under the percentage-supplement scheme, the revenue will be dependent on the Council Tax banding of the properties. Compared with the flat-rate scheme, under the percentage-supplement scheme, an authority would face incentives to protect more wealthy areas, and not to protect less wealthy areas. So, while the distribution of the burden of funding would be more progressive under the percentage supplement, the outcome in terms of flood defences would be more regressive. It would be possible to remove the worst of this effect by providing a top-up of the flood-defence levy revenue for the lowest Council Tax bands, such as A and B, bringing them up to equivalent of band C in revenue. An even more progressive result would be obtained by topping up bands A, B and C to the average level, D. This top-up could be provided by the Exchequer.

### Practicalities

110. Perhaps the main challenge to be met before the introduction of this levy would be to achieve a sufficiently well-defined boundary between payers and non-payers, or between tiers of payers. Boundary problems have not prevented the introduction of charging and communal insurance schemes in the USA. While indicative flood-plain maps have been published for England and Wales, their resolution is quite coarse, and likely to be open to challenge. In order to minimise the number of disputes over the location of the boundary:

- the charge could be introduced initially at a low level and gradually increased;
- the quality of flood-plain mapping could be improved; and,
- during the gradual introduction of the levy, the status of households could be switched from charged to uncharged, but not the other way around.

111. Local authorities could be given some freedom to set the magnitude of the percentage supplement to Council Tax and NNDRs limited by a ceiling rate of charge, determined by central government. The tariff of the charge—that is, the relationship of the rates for different Council Tax bands, and between Council Tax bands and NNDRs—could also be set by central government. The process for setting the supplement should be transparent; could be linked to a long-term flood-defence management programme; and could take into account the cost savings from insurance premiums and uninsured flood damage.

### The taxpayer pays: Exchequer funding

112. There are several reasons why a scheme involving taxpayers' finance may be appropriate.

- There are public goods that the population of the country as a whole is willing to pay for, such as environmental quality and cultural assets. Public funds could be used to supplement other funds.
- There are public good benefits from the protection of services provided publicly, such as roads and emergency services, which use the flood plain.
- If the local community that loses as a result of flooding is poor, then the nation as a whole may be willing to supplement that community's willingness to pay for additional defences.
- Option value—some people might wish to move to a flood-prone area at some time in the future, and may be prepared to contribute towards the protection of these areas.

### Summary of funding options

113. Table 6 summarises the funding options and the existing arrangements upon which they might be based.

114. In summary, the funding options have the following features:

- beneficiaries pay in proportion to the services they receive, so that undefended beneficiaries pay less than defended beneficiaries;
- local levies reflect local benefits, so that, by hypothecating the receipts for local use, the public acceptability of the levy is likely to be higher;
- polluters contribute to the cost of defending both public and private goods;
- the defence of national public goods is funded centrally;
- developers pay the costs imposed by new development.

**Table 6: Summary of additional and alternative sources of funding**

| Proposed new charge | Existing tax base which might be used as the base for new charges | Existing arrangements that provide examples of the new charge in operation |
|---|---|---|
| Flood-defence development charge | Town and Country Planning Act s.106 agreements | IDB developer charges<br>S.106 agreements<br>Trust fund |
| Flood-defence levy | Supplement to Council Tax and NNDR | |
| Surface-water drainage charge | EA General Drainage Charge (for agricultural land)<br>Discharge consent licence fees | IDB rates<br>Highway drainage charge<br>Sewerage service company surface-water drainage charge |

## COMPENSATION AND INSURANCE

115. The discussion has mainly revolved around two possibilities: polluters are liable for the damage they cause; or somebody (the polluter, the beneficiary or the government) bears the cost of the 'optimal' level of flood defences. There are, in principle, other options that would affect the funding of defences, which involve arrangements for compensation. In some countries, the government compensates households that suffer flood damage (see Appendix 3).

116. The availability of private insurance clearly changes the economic choice facing a household. The choice becomes one between:

- the certain payment of an annual premium, which would lead to a reduced risk of suffering major financial loss;
- bearing the private costs of flooding; and
- making some contribution now for flood defences.

117. Where no insurance is offered, or it is unaffordable, the choice is restricted.

### The case in favour

118. The first argument in favour of some form of compensation revolves around information. If there were perfect information then flood risks would already be capitalised in house and land prices. Those who moved to a flood plain would already be compensated by house prices lower than they would otherwise be. There would be no case for them to be compensated again, and whether they took out insurance would be a private decision and should not involve the state. This argument supports a policy of providing information.

119. There is a strong case for ensuring that developers pay much greater attention to the future prospects for insuring property that they build. If the risk of flooding is well understood before land is purchased then it should be possible to make an initial assessment of the cost of insurance.

120. The second argument in favour is that the constraint on public expenditure (the opportunity cost of capital) means that some property worthy of protection will not be protected.

121. Furthermore, some properties will receive a higher standard of flood defence than others, yet owners of similar properties will make the same contributions to local taxes. The result is that those in undefended or poorly defended areas may press for expenditure on defences. However, it may be inefficient expenditure, in the sense that there may be insufficient funds available.

122. In principle, one way to satisfy non-beneficiaries might be to introduce a compensation mechanism, so that, where it is uneconomic to provide defences, owners receive compensation for damage and distress as a result of property being flooded. In this way, flood-related taxes levied on properties could be seen as a premium for a flood-insurance scheme.

123. There is also a distributional argument. The poor are generally not so well covered by insurance. A collective scheme or one supported by a public contribution could therefore address social exclusion, especially in rural areas where risk is greatest.

### The case against

124. Any insurance scheme with a public contribution might be seen as a precedent for the provision of public compensation for disaster damage, which could expose the Exchequer to a large number of unrelated compensation claims. The question is whether this problem is sufficiently overwhelming to rule out any consideration of a collective or public insurance scheme. It is certainly an important argument against a public scheme.

125. To avoid introducing new property rights, undefended properties on the flood plain would have to pay for their own insurance. The revenue from undefended properties on the flood plain would then equal the total insurance cost. Alternatively, and as preferred, contributions could be paid into a pooled fund covering both defences and insurance. This is the concept of a collective insurance scheme.

126. Any scheme of compensation carries the risk of 'moral hazard'. If a household knows that compensation is readily available, it will have little, or no, incentive to avoid the flood plain or mitigate flood damage, in the knowledge that the taxpayer will cover the cost of flooding. Similarly, even LAs may have reduced incentives to protect their communities if they know that national funds will be available in the case of flood disaster. One method is to introduce the requirement for an 'excess', which is payable on every compensation claim.

## Design

127. The model for an insurance scheme is a system in which a collective funds a proportion of a claim over a threshold percentage of the value insured. For example, if the threshold were 10%, and the claim were for 15%, then the fund would pay 5% to the insurer. The level of the threshold determines the size of the insurance premium payable by the property owner;

128. a collective insurance scheme could be administered by the private insurance industry, while the fund is maintained by levy revenues. The premiums and excesses would be regulated.

129. The insurance would be designed to cover fluvial and coastal flooding. It would be particularly important in rural areas where the standards of defence are lower, and flooding is more frequent. It is probable that if the introduction of an insurance scheme were voluntary then rural communities would be among the first to take advantage of it.

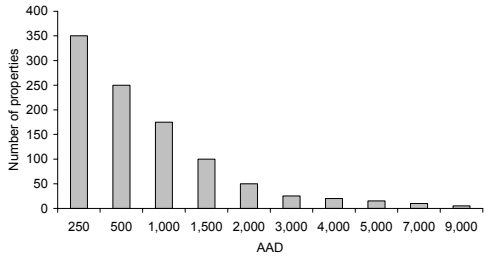
130. Where the private insurance industry is content to offer cover, no public system need be introduced. However, where private insurance has been withdrawn, or premiums have become very high, a public insurance provision might be desirable.[22] Communities could decide whether to adopt the collective element of insurance. It is proposed that the collective insurance would be funded partly from flood-plain levies raised by the LA, and partly by the Exchequer. The LAs would therefore need to decide whether to opt in or out of a public insurance scheme.

131. The introduction of an insurance scheme on a community-by-community basis allows the attachment of conditions. These could include a flood-defence management and reporting system, accurate maps, and effective warning systems to enhance the governance of flood defences.[23]

132. The expected annual cost of the insurance mechanism can be estimated. In the example calculation below, a national assessment of damage for properties at risk is combined with case studies of accurate damage estimates for small samples of properties. It is not possible to generate accurate national damage figures, because the national assessment does not account for existing defences. Unfortunately, the sample estimates may not be representative of England and Wales, and there were differences in the way in which properties were defined as being at risk of flooding, so the results are approximate. Furthermore, a large proportion of the sample was captured in a single open-ended band (> £5,000) which meant that the mean damage could not be calculated. These difficulties illustrate the paucity of useful national data on flood damage.

For illustration, Figure 5 shows a stylised distribution of average annual damage (AAD) for 1,000 residential properties. The distribution has an AAD of £1,000 per property, consistent with the mean AAD reported in the NAAR study.

**Figure 5: Stylised distribution of AAD (£/property/yr) for 1,000 properties**




*Source*: Middlesex University.

133. In the model, a claim is divided into: the excess, paid by the property owner; a payment up to a ceiling paid by private insurers; and the balance, covered by the public or collective fund. Table 7 shows the annual expected pay-out from a collective fund when the private insurance claim is capped at different levels and an excess of £1,000 is applied.

[22] Maddrell (1995), Crighton (1997).
[23] see also Association of British Insurers (2001)

**Table 7: Estimated cost of insurance scheme**

| Ceiling on losses met by private insurer (£/property) | Expected annual payout from collective fund for 1,000 properties (£m per annum) | Collective funding for 2m residential properties, NAAR 'economic' estimate (£m per annum) | Collective funding for 2m properties, 'insurance' estimate (£m per annum) |
|---|---|---|---|
| 0 | 0.4 | 740 | 1,850 |
| 1,000 | 0.2 | 390 | 975 |
| 2,000 | 0.1 | 240 | 600 |
| 3,000 | 0.07 | 140 | 350 |
| 4,000 | 0.04 | 80 | 200 |
| 5,000 | 0.03 | 50 | 125 |
| 6,000 | 0.01 | 20 | 50 |
| 7,000 | 0 | 10 | 25 |
| 8,000 | 0 | 0 | 0 |

*Note*: The insurance estimate is 2.5 times greater than the NAAR 'economic' estimate.
*Source*: OXERA calculation.

The NAAR figures in Table 7 use an 'economic' valuation that all furnishings have been depreciated by 50%, whereas the insurance valuation assumes 100% of the replacement value, consistent with 'new-for-old' insurance policies.

### Examples of use

134. Insurers in the UK have provided flood cover since a major flooding incident in the 1960s when the government asked the industry either to do so, or have a public insurance system imposed by the government. Insurers used to be unable to identify property at risk of flooding. However, recent technology may allow them to assess the risk and set a premium to match it. Although insurers may now be able to identify properties at risk, so far they have chosen not to do so. If they had, then the insurance premiums for properties at greatest risk could have increased substantially, and the owners might have pressed for enhanced defences. Not all properties hold flood insurance, especially those which are flooded regularly, and those owned or occupied by the poor.

135. Outside the UK, public flood insurance is common. The US example is presented in Appendix 3. A state–industry partnership provides flood insurance cover, known as the National Insurance Flood Program. The premiums are held in a fund, which is guaranteed by the federal government. Local communities may opt into the scheme, and, upon doing so, a Flood Insurance Rate Map is drawn up. There is an excess of $1,000, a limit to the insurable value per property, and the subsidised annual premium for properties at the 1 in 100 event level is about 0.7% of the value insured.

136. The USA differs from the UK in that the at-risk areas, such as the Mississippi flood plain, are much larger, and the damage caused by inundation much greater than ever likely to be experienced in the UK.

## Other forms of compensation

### An exit payment for managed retreat

137. An 'exit payment' would be a counterpart to a fee for new development. A payment could be made where the costs of defence or insurance are much higher than the ceiling for flood-defence charges for the property. The provision would allow the operating authority to buy out the property owner where the net present value of the shortfall of revenue against costs is greater than the value of the property, plus reasonable disturbance costs. Guidance could be composed on the appraisal of candidates for exit payments.

138. Exit payments could attract rent-seeking behaviour—persons deliberately placing themselves in a position to qualify for a payment. In order to prevent this, the criteria for exit payments would have to be highly restricted, so that payments would be made in exceptional circumstances only.

### Payments for flood storage and soft defences

139. It is fairly common practice to maintain low defences around some areas of flood

plain, so that these selected areas flood first, storing the flood water until the emergency has passed. Since the operating authorities are not required to protect property from flooding, an active policy to maintain flood-storage areas for this purpose can be followed without having to make compensating payments to landowners.

140. Nevertheless, in some cases payments might be made, as compensation for a reduction in the standard of defence, or to prevent the landowner erecting new defences. In some cases, land has been bought and leased back to the landowner so that it can be used for flood storage.

141. Similarly, payments are sometimes made for soft defences in areas at risk of coastal erosion or flooding. Soft defences are areas of land that are not defended, and dissipate the force of the sea, reducing the need for defences further inland. Under the Countryside Stewardship Scheme there are standard payments that can be made for agricultural land.

142. Under current levels of agricultural subsidy the farmer would have to be offered in the region of £100–£300/ha per annum to gain financial benefit from the creation of a wasteland or flood-storage area. English Nature has identified environmental benefits that may match or exceed this value for the best sites, so it may be possible to justify the creation of wastelands that provide habitat, recreation and/or flood-storage benefits. [24]

143. There is no national system of payments or contracts for flood-storage areas and soft defences, but there is a case for establishing such a system.

[24] English Nature (2001).

## CONCLUSIONS

### Changes to current arrangements

144. There are a number of options for improving the existing arrangements that could be implemented immediately without the need for major reform of strategic or operating authorities, or primary legislation. The options relate to the incentives for managing flood risk and the system of **local government financing**.

145. One of the following options may be considered for local government financing.

- 'Perspiring' of flood-defence expenditure by LAs, similar to education funding, to reduce diversion of funds to other activities, and improve the credibility of flood-defence expenditure statistics. This would reduce LA control, and run counter to current local government finance policy. Or;

- A formal ring-fence of flood-defence funds, similar to the Housing Revenue Account, would provide even stronger protection. It could be complemented by an error-correction mechanism so that surpluses, such as budget over-estimates, could be recovered—for example, a three-year rolling error-correction mechanism could be introduced. Again, this would run counter to local government finance policy.

- To separate the SSA indicator into two parts: the EA-levy element and the own-spend element. Each element could then be pro-rated by the scaling factor, rather than the whole flood-defence budget as at present. In this way the own spend would not be squeezed when (as recently) EA levies are raised above the rate of increase in the flood-defence control total. This would be appropriate if EA-levy expenditure were to be increased substantially over a short period of time.

146. The current system of SCAs allows LAs to spread the cost of lumpy **CAPEX** over time. The SCA system allows them to do this by transforming the cost from a lump sum into a flow of interest and principal repayments. This system not only allows capital and operating options to be considered on a more equal basis, but also spreads the cost over time so that those that will benefit in the future also pay.

147. The eligibility criteria and project appraisal exercised by DEFRA provides central government control of a considerable proportion of CAPEX. If local decision-making power were to be increased, this system of competitions for grants might be scaled back. It would be possible to retain the advantages of the SCA system and some central control over CAPEX without engaging in the current micro-management of project-by-project approval. The DTLR consultations on the local government finance review suggest how this might be done. First, strict definitions of CAPEX would be needed, and effective auditing of expenditure. Second, '**prudential indicators**' could be used to monitor expenditure, and could be limited by a ceiling. For flood defence, a ceiling of capital finance outgoing in the form of SCA interest and principal repayments could be set, and could be converted into a ceiling for average annual CAPEX. The conversion would be simple to calculate, taking the total borrowing implied by the cash-flow ceiling and dividing it by the average term of repayment.

148. The current scheme makes grants available to some capital projects, but not to maintenance and operations. It is not clear whether, under the present arrangements, the overall rate of support for capital schemes is set at the same level as the rate of support for maintenance and operations. It may be appropriate to offer a uniform rate of support across all forms of expenditure, recognising the public benefits accruing from flood defence, and the variations in local wealth—that is, ability to pay for defences. It may also be appropriate to question whether the same eligibility criteria should be applied to grants across all forms of expenditure.

149. Where a flood-plain is earmarked for strategic development in **land-use plans**, flood defences might be funded in advance, and the costs recovered from developers once the development is completed. In this way, flood defences could be provided from the start of the development, and a partially complete development would not be left unprotected.

### Additional and alternative sources of funding

150. It is clearly established that there is a case on simple cost–benefit grounds for increasing the level of flood defence expenditure, although this case might be weakened if the cost–benefit appraisal were to take into account the opportunity cost of capital in public-sector expenditure.

151. The following options could provide additional funding, and could be considered as alternative sources of funding, where they perform better.

- A flood-plain development charge to reflect the cost of providing flood defences for new development in undefended flood plains.

  The charge could be raised under the provisions in s. 106 of the Town and Country Planning Act for contributions to local infrastructure and amenities; through separate arrangements being considered for 'impact fees'; or through specific new primary legislation granting LAs powers to raise levies, similar to those granted under the Transport Act 2000 to introduce congestion charging on roads.

  A payment by area and class of development would reflect the area protected by defences and ability to pay. The landowner or developer could be charged at the time of seeking planning permission.

- A tiered flood-plain levy, possibly complemented by a collective insurance scheme, could be implemented through the Council Tax and NNDR systems. A percentage supplement to Council Tax would be both simple and progressive. The charge could be introduced initially at a low level and gradually increased, and the quality of flood-plain mapping could be improved.

  Local authorities could be given some freedom in setting the magnitude of the percentage supplement to Council Tax and NNDRs. The process for setting the supplement should be transparent, linked to a long-term flood-defence management programme, and take into account the cost-savings from insurance premiums and uninsured flood damage.

  It would be possible to top up the flood-defence levy revenue for the lowest Council Tax bands, such as A and B, bringing them up to equivalent of band C in revenue. An even more progressive result would be obtained by topping up bands A, B and C to the average level, D. This top-up could be provided by the Exchequer.

152. The mechanism for providing Exchequer funding could be reformed to reflect the public benefits from flood defences and to address issues of social equity. The contribution would have two elements:

- a fixed contribution for the authority that would reflect the local ability to pay for flood-defence work against a national standard of ability to pay. In this way, less-affluent authorities where residents were less able to pay for expensive works would receive the greatest subsidy;
- a contribution reflecting the value of the public goods provided.

153. These contributions could leverage finance raised locally, and might not be specifically attached to capital or revenue budgets. This goes beyond the current Scottish arrangements, where the Scottish Executive has the power to determine which projects are eligible for capital grant support.

154. Also, a component (top slice) of Exchequer funding control could be used to fund directly flood-defence services at a national agency level.

### Insurance and compensation

155. The major benefits of an insurance scheme are its incentive properties. Without insurance cover, property owners would be likely to demand enhanced defences, and might influence the operating authorities.

156. The study has shown the importance of the private insurance industry, through which all subscribers partly finance the flood insurance cover of those at risk. There is effectively a partnership between government and the insurance industry at present, which provides a great deal of policy flexibility. However, there is a risk that competition will erode the *status quo*, so an alternative arrangement should be considered.

157. The model proposed is a payment contribution, where the collective or public fund meets a proportion of a claim over a threshold percentage of the value insured. This would be administered by the private insurance industry, but maintained by direct contribution from levies raised by the LA (with a top-up from the Exchequer). The premium and excess would be regulated.

158. LAs would be allowed to opt in to the collective insurance scheme, and support might be phased in gradually.

159. **Soft defences and flood storage**–an 'exit payment' would be a counterpart to a fee for new development. A payment could be

made where the costs of defence or insurance are much higher than the ceiling for flood-defence charges for the property. The provision would allow the operating authority to buy out the property owner.

160. There is no national system of payments or contracts for flood-storage areas and soft defences. A system could be devised, and could be integrated with any exit payments for managed retreat.

### Enhanced control

161. One beneficial aspect of the current arrangements is the fairly high level of local accountability. This could be further enhanced by passing more of the responsibility for fundraising and budget-setting to LAs. At the same time, centralised control of CAPEX could be rolled back.

162. The EA receives the bulk of its flood-defence funding via LAs. The involvement of a FDC in setting the levy rate introduces an additional step in the process and reduces the transparency of responsibilities. An alternative arrangement is for the levies to be agreed directly between the EA and the LA, against an agreed programme of work and projected standard of service. This could form a contract between the LA and the EA. The FDC could retain a function overseeing catchment management planning, and resolve disputes between LAs and the EA.

163. Alternatively, funding for capital and revenue work could be delivered entirely through by a block grant to the EA, and an auditing system could be put in place to check that spending was efficient and equitable, but the incentive properties would be weak.

164. In the first case, contracts between the EA and LAs could conform to a standard code, and cover main and non-main river defences. The contract could detail flood warning, monitoring, operations, maintenance and construction services. It would be for the EA to decide or agree which of these is outsourced, and which is carried out itself or by the LA. This arrangement would allow the LA to fund works through the Private Finance Initiative (PFI) if it wished to do so. The contract could be written around a long-term asset management plan which the FDC could approve.

165. LAs have a mixed reputation for the stewardship of flood-defence assets. The two main criticisms levelled at them are that some of the budget for flood-defence expenditure is spent on other activities, and that some of them do not manage their flood-defence assets to a high standard. Given the small scale of much of LA flood-defence work, it would be possible to hand over operational responsibility for flood defences to the EA, leaving LAs to strike the balance between local targets for levels of service and costs, and to agree the priorities for works with the EA.

166. The division of rivers into the two classes of main and non-main river has substantially added to the complexity of responsibilities and funding. It makes sense to address the same expertise to both sets of rivers. Full control of flood-defence expenditure on main and non-main rivers could *not* be handled by LAs, which have insufficient expertise, and which would then have to coordinate their efforts to deliver integrated catchment plans. Coordination of flood defence should rest with the EA, or other competent body, to be established under the Water Framework Directive.

167. If this were done, there would be little need for LAs to retain their own flood-defence budget, and further reform of the financing arrangements could be considered.

168. If LAs were given greater control over revenue-raising, then there would need to be another means by which central government could prevent excessive local tax-raising from squeezing out other taxes. Central government control could be exerted through ceilings on the rates of local forms of taxation hypothecated to flood defence.

169. These proposals have some similarity with the arrangements in Scotland, where LAs appear to be more likely to fund projects through European Community grants, or to use the PFI to deliver projects.

170. In an arrangement giving LAs this degree of control, central government control of contributions for individual capital projects might be inappropriate for all but the largest projects.

171. The IDBs appear to function well. They provide a high standard of drainage and did not experience serious flooding during the recent heavy floods in other areas. They report extremely low levels of bad debt, which suggests that their ratepayers are content to support the IDBs' activities. It is not recommended to change the function of the IDBs.

172. It is difficult to observe how much in total is being spent on flood defence and drainage

because of the number of parties involved, the many transfer payments, and the absence of a national summary report. Enhanced auditing of flood-defence accounts and tighter accounting definitions could lead to a more accurate picture of flood-defence expenditure.

173. A national unit could be set up to benchmark flood-defence procurement across LAs and flood-defence regions. This unit could be responsible for publishing annual returns of activity, funding and expenditure, and for advising funding departments of year-by-year changes in the unit costs of operations and capital procurement.

### Asset plans and coordination

174. A more formal, cyclical, asset-planning regime could be introduced, providing greater certainty in future expenditure and funding levels, and allowing more efficient capital procurement. This could, for example, be a five-year review process, within which LAs maintain 10-year investment plans. Expenditure would be set well in advance and under a long-term plan, rather than in response to recent weather events.

175. The capital programme could then be agreed on a multi-year planning cycle, rather than just for the year ahead. This might release efficiency savings and could inform the three-year cycle of the inter-departmental spending review.

176. Longer-term plans might also allow efficiencies to be gained from the closer coordination of flood defence and other catchment management activities, such as water availability and quality. It is not known how large these synergies might be.

177. There are two reasons which demand for the effective coordination of flood-defence activities: the Water Framework Directive; and the impact of flood-defence works on the hydrology of the catchment downstream. They would be able to continue their coordinating role by approving long-term asset management plans. The FDCs could also address themselves towards large capital projects which cross LA areas, and arbitrate agreement about contributions from each LA. Also, the FDC could be given a more formal relationship with regional government, and might assume a technical advisory and brokering role without recourse to executive powers.

# APPENDIX 1: POWERS AND DUTIES OF AUTHORITIES

## Responsible authorities

178. Under the existing flood and coastal defence arrangements, overall responsibility is held by DEFRA (in England) and the NAW (in Wales), along with the EA.

## DEFRA

179. DEFRA has overall responsibility for flood and coastal defence policy in England, and for the administration of legislation relating to these issues. Its stated objective, as defined in the 'Strategy for Flood and Coastal Defence in England and Wales', is:

> to reduce the risk to people and the developed and natural environment from flooding and coastal erosion by encouraging the provision of technically, environmentally and economically sound and sustainable defence measures.[25]

180. DEFRA's policy is expressed in a number of key objectives, including:

- to encourage the provision of adequate and cost-effective flood-warning systems;
- to encourage the provision of adequate, economically, technically and environmentally sound and sustainable flood and coastal defence measures; and
- to discourage inappropriate development in areas at risk from flooding and coastal erosion.

181. DEFRA issues guidance to operating authorities, runs a research and development programme, and distributes grant aid to eligible capital works.

## National Assembly for Wales

182. The NAW carries out similar functions in Wales to those undertaken by DEFRA in England. It has adopted the same policy aim as DEFRA, outlined above, assuming the responsibility formerly held by the Welsh Office.

## Environment Agency

183. The EA is the main operating authority in respect of flood defence, with supervisory responsibility for implementation of government flood-defence policy in both England and Wales. The work of the EA in this respect is undertaken through the regional and local flood defence committees (RFDCs and LFDCs), with the exception of the issuing of levies and drainage charges, a duty which is retained by the EA. There are currently ten RFDCs and 20 LFDCs within England and Wales, although this is under review.[26]

184. The EA, through its FDCs, is responsible for:

- flood defence, the assessment of flood risk and the preparation of Water Level Management Plans on 'main rivers' (defined in the Water Resources Act 1991, s.113, as 'a watercourse shown as such on a main river map');
- the construction and maintenance of sea defence works, and assessment of flood risk relating to sea defence;
- the maintenance of the National Flood and Coastal Defence Asset Database;
- issuing guidance to local planning authorities regarding the possible effects of development proposals on flood-risk issues;
- the monitoring of 14 high-level targets, in place since April 2000 (April 2001 in Wales), which assist in the delivery of DEFRA's and NAW's stated policy objectives; and
- the provision of flood warnings.

185. The EA has powers to issue the RFDC levies, and to direct FDCs under s.106 (3), (4), (5) of the Water Resources Act 1991 only if the FDC's action is likely to have a material effect on the EA's ability to manage water for purposes other than flood defence (eg, pollution control or water supply).

## Internal drainage boards

186. The IDBs are local committees which operate in areas known as internal drainage districts. These are to be found mainly in low-lying areas with specialised flood-defence needs (eg, East Anglia and Somerset). The IDBs carry out drainage and flood-defence work on non-main rivers. There are 230 IDBs

[25] MAFF (1993).

[26] Agriculture Select Committee (2001 and 1998).

in England and Wales, most of them covering agricultural land, and they work together in 68 management units. Their number has recently declined from around 250 as the result of amalgamations.

### Local authorities

187. LAs, of which there are around 400 in England and Wales, have permissive powers to carry out flood-defence work on non-main rivers outside the areas covered by internal drainage districts. Specific responsibilities and financial obligations vary according to the type of LA.

188. There are 88 LAs in England and Wales whose areas of responsibility include land adjacent to the sea. These authorities have powers to undertake coastal defence measures, including both sea defence to prevent flooding, and coast protection to protect the land from erosion.

### Other bodies and individuals

189. Private individuals and companies owning coastal land or responsible for rivers requiring flood-defence work can also carry out defence work, with consent from the relevant operating authority, but do not receive any government grant for this. LAs or the EA may apply on their behalf for 'riparian-owner' schemes and receive funding, but the individual owner would have to make up the shortfall and be responsible for the upkeep of the defence.

190. Landowners can be required by the operating authorities under powers vested in them by the Water Resources Act 1991 and the Land Drainage Act 1991 to ensure a free flow of water through their land. A landowner whose land has suffered injury due to flooding can sue a riparian owner for damages if they failed to maintain a free flow of water. The legal requirements on riparian owners to undertake maintenance of flood defences are rarely statutory, but may exist by covenant or prescription. Therefore the responsibilities vary by location and are complex; however, in most cases, neither the owner nor the operating authority is obliged to construct or maintain defences.

### The Regional Flood Defence Committees

191. Although part of the EA, the RFDCs deserve special attention because, under s.106 of the Water Resources Act 1991, they hold executive powers beyond the control of either the EA Board, DEFRA or LAs, to undertake flood-defence activities. The FDCs may delegate them to a sub-committee, an EA officer, or to other FDCs.

192. The FDCs are composed of LA members, DEFRA-appointed members, and EA members. The LA appointees who sit on the RFDCs are bound to act as members of an EA committee, not as representatives of Las. However, it is not clear that this distinction is always made in practice, and, if it were, an element of local accountability that appears to exist *de facto* from current practice might be lost. The LA members have a greater say in the level of the levy than the other members, through the mechanism of 'special consent' laid out in the Land Drainage Act 1976.

193. Although the RFDCs have executive powers, they do not have separate legal status from the EA. They cannot borrow, raise levies or appoint their own staff, although they can determine their own committee procedures. When they act, they act in the name of the EA, although they are not accountable to the EA Board.

### Legal framework

194. Flood and coastal defence policy is covered by a number of pieces of legislation, some of which date back more than 50 years. The most recent is the **Environment Act 1995**, which established the EA and outlines its duties. The **Water Resources Act 1991** relates to the functions and powers of the EA and the FDCs. The **Land Drainage Act 1991** consolidates the enactments relating to IDBs, and to their function (and that of LAs) with regard to land drainage. It details a number of financial provisions for the expenses of IDBs and for the levying of drainage rates. The **Coast Protection Act 1949** concerns the protection of the coast against erosion.

195. A more detailed examination of some of these is given in the sub-sections below.

### The Environment Act 1995

196. This Act contains the legislation for the creation of the EA. Under the Act, the functions of the National Rivers Authority which relate to flood defence and land drainage, as set out in the Land Drainage Act 1991 and Water Resources Act 1991, were transferred to the EA (s.2(1)(a)). This transfer is reflected in the discussion of these two Acts below. The Environment Act reaffirms and refines many of the commitments set out in the two Acts of 1991 in relation to flood-defence

responsibilities, RFDCs and LFDCs (ss.6, 14–19, Schedule 5).

197. The EA's supervisory duty is set out under s.6(4): 'the Agency shall in relation to England and Wales exercise a general supervision over all matters relating to flood defence', whereas under s.106 of the Water Resources Act 1991, flood defence is to be carried out by the RFDCs. Schedule 5 (p. 12) of the 1995 Act permits FDCs in turn to arrange for their functions to be carried out by a sub-committee or officer of the EA, or by another FDC.

198. The Environment Act broadens the categories of works eligible for grants in s.147 of the Water Resources Act 1991 and s.59 of the Land Drainage Act 1991, to include strategic studies, information gathering about natural processes affecting the coastline, and post-project evaluations (s.101).

199. While the Act enables the appropriate Minister to direct the EA to pay to the relevant Ministry all or part of a surplus on its capital or revenue accounts, funds relating to flood defence are exempt from this (s.44(5)).

### The Land Drainage Act 1991 (amended 1994)

200. This Act comprises five parts.

- Part I outlines the constitution and functions of IDBs in internal drainage districts. Their purpose is to 'exercise a general supervision over all matters relating to the drainage of land within their district' (s.1). The EA may, if requested, review the boundaries of internal drainage districts or the constitution of IDBs (ss.2–3), and may direct the IDBs in their duties (s.7), although this direction is only for guidance and is not enforceable. Consent must be obtained from the EA for works that affect another board (s.7). The EA (or, on application, the LA) can carry out the functions of an IDB where land is endangered by flooding and the board is not exercising its powers (ss.9–10). Arrangements may be made between drainage authorities to carry out work outside their usual district, and IDBs may, with the agreement of the EA, carry out work on a main river (s.11).

- Part II gives IDBs and LAs powers to maintain or improve existing works or construct new works (s.14). The EA or an LA may carry out small-scale schemes and recover certain expenses from the owners of the land to which the scheme relates (s.18). IDBs and LAs have powers to require works to be carried out for maintaining the flow of watercourses, or to carry out the works themselves and recover the costs from the person upon whom the notice is served (s.25).

- Part III allows for the application to a relevant Minister for the amendment to, or revocation of, any scheme that affects land drainage.

- Part IV deals extensively with financial provisions. The expenses of the IDBs, in so far as they are not met by the EA, are to be raised by means of drainage rates, and by special levies under the Local Government Finance Act 1988 (s.36). The proportion of expenses raised from drainage rates is equal to the agricultural proportion of land values in the district, while the amount raised by special levies must be enough to balance the expenses of the IDB, taking into account the proceeds from the EA and drainage rates (s.37). Rates are assessed at a uniform amount per pound on the annual value of the agricultural land or agricultural buildings in the district (s.41), although the IDB may adjust individual values to ensure that 'the burden . . . is fairly distributed' (s.43). IDBs have the power to grant exemptions (eg, to occupiers of property that is located at a significant height above sea level (s.47). IDBs may apply to the EA for further contributions (s.57).

- Part V confers a variety of supplementary powers on IDBs, including the right to acquire land outside their district (s.62), or to dispose of land (s.63). It entitles boards and LAs to make by-laws for the efficient working of the drainage system (s.66). Under s.73, any question about whether a proposed work is connected with a main river or not is referred for arbitration to the Secretary of State or DEFRA.

### The Water Resources Act 1991

201. Part IV of this Act concerns flood defence, although several relevant sections were repealed by the Environment Act 1995. It sets out that the EA's flood-defence function (with the exception of the issuing of levies and drainage charges) is to be carried out by RFDCs (s.106). The EA exercises those

functions in respect of main rivers that are conferred upon IDBs in respect of non-main rivers under the Land Drainage Act 1991 (s.165).

202. The Act declares that revenue raised by the EA in relation to flood defence and land drainage must be spent only in carrying out the EA's flood-defence functions, in, or for the benefit of, the local flood-defence district in which it was raised (s.118). It allows for the raising of general drainage charges at a uniform amount per hectare of chargeable land in a local flood-defence district, and states the formula for calculating the charge (ss.134–136). Special drainage charges may be raised in the interests of agriculture (ss.137–138). IDBs must make contributions to the EA as required (s.139). The FDCs cannot raise levies, which have to be issued by the EA Board; however, they can set the rates of the levies, and the EA Board cannot over-rule them.

203. DEFRA may make grants towards expenditure incurred by the EA in the improvement of existing drainage works, the construction of new works or the installation of flood-warning systems (ss.147–148).

204. The EA's general powers are outlined in ss.165–167, and include to maintain, improve and construct works for main rivers, or for defence against sea water, and to provide flood-warning systems. The EA is required under s.193 to keep maps showing the watercourses which have been designated as 'main rivers'. Watercourses not appearing on the main river map are regarded as 'ordinary watercourses'.

205. The EA has permissive powers to undertake flood-defence works on main rivers. The same powers for ordinary watercourses reside with other authorities. In the past, authorities have not been called to account for the watercourses for which they have assumed authority, and therefore it has not always be clear where a riparian stretch is being operated by an LA and where management has resided with the riparian owner. There are many cases of ordinary watercourses that have received little management of flood risk, and the EA has not used its supervisory power to monitor or enforce management. It has recently begun to adopt a more proactive supervisory role.

206. The pattern of main or non-main rivers follows no set rule. The procedure set out in s.194 for enmaining rivers has been used extensively in the North West Region, but more sparingly elsewhere. The proposal to enmain a river must be accepted by the RFDC, and committees have sometimes refused applications for rivers whose flood defences are in poor condition or absent.

207. In response to DEFRA's high-level targets, operating authorities have been asked to provide statements describing the intended flood-risk management regime for main and ordinary watercourses. In preparation, the EA has been working with the other authorities to identify a sub-class of ordinary watercourses, 'critical watercourses', where the value of property or size of population at risk is high. These watercourses may become candidates for enmaining.

208. The EA's supervisory duties are not supported by statutory powers. The EA can only carry out the work for which it is funded by the RFDCs, and can therefore only exercise its statutory powers in so far as the RFDCs are prepared to fund it to do so.

### Land Drainage Act 1976 and National Rivers Authority (Levies) Regulations 1993

209. Parts of the Land Drainage Act 1976 continue to be effective through the National Rivers Authority (Levies) Regulations 1993 (SI 1993 No 61). The provisions for funding from year to year are set out in s.46 of the Act, and normally require excesses or deficiencies in a financial year to be balanced in the following year. An excess of funding in the current year (for example, due to slow progress on capital works) would result in a decrease in the 'qualifying expenditure' for the levy in the following year. In this fashion, deviations from budgeted expenditure are automatically clawed back, and work which bridges several years has to be subdivided into annual components. Working capital can only be raised to meet requirements in the financial year.

210. Furthermore, the levy issued by the EA can only be used to recover 'qualifying expenses' in the flood-defence district concerned. These include expenditure in performing the flood-defence functions in, or for the benefit of, the flood-defence district in question. The EA is required to keep separate accounts for each FDC; however, the funds of one district can be used to provide a loan to another district for a short time. It would be difficult for the EA to guarantee repayments on such a loan.

211. Each FDC holds some funds as 'balances' for contingencies in the current

financial year. The provision of a reserve, replacement or sinking fund is described in s.45 (2). This can be used to meet contingencies and emergency works, or to spread the cost of capital works across more than one year. Usually reserves have been accumulated from unused yearly balances. The RDFCs and DEFRA have agreed that the reserves will be limited to between 5% and 10%.

212. In setting its levy, the FDC can only raise the levy by more than the retail price index (RPI) referenced to 1992 expenditure by means of the 'special consent' of a majority of its LA members.

## Human Rights Act 1998

213. The Human Rights Act has a significant potential impact on environmental law which to date has been largely untested, and for which little case law has been established. The Act incorporates broad descriptions of rights from the European Convention on Human Rights, including:

- the right to peaceful enjoyment of possessions and protection of property (Article 1); and
- the right to respect for private and family life, home and correspondence (Article 8).

214. As a result, the deliberate flooding of land without compensation may be challenged, and the decision not to maintain existing defences to a sufficient standard leading to flooding and damage to property may also be challenged. There must also be safeguards against arbitrary decisions by authorities affecting these rights, under the right to a fair and public trial within reasonable time. This could mean that the process for allocating public expenditure on flood defences becomes more open to challenge and more accessible to the public.

215. The implications of the Human Rights Act extend further, including obligations on authorities with the powers to protect the rights of individuals against the activities of others that might prevent the effective enjoyment of those rights. Given that run-off which contributes to floods could be described as pollution and is caused by the activities of individuals other than those who are at risk of flooding, the Human Rights Act may place a duty on government to protect the rights of those on the flood plain against the run-off from the property of those higher in the catchment. It is difficult to mitigate against the established patterns of flood risk and run-off that currently exist. However, in respect of operation of the defence network, and permission to develop new land, where authorities have greater powers of control, the Human Rights Act might bite. One of the potential mitigants that might be introduced is a principle of compensation for flooding, at the least in circumstances of intentional flooding to manage river levels.

216. The government's statement on compensation is as follows.

> Except in limited circumstances, outlined below, no compensation is payable to those affected by flooding or erosion, including cases where it is decided not to defend a particular area, or to undertake managed realignment. … Save for the specific requirements of the Habitats Directive, there is no general obligation to build or to maintain defences either at all, or to a particular standard. Consonant with this approach, the legislation also makes no provision for compensation from public funds to persons whose property or land is affected by erosion or flooding.
>
> Payment is, however, possible where quantifiable beneficial use arises. Thus land may be acquired for the construction or maintenance of defences, and compensation paid for damage arising expressly from such operations. Also, in some circumstances where land seaward of justifiable new defences can be shown to contribute to effective defence, whether locally or remotely, landowners may be eligible for payment for depreciation or loss of land. Finally, if a defence is realigned landward, land currently in agricultural use may be considered for payments under agri-environment schemes if a long term return to inter-tidal habitat fulfils the relevant objectives.[27]

217. As with other areas of public administration, the Human Rights Act 1998 may affect the exercise of flood and coastal defence functions. The position prior to the Human Rights Act was that such functions rested on powers vested in the EA and IDBs, rather than duties. As such, a decision not to exercise those powers would not generally

[27] page vi, Government response (October 1998) to the Sixth Report (1998) of the Agriculture Select Committee.

give rise to any liability to affected members of the public.[28] However, if such powers were exercised, there would be a duty of care not to exacerbate the damage that the person would have suffered if the authority had done nothing.[29] Similarly, there are long-standing statutory obligations to compensate persons who sustain injury owing to the exercise of the statutory powers.[30] However, these provisions have been interpreted as applying only where the action that is the cause for complaint would have been actionable under common law (for example, nuisance) but for the statutory powers.[31] So, for example, it would cover the situation where drainage works cause damage to banks, trees, bridges, fishing rights, etc, or where flooding arises from defective works.[32] There will therefore be no remedy under these provisions for 'normal' flooding arising from failure to carry out works.[33]

218. By contrast, the Human Rights Act 1998 makes it unlawful for a public authority to act in a way that is incompatible with a Convention right (s.6(1)). Damages are among the range of possible remedies for such unlawful conduct (s.7). For this purpose, an 'act' includes a failure to act (s.6(6)).

219. In extreme cases, flooding may threaten life, the right to which is protected under Article 2. It may also interfere with private and family life (Article 8) and with the peaceful enjoyment of possessions (Article 1, First Protocol). It may also be argued that decisions as to whether, when and how to provide flood protection affect the 'civil rights' of those at risk, and, as such, are subject to the requirement under Article 6(1) of a fair and public hearing within a reasonable time by an independent and impartial tribunal established by law.

220. The rights regarding private and family life and peaceful enjoyment of possessions are not absolute, and, accordingly, not all decisions that have the effect of interfering with them will necessarily be unlawful. The courts would no doubt have regard to matters such as resource constraints in determining whether there had been unlawful interference by a failure to act. The key differences arising from the Human Rights Act are probably as follows:

- authorities will be required to justify their decisions in policy terms where they involve interference with these rights;
- the requirements of due process will have to be considered as part of the decision-making process;
- there may arguably be an obligation to compensate those affected.

221. On the first issue, the UK courts are already recognising that, where fundamental rights are affected, the courts will not necessarily defer to decisions reached by public bodies. In the context of flood defence there will therefore be a need to demonstrate, in cases of challenge, a rational basis on which decisions have been reached, and how the rights of individual landowners were addressed. The issue of justification will be addressed in the light of the aims and objectives of the measure in question, with regard to the principles that prevail in democratic societies.[34] Local accountability and decision-making may therefore be important aspects of this process. However, this is not a general mandate for subordinating the interests of the majority of the public to those of individuals. Article 1 of the First Protocol requires a fair balance to be sought between the general interests of the community and individuals affected. The requisite balance will not be struck if an individual has had to bear an excessive burden.[35] A key element here may be the availability of compensation, discussed below.

222. The requirement of due process raises the question of the institutional structures for decision-making as to the exercise of flood-defence functions, and, as such, is beyond the scope of this study. However, it may mean that decisions cannot be taken purely on policy or democratic grounds without giving a formal process for the specific effects on individuals to be considered.

[28] See Wisdom (1992).
[29] *East Suffolk Catchment Board v. Kent* [1941] 105 JP 129.
[30] See Water Resources Act 1991 and s.14(5) of the Land Drainage Act 1991.
[31] *Marriage v. East Norfolk Catchment Board* [1949] 2 KB 456; [1950] KB 284.
[32] For example *Day & Sons v. Thames Water Authority* [1984] 270 EG 1294, where a sluice gate was defectively maintained and failed to open as it should.
[33] *Lovegrove (AH) & Son v. Isle of Wight River Board* [1956] 6 P & CR 82.
[34] *Belgian Linguistics Case* [1968] 1 EHRR 252, 284.
[35] *James v. UK* [1986] 18 EHRR 440.

223. Compensation is relevant to the proportionate nature of action, and to whether the fair balance referred to above has been struck. It may arise in the context of property owners whose property is affected or rendered uninsurable by decisions relating to flood defence, or to persons whose property is used to create washlands or other flood-alleviation measures. A state will enjoy considerable leeway in the terms on which compensation is payable, and failure to compensate for natural events such as floods is not unlawful. However, where decisions as to whether to defend coasts or protect communities from flooding may have very direct effects on the use, enjoyment and value of property, it can be expected that arguments will arise as to the extent to which compensation in some form is a legal requirement.

### Powers of direction bestowed upon Ministers

224. Under s.40 of the Environment Act 1995, the Minister is allowed to give directions to the EA (and hence the FDCs)—for example, the Flood Warning Direction. The EA is obliged to comply with a Ministerial direction.

225. The RFDC chairpersons are appointed by DEFRA, but are part of the EA, although they are employed neither by the EA nor DEFRA. Finally, where an appeal is lodged against the decision of an FDC, Ministers have powers to determine whether a river should be classed as a main river or an ordinary watercourse.

# APPENDIX 2: PATTERNS OF FUNDING

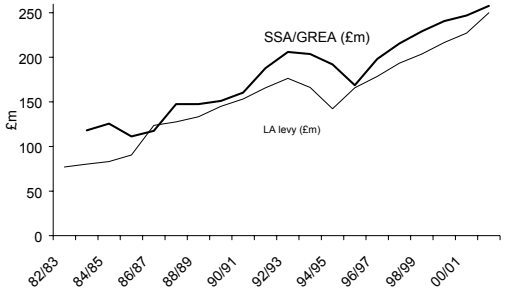
## Historic patterns of funding

226. Funding for flood defence has totalled between about £320m and £350m per annum in recent years, if SCAs are included. More than two-thirds of the funding is directed through LAs, from where most is then passed on to the EA through the levy. Figure 6 shows the nominal funding since 1982/83. The SSA has risen by 5.7% per annum on average over the last three years, or 2.8% per annum after adjustment by the RPI. Local government revenue funding for flood defence has increased by about 4% in real terms over the past 20 years. It reached a peak in 1992/93 at about 3% above current levels.

227. The levy paid to the EA by LAs rose by 41% in real terms, and special levies paid to IDBs remained broadly stable.

228. Figure 6 compares the total LA levy for England and Wales with the flood-defence funding allowed for by LAs in the SSA and its predecessor, the Grant-Related Earnings Assessment (GREA).

**Figure 6: Comparison of SSA/GREA with LA levy, nominal values, 1982–2002 (£m)**



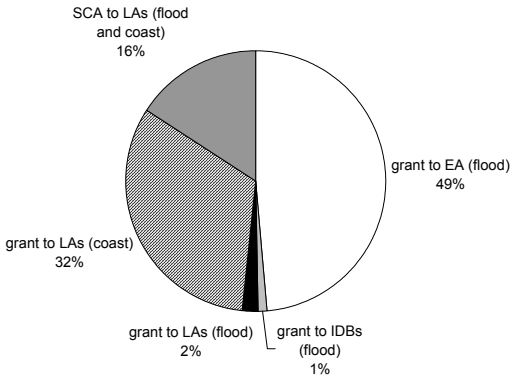

*Source*: DEFRA.

229. The SSA funding allocation shown in Figure 6 covers revenue expenditure and debt finance (interest and repayments) for LA borrowing. The revenue that is used for debt finance is not additional to the SCA which it is used to repay. Hence, if calculating the cash expenditure on flood-defence activities from the funding totals, debt finance should be excluded. Alternatively, if calculating the long-term expenditure on flood defence, the SCA component could be excluded. Figure 7 shows the grants and SCAs awarded annually since 1990/91, and Figure 8 shows its decomposition since 1993/94.

**Figure 7: Total DEFRA grants and SCAs for capital works, 1990/01–2001/02, nominal values (£m)**


*Note*: * Estimated figures.
*Source*: DEFRA.

**Figure 8: DEFRA grants and SCAs by recipient on average, 1993/94–to 2001/02**



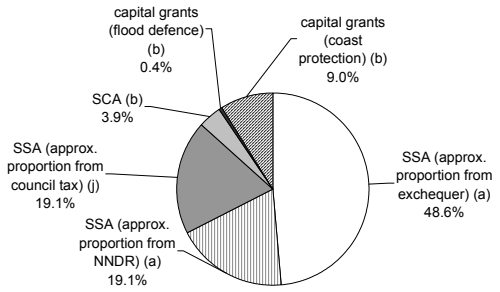

*Source*: DEFRA.

## Local authority funding

230. LAs can finance CAPEX through usable capital receipts, credit approvals, revenue reserves, or direct revenue financing.

231. LAs receive most of their funding for flood defence directly from the Exchequer. Council Tax revenues and NNDR account for only about 40% of LA flood-defence receipts, see Figure 9.

**Figure 9: Sources of flood-defence funding for LAs, including maritime authorities, 1999/2000**




*Note*: See Notes to Figure 1.
Source: DEFRA.

232. Total standard spending is the amount of LA revenue spending that the government is prepared finance. This is fixed by DEFRA and HMT in the periodic spending reviews, the last of which was in 2000.

233. DEFRA makes an argument for a capital programme and for revenue maintenance to HMT within the same spending review. Unlike the water periodic reviews, for example, the case is not approved by the EA, but is discussed between DEFRA and HMT. On the strength of this case, HMT determines the flood-defence component of local government finance. Having received cases for other components from other departments (such as the Home Office for police expenditure, and DfEE for education), HMT combines the local government finance components and presents DTLR with spending review totals for blocks of expenditure. In the 2000 spending review, the increase awarded to the Environmental Protection and Cultural Services (EPCS) block was 4.4% per annum.

234. Flood-defence and coastal-protection *revenue* funding fall within the EPCS block. The seven components of this block cover waste management, libraries, concessionary fares, and others, including flood defence and coastal protection. The DTLR apportions spending between these components to give the control totals that will apply to each one. The control totals are set for three years. When the DTLR apportions spending within the EPCS component, it assesses whether flood defence and coastal protection merits a higher increase than other components. DEFRA presents the case for an increase to the DTLR funding as part of this process. At the last spending review, the DTLR (DETR) judged the case for increasing flood defence and coastal protection to have average merit within the EPCS block. Consequently, flood defence and coastal protection was awarded the average increase for the block of 4.4% per annum. The control total for flood-defence revenue funding is £257.7m in 2001/02 and for coastal protection £10.7m.

235. Flood-defence and coastal-protection *capital* funding is handled slightly differently. HMT sets a control total across all services. There is no allocation to blocks, but for flood defence and coastal protection, debt finance revenue (to cover debt charges) is allocated to the DTLR sufficient to meet current liabilities and the SCAs (transferable borrowing limits) made available to DEFRA within the spending review. An assessment of these liabilities is made in the SSA. However, the total liabilities of all LAs for debt charges across all activities may exceed the DTLR's control total for local government debt finance. If this happens, the DTLR scales down the debt finance paid to each LA *pro rata* using a scaling factor such that the department does not exceed the control total.

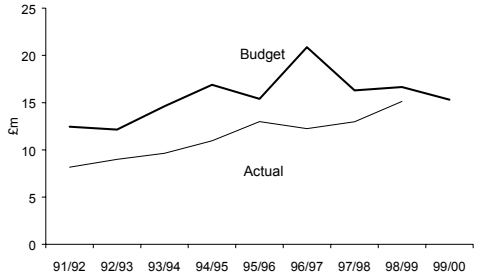
236. This scaling exercise is applied to revenue funding as well as capital funding, with a separate scaling factor calculated for each control total. While the capital funding scaling factor applies uniformly to all local government capital finance, a revenue funding scaling factor applies only to flood defence and another only to coastal protection. The SSAs and scaling factors are published in Annex E and Annex F of the Local Government Finance Report.[36]

237. An SSA is allocated to each LA for flood defence and for coastal protection. The DTLR has devised a method for allocating the flood-defence control funding among LAs. The allocation is made on the basis of an indicator, which is then multiplied by the scaling factor to give the actual funding available in each year for that LA. The indicator is the sum of three elements. The first two are historical expenditure on flood defence or coastal protection in the preceding two years. The third is the budgeted expenditure for the year ahead. Of the third component, the EA levy will already have been set, so is known exactly, and special levies to any IDBs will also be known. The estimated part is the remainder of LA expenditure—spending by the LA on its own works. LAs with a recent history of high expenditure on flood defence or coastal protection receive a high indicator. Since the scaling factors for flood defence and

[36] DETR (2001).

coastal protection have recently been less than unity by between 2.5% and 13%, LAs have to submit budgets for increases in their own expenditure or the EA levy in order to receive an award of top-up RSG funding equal even in nominal terms to their previous expenditure. The scaling factor means that, while the flooding funding awarded 'fully reflects' the indicator, it does not 'fully recompense' the LA for its budget. Hence, LAs may tactically underspend (or overstate) their budgets. This may explain the shortfall in expenditure relative to budget shown in Figure 10 below.

**Figure 10: LA own-spend budget and actual expenditure, 1991/92–1999/00 (£m)**




*Source*: DEFRA.

238. While the RSG is capped by the spending review and the control totals, the total finance available to an LA is capped by a combination of the RSG cap (of 4.4% per annum) and a capping mechanism applying to increases in local taxation (ie, the Council Tax). Over the next couple of years, until the next spending review, the amount by which Council Tax will have to increase per annum to fund the SSAs is 5.95%. Local authorities may increase Council Tax levels faster than this. If they do so, however, they will be progressively penalised through reductions in another element of local government finance, a subsidy to compensate for Council Tax benefit. It is not uncommon for LAs to set Council Tax levels close to, or above, this ceiling.

239. LAs are free to redistribute most of their revenue across budget spending headings in whatever way they choose.

## Changes to local government revenue finance

240. From time to time over the last five years the DETR considered alternative financing arrangements, mostly focusing on alternative calculations of the indicator. More wide-ranging changes were discussed in the Green Paper on Local Government Finance, published in 2000, and may be refined for a White Paper later this year.[37]

241. In 1995, the Department of the Environment considered two alternative indicators: out-turn expenditure two years earlier; and budgeted expenditure and an error-correction mechanism to adjust the funding awarded in previous years to the actual out-turn. In 1997, the Department examined:

i. absorbing flood defence and coast protection into 'all other services' in the SSA;
ii. as above for LA own spend, but retaining a separate flood-defence element to cover levies to the EA and special levies to IDBs; and
iii. the use of 'objective measures of need' for each element.

242. In 1997, the SSA sub-group noted that:

- money budgeted to be spent by an LA in a particular year may not actually be spent in that year for reasons outside the LA's control, such as delays in agreement from landowners;
- some LAs might reallocate budgeted expenditure under other headings to flood defence to secure extra SSA, at the expense of the remainder, although no conclusive evidence of this practice was presented to the sub-group;
- the possible indicators for, or drivers of, flood-defence expenditure include the percentage of land below sea level, the type of land, population or property at risk, and information on watercourses and river flows;
- the control totals for other services were being squeezed by more generous treatment of flood defence and coast protection;
- there was a commitment to move towards option (iii) above in the long term;
- it is a condition of DEFRA grants that structures are properly maintained, but there was no discussion of a mechanism for enforcement;
- it was suggested that a specific grant for coast protection might be particularly

[37] DETR (2000).

realistic because only a few authorities were affected; and
- the treatment of own expenditure by LAs was seen as in need of review.

## Changes to local government capital finance

243. The Green Paper sets out two main issues:

- the balance between general and ring-fenced grant; and
- the extent to which LAs' spending, borrowings, taxes, fees and charges are constrained by legislation or Ministerial decision.

244. The spending review sets expenditure priorities and performance targets for LAs for the next three years. However, the annual system of SSA still does not give LAs certainty from year to year about the level of finance to expect. This feeds through into uncertainty for the EA about the level of levies that will be set by the FDC.

245. The SSA system has not examined predictors of future spending priority, and, in the case of flood defence, no budget forecasting is attempted at all. The Green Paper asks whether the SSA can be developed to take into account future spending priorities, and notes that the control total and the individual SSAs are determined mechanically by the application of formulae.

246. While the 2000 spending review introduced three-year spending plans for at least 85% of total capital resources provided to LAs, this does not cover the capital resources provided by means of grants and SCAs issued by DEFRA.

247. The proposed general framework for the new revenue grant distribution system has the following components: formulae, floors and ceilings, local performance service agreements, safety valves and target grants. Some or all of these elements could be built into the flood-defence SSA.

248. The scope for replacing the current system of borrowing controls for capital spend with a 'prudential system', which allows LAs 'to borrow freely' for capital investment 'subject to controls', is under discussion. The capital programme's working party that was set up to develop these ideas has concluded that a new system is feasible. It would require changes to legislation and the creation of a new power to set statutory prudential indicators. This indicator could be a temporary limit on the increase in a council's net debt from year to year to prevent a surge in LA spending.

249. No other indicators, such as the ratio of net debt to revenue, have been supported because of their variation between authorities and independence from affordability. The working party took the view that professional codes of practice, self-regulation and audit would become the main checks. With these changes, and in particular the abolition of credit approvals, it would not be clear how the government would cascade capital investment targets down to local government, nor how it would determine the revenue stream to meet capital finance. Therefore the current proposals from the working party do not appear to be viable.

250. At present, there is a ring-fenced Housing Revenue Account, which it is proposed to retain, so that ring-fenced housing budgets and expenditure are contained within the broader local government financial controls offered by the prudential indicators. A similar system could be introduced for flood defence. There are also central government (such as the Highways Agency), regional (such as regional health authorities and fisheries boards), and single-purpose authorities (such as combined fire authorities, waste disposal authorities and probation committees), all of which receive funding from LAs. LAs may also have formal or informal joint arrangements with other LAs. All these options present potential models and lessons for flood-defence financing.

## Allocation of grants awarded by DEFRA

251. DEFRA operates a mechanism for determining the proportion of the capital funding of any individual project that it will meet from its grant allocation in the spending review. Its overall objective is that the national average proportion (for eligible projects) of project cost met through grants should not exceed 55%.

252. First, projects compete for funding on a point-scoring system, with points awarded for fulfilment of criteria set by DEFRA. This project appraisal system is largely outside the scope of this study.

253. For any given project, DEFRA uses a schedule to determine the proportion of project cost that will be met by grant. For coast protection projects, the LA receives 85% grant

support. For fluvial projects, DEFRA divides the grant-earning ceiling (the total grant made available to DEFRA for flood defence and coast protection in the spending review) by the total Band D-equivalent Council Tax base in England and Wales. In doing so, it calculates the ratio shown in Table 8. The Schedule shown in the table maps the correspondence between the ratio and the grant rate.

**Table 8: Schedule of grant rates for eligible capital projects**

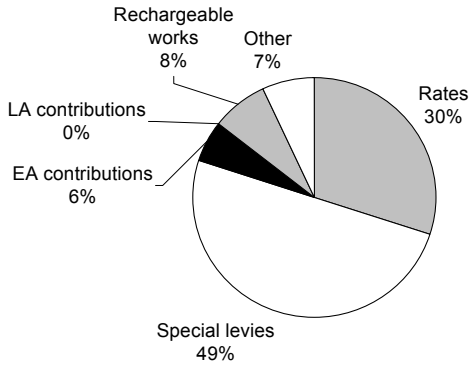
| Grant earnings ceiling/Council Tax base | Grant rate, % |
|---|---|
| 0 to 3.1 | 15 |
| 3.1 to 4.5 | 25 |
| 4.5 to 6.0 | 35 |
| 6.0 to 16.3 | 45 |
| 16.3 to 42.6 | 55 |
| over 42.6 | 65 |

*Source*: DEFRA.

## Internal drainage board funding

254. IDBs receive funding from the collection of rates from local land and property owners, through special levies upon LAs, and from contributions from the EA and LAs in remuneration for works carried out on main rivers and watercourses under LA control, and works rechargeable to riparian landowners. In 1997, the total funding was £35m, comprised as shown in Figure 11.

**Figure 11: IDB income in 1997**




*Source*: Rita Hale & Associates Ltd (1997), Appendix 12.

255. The rates levied by IDBs in 1997 on agricultural land and buildings varied from 0.07p to 21p per £1 of rateable value (RV). The total RV was £136.7m and the rates collected amounted to £10.8m.

256. The IDBs were managing 1.2m ha of drained land, of which 90% was agricultural, in a total catchment area of 3.5m ha. The assets included 616 pumping stations and 19,000km of drains.

## Environment Agency funding

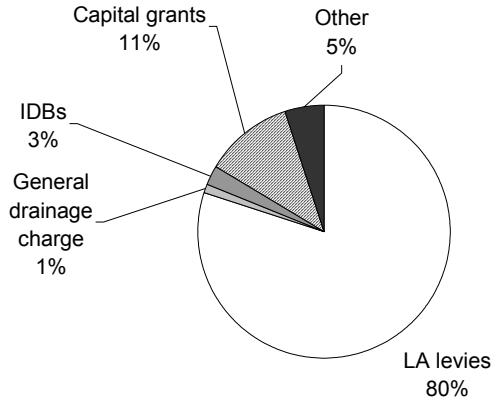
257. The EA receives the majority of the capital and revenue funding as shown in Figure 12. It receives project-specific grants directly from DEFRA, and levy revenue from LAs. CAPEX was estimated at £124m for 2000/01 and revenue expenditure at £172m. Most of this revenue is spent on flood-defence maintenance, enhancement and new defences. Some is spent on flood-warning systems and research. Table 9 provides a more detailed breakdown.

**Table 9: EA flood-defence expenditure, expected 2000/01**

| | 2000/01 estimate (£m) |
|---|---|
| Revenue | |
| main river (inland) | 79 |
| main river (tidal) | 14 |
| sea defence | 6 |
| flood warning | 9 |
| other | 65 |
| Capital | 124 |
| Balances brought forward | 19 |

*Source*: Environment Agency.

**Figure 12: Sources of flood-defence funding for the EA, 1999/2000**




*Source*: Environment Agency, Corporate Plan 1998/99.

258. The level of the EA levy in 1997 varied between £4 and £20 per Band D property in England and Wales. This was calculated by Rita Hale & Associates by dividing the EA levy for each LA by the Band D-equivalent Council Tax base.

# APPENDIX 3: ARRANGEMENTS IN OTHER COUNTRIES

259. About 10% of land is at risk of flooding in England and Wales, which is considerably less than in some countries; in Hungary it is 23% (and over 50% if land drainage problems are included); in Japan, the proportion is over 50%, while in the Netherlands it is over 60%. Flood problems may also be more manageable in the UK since rivers are relatively small and are wholly within the boundaries of one country.

## USA

260. Flood defence in the USA was originally based on local levee or special-purpose water districts. However, a notable shift towards federal management occurred after major flooding in the early part of the 20th century. In general, flood-defence work is undertaken by the US Corps of Engineers, provided a proportion of funds comes from local sources. This currently stands at 25%, although there appears to be some flexibility. The levee districts raise money through an *ad valorem* property tax, and individual states have various forms of income and sales taxes.

261. An important feature of the US system is that all projects undertaken by the US Corps of Engineers must be authorised by the US Congress. Public Law 99-662 of 1986, in which the requirement for cost sharing was set out, lists harbour development, inland navigation, flood control, shoreline protection, water resource, dredging and bank protection, and other projects for which approval for either construction or planning must be sought.[38] Therefore, final control over project authorisation rests with the legislature, not the executive. Whereas the dependence on legislative approval gives a strong form of democratic oversight, it can result in members of Congress negotiating the inclusion of a project to benefit their home district. The introduction of cost–benefit analysis was intended to reduce the inclusion of schemes that had only local financial benefits rather than any national gains. However, the guidelines for economic analysis introduced by the Water Resources Council are now very dated and noticeably do not require that subsidy elements be removed in, for example, the calculation of agricultural benefits. A set of guidelines that reflected current thinking in economic appraisal would undoubtedly make it more difficult for members of Congress to deliver projects to their home district.

262. The USA has established a system of compensation payments whereby disaster victims are either compensated for their losses or given financial support in the form of soft loans. A significant number of policy actions have therefore come about in an attempt to reduce the overall cost to the federal government of disasters, including the National Flood Insurance Program (NFIP). It is also an attempt to work around the restrictions of the US constitution which meant that the federal government could not require building regulations to be enacted in each state that reduced the vulnerability of properties to flooding.

263. The NFIP is a state–industry partnership to provide subsidised flood insurance cover. Under the programme, the industry takes a fee for writing policies for which the premia are, up to some limits, subsidised by the federal government. The balance of the premium is held by the federal government in a pool to cover losses, with any excess of losses over the amount in the pool being made up by the federal government. The NFIP is primarily targeted at communities, to encourage them to introduce building regulations to reduce losses from flooding. Consequently, the NFIP was designed as a mixture of incentives for communities to take such action, and penalties for those that did not do so.

264. The NFIP was reinforced by the Flood Disaster Protection Act 1973. This added the provisions that disaster relief would only be available to communities that had joined the scheme, and that property buyers could not obtain a federally guaranteed mortgage from a lender unless the purchaser had flood insurance, which was only available if the municipality had joined the programme. This added a powerful incentive for municipalities to join, since some areas are largely dependent on property tax revenue for income. If a community elects to take part, a Flood Insurance Rate Map is prepared for that community, the costs being borne by the federal government. The community is then required to restrict development on the flood plain; new residential properties must be elevated above the flood level for the 100-year flood event; and non-residential properties must be elevated or flood-proofed to this level.

[38] The Water Resources Conservation, Development and Infrastructure Improvement Act was passed as public law 99-662 in 1986.

265. The insurance premium rates are typically set to reflect risk. However, even with subsidies or cross-subsidies, poor communities and poor inhabitants tend not to be insured. It can therefore be argued that the result is somewhat regressive in terms of income: the richer having access to subsidised insurance and the poor and elderly being excluded from coverage because they are less likely to be able to afford any form of insurance. The subsidised premiums vary according to the risk zone in which the property is located. There are limits on the cover available at subsidised rates, $250,000 for structure and $100,000 for contents, and the excess is $1,000.

266. 18,700 communities are now part of the programme, although not all are exposed to significant flood risk. It is thought that 20–25% of flood-plain properties and 80% of communities at risk are included in the programme, with 4.1m policies issued. 2m properties have been built in the communities that are part of the programme. The total coverage in force is $483 billion. However, by 1995, the accumulated deficit of the programme was $1.3 billion. A significant number of properties are found to make repetitive claims—38% of the annual average total. Some 5,100 of these properties have been acquired (and demolished) or elevated at a cost of $66m. The funding for purchasing such properties has recently been expanded. The NFIP is estimated to have resulted in a 77% reduction in annual flood losses, which now run at $770m per year.

## China

267. Water management and flood-control work has long been of critical importance in China due to the value of the flood plains for flood production. Only 10% of land is at risk of flooding, but this includes 50% of the population and two-thirds of agricultural and industrial production. Population growth is creating further pressure to increase the productivity of flood plains.

268. Historically, flood-defence work has been undertaken by local voluntary labour, largely farmers. However, some major projects are funded by hypothecated taxes—for example, the Three Gorges Project is being financed through a levy on electricity sales—and in some provinces there are water conservation charges and occasionally more localised flood-control charges.

## Japan

269. Japan consists of mountainous interiors surrounded by coastal flood plains. The river levels can rise very quickly and peak flood flows in some cases are more than 100 times base flow.

270. The most recent legislation on river management was passed in 1997. This required Fundamental River Management Policies to be prepared by the River Council and River Administrators to prepare a River Improvement Plan that defines the specific projects that will be required to implement the Fundamental River Management Policy. The report of the River Council in August 1999 concluded that, not only should the demarcation between central and other levels of government be reviewed, but also that it was essential to ensure the widest possible participation of stakeholders in river management.

271. Upland water storage is very important in the management of rivers, and dams are the subject of a separate law that provides specific exemptions from the River Law. The law covers cost sharing by the beneficiaries of dams.

272. For rivers of national economic or land conservation interest, all expenses including operation and maintenance, as well as the costs of capital works are in principle borne by central government. However, in practice, a cost-sharing approach has been established with contributions being made by the prefectural government. Similarly, for smaller rivers, costs are in principle borne by the prefecture, but the high costs of improvement works have resulted in central government contributions of around 50%.

## France

273. The structure of government in France is complex: beneath the national government are 22 *régions*, 96 *départements* and 36,500 *communes*. Overlying these are special institutions created, for example, to undertake flood-alleviation works for the Loire and Paris.

274. The six *Agences de l'Eau*, one for each major catchment, are the central institutions for the delivery of water resource and quality management. Each has a basin committee composed of representatives of the *communes*, water users and organisations having an interest in water management. Each basin prepares a five-year plan of works and

sets charges on abstractions and discharges, although the Finance Ministry sets upper limits on these charges. The *Agences de l'Eau* have considerable autonomy, as they are funded through hypothecated taxes. The French government recently sought to reduce their autonomy by eliminating the hypothecated taxes. It proposed to fund the *Agences* by direct central government funding from a new pollution tax that incorporates the water pollution charges. There was considerable resistance to the change, so that the plans were abandoned.

275. The rivers are divided into state and non-state rivers; only 16,500km of a total of 278,000km are deemed to be state rivers. The state must guarantee the upkeep of the banks and riverbeds of these rivers, as well undertaking any works on them. Those state rivers that are navigable are the responsibility of the Ministry of Transport, and the remainder are the responsibility of the Ministry of the Environment. In the former case, any works are carried out by the *Voies Navigables de France* and, in the latter, by the Public Works Service. The state may ask for contributions from users of the rivers.

276. For non-state rivers, the responsibility for flood alleviation lies in principle with the riparian owners and they may form associations to undertake works: 80% of the works are undertaken by such associations or syndicats of local authorities. In addition, central government may direct that works be undertaken on non-state rivers 'in the public interest'; in this case, part or all of the capital costs (but not the operation and maintenance costs) are borne by central government.

277. Riparian owners and *communes* often do not have funds available to finance works; in the case of the smaller *communes*, the majority of their financial resources in any case are receipts from central government. Since they cannot ask central government directly for support, they lobby for a declaration that works are necessary in the public interest. If they are successful, then central government provides a proportion of the capital costs. This proportion is subject to case-by-case negotiation, but is higher when a syndicat rather than an individual *commune* undertakes the works.

278. Total spending is estimated to be £40m–£50m per year, with around £10m–£12m in central government funding, with the larger part of the spending coming from *régions* and *communes*, although it may be channelled through a *syndicat*, association or other body.

279. Another form of institutional cooperation is the *Plan Loire Grandeur Nature*, now simply the *Plan Loire*, instituted in 1994. This is a catchment-wide comprehensive plan covering an area with a population of 6m people and with the emphasis, as the name indicates, on environmental enhancements. It is a cooperative plan between the flood-alleviation association, *L'Agence de Bassin* and five central government ministries.

280. Increasingly, action and financing programmes are specified in formal contracts between the state and the *région*. For example, the 'Contrat de Plan entre L'Etat et la région Rhône-Alpes 2000–2006' (Republique Française 2000) specifies the actions to be taken by central government and by the *région*, and the budgets to be applied by central government and by the *région*.

281. The French insurance system is somewhat similar to that adopted in the USA. However, rather than a specific insurance against flooding being subsidised through tax revenue, a 12% levy (recently increased from 9% after the reserves were exhausted) is added to all property insurances to go into a fund to provide cover against catastrophic events, including floods. The government acts as the reinsurer of last resort, topping up the fund if the resources are inadequate to meet claims. Compensation from this fund is only available when the *Préfet*, the central government civil servant in charge of the relevant regional government area, declares that a disaster has occurred. Therefore, in practice, not all flood losses are insured. Like the US system, it is linked to zones with varying constraints on development. However, unlike the US system, compensation is not conditional upon local land-use controls being introduced.

## The Netherlands

282. Flood defence is a constitutional duty of the Dutch government. There are 12 provinces beneath the national government, and around 500 municipal councils. The national government has responsibility for main rivers and major hydraulic structures, with other flood-defence and land-drainage duties being carried out by 66 *Watershappen*. The largest proportion of expenditure on flood protection is from the national budget. The standards of protection provided are very high since there is a high risk of permanent land loss to the sea.

283. The *Watershappen* consist of a General Assembly, whose members are elected by local stakeholders and an executive council,

elected by the assembly. Both are chaired by a chief executive nominated by the national government. The provincial government sets the terms of reference of the *Watershappen*, with many also being given responsibilities such as water quality. The *Watershappen* have a tax-raising power, and their funding is through hypothecated local taxes. In the case of the land drainage and flood-protection tax, farmers are taxed on land area, and urban residents according to the value of their property. Historically, the *Watershappen* have been dominated by farmers; however, in recent years their responsibilities and membership have become much broader. Further consolidation between *Watershappen* is expected, but they have the right to retain sub-boards so that local identity can be preserved. The amalgamation has been driven by the belief that small *Watershappen* (there were originally around 3,500) lacked the specialist knowledge to discharge their duties effectively and efficiently, although the broadening of responsibilities has also been a driver.

284. At all three levels of government, there is a requirement for integrated land water and environmental management plans to be prepared. The development of these plans has resulted in a shift towards the use of flood-management approaches, such as wetland creation and re-creation of meanders, since the plans promote options that have benefits in addition to flood management.

285. Negotiations with commercial insurance companies to provide cover were started in 1995, after a major flood. Proposals for a disaster fund were dropped after encountering technical and legal difficulties, and replaced, in 1998, by compensation for flood victims.

## Scotland

286. The Flood Prevention (Scotland) Act 1961 gave the LAs discretionary powers to undertake works to prevent or mitigate flooding of non-agricultural land, although the basic responsibility lies with the landowner. However, the Flood Prevention and Land Drainage (Scotland) Act 1997 requires LAs to undertake assessments of the watercourses in their area to determine whether any are in a condition likely to cause flooding of non-agricultural land, including land outside the LA's boundaries. They are required to maintain any watercourses that are in such condition; and to report every two years on flooding that has occurred, the measures taken to mitigate or prevent flooding, and further necessary action.

287. The Scottish Executive has the duty to maintain the statutory land drainage schemes under the Land Drainage (Scotland) Acts of 1930–41. In general, Scotland has maintained a higher level of public expenditure per capita, including transfers from the UK as a whole, than that in England and Wales.

288. New works must be approved by the Scottish Executive and are given grant aid equal to 50% of the cost, subject to a cost–benefit analysis. In 2000/01, £4m was available in grant aid, which has been increased to £28m for the period 2001–04, with an additional £5m being made available following the autumn 2000 floods.

289. The LA can fund its share of the capital cost through its annual capital allocation from the Scottish Executive or through other revenue, EU funding, capital receipts or the PFI. The capital allocation for 2000/01 was £380m, of which £310m is available for the LAs to determine their own priorities for CAPEX and £68m is 'top-sliced' for specific purposes, including flood alleviation.

290. LAs can form Flood Appraisal Groups to assist in their development of a broad-based policy approach to flooding. These are intended to develop, through discussion, a consensus view on the implications of flooding for development, and to include, not only LA departments and other relevant government agencies, but also housebuilders and insurers.

291. The insurance industry has been active in the Flood Appraisal Groups, and the ABI has produced an 'insurance template' outlining the conditions under which the industry is likely to find future development to be insurable. This specifies a 1 in 200-year return period for residential properties as the minimum necessary defence standard for a property to be insurable, and higher standards for properties where residents are mainly old or infirm.

292. Scottish planning guidance comes out strongly against allowing development in flood plains, stating that:

> Development of an area which is exposed to frequent or extensive flooding is likely to be unsustainable and should be avoided. [39]

[39] Scottish Office (1995).

293. The susceptibility of land to flooding is cited as a material consideration in deciding a planning application. Where the developer intends to provide flood alleviation for the development, the planning authority is encouraged to consider entering an agreement to ensure continued maintenance of those works. Where the proposed development is not on the flood plain, but may increase flood risk through changing run-off, an Article 4 Direction can be made to control permitted development.

294. The use of wetlands and washlands in providing flood storage is encouraged, and the Rural Stewardship Scheme provides management payments for agricultural land to be managed so that natural flooding of the land is unhindered.

# APPENDIX 4: FLOOD DEFENCE AND AGRICULTURAL LAND

295. This appendix reviews two interactions between agriculture and flooding: drainage and flood damage. The interaction with drainage is examined to establish whether drainage charges would cause farmers to change their land use to reduce run-off. The flood-damage estimates are examined to determine what level of insurance might be required under an insurance scheme, and the compensation that would have to be paid to farmers to persuade them to offer their land for storage of flood waters as a way of managing flooding.

## Introduction

296. The benefits of agricultural flood defence are:

- improved crop growth and yield;
- timely access to fields for machines and grazing livestock;
- reduced damage.

297. The benefits of improved standards of flood defence for agriculture are apparent in variations in land use (eg, high-value potato crops versus extensive grazing) and profitability. Low standards of flood defence restrict land use and farming options, and are associated with higher operating and damage costs compared to land which enjoys a higher level of service.

298. Drawing on a mix of research and empirical findings, standards of service for agriculture can be specified in terms of acceptable levels of risk regarding flooding (Table 10) and water-table levels (Table 11). In the case of flooding, risk tolerance varies according to land use and time of year, reflecting the relative sensitivity of crops (including grass). In the case of water logging, persistently high water tables prevent intensive arable and grassland systems.

**Table 10: Drainage and productivity**

| Water-table height from surface (mm) during critical periods for crop growth and field access | Field drainage conditions | Agricultural productivity |
|---|---|---|
| Greater than 500 | Good | Normal: no impediment due to drainage |
| 300 to 500 | Bad | Restricted: reduced yields, reduced field work days and grazing season |
| Less than 300 | Very bad | Low: severe constraints on land use, restricted cropping options, severe yield penalties, forage conservation restricted |

*Source*: Cranfield University.

**Table 11: Flood risk standards by land use**

| | Commonly accepted minimum intervals in years between floods | |
|---|---|---|
| Land use | **Whole year** | **April–October inclusive** |
| Horticulture | 20 | 100 |
| Arable and roots | 10 | 25 |
| Arable cereals | 5 | 10 |
| Intensive grass | 2 | 5 |
| Extensive grass | <1 | 3 |

*Source*: Cranfield University.

## Case studies of flood defence for agriculture

### Capital projects

299. During the period 1950–75, a large part of the public expenditure on flood defence involved capital projects to provide flood defence for agricultural land, justified against prevailing agricultural policy objectives. The benefits of these projects to farmers were twofold:

- 'automatic' benefits—eg, avoidance of flood damage on a particular land use, whether grass or arable; and,
- 'potential' benefits which need to be 'taken up' by the farmer and involve some action on their part, such as the switch to high-value cropping as a result of flood defence.

300. The greatest benefits to agricultural drainage or flood-defence projects are those associated with the take-up of potential benefits, especially the switch from grassland to arable.

### Maintenance programmes

301. Considerable funds are committed to annual maintenance of the drainage system in rural areas, such as vegetation cutting and clearance, and desilting.

302. A review of 15 river maintenance programmes in six EA regions revealed benefits to maintenance programmes of between £4 and £57/ha/year, with the average weighted by area being £37/ha.[40] Maintenance costs varied from £3 to £62/ha, with an average of £27/ha. Of the 15 schemes, 12 appeared to be cost effective using financial prices for farm commodities, but this was reduced to nine using economic prices.

### Compensation for flood storage

303. Farmers might be willing to forgo improved drainage by either;

- accepting lower standards of drainage;
- actively retaining their own waters that otherwise might flow to the main drainage system and add to flood risk elsewhere; or
- accepting water from the main system and storing this until it can be returned without risk of downstream flooding.

304. Table 12 contains broad estimates of the financial returns obtained by farmers for a range of types of land use classified by field drainage conditions. Table 13 contains estimates of flood costs by land-use type and by the seasonal distribution of flooding. These tables indicate the approximate magnitude of losses that might be associated with a change in flood standards of service. For example, land that switches from cereals under good drainage to extensive summer grazing with very bad drainage incurs an average annual loss of £170–£200/ha before adjustment for flooding costs. The estimates reflect prices to farmers. The use of economic prices, as suggested by Project Appraisal Guidance Note 3, would show a lower cost.[41]

[40] Dunderdale and Morris (1997*a* and *b*).
[41] MAFF (1999b).

**Table 12: Indicative financial returns by land-use and drainage status**

| Land-use type | Field drainage | Net returns (£/ha/year) |
|---|---|---|
| Extensive grass | Good | 230–280 |
| (beef and sheep) | Bad | 165–200 |
| | Very bad | 100–130 |
| Intensive grass | Good | 500–600 |
| (dairy) | Bad | 400–500 |
| | Very bad | 250–300 |
| Grass (diary)/arable | Good | 400–450 |
| rotation | Bad | 300–350 |
| | Very bad | 150–200 |
| All cereals | Good | 300–330 |
| | Bad | 200–220 |
| | Very bad | 100–115 |
| Cereal/oilseed | Good | 315–330 |
| rotation | Bad | 280–310 |
| | Very bad | 170–190 |
| Cereal/rootcrop | Good | 550–600 |
| rotation | Bad | 250–300 |
| | Very bad | 100–115 |

*Note*: Year 2000 prices. Net returns/ha equal gross margins (value of output including area payments, less direct costs), less costs of labour and machinery, and buildings and storage, but excluding rents and general farm expenses.
*Source*: Based on Dunderdale and Morris (1996).

## Agri-environment schemes

305. There are already incentives to accept lower standards (from an agricultural perspective) of land drainage and flood defence within current agri-environmental schemes. The Environmental Sensitive Area scheme, covering 43 designated areas, offers tiered payments. Tier 1 payments typically require a commitment to permanent grassland in return for payments of £80–£130/ha/year, although payments can be up to £200–£250/ha/year for conversion from arable. Payments for wet grassland on tier 2 range are typically £170–£250/ha/year, and, for tier 3 with raised water levels, payments are £350–£400/ha/year. These rates are greatly in excess of the drainage rates charged by the EA and IDBs.

306. The Countryside Stewardship Scheme aims to conserve and restore habitats and landscapes in the wider countryside beyond those covered in the Environmental Sensitive Areas. Incentives are available for wetland-related activities, such as managing fen or reed beds (£100/ha/year), and the recreation of grassland on cultivated land (£280/ha/year), with an additional supplement of £60/ha where this includes raised water levels. The scheme has been oversubscribed in many predominantly grassland areas, and relatively undersubscribed in arable and intensive dairy areas.

307. Agri-environmental schemes have become a central feature of the Agenda 2000 Common Agricultural Policy reform process, with significant redirection of funds for this purpose. The payments for grassland conversion and wetland grassland management under the Environmental Sensitive Area schemes (ranging from about £200 to over £400/ha/year) are indicative of the incentives deemed necessary to encourage change in land use.

308. Studies of the impact on farm incomes of a switch from arable to wet grassland in eastern England, and from relatively intensive grassland into wet grassland in the south west of England confirmed that the payments regimes under the schemes approximated to estimated income losses involved in making the change.[42]

## Drainage charges to agricultural land

309. Two main mechanisms exist for the recovery from farmers of the cost of flood-defence services: IDB charges and general agricultural drainage rates.

### IDB charges

310. IDBs collect rates from farmers for land which falls within their boundary of influence.

311. The charging criteria reflect a mix of cost- and benefit-based pricing. Annual charges are made in pence per pound of rateable value (RV). The Bedford Group of Drainage Boards, for example, charges 2.75p, 3.5p and 5.6p per pound of RV in its three constituent areas, reflecting differences in costs and sources of revenue. In the case of farm land, RV reflects local rentable value as defined in the base year 1989. Thus, in Bedfordshire, for example, typical RVs range from about £12.5/ha for woodland to about £125/ha for arable, with £87/ha for pasture. In the Fens, intensive horticultural land may be rated at about £180/ha. The derivation of these values appears to vary between regions. In some cases it is based on observed land use (eg, arable or grassland) and, in others, on the

[42] Morris *et al*. (2000).

Agricultural Land Classification (Grades I to VI), which is not necessarily tied to land use. By comparison, urban property rates may be well in excess of £2,500/ha.

312. The charges to farmers can vary significantly between IDB areas, from, for example, 1.4p/£ to 30p/£. Arable land in the Bedfordshire Group attracts a drainage rate of between £3.44/ha and £7/ha. Intensively drained land in the Fens, for example, may incur annual charges of £32.5/ha or more.

### General agricultural drainage rate

313. There is scope under the Water Resources Act 1991 (s.135) for the EA to make a general charge for flood-defence services on agricultural land outside the IDB areas, in order to share the burden of expenditure and to recover costs attributable to flood-defence services that are directly enjoyed by those outside the IDB areas.

314. The Anglian Region of the EA is the only region which applies the charge. This reflects the relative importance of flood-defence expenditure in the region, and that much of it is carried out to provide protection for agricultural land. The agricultural charges are set annually by the District Flood Defence Committees. Table 14 shows the charges levied for the year 2001/02. About 5% of total flood-defence expenditure is recovered through the general agricultural charge.

**Table 13: Indicative average annual flood costs (£/ha/year) by land use and flood frequency**

| | Flood return period (years) | | | | |
|---|---|---|---|---|---|
| Land-use type | ≤1 | >1–2 | 3–5 | 6–10 | >10 |
| Extensive grass | 20–40 | 8–15 | 2–5 | 2–3 | 1 |
| Intensive grass | 44–82 | 17–31 | 5–10 | 3–6 | 1–3 |
| Grass/arable rotation | 93–162 | 26–61 | 8–20 | 5–12 | 2–5 |
| All cereals rotation | 138–232 | 35–88 | 10–30 | 6–18 | 3–8 |
| Cereal/oil seed rotation | 142–240 | 36–91 | 10–31 | 6–19 | 3–8 |
| Cereal/root crop rotation | 335–620 | 96–256 | 29–89 | 18–54 | 8–24 |

*Note*: Year 2000 prices. Of the range quoted, the lower figure applies to large catchments, over 25km$^2$, with floods distributed 80% winter, 20% summer. The higher figure applies to small catchments, below 25km$^2$, with 60% winter and 40% summer flooding. Estimates assume 'good' field drainage conditions. Estimates for 'bad' and 'very bad' field drainage conditions associated with persistent, frequent flooding would be about 15% and 30% lower.
*Source*: Based on Dunderdale and Morris (1996).

**Table 14: General agricultural drainage rates in the Anglian Region, 2001/02**

| Anglian Region district | Rate: £/ha | Charge area ('000ha) | Total general drainage charges (£'000) | Total expenditure (£'000) | General drainage charges as % of expenditure |
|---|---|---|---|---|---|
| Lincolnshire | 2.7 | 261 | 715 | 14,132 | 5 |
| Norfolk and Suffolk | 2.5 | 354 | 831 | 14,677 | 6 |
| Great Ouse | 1.5 | 445 | 686 | 11,712 | 6 |
| Welland and Nene | 1.7 | 202 | 345 | 8,646 | 4 |
| Essex | 2.0 | 250 | 511 | 11,521 | 5 |
| **Total** | | **1,511** | **3,088** | **60,688** | **5** |

*Source*: Information provided to OXERA by the Environment Agency, Peterborough, 2001.

315. The charges are levied on all farm land (including buildings and tracks) at the standard rate, irrespective of land use or land classification, except for woodlands which are charged at 20% of the rate. Parks, gardens and recreational areas, and rough pasture are exempt, as are properties covered by residential or business rates. The charges are collected by direct billing by the EA from over 20,000 occupiers on about 1.5Mha of farm land and 12,300 ha of woodland. This generates annual revenue of about £3m.

316. It appears that the charge has not been taken up in other regions partly because flood-defence expenditure for agriculture outside IDB areas is less important than in the Anglian Region. Furthermore, in these other regions, the cost of administering a general rate for agriculture is perceived to be high (partly due

to smaller farm sizes and large numbers of potential exemptions).

317. There is scope to apply a general drainage charge in other parts of the country and general agricultural land drainage charges could be banded, including exemptions, to reflect the extent to which water was retained on the land. Water retention is determined by topography, soil type, land use, farming practices and the intensity of drainage systems (whether naturally or artificially drained). For a given catchment, most of these variables could be captured by a banding system based on either land use or on Agricultural Land Classification, similar to that used in the IDB areas.

318. In practice, however, it would probably not be efficient to discriminate charges between land use and grades, other than to provide exemptions for land, such as extensive grassland and woodlands which offer water-retention benefits, and for unprotected areas subject to flooding. The general charges would best be defined at district or catchment level to reflect local conditions and collected by the EA. While it could be argued that such charges (perhaps between £1 and £2/ha) could be justified on cost-recovery and equity grounds, they are unlikely to provide incentives to change behaviour in terms of actions to retain potential flood water. Furthermore, in some areas they could prove administratively expensive, although farmers have now become familiar with area- and map-based payment regimes.

319. Table 15 shows the areas of farmed land by Agricultural Land Classification grade and revenues arising from the imposition of general agricultural drainage rates at specified rates. There are about 9m ha of Grade 1 to 3 land (including that in the Anglian Region) on which drainage rates could be raised, perhaps contributing up to £18m before collection costs at an average rate of £2/ha currently charged in the Anglian Region.

**Table 15: Estimates of potential revenue from general rates**

| Grade | Total area (England and Wales, whole catchment) | Rated at £/ha |
|---|---|---|
| 1 | 358,640 | 2 |
| 2 | 1,890,654 | 2 |
| 3 | 7,118,493 | 2 |
| 4 | 2,667,099 | 1 or exempt |
| 5 | 1,741,164 | 0 |

*Note*: Including IDB and Anglian Region areas.
*Source*: Halcrow Maritime; OXERA.

## Compensation for flood water storage

320. The options for compensation are as follows.

First, with transfer of land ownership title:

- outright purchase and subsequent management of land by flood-defence authority;
- outright purchase of land with lease-back or rental agreements to previous occupier or new tenants;
- modified version, whereby land rights are returned, possibly at zero cost, to previous landowners, with rights to use the land for flood storage retained by the new owner to be used at their discretion.

Second, without transfer of land title:

- annual flood-service retention payments to farmers (a standing charge), plus payments on the occasion of a flood, based on damage negotiated for the specific flood;
- modified version, but with flood-event payments at predefined compensation rates;
- a constant annual payment to the landowner to accept a level of flood risk, irrespective of the occasion of flooding;
- an up-front, lump-sum payment to farmers to accept specified flood risks over an agreed period of years.

321. Payment regimes for flood-water storage would need to run for at least 10 years, and more likely 25 years to reflect the depreciation life of machinery and buildings associated with a change in farm management practice. There may be a requirement to build in provision for rehabilitation costs, should land and the drainage system return to agriculture at the end of a contract period.

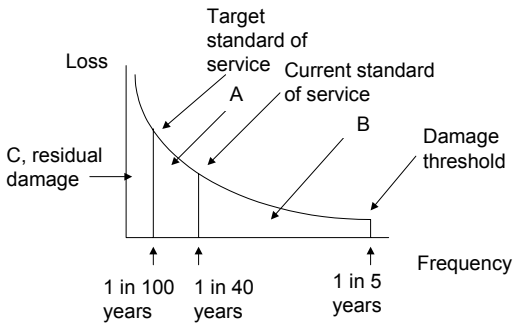
322. Land-purchase options would cost between £3,000/ha and £7,500/ha at current rates for Grade 4 and Grade 1–3 land respectively. Annual payments for flooding would need to reflect income lost and potential damage costs probably varying between £100 and £300/ha/year.

## APPENDIX 5: DERIVATION OF ANNUAL AVERAGE DAMAGES

323. A statistical probability of occurrence, known as a return period, can be assigned to flood events. The AAD for a site is estimated by constructing a damage–frequency curve (sometimes referred to as a loss–probability curve). The curves are usually asymptotic to both the damage and frequency axes.

324. Calculating the area under the curve gives the AAD of all flood events from the threshold of flooding to the most severe event.

**Figure 13: Damage–frequency curve**




325. Figure 13 illustrates the features of the calculation of AAD. Fluvial dense urban land use has an indicative standard of service in the range 50–200 years. In Figure 13, the current standard of service is defined as flood alleviation for all events that occur more frequently than once in 40 years, or with a 0.025 (2.5%) chance of occurring in any one year. The target standard of service is set at one in 100 years.

326. A is the AAD that is avoided by increasing the standard of flood alleviation from the 40-year to the 100-year standard.

327. B is the increased AAD if the current 40-year standard of protection is not maintained.

328. A plus B is the AAD if there is no flood alleviation.

329. C is the residual AAD with one in 100-year flood-alleviation defences in place.

330. AADs are measured in economic rather than financial terms. The economic value assumes that the inventory (excluding structural building fabric) is 50% of the replacement value. The damage data is also adjusted to net out salvage costs and VAT. It is estimated that the replacement value that reflects insurable losses may be two or three times the economic value.

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