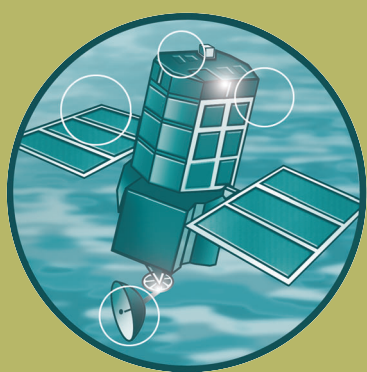


Who Benefits from Flood Management Policies?

R&D Technical Report FD2606/TR



Joint Defra/EA Flood and Coastal Erosion Risk
Management R&D Programme

Who Benefits from Flood Management Policies?

R&D Final Report FD2606

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Author(s):

HR Wallingford Ltd. in association with
Flood Hazard Research Centre and
JB Chatterton & Associates

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Defra project officer: Karl Hardy

Publishing organisation

Department for Environment, Food and Rural Affairs
Flood Management Division,
Ergon House,
Horseferry Road
London SW1P 2AL

Tel: 020 7238 3000 Fax: 020 7238 6187

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Executive summary

Background

Flood and Coastal Erosion Risk Management (FCERM) provides a complex mix of public and private benefits to, and burdens on, society over long time periods. However, there is currently only limited understanding and evidence of how different interest groups and sectors benefit from public investments (or decisions not to invest) in reducing flood and coastal erosion risks.

Knowing *Who benefits?* is important across a number of FCERM strands: HM Treasury's Green Book urges that distributional impacts be explicitly stated and quantified during appraisals and these principles have been embodied in Defra's supplementary guidance; social justice is of growing concern in the efficient and effective use of public investments and is reliant on being able to identify and disaggregate costs and benefits across different socio-economic groups; and, third party contributions to public spending are at least partly predicated on the assumption that they should be related to benefits and the application of a beneficiary pays principles.

Main objectives

The project aims to contribute to our overall understanding of *Who Benefits From Flood Risk Management Policies?* It is a simple question to ask but one that is difficult to answer. The work builds on previous research but rather than focusing on project appraisal the aim is to provide a broader insight into which groups benefit, the size and scale of these benefits, and the potential distributional imbalances between groups resulting from current FCERM policies and activities. The specific objectives of the project were:

- to define those groups or sectors who benefit and lose out from flood and coastal erosion risk management (FCERM) policies;
- to develop robust methodologies to evaluate and communicate the flow of benefits;
- to test the methodologies and undertake case study assessments, and
- to draw conclusions to inform policy development.

Results

Methodology development and application

A generic framework for assessing *Who Benefits from Flood Management Policies?* has been developed that builds on the three central components of risk: probability, exposure and vulnerability. A methodology is presented that provides a systematic way of considering a wide range of potential beneficiaries, organises information, and provides a consistent structure for assessing the size and scale of the benefits they receive. It has shown promise as an analysis tool and further stages of the research could consider developing the approach to provide a more detailed analysis tool supported by appropriate methods and user guidance.

The methodology is applied to a number of case study assessments covering a wide range of FCERM activities and impacts. The case studies provided a basis for refining the methodology as well as providing an evidence base and improved understanding of how different interest groups and sectors benefit from FCERM investments, including the size and scale of distributional imbalances. Availability of information has been a constraining factor in many instances but the case study findings are intended to be illustrative rather than detailed quantitative assessments.

Case study findings

Selected findings from the case study assessments include:

Distribution of costs and benefits

- The costs for FCERM activities are widely spread through society in the form of national and local tax payer contributions.
- Direct benefits are largely to property (domestic and non-domestic) accruing to private individuals and business concerns. The case studies highlighted varying degrees of benefit across these groups.
- In a largely urban context, reduced EAD benefits for the non-residential property sector can far outweighed reduction in EAD benefits to the domestic sector with, in some instances, a large majority of overall benefits going to a select few business concerns.
- Environment and amenity gains were evident in case studies such as West Bay but the value of these benefits remain relatively low in comparison with the benefits to property at risk.
- There was little evidence to show long-term adverse impacts on house prices for properties in flood prone areas, however it is difficult to extrapolate these findings beyond the case study areas themselves
- Intended benefits of FCERM activities are not necessarily realised and it can be difficult to predict in advance what the actual benefits of a particular FCERM activity will be. Benefits calculated from EAD assumptions can exceed those for simple write-off costs and may inflate benefit estimates.
- The consultancy and construction industry provide services for the design and construction of flood defence schemes and an element of profit will be factored into such services. For the case studies under investigation, Consultant costs varied between 5% and 12% of total costs and Contractor costs between 58% and 90% of total costs.
- A significant proportion of FCERM costs incur taxation and result in resource flows back to central government. Tentative estimates for West Bay suggest over £2.5M of the £18.3M Contractor's total costs alone were incurred as income tax. Further returns to central Government are incurred through VAT on supplies, materials, etc.

Wider benefits

- FCERM activities can be a major catalyst for local regeneration and/or development on the floodplain where significant risk of flooding has been mitigated. Successful regeneration has wider benefits on employment and regional development.

- Reduced vulnerability of key infrastructure services (eg water, wastewater, electricity, and transport) and avoidance of outage is of benefit to large numbers of domestic and non-domestic customers, many of whom may not be directly located in a flood risk zone.

Insurance

- Most flood risk management investment is based on future economic flood losses avoided and most of these flood losses are insurable.
- Investments in reducing flood or coastal erosion risk should result in a decline in insurance claims/payouts, but it has not been possible to ascertain how these benefits are re-distributed among the insurance industry and its customer base.
- Cross-subsidisation within the domestic insurance market widely spreads the cost of insurance liabilities but the benefits (through insurance returns) are attributed to a much smaller number of insured property owners in areas at risk of flooding.
- Flood insurance provides cover for repair and replacement of material loss and temporary accommodation but does not cover health and social costs. An imbalance between estimated and actual losses was evident in some instances with insurance not covering the full costs of recovery for all flood victims.
- When invoked, insurance payouts result in surges in post-flood sales for goods and building services, but the distribution of this among the local and national economy has not been ascertained.
- SMEs are reported by the ABI to be major losers in flood events, with many being under-insured and/or failing to recover after a major flood incident.

Conclusions and recommendations

A number of gaps have been identified during the research and the direction of future work should take these into account. A key question to resolve before moving the research forward is to establish more thoroughly the intended application of a methodology - *actual benefits* or *future potential benefits* - as this will determine the scope of analyses to be undertaken, influence the selection of data sources, and impact on recommended methods and measurement techniques.

Further work is needed to assess the application of the methodology at a CFMP and SMP level and to investigate the use of these analyses as a basis for achieving a national picture of distributional effects. Potential exists to link the assessment procedure more closely to analysis tools (eg NaFRA, MCM, etc.) and other national datasets as a means to assess impacts and benefits at a range of levels, as well as disaggregating information according to sub-groupings such as levels of protection, socio-economic classifications, business types, and key assets at risk.

In view of the complexity, and despite best endeavours, the study was unable to amass sufficient evidence to conclusively prove one way or the other which specific sectors and/or interest groups benefit at a national-level. The research

has also encountered a number of barriers and lessons learned should be used to determine what this means for future research and the problems faced in taking the work forward. Some of the original research questions remain unanswered or partly answered and for such an important question as *Who benefits from FCERM policies?* it is essential that the present research is not an end, but a start.

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1. Introduction

1.1 Background

Continued improvement in the delivery of public services should ensure that public funds are spent on activities that provide the greatest benefits to society, and that they are spent in the most efficient way.

Flood and Coastal Erosion Risk Management (FCERM) provides a complex mix of public and private benefits to, and burdens on, society over long time periods. However, there is currently only limited understanding and evidence of how different interest groups and sectors benefit from public investments (or decisions not to invest) in reducing flood and coastal erosion risks.

Knowing *who benefits* is important across a number of FCERM strands. HM Treasury's Green Book urges that distributional impacts be explicitly stated and quantified during appraisals and these principles have been embodied in Defra's supplementary guidance to project appraisal, and recent research (Defra, 2006) has focused on the development and testing of disaggregated approaches. Social justice (Nera, 2007) is of growing concern in the efficient and effective use of public investments and is reliant on being able to identify and disaggregate costs and benefits across different socio-economic groups. Finally, the debate on third party contributions to public spending are at least partly predicated on the assumption that they should be related to benefits, and the application of a beneficiary pays principle is highly dependent on the identification and quantification of benefits among different interest groups.

This project aims to contribute to our overall understanding of *Who Benefits From Flood Risk Management Policies?* It is a simple question to ask but one that is difficult to answer. The work builds on previous research but rather than focusing on project appraisal the aim is to provide a broader insight into which groups benefit, the size and scale of these benefits, and the potential distributional imbalances between groups resulting from current FCERM policies and activities.

The work was undertaken as part of the joint Defra/Environment Agency FCERM Research and Development (R&D) programme under *Theme 1: Strategy and Policy Development.*, Project No. FD2606. The R&D contract was awarded to HR Wallingford in association with the Flood Hazard Research Centre (FHRC) and JB Chatterton & Associates (JCA) in June 2007.

1.2 Project objectives and outcomes

The overall purpose of the project is to improve understanding of how different interest groups and sectors gain or lose from existing Flood and Coastal Erosion Risk Management (FCERM) policies and to provide evidence for the nature and scale of all key resource flows.

The specific objectives of the project are:

- to define those groups or sectors who benefit and lose out from FCERM policies;
- to develop robust methods to evaluate and communicate the flow of benefits;
- to test the methods and undertake case study assessments, and
- to draw conclusions to inform policy development.

The work aims to provide a clearer understanding of the size and scale of any distributional imbalances, which in turn may inform future policies and programmes.

The focus of the work is toward who benefits from policies *now* rather than how future policy choices will influence and change beneficiary groupings. The latter could however be informed by this research.

Discussions early in the project between the Steering Group and the project team flagged concerns about the extent to which readily available national-level information would be relevant in exploring disaggregated benefits. Case study assessments were agreed as the most appropriate means to achieve an improved understanding and three case study locations were selected for detailed analysis. The case studies aimed to be representative of a broad range of FCERM activities and the benefits they bring to different interest groups and sectors.

Finally, at this point in time, the emphasis is on advancing understanding rather than the formal development of an appraisal or evaluation tool, although future phases of the work may focus in this direction. The framework should be primarily applicable to the assessment of present policies and benefits but it should also be flexible enough to allow for the assessment of future policy alternatives, should this be required at a later stage.

1.3 Scope and organisation of this report

This Final Report includes the following sections:

- Section 1 - Introduction and background
- Section 2 - Flood and coastal erosion risk management
- Section 3 - A methodology to assess distributional effects
- Section 4 - Case study assessments
- Section 5 - Lessons learned & scaling-up
- Section 6 - Conclusions & recommendations

2. Flood and coastal erosion risk management

2.1 Flood and coastal erosion (in England)

Large parts of England and Wales are at risk of flooding from rivers and the sea and around 11% of land, or 1.7 million hectares, could flood. Areas particularly at risk include the Humber corridor, the coastal areas in the South and East, low lying areas in East Anglia and the South West and major estuaries (see Figure 2.1). Erosion by the sea is also a hazard to property on the coast.

In England alone, some 2.1 million properties are in flood risk areas, affecting 4.3 million people (8.7 per cent of the population). Of these, around 469,000 properties are at significant risk of flooding (affecting 900,000 people) and around an additional 500,000 properties are at moderate risk of flooding (affecting a possible further 2 million people). These figures exclude those at risk to flooding from other sources such as surcharging of sewers or groundwater.

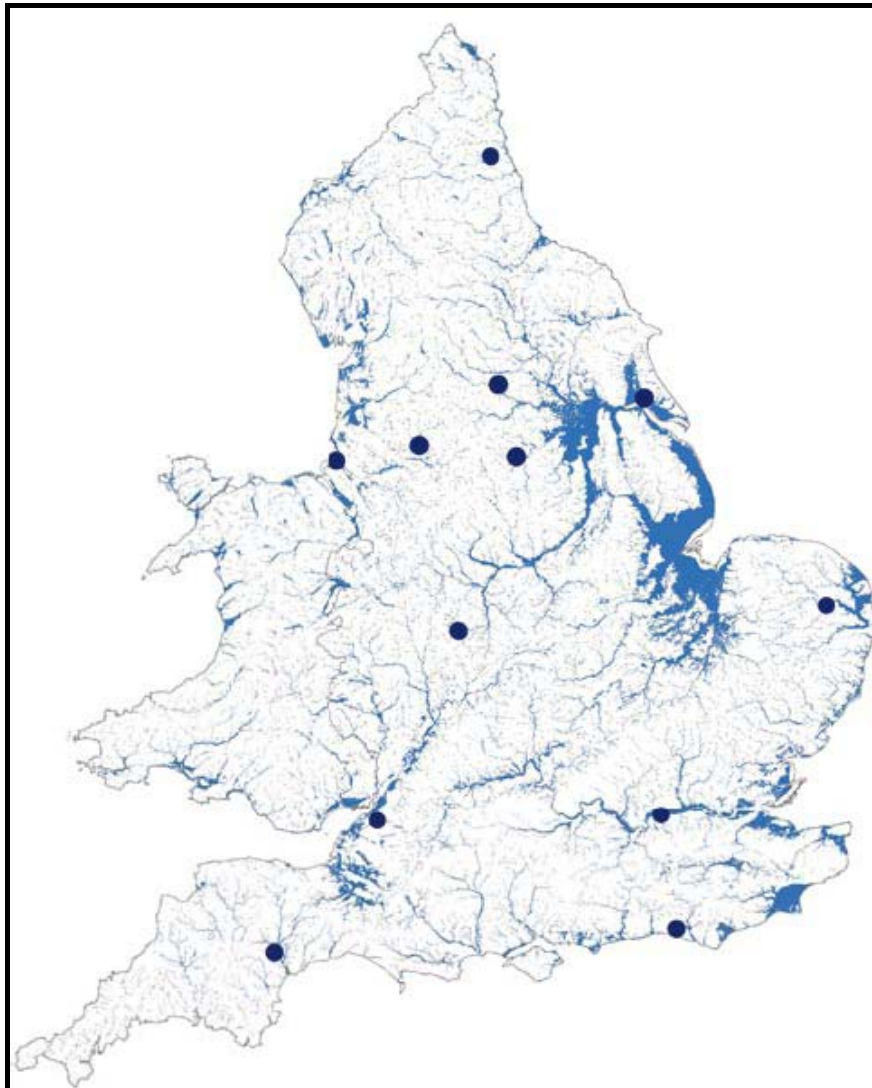


Figure 2.1 Areas at risk to flood (Source: NAO, 2007)

2.2 FCERM policy

Defra has *policy* responsibility for flood and coastal erosion risk management in England. Defra's policy is:

To reduce risks to people, property and the environment from flooding and coastal erosion through the provision of defences, flood forecasting and warning systems, increased flood resilience of property, beneficial land management changes and discouragement of inappropriate development in areas at risk of flooding.

The top priority is to avoid loss of life and Defra is leading development of the cross-Government strategy for flood and coastal erosion risk management 'Making space for water' in close consultation with stakeholders. The strategy comprises a broad range of sustainable measures to manage risk from all forms of flooding.

Box 1: Making space for water (Defra, 2005)

'Making space for water' comprises a broad range of sustainable measures to manage the risk from all forms of flooding (river, coastal, groundwater, surface run-off and sewer) and coastal erosion including:

- giving the Environment Agency a strategic overview of all forms of flooding and coastal erosion;
- identifying the most effective way to tackle the different causes of urban flooding;
- ways to help people adapt to changing risk of flooding and coastal erosion;
- encouraging uptake of flood resilience and resistance measures for individual properties especially where publicly-funded community defences are impractical;
- working with natural processes and developing approaches to flooding and erosion which achieve many objectives at once, such as improved nature conservation alongside protection of communities;
- new Outcome Measures to provide greater clarity on what we are trying to achieve with our policies and funding whilst leaving decisions on the best mix of activities and individual projects to the operating authorities.

2.3 Roles and responsibilities

Delivery on the ground is the responsibility of operating authorities - the Environment Agency (EA), local authorities and internal drainage boards (IDBs). Defra fund most of the EA's flood related work and grant aid individual capital improvement projects carried out by local authorities and IDBs. Defra does not itself build defences or decide which projects the operating authorities should carry out. Instead, Defra guide investment decisions by setting broad outcome measures and other targets and by providing guidance.

The EA is the principal flood risk management operating authority. EA is empowered (but does not have a legal obligation) to manage flood risk from designated main rivers and the sea. The Agency's asset management includes the constructions of new traditional flood defences (eg sea walls, embankments, etc.) and more innovative engineering solutions (eg flood storage, man-made

channels, etc.). The function also includes maintenance and operation of existing defences including repair or replacement of defences and structures, routine maintenance of channels and structures, and operation of pumping stations, gates and barriers.

The EA is also responsible flood forecasting and warning, including increasing public awareness of flood risk, and has a general supervisory duty for flood risk management. Defra agree targets with EA annually which are set out in its corporate plan.

Local authorities and, in areas with special drainage needs, internal drainage boards have similar powers for ordinary watercourses (that is those not designated as main rivers). Coastal local authorities have powers to carry out works to manage the risk from coastal erosion and in some areas may also manage the risk from sea flooding.

Although flood risk can be reduced in many locations through a range of flood risk management activities, all flooding and erosion cannot be prevented and there is always a residual risk of flooding (eg extreme events may overtop or breach defences). Dealing with the impacts of flood events through emergency planning and response is therefore a core activity. At the national level, Defra has the lead role in Government for flood emergencies and a lead department plan sets out the co-ordination arrangements at local, regional and central levels for flooding from rivers or the sea. The Government has set up regional resilience teams in each of the English regions to enhance the co-ordination of planning for wide impact events, such as major flooding.

Anybody who lives or works in areas at risk has a role to play in reducing the consequences of flooding. The EA provides further advice on flood protection and how to further manage risk to homes or businesses through flood resistance and resilience measures.

To ensure flood insurance cover remains available for as many people as possible, the Government has agreed a "Statement of Principles" with the Association of British Insurers (ABI) whose members provide most domestic insurance covering flood risk in England. The Statement sets out the commitments made by the insurance industry to maintain flood cover for the majority of domestic and small business properties at risk, in association with commitments made by the Government on flood risk management.

The Department for Communities and Local Government (DCLG) leads on development planning policy and has given local planning authorities clear guidance to ensure that where new development is necessary in areas at risk to flooding it is appropriate and safe, does not increase flood risk elsewhere, and where possible reduces flood risk overall. These spatial planning principles are set out in the CLG's Planning Policy Statement 25 *Development and Flood Risk* (PPS 25). The EA advises planning authorities on development proposals to ensure flood risk is properly taken into account and became a statutory consultee on development where flood risk is an issue in 2006. The Government has also established powers for the Secretary of State for Communities and Local Government to call in applications where the planning

authority is minded to approve an application against sustained Agency objection on flood risk grounds.

2.4 Investment in FCERM activities

Central and local Government spent some £600 million on FCERM in 2005-06, an increase of 40% in real terms and a doubling in cash terms since 1996-97. Further spending increases were announced in 2007 with FCERM spending to top £800 million per annum by 2010/11. As part of these increases, Capital Programme expenditure (for new and improved defences and projects) will increase significantly from £259 to £400 million and EA Resource expenditure (maintenance & operational costs) increases from £247 to £279 million. Local Authority contributions will remain relatively stable at about £86 million.

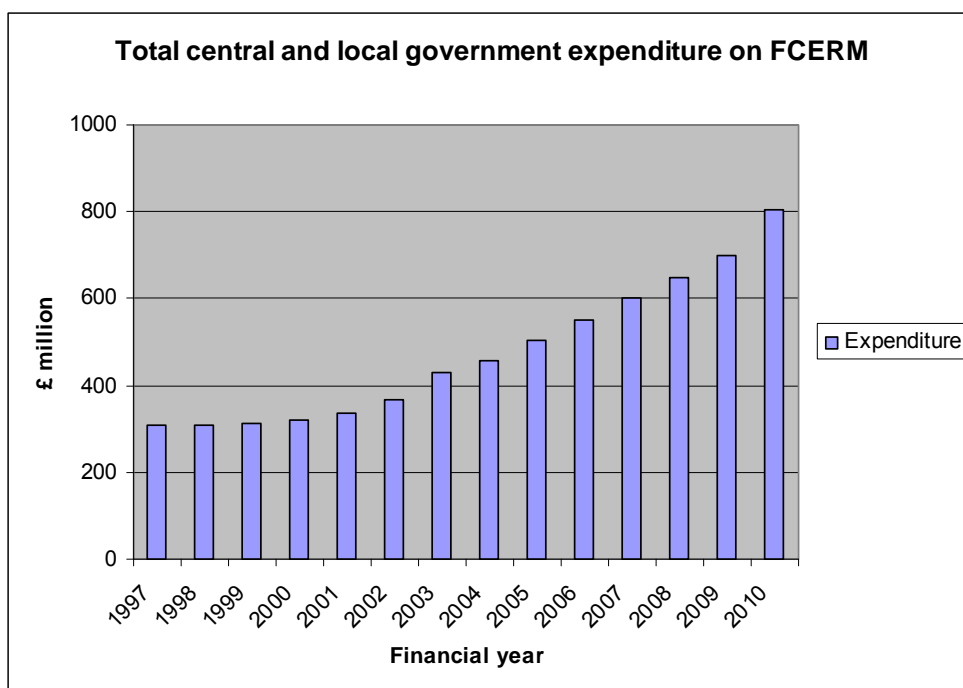


Figure 2.2 Total central and local government expenditure on flood and coastal erosion risk management

The funds for investment contribute to a wide range of FCERM activities and are ultimately paid for by national and local taxpayers.

3. Development of a methodology to assess the distributional effects of FCERM activities

3.1 Initial scoping of a methodology

The scoping phases of the work researched alternative approaches for the assessment of disaggregated costs and benefits among different beneficiary groupings. The review identified a range methodologies, see Table 3.1, and their relative advantages and limitations were assessed against the project requirements.

It was made clear by the Steering Group early in the project that the majority of effort was to be targeted toward improving understanding via the application of a methodology, rather than in the detailed development of a software analysis tool or similar. A number of the analysis techniques reviewed above would require significant effort and resources to develop (eg agent-based modelling) and it was clear that this would detract from the true focus of the work.

Table 3.1 Alternative methodologies and approaches

Methods & Techniques	Comments
Agent-based modelling	<p>Potentially a powerful method to model the overall consequences of the behaviour of individual entities within an environment.</p> <p>Beneficiaries could be modelled as dynamically interacting rule-based decision-makers within the 'FCERM environment', developed independent of specific policies. Policy interventions then applied to the system as a set of initial changes to different beneficiaries, and the consequences and responses of affect beneficiaries evaluated over time and space.</p> <p>Can be resource intensive in setting-up 'agents' sufficiently to adequately model their behaviour and rule-based decision-making. Significant effort would be required to fully develop a robust framework that provided confidence in the conclusions produced. However, such an approach may be more likely to uncover less obvious consequences of policy intervention.</p>
Impact assessment / cause-and effect modelling / 'Ripple analysis'	<p>Relatively flexible and simple to set-up a conceptual model that defines the resource flows between different beneficiaries by impacts and their causes and effects.</p> <p>Limitations of this approach are that the links between beneficiaries may be limited to those that are already immediately apparent and may not necessarily uncover less obvious consequences.</p>
Combination of a cause and effect model with an element of ABM	<p>One potential solution for this project is to set-up a cause-and-effect model supported by a relatively simple agent-behaviour model that attempts to draw out potential responses of individual beneficiaries due to a change in environment (e.g. increased perception of flood risk). This agent-model would not be sufficiently developed to determine what 'would' happen but could inform as to what 'could' happen.</p> <p>This approach would support development into a full Agent-based model in the future.</p>

Disaggregated cost-benefit analysis (FD2018)	Based on widely used and accepted cost-benefit analysis. Monetised benefits distributed between beneficiaries. For appraisal purposes can be combined with MCA to account for non-monetised benefits. Relevant to appraisal and may not be appropriate for this project in evaluating and communicating resource flows and highlighting less obvious consequences from policy intervention.
Multi-criteria analysis	MCA provides a mechanism by which monetised and non-monetised benefits can be included in an appraisal. As with CBA, this is primarily an appraisal technique and may not be appropriate for this project in evaluating and communicating resource flows and highlighting less obvious consequences from policy intervention.

A procedural step-by-step methodology linked to cause-and-effect impact assessment was finally selected for use in the case assessments. This ensured flexibility in the application of the methodology and maintained an ability to make adaptations to the approach as the research progressed and lessons were learned. The methodology also ensures a higher degree of transparency in how findings and results are determined, which can often be lost in black-box system-type analyses.

The outline methodology provides a systematic way to consider a wide range of potential beneficiaries, to organise information, and to provide a consistent structure for assessing the size and scale of the benefits they receive. The framework is applicable to the assessment of present FCERM policies and activities also has flexibility to allow for the assessment of future policy alternatives, should this be required at a later stage. The approach also ensures the methodology can be extended and enhanced as time progresses.

Application of the outline methodology is supported by a number of templates and impact diagrams to support the structured approach to the assessments. Impact diagrams provide guidance on likely impacts of different FCERM activities and the templates are intended to provide a summary of the evidence gathered. As importantly, these are intended to help capture and communicate findings by showing how costs and benefits are distributed among different groups.

3.2 Outline methodology

The key steps in the outline methodology by which the distributional effects of FCERM activities can be assessed are:

Step No.	Question
1	What are the characteristics of the FCERM policy/activity that we are examining?
2	What are the likely impacts of these measures?
3	Who are the funders of these measures: those who pay for flood and coastal erosion risk management?
4	Who are the gainers and losers from these measures?
5	What is the value of these gains and losses?
6	What are the distributional effects on different interest groups?
7	What gaps in our knowledge/data limit the above analysis and therefore how robust are the results?
8	What are our conclusions as to how the gains and losses from the FCERM policy/activity are distributed in society?

The philosophy behind the methodology is encapsulated in the in the schematic shown in Figure 3.1.

Characteristics of FCERM activities

The characteristics of FCERM activities are clustered according to the impacts they have on the central components of risk: a combination of probability and consequences, with exposure and vulnerability together contributing to the consequences. For example, improvements to flood defences reduce the probability of flooding in the area protected, spatial planning to restrict development in a floodplain reduces exposure, and emergency response to a flood event reduce vulnerability.

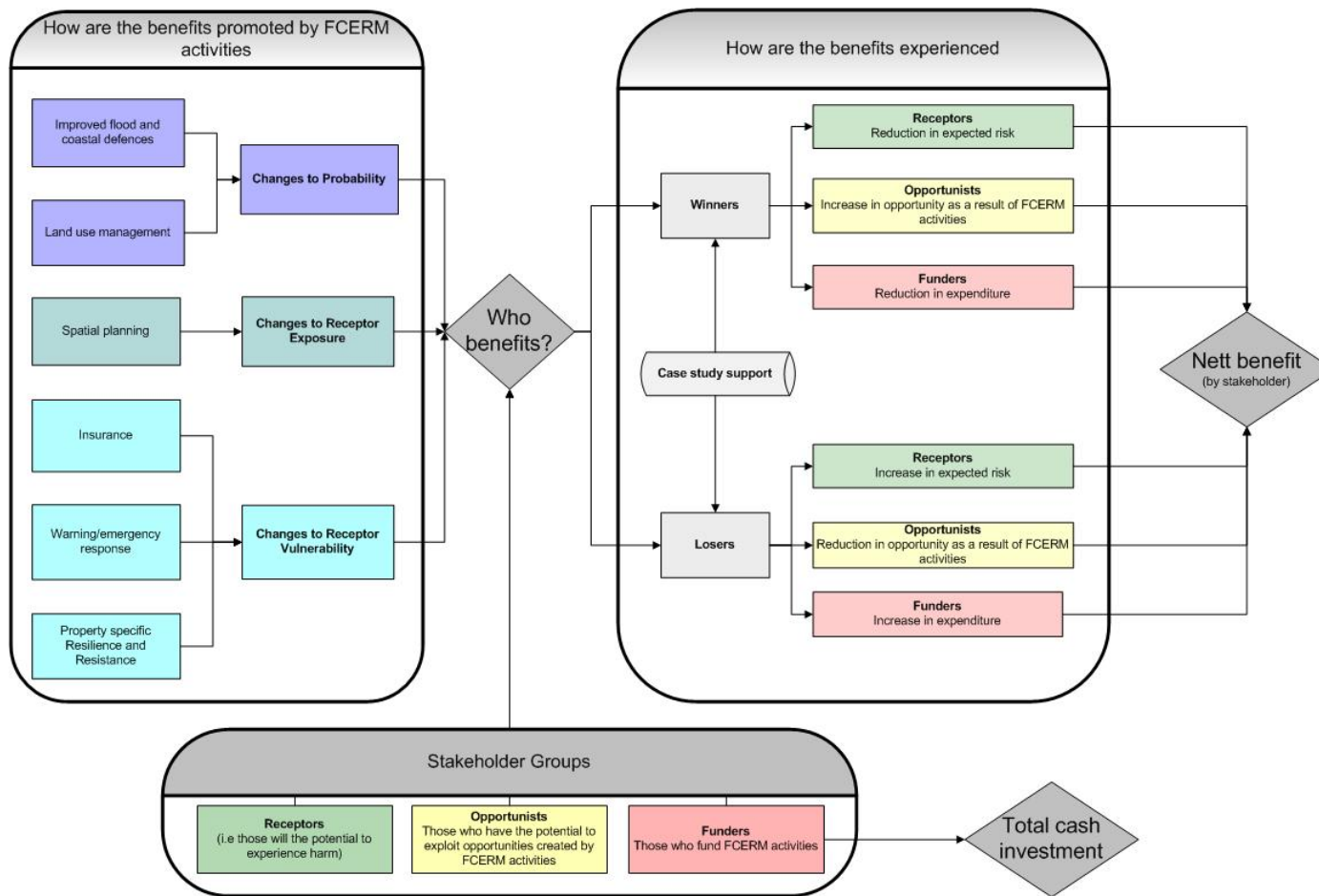


Figure 3.1 Schematic for the generic framework

Stakeholder groups

The impacts of the FCERM activities are dependent on how the benefits are promoted by the FCERM activities and how the benefits are experienced by different stakeholder groups. Three key stakeholder sub-groups are categorised as experiencing benefits (or disbenefits) from FCERM activities:

- Receptors:
- those with the potential to experience harm from flood and coastal erosion risk such as house householders, businesses, etc. Further sub-classification can be defined by introducing additional attributes such as householders who are insured/not insured, at risk/not at risk of flooding, and socio-economic groupings. Similarly, businesses can be sub-divided according to business size
- Opportunists:
- those who have the potential to exploit opportunities created by FCERM activities such as land owners and developers in areas where flood risk has been reduced, and
- Funders:
- those who provide the funds for FCERM investments and activities

How are the benefits promoted and experienced

The benefits of FCERM activities are promoted by a change in risk. In general, wins or gains may be attributed to a reduction in expected risk, an increase in opportunity, or reduced expenditure. Similarly, losses may be attributed to an increase in expected risk, a reduction in opportunity, or an increase in expenditure. Individual stakeholder groups can experience both wins and losses. As importantly, individual stakeholder groups can both win and lose from a FCERM activity.

How are the benefits experienced

Benefits are experienced by the stakeholder groups in different ways and three *benefit types* are considered:

- Direct monetary benefits
- for example direct cash flows for providing FCERM services and implementation, or direct monetary flows related to funding
- Direct benefits (other)
- benefits are not direct monetary flows but benefits accrue to the beneficiary without them needing to take action (eg a reduction in estimated household annual damages due to the construction of a flood defence)
- Indirect benefits
- indirect benefits require action on behalf of the beneficiary to realise the benefits, eg an increase in land-value or development potential due to the implementation of a flood protection scheme

Beneficiary impact diagrams

The philosophy of how benefits are promoted and experienced by different stakeholder groups has been encapsulated in a series of beneficiary impact diagrams for different FCERM activities and characteristics. The beneficiary

impact diagrams are not intended to be fully exhaustive but rather to provide an indication of the likely major impacts and resource flows. Application of the outline methodology to case-specific assessments should re-confirm the impacts, clearly define the different stakeholder interest groups, and establish the size and scale the benefits (or disbenefits) as far as possible.

Figure 3.2 is an example of a generic beneficiary impact diagram for FCERM activities resulting in a change (reduction) of flood probability. Typical FCERM activities may include flood defence construction/maintenance, coastal protection works, channel modifications and maintenance, and land-use / catchment management. The diagram indicates the likely flow of benefits to and from different stakeholder groups in terms of direct monetary benefits, direct benefits (other) and indirect benefits, see colour coding in the legend. The direction of the arrows indicates a positive flow, or more generally, a gain or benefit to the stakeholder identified by the box the arrow enters.

intermediary stakeholder groups who facilitate the transfer of benefits (eg national/local government, Defra/EA, etc.) or provide services related FCERM activities yet are neither the intended end-beneficiaries nor the ultimate funders of FCERM activities are also included. For example, engineering consultants/contractors provide design and construction services and although not an intended end-beneficiary they do benefit from FCERM investment through an element profit associated with their services.

FCERM activities impacting on receptor exposure have a different flow of likely beneficiary impacts and an example impact diagram for a change (reduction) in flood risk exposure is shown in Figure 3.3. FCERM activities in this category may include spatial planning and development control to restrict development in a floodplain.

Finally, a beneficiary impact diagram for FCERM activities that impact on receptor vulnerability has been developed and is shown in Figure 3.4. Reduced vulnerability could result from a variety of FCERM activities including flood warning, emergency planning, and property resistance/resilience. The representation for individual measures can be disaggregated as a sub-set of these and Figure 3.5 gives an example for flood warning. Flood insurance also acts as a measure to reduce vulnerability to flood and is shown in Figure 3.6.

A policy mix of FCERM activities that impact on probability, receptor exposure, and receptor vulnerability may be aggregated from the impacts of individual FCERM activities as shown in Figure 3.7.

Value of gains and losses

The beneficiary impact diagrams provide an indication of the likely major impacts and resource flows. Application in a case-specific assessment requires that the full breakdown of the different beneficiary groups is expanded as appropriate and the nature of the benefits they experience evaluated. During case-specific assessments, measurement and evaluation techniques will draw on secondary sources such as project appraisal reports, *ex-post* evaluation

reports, implementation reports and other secondary sources. More detailed techniques may also include:

- Market prices
- Contingent valuation of recreational/amenity gains and losses
- Hedonic methods for changes in property values
- Reductions in estimated annual losses
- Changes in tax receipts

A balance between level of detail and resource intensity is necessary and in the confines of this project the case study assessments were intended to be illustrative rather than highly detailed and techniques were selected accordingly.

Distributional effects and conclusions

Based on case-specific beneficiary impact analyses, a template of stakeholders (funders / receptors / opportunists) and the value of their benefits (direct monetary / direct / indirect) can be prepared (Figure 3.8) and details extracted to communicate winners and losers in a disaggregated format (Figure 3.9). It is important to record gaps in our knowledge and/or limitations due to data availability and accessibility before drawing general conclusions on who benefits as these can impact on the accuracy and robustness of the analyses.

A step-by-step schematic for application of the outline methodology and the use of the impact diagrams and templates is provided in Annex 1. Example applications for the case study assessments are given in Chapter 4.

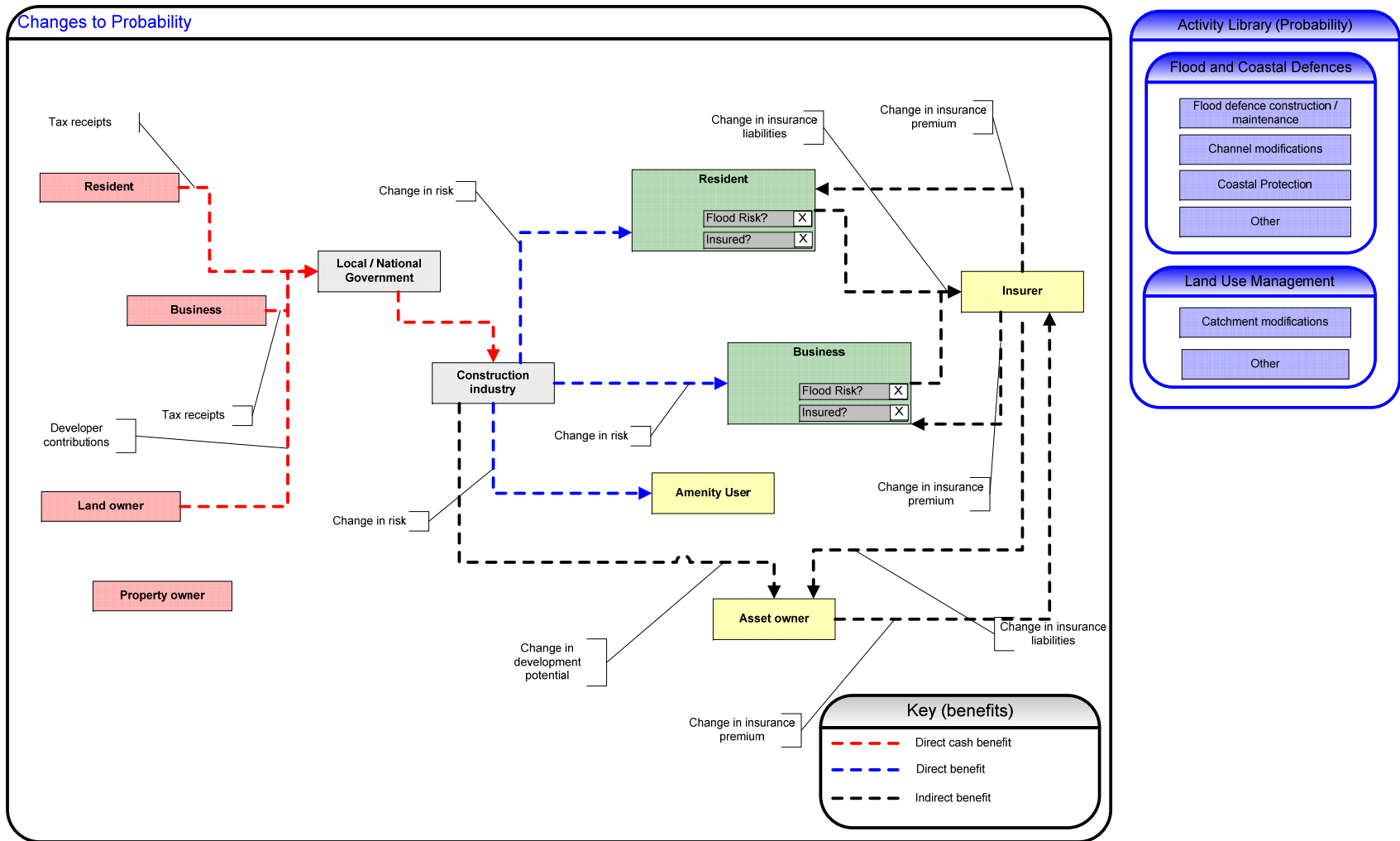


Figure 3.2 Example of beneficiary impacts: Probability

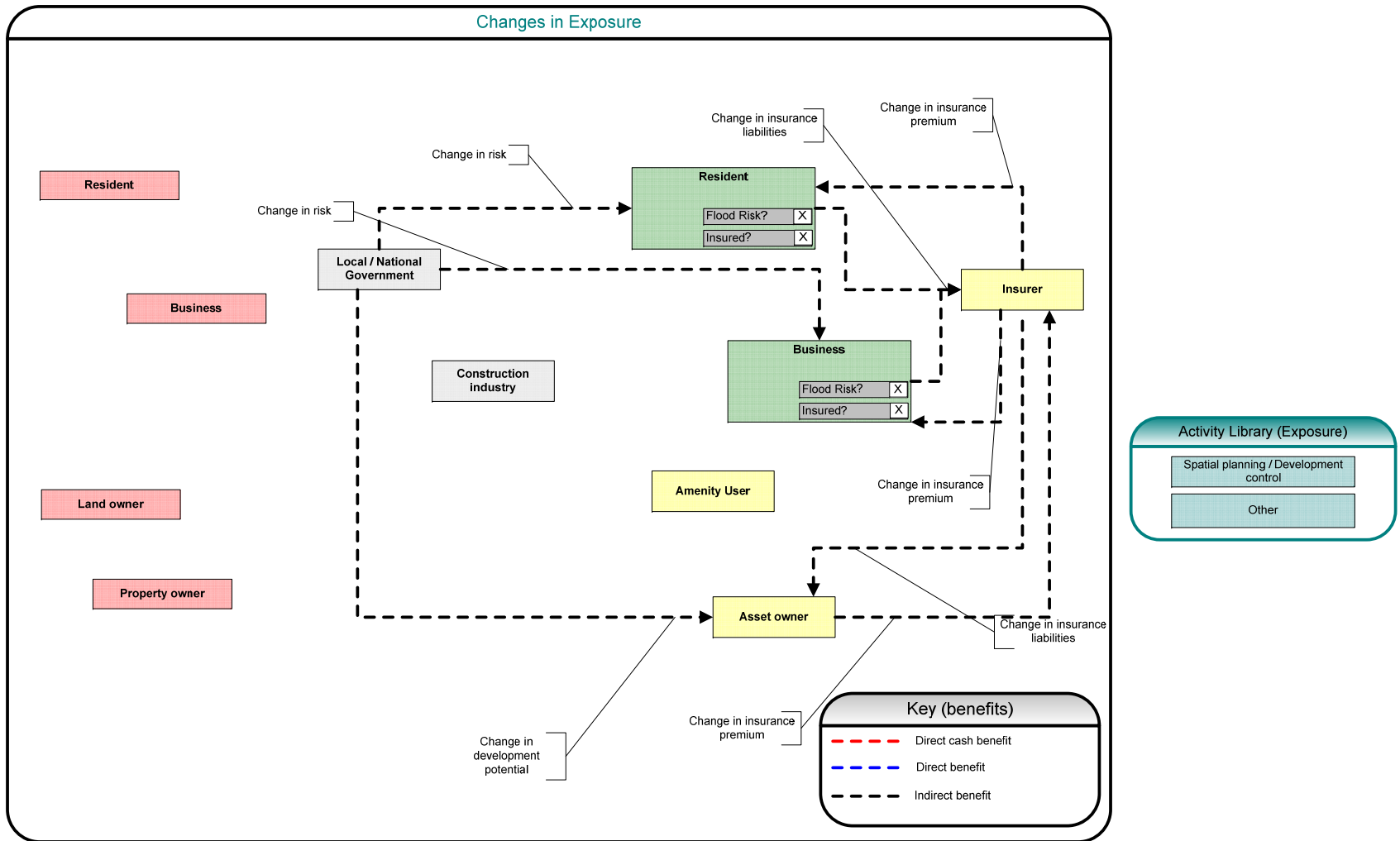


Figure 3.3 Example of beneficiary impacts: Exposure

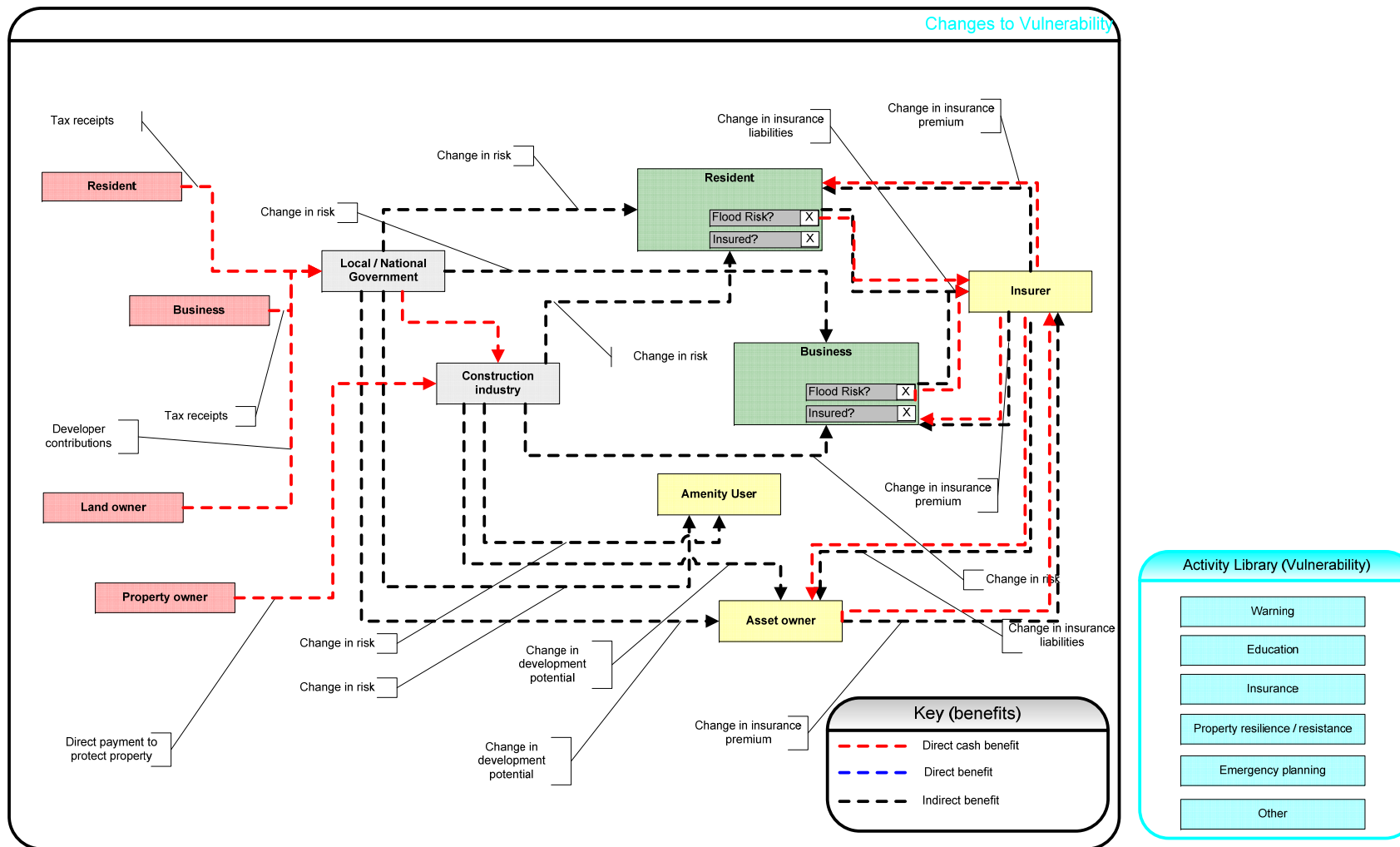


Figure 3.4 Example of beneficiary impacts: Vulnerability

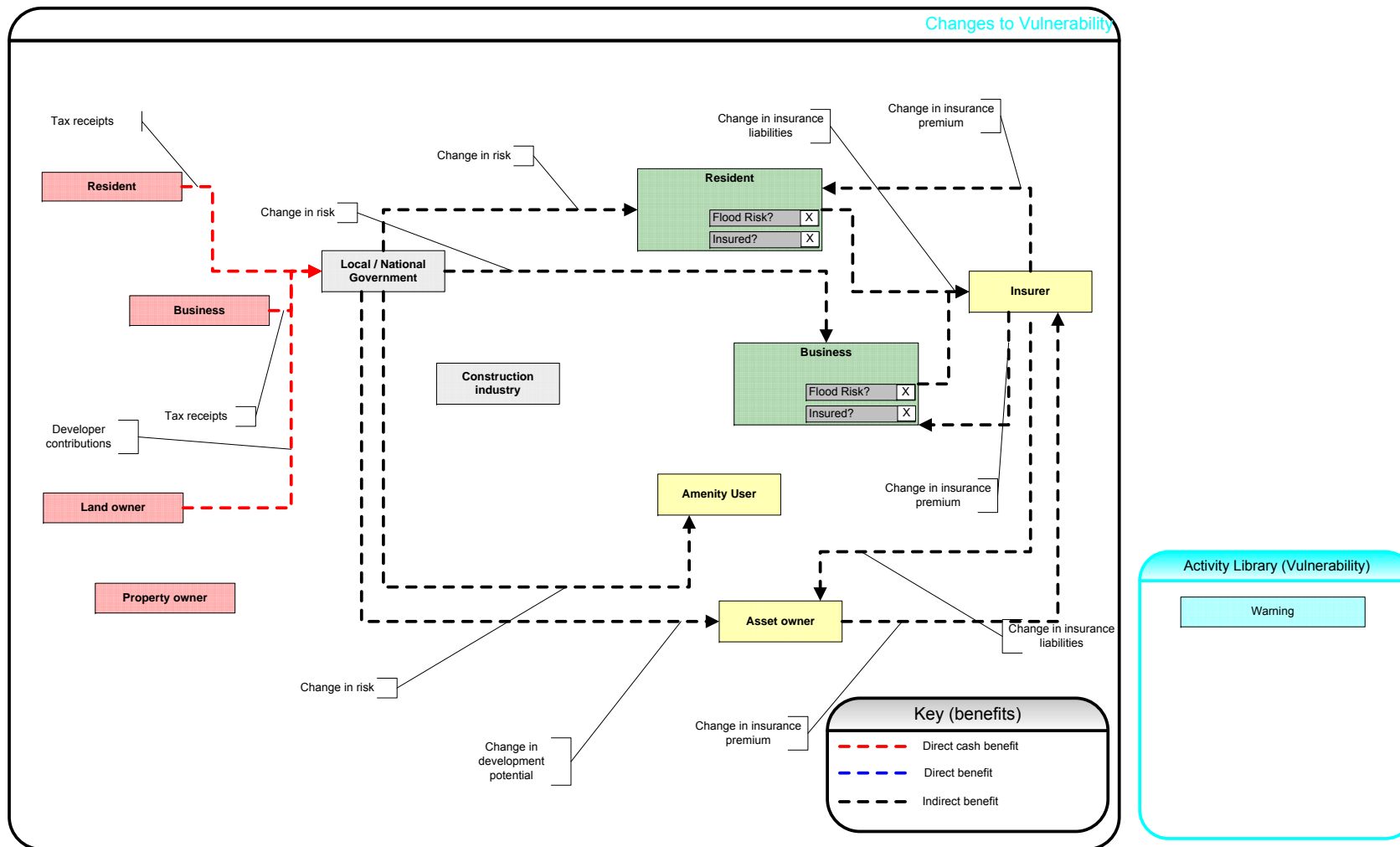


Figure 3.5 Example of beneficiary impacts: Vulnerability / Flood warning only

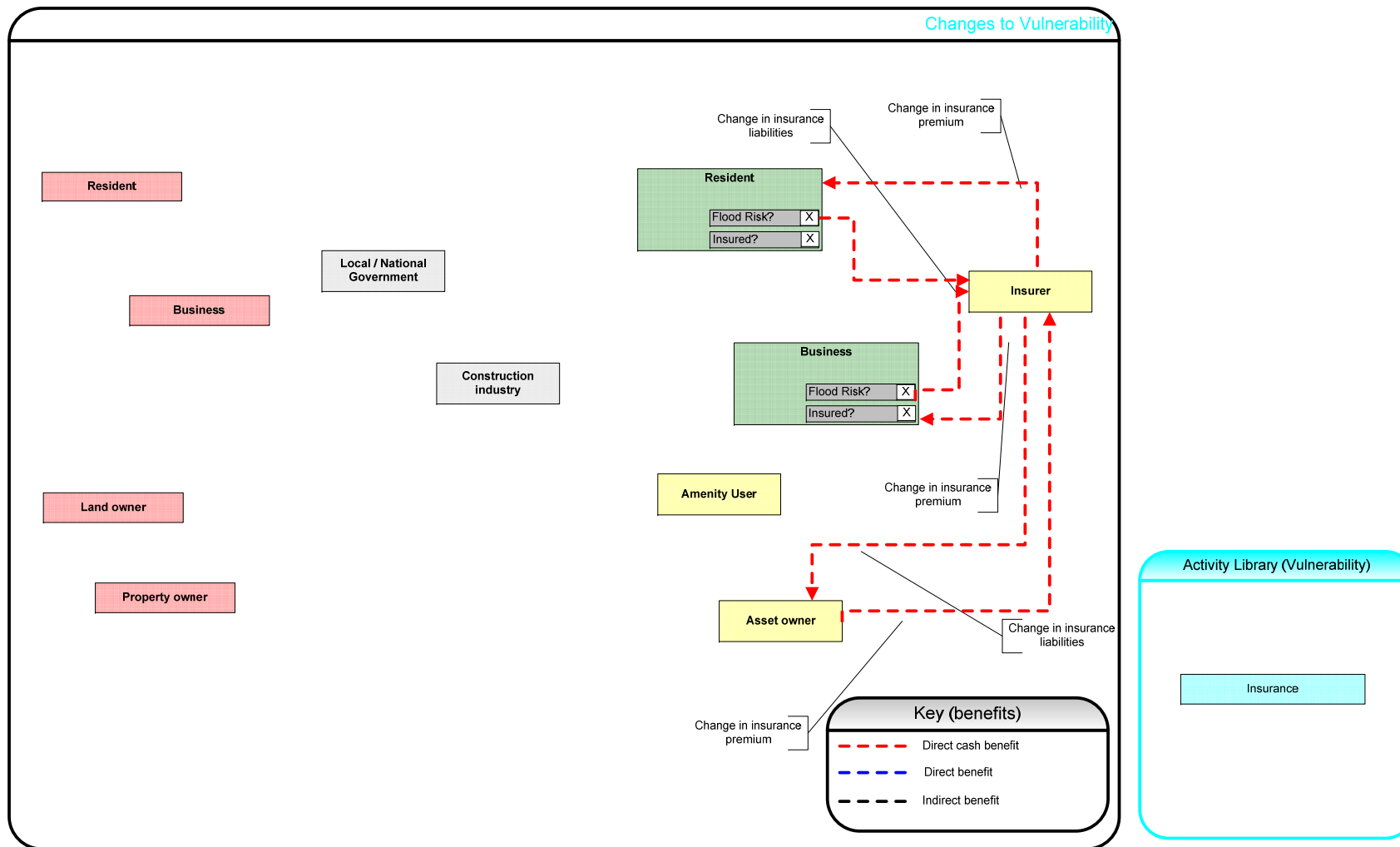


Figure 3.6 Example of beneficiary impacts: Insurance only

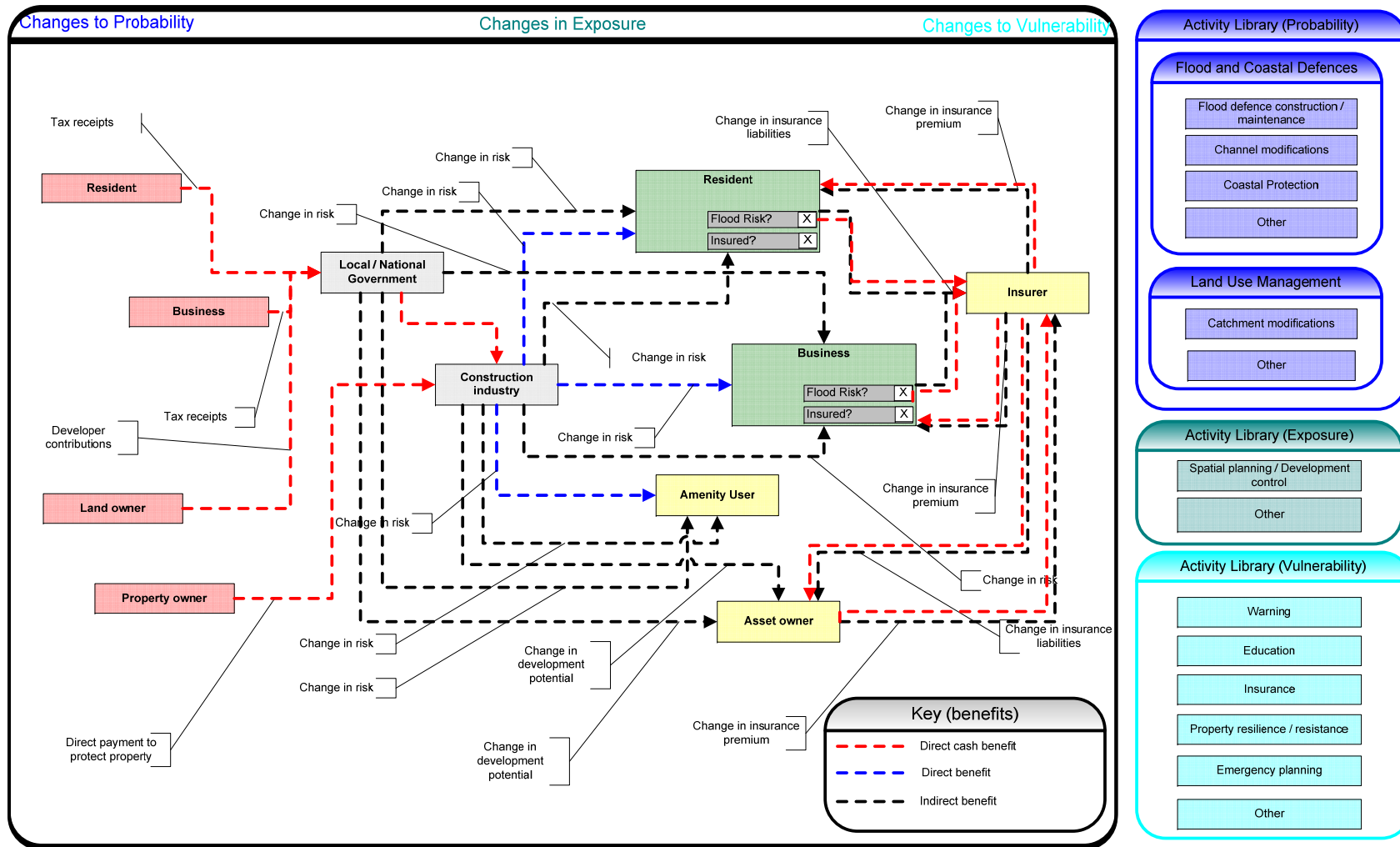


Figure 3.7 Example of beneficiary impacts: Policy mix

West Bay - Capitla Scheme

Template:

FCERM Activity Type: Changes to **probability**

FCERM Activity Measures Flood defences & coastal protection works

Stakeholder		Impact			Evidence	Comments	
Type	Sub-class	Benefit Type	Source	Value (examples in £ Million)			
Funder	Resident	Direct Monetary (Cash)	Change in Tax receipts	20.319	Initial funding for scheme from national and local council tax payers	Initial funding for scheme from national and local council tax payers. There were no developer contributions.	
	Business						
	Land Owner						
Conduits	Funding conduits / contributors	Direct Monetary (Cash)	Provision of funding	10.119	Breakdown given in Engineer's Report.	Combination of various grants and resources.	
				EA			2.700
				WDDC			7.500
	Construction & services		Provision of services	18.400	Breakdown given in Approved and Requested Grant Sums (WDDC)	Further breakdown of contractors costs according to fees, labour, materials, etc. available in Contractor's Final Account. Sums include resource flows back to Govt. (eg income tax estimated at ~£2.5M)	
				Contractors			1.036
				Consultants			0.883
	Other						

Receptor	Resident	Household	Direct	Change in level of risk	38.500	Engineers Report. 550 homes protected (average £70k PV write off per property assumed)	Also intangible benefits from peace of mind/reduced worry. No noticeable impact on house prices and saleability reported.
	Business	Commercial			7.700	Engineers Report. 55 commercial properties protected (average £140k PV write off per property assumed).	Also intangible benefits from peace of mind/reduced worry
	Resident	Household	Indirect	Change in insurance premiums	?	No evidence was obtained to support the idea that residents and businesses benefited from reduced premiums or excesses.	Most recent major flood events occurred in the 1970s and it is possible that the flood risk was not a live consideration for insurers
	Business	Commercial			?	No evidence was obtained to support the idea that residents and businesses benefited from reduced premiums or excesses.	Most recent major flood events occurred in the 1970s and it is possible that the flood risk was not a live consideration for insurers
Opportunist	Asset Owner	Land owners & Developers	Indirect	Change in development and regeneration potential	?	Old Shipyard/West Quay site & Forty Foot Way/Driftwood site developments.	WDDC and private landowners/developers continue to explore further proposals for redevelopment.
		Tourism facilities		Change in visit numbers	2.107	Various: caravan Park; angling shops; hotels; restaurants; cafes; arcades; etc.	Complex range of factors makes it difficult to clearly attribute gains and losses to the scheme. But, benefits are local rather than regional or national.
	Amenity User	Harbour users	Direct	Change in level of risk	3.000	Main benefits to commercial fishing boats and leisure craft. Anticipated benefits not fully realised but compensated for by increase in visiting commercial boats.	Intangible benefits include enhanced safety and convenience.
		Visitors & sea anglers			9.000	Increased enjoyment by current and new users	Overall, visitors benefit although sea anglers
Insurer		Indirect	Change in insurance liabilities	46.200	Reduction in liabilities due to reduced level of risk to domestic and commercial stock.	Assumed equal to savings from flood and coastal erosion avoided.	
Wider benefits	Economic				Yes	Minor	
	Social				No	No evidence was obtained	
	Environmental				No	No evidence was obtained	

Figure 3.8 Example template of beneficiary impacts

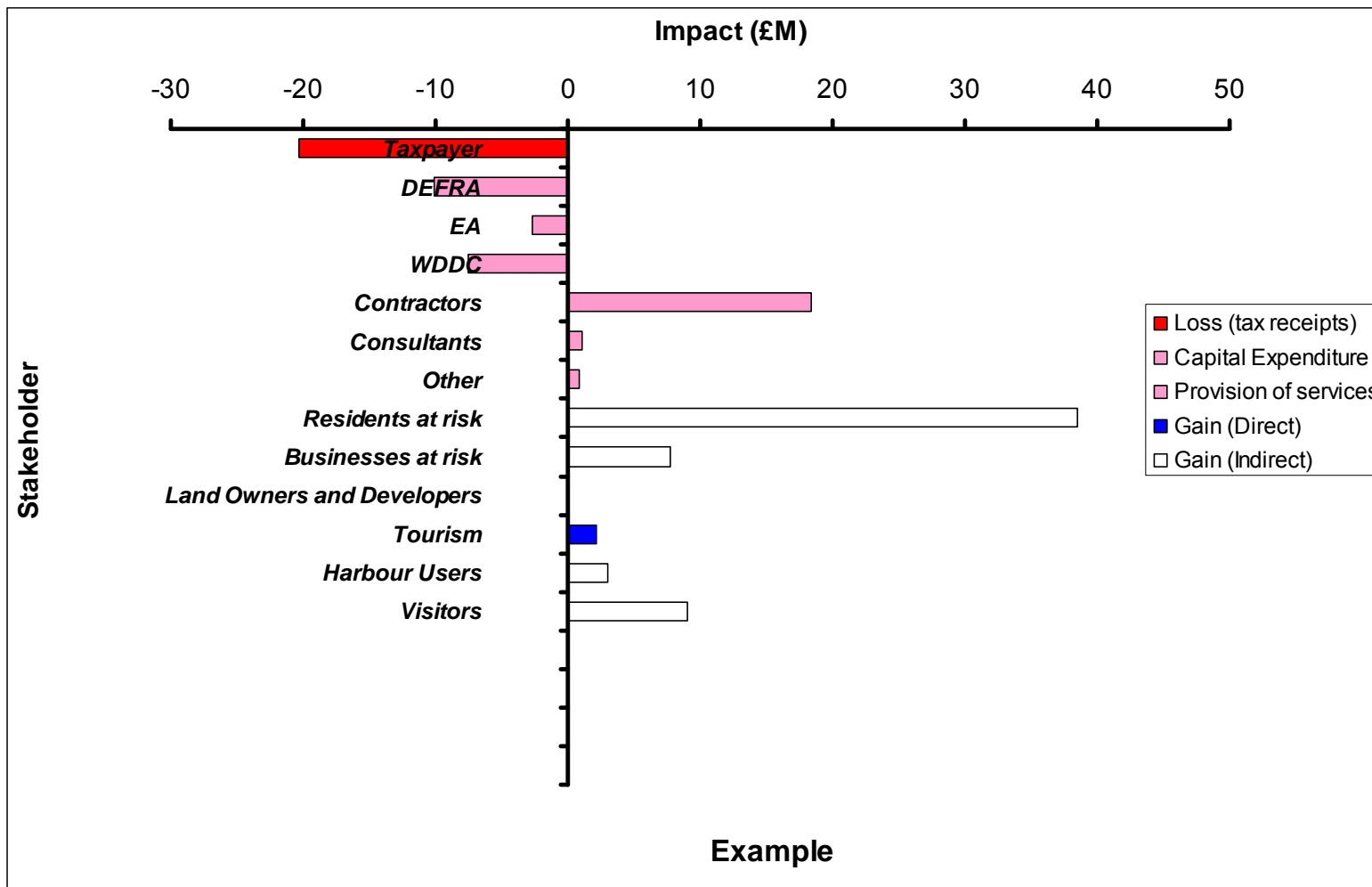


Figure 3.9 Example of distributional beneficiary impacts

4. Application to case studies

4.1 Case study selection

Three geographic case studies were undertaken as an integral part of the project. Together, the case studies aimed to include a rich mix of FCERM activities and to be a source of information and evidence-base for a range of issues associated with *Who benefits or loses?* and *How do they benefit or lose?*.

Carlisle: Carlisle was selected as a first case study location as it has a rich mix of FCERM activities. It was expected to be of particular use in adding value on the distributional impacts of:

- Capital flood defence schemes
- Insurance related issues,
- Flood forecasting and warning, and
- Emergency planning and response.

Information from recent flood events also enabled a number of supplementary assessments to be undertaken, including information on some of the wider consequences and benefits of flood management activities and policies.

West Bay: The West Bay Coastal Defence and Harbour Improvement Scheme was selected because it appeared have a number of special features relevant to the *Who Benefits* project:

- The scheme was a fairly recent one developed mainly within the current policy regime, with multipurpose elements.
- It was judged to be a successful engineering project.
- It has been singled out as an example of a successful partnership project
- It drew a variety of funding sources.
- It appeared to be likely to have a variety of beneficiaries.
- It aimed to offer significant amenity gain.
- It was linked to local regeneration schemes and potential developments in the area.

Lyth Valley: The Lyth Valley scheme was selected because it had a number of features relevant to the *Who Benefits* project:

- It was an ex-IDB scheme now maintained by the EA
- It combined land drainage and flood protection
- The area suffers from both fluvial and tidal flood risk
- Benefits were originally targeted toward the agricultural sector
- Maintenance costs remain relatively high under a business as usual case
- Environmental issues are relevant to the case.

A matrix of anticipated key issues versus case study location is provided in the Table 4.1 below.

Table 4.1 Case studies and anticipated issues

No.	1	2	3
Location	Carlisle (Cumbria)	West Bay (Dorset)	Lyth Valley (Cumbria)
Issue	Regional town suffering severe flooding in 2005 and with a range of FCERM measures	Coastal defence scheme promoted by the district council in partnership with the EA.	Former IDB scheme now maintained by the EA with coastal and fluvial flood risk.
Role of insurance in influencing benefits/losses	√	√	
Cross subsidy influences on resource flows			√
Influence on house prices and property values	√	√	
Development on the floodplain	√	√	
Influence on production in industrial/commercial sectors	√		√
Influence on employment and regional development	√		
Impacts on the construction industry	√	√	
Impacts on manufacturers, distributors and retailers	√	√	
Health and welfare issues	√		
Quality of life, environment and amenity gains	√	√	√
Differential impacts on groups	√	√	√

Individual case study analyses are summarised in the sections below including:

Carlisle

- flood alleviation schemes
- flood forecasting and warning services
- emergency planning and response
- additional assessments

West Bay

- coastal flood protection and harbour improvement

Lyth Valley

- land drainage

Insurance is discussed separately in Section 4.9.

General findings from the case studies and lessons learned are summarised in Chapter 5.

4.2 Carlisle Case Study – Capital Scheme

What are the characteristics of the FCERM policy/activity

Following the Carlisle flooding in January 2005, affecting approximately 1,844 properties and associated roads and infrastructure, two capital schemes qualified under Grant in Aid Funding to alleviate flooding in the City:

- Eden and Petteril (E&P) largely protecting residential properties in the Warwick Road area of the City (now largely complete giving protection to 1 in 200 years)
- Caldew and Carlisle City (C&CC), protecting the City Centre and Willowholme industrial estates (to commence imminently for completion in 2010 and also giving protection to 1 in 200 years)

What are the likely impacts of these measures?

The likely impacts are anticipated to follow those associated with a change in the probability of flooding.

Who are the funders of these measures: those who pay for flood and coastal risk management.

The ultimate source of funding for the two schemes is from national and local tax payers channelled through the EA's Grant in Aid scheme.

The actual Outturn cost for Eden and Petteril was £13,373,000 with minor contributions (~£65k) made by Carlisle CC and Toby Inns. For the Caldew and City Centre FAS costs for the preferred scheme are £23 million (PAR 2007). Details of the cost breakdowns are given the tables below.

Eden and Petteril

The following table summarises how this was split:

Table 4.2 Outturn costs for the Eden and Pettril scheme

Beneficiary	£'000's	% Total	Remarks
Salaries	376	2.81	
Area Staff	0	0.00	Area Staff don't charge time: Part of day job
Project Management	270	2.02	Pre PAR costs of £390,000 not included: Sunk
NEAS Officer	43	0.32	Environmental liaison
NCPMS Public Liaison	63	0.47	Not including public time: substantial
Consultants	1,668	12.47	
Paul Wilson	83	0.62	Estates consultants assisting EA estates
Atkins Water	1,517	11.34	Detailed design/modelling
Arup	42	0.31	Cost consultants
Others	46	0.34	
Transfer to Strategy	-20	-	
Construction	10,246	76.62	
Volker Stevin	10,146	75.87	Contractors
Site Investigation	120	0.90	
Credit from Carlisle City	-25	-	Contribution to New Cycle Way
Other	5	0.04	
Land and Compensation	998	7.46	
Colville and schools	78	0.58	Finishing works

Riverside Office Rental	31	0.23	Hire of off-site office
Stonyholme Cottage	221	1.65	Cottage outside defences; EA purchased to avoid complex and unreliable flood gate structure.
Carlisle United FC	376	2.81	Land take allowed construction of cheaper flood banks rather than sheet piling. CUFC wanted £500k. Regarded as benefit not compensation
Toby Inn	-40	-	Contribution to protect public house
Landowners etc	322	2.41	Negotiated compensation for land loss etc
Tesco	10	0.07	Protection against increased flooding
Other	85	0.64	
TOTAL	13,373		

Caldew and City Centre FAS

The April 2007 PAR summarises the costs for the preferred £23 million scheme as follows:

Table 4.3 Estimated costs for the Caldew & City Centre Scheme

	Cost for Economic Appraisal PV	Whole Life Cash Cost	Agency SoD Approval Cost (Cash)
Costs pre PAR	N/A – sunk costs	£1,092,000	£1,665,000
Costs post PAR			
Agency costs	£558,000	£575,000	£575,000
Consultant fees	£1,373,000	£1,400,000	£1,400,000
Cost consultant fees	£49,000	£50,000	£50,000
Investigations	£587,000	£590,000	£590,000
Construction	£13,114,000	£13,723,000	£13,723,000
Environmental enhancement	£309,000	£323,000	£323,000
Compensation	£1,069,000	£1,112,000	£1,112,000
Contingency			
95%ile (16% of SoD approval)	£3,663,000		£3,814,000
50%ile		£2,189,000	
Inflation (at 5% p.a.)	N/A	N/A	£2,008,000
Future costs (maintenance etc)	£2,371,000	£13,930,000	N/A
Other	-	-	-
TOTAL	£23,093,000	£34,984,000	£23,595,000

Who are the gainers and losers from these measures? What is the value of these gains and losses?

Eden and Petteril

The pie chart in Figure 4.1 illustrates the component split for the Eden and Petteril scheme costs:

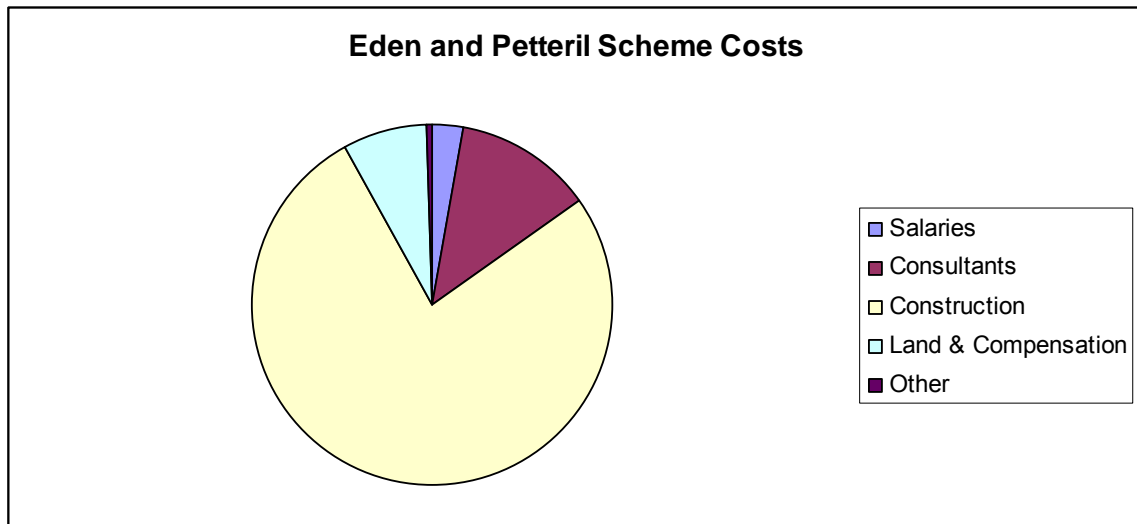


Figure 4.1 Eden and Petteril scheme costs

Construction (77%) and Consultants (12%) and salaries (3%) make up most of the costs. Some 22% of target construction costs were attributable to contractor risk, overheads and profit.

The breakdown of Labour, Plant and Material was anticipated to be:

- Labour 30.0%
- Plant 18.4%
- Materials 51.6%

It may be assumed that of construction costs nearly one-third returns to National circulation either through taxes, pensions, national insurance and general consumption. A half of costs are generated through purchase of materials which attracts VAT and sustains the income and livelihoods of suppliers. Almost a fifth of costs relate to plant and again generates income for suppliers and plant hirers, and insurance companies with VAT to the exchequer along with excise duties and road and fuel tax.

Land and compensation was over 7% of which up to 5% (landowners and Carlisle United FC) payments constitute an apparent benefit or windfall.

Some 1,489 residential and 45 commercial properties benefit from the scheme, equal to about £55 million of the Do Nothing damages (£92 million) over 100 years, equivalent to nearly £36,000 per property.

Caldew and City Centre FAS

Construction (58%), Consultants (9%, including investigations) and salaries (3%) make up the lion's share of costs. Some environmental enhancement has been separately costed at 1.3% of total costs. Transfers back to Central Government through taxation on profits and individual personnel taxation and insurance including VAT @ 17.5% will be significant.

Some 2,330 properties (a mix of commercial and residential) are assumed to benefit from the improvement work. The 1 in 200 year (0.5%) scheme of bank raising and channel improvements will reduce 85% of Do Nothing Damages and present £176 million benefits (against the £23 million costs) representing a benefit of over £75,000 per property (cf Eden and Petteril at £36,000). This figure is bolstered by the large number of non residential or commercial properties in the benefit area (with large and susceptible foot prints) e.g. McVities/United Biscuits.

The distribution of residential/non residential (uncapped) PV damages under the Do Nothing scenario is as follows:

Table 4.4 PV damages under a Do Nothing scenario (C&CC)

Type	Number	Percentage PVd
Non Residential	430	77.7
Residential	1900	22.3

Although more than 80% of the properties to benefit are residential the vast majority of the benefits (more than 75%) will be realised by the non residential properties. Thus the scheme benefits largely non-residential property.

A breakdown by NRP type is given Table 4.5 below. Private enterprises make up 95.8% of NRP potential beneficiaries (shown in **bold**) with small numbers of individual NRPs contributing a significant amount to the potential damages avoided (from Do Nothing). Well over 50% of NRP damage is derived from only 19 NRPs, less than 4% of the total NRP's. Of these, 4 are classed as computer centres (27% of total NRP damages avoided), 11 as offices (19% of total NRP damages avoided), and 4 'superstores' (10% of total NRP damages avoided). Small numbers of private enterprises are therefore major beneficiaries of the scheme.

Table 4.5 Non-residential property damages (C&CC)

<i>Property</i>	<i>MCM code</i>	<i>% NRP</i>	<i>no.</i>
Hairdressing salon	231	0.02	2
Surgery	620	0.1	2
Library	640	0.1	2
Petrol Filling Station	222	0.3	4
Fire/Ambulance	650	0.3	3
Café	236	0.4	8
Law court	680	0.5	1
Vehicle Repair	221	0.6	24
Car Showroom	223	0.6	3
Pub/club	234	0.7	13
School/college	610	0.8	4
Sewage Works	840	1.2	1

<i>Property</i>	<i>MCM code</i>	<i>% NRP</i>	<i>no.</i>
Community Centre	630	1.4	26
High Street Shop	211	4.5	54
Retail Warehouse	214	5.9	38
Leisure and Sport	5	7.4	7
Factory/workshop	810	7.7	32
Superstore	213	10.9	4
Warehouse	410	10.9	88
Office	310	18.7	11
Computer Centre	311	27.2	4

Impacts on property prices

Analysis of pre-post 2005 flood has shown little or no evidence of falls in the values of residential property post flood and the market in Carlisle has shown no depression, see Figure 4.2.

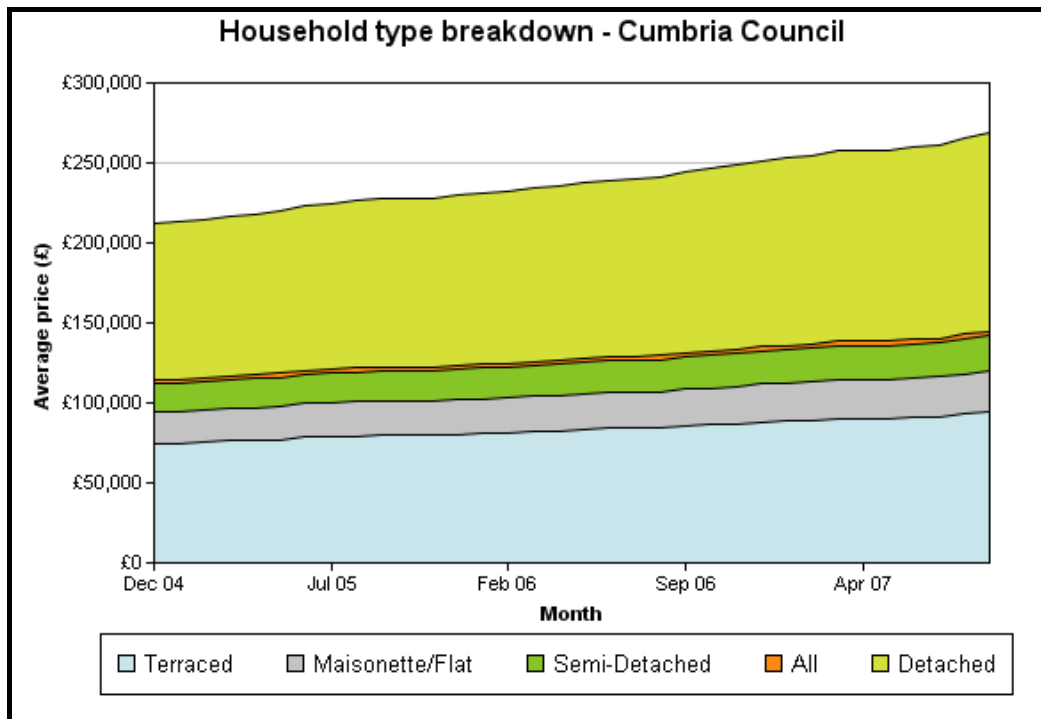
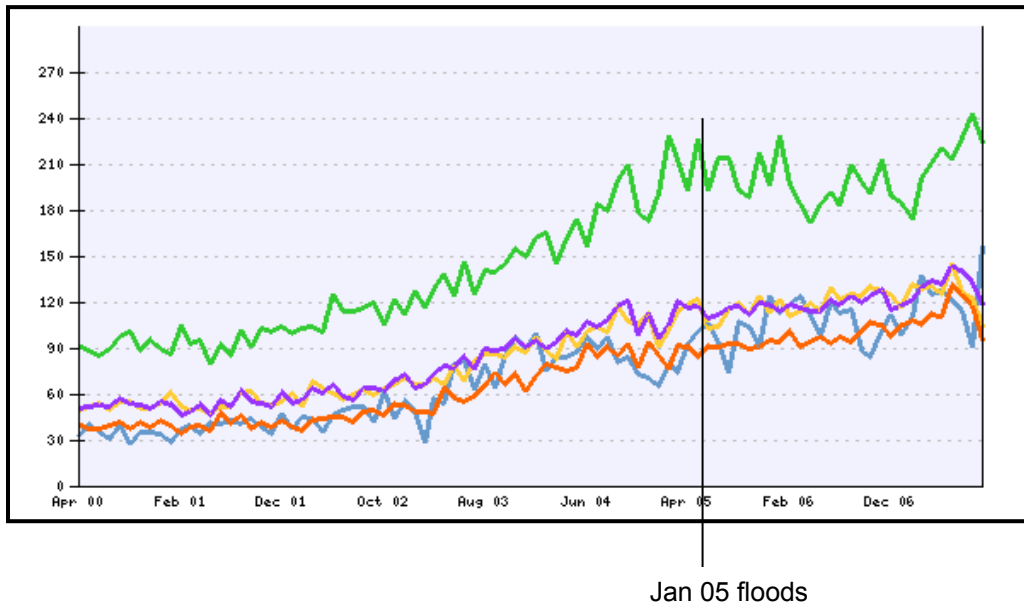


Figure 4.2 Household-type breakdown – Cumbria Council

A minor downturn is seen around the immediate date of the floods (see Figure 4.2) but the general trend since is upwards, but with some seasonal fluctuations. It is assumed that the schemes under construction are alleviating fears of future flooding and that other social or economic advantages of moving to a town or city that just happens to be on a flood plain outweigh the disadvantages of a potential flood even when memories are raw from past flooding.



Source: www.home.co.uk

Figure 4.3 Average Property Selling Prices in Carlisle (£000's)

Property trends could possibly be taken to post code level for analysis but consultations with estate agents were used as a means to verify that flooding is not a contributory factor to depressing the house market.

Wider Benefits & Regional development

The flood of 2005 was a major catalyst for re-development in Carlisle but its realisation is wholly dependent on the implementation of post-2005 FCERM activities. The Carlisle Renaissance Development Framework and Movement Strategy (DF&MS) study was commenced in November 2005 in the immediate aftermath of the floods. A Task Group of local, regional and national public sector organisations was convened to bring forward a long-term vision for the regeneration of Carlisle. This ambitious project will redevelop the heart of the city as a means to address regional development and employment issues in what is one of the most deprived regions in the NW of England. The City Council set out six high-level objectives for the renaissance of Carlisle:

- Establishing Carlisle as a Learning City (improving educational attainment, participation)
- Strengthening the City's economy (securing jobs and growth)
- Establishing sustainable communities (tackling multiple deprivation)
- Growing the visitor economy (attracting more leisure and business visitors)
- Expanding and revitalising the City Centre; and
- Improving movement into and around the City

Significant benefits may be anticipated from a successful Renaissance initiative. The two proposed development sites, Rickergate and Caldew Riverside, consist of a large scale of mixed use development to provide modern desirable retail units to meet unsatisfied demand; create good quality civic and private sector offices to stem the flow of office occupiers out of the City and to attract inward investment; bring forward good quality City Centre apartments; and create good

quality car parking to service new development and existing City Centre uses. Various options are proposed but even moderate options will generate over 2600 jobs and deliver over 70,000 sq.m of office, commercial, retail and residential space.

Both the core developments are within the flood plain which by 2010 will have a comprehensive 0.5% per year standard of protection. However, the Project Appraisal indicated significant residual (above design standard) losses assuming the existing land use and these residual losses are likely to remain, if not become a greater issue, following completion of development. With the potential for a denser use of the flood plain and significant residential development, the incorporation of preparedness planning and resilience/resistance measures into the strategic development is very real.

What is the impact on different interest groups?

A summary of the distributional impacts is presented in the template diagrams in Figure 4.4 below.

Carlisle - Capital Scheme

Template:

FCERM Activity Type: **Changes to probability**

FCERM Activity Measures **Flood defence scheme**

Stakeholder		Impact			Evidence / Comments	
Type	Sub-class	Benefit Type	Source	Value (examples in £ Million)		
Funder	Resident	Direct Monetary (Cash)	Change in Tax receipts	36.4	Initial funding for scheme from national and local council tax payers. There were only very minor other contributions (CCC & Toby Inns)	
	Business					
	Land Owner					
Conduits	Funding conduits / contributors	Direct Monetary (Cash)	Provision of funding	0.0	Grant in Aid schemes	
				EA		36.4
				Carlisle CC		0.0
	Construction & services		Contractors	23.9	Further breakdown of contractors costs according to fees, labour, materials, etc. available	
			Consultants	3.7		
			Other	16.2		

Receptor	Resident	Household	Direct	Change in level of risk	92.8	E&P 1489 properties and C&CC 1900 properties. Also intangible benefits from peace of mind/reduced worry.
	Business	Commercial			138.9	E&P 45 properties and C&CC 430 properties. Also intangible benefits from peace of mind/reduced worry.
	Resident	Household	Indirect	Change in insurance premiums	?	No clear evidence of reduced insurance costs as yet.
	Business	Commercial			?	No clear evidence of reduced insurance costs.
Opportunist	Asset Owner	Land owners & Developers	Indirect	Change in development and regeneration potential	?	No evidence of long term change in house prices.
	Amenity User		Direct	Change in level of risk	?	Some benefits to locals, visitors, etc.
	Insurer		Indirect	Change in insurance liabilities	231.7	Reduction in liabilities due to reduced level of risk to domestic and commercial stock.
Wider benefits	Economic				Yes	Regeneration of local area and significant potential for employment and other benefits under the Renaissance initiative potential for
	Social				Yes	Regeneration of local area and significant potential for employment and other benefits under the Renaissance initiative potential for
	Environmental				No	Investment in some environmental improvements and some potential heritage benefits

Figure 4.4 Carlisle - Beneficiary impact template – Flood alleviation scheme

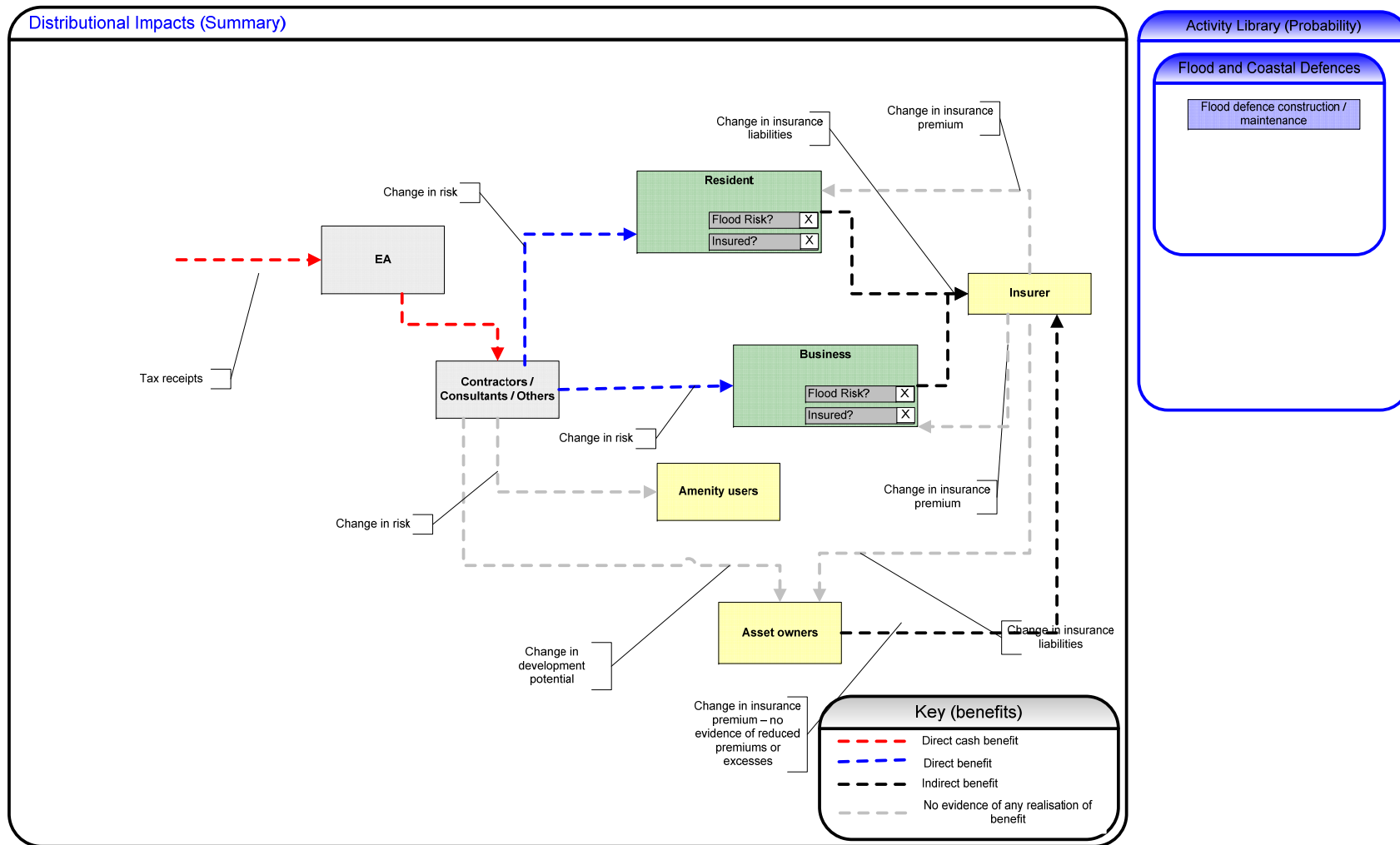


Figure 4.5 Carlisle – Beneficiary impacts – Flood Alleviation Scheme

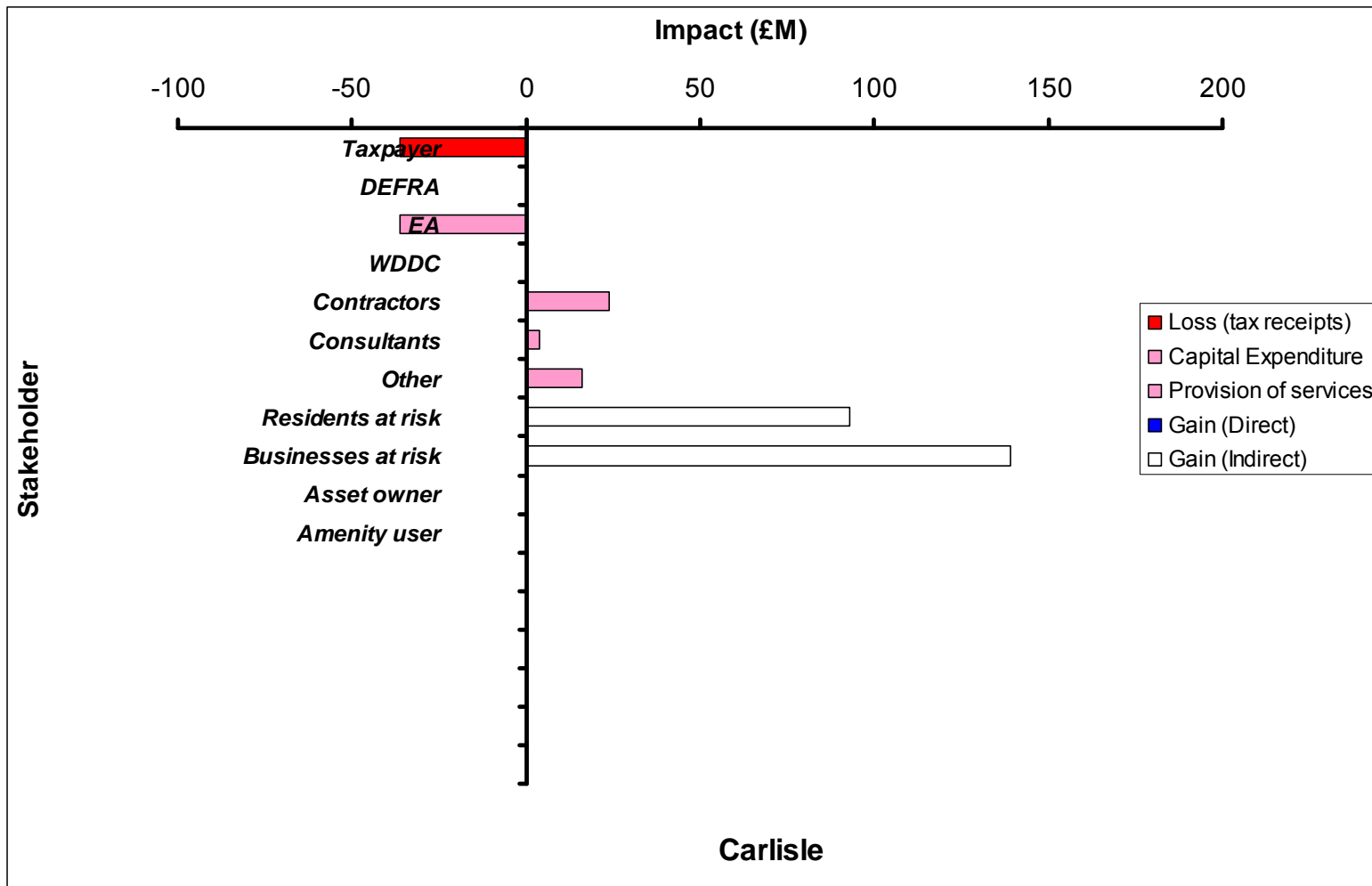


Figure 4.6 Carlisle – Distributional impacts - Flood Alleviation Scheme

What gaps in our knowledge/data limit the above analysis?

The analysis comes at a point in time whereby the implementation of the schemes are on-going. A clearer picture of who actually benefits will emerge as time progresses, including the wider benefits of the scheme should the Carlisle Renaissance initiative come to fruition.

Much of the information on benefits (eg damages avoided) is drawn from PARs and the accuracy of the information is dependent on the accuracy of the base data used in the PAR process.

What are the conclusions as to how the gains and losses are distributed?

The benefits from the E&P and C&CC schemes are primarily to local beneficiaries including some 3389 residential properties (E&P 1489 and C&CC 1900) and 475 commercial properties (E&P 45 C&CC 430). The configuration of property in the flood risk zones of the E&P and C&CC schemes varies considerably, giving a marked difference in the distribution of benefits.

The E&P scheme is largely a community scheme benefiting a swathe of householders living in the flood zone. On the other hand, the C&CC scheme predominantly benefits non-residential private enterprises and a few public buildings and facilities. At first sight, it appears the benefits of the C&CC scheme are spread across a diverse range of small local businesses but evidence also suggests that the major share of the benefits from this scheme are attributed to only a handful of the larger business concerns. Although the two schemes are distributionally different (community-focus versus commercial-focus) it could be argued that the C&CC scheme also brings community benefits by securing jobs and employment.

The wider society benefited through the employment available as a result of the work to contractors and sub-contractors. More would need to be known about where they resourced their labour from in order to assess how widely these potential benefits were spread in the society.

The 2005 flood was regarded by Carlisle City as a tipping point to regenerate the floodplain and the disaster itself forms the gel for community commitment to the Renaissance project. But, the Renaissance would not happen without the new schemes and the E&P and C&CC schemes and these have acted as a major catalyst for the initiative. The wider consequences of the initiative are likely to be significant and to provide substantial employment and development opportunities to the city, and the region as a whole.

4.3 Carlisle Case Study – Flood forecasting and warning

What are the characteristics of the FCERM policy/activity

Flood forecasting and warning provide advance warning of conditions that are likely to cause flooding to property and a potential risk to life. The main purpose of flood warning is to save life by allowing people, support and emergency services time to prepare for flooding. The secondary purpose is to reduce the effects and damage of flooding.

What are the likely impacts of these measures?

Flood warning systems can provide a reduction in losses through a number of means including: the timely operation of flood control structures (e.g. gates, temporary flood defences) preventing inundation of property and land; pre-event maintenance operations to ensure free channel conveyance; the installation of flood proofing measures (e.g. sandbags, property flood barriers); and the removal of property to somewhere above the flood level or out of the flood plain. Reductions in losses include reduced damages to property and other material effects and reductions in loss of life and injury, and the damage caused to human health and long-term well-being. Such losses are difficult to quantify in economic terms but are important considerations when evaluating benefits and resource flows.

Who are the funders of these measures: those who pay for flood and coastal risk management?

The National Flood Forecasting System (NFFS) strategy completed in 2003 costed the preferred option for improvement of Forecasting and Warning at £15.946 million (Capital £10.506 millions and Revenue at £5,440 million) with benefits at £35.4 millions over a 10 year project time horizon). The Benefit cost ratio was therefore 2.22. The costs allocated to NW region, funded through the Local Flood Defence committee was £1.392 million with annual revenue costs of £134,300 split as 41% maintenance support, 44% CIS and 15% EA staffing.

Who are the gainers and losers from these measures? What is the value of these gains and losses?

The benefits associated with flood forecasting and warning are inextricably linked with the effectiveness of the warning dissemination programmes and the activities of the public and supporting agencies (both voluntary and official) in their response. The benefits can be defined as ‘the reduction in losses (tangible and intangible) resulting from the provision of a warning when compared to the situation prior to the operation of the warning system. Benefits of the NFFS are not apportioned regionally let alone locally but apportioning Investment in Targets to achieve increased benefit by 2012/2013 showed the split shown in Table 4.6.

Table 4.6 Forecast benefits of the National Flood Forecasting Scheme

Targets	Investment in Targets	Forecast Benefits	% increase per £10 ⁶
	£10 ⁶ into each target	increase in %	
	T	B	B/T
Damage Reduction:	9.2	10	1.09
Coverage:	2.0	10	4.97
Reliability:	7.8	15	1.93
Residents Available:	0.6	17	29.57
Residents Able:	0.6	5	8.70
Residents Effective:	2.9	35	12.17
	92		

Damage reduction was the key Target for investment with a modest 10% increase over the 10 year investment period. It remains to be seen how this benefit was either estimated or the success of the investment reviewed. Evidence from Carlisle suggests that this priority target from investment at best is not being measured or at worst not being achieved.

In January 2005 in Carlisle, flood warnings were sent out by EA to those who were signed up to the flood warning service but only 50% of people within flood warning areas had signed up to receive warnings. In all, 13,875 individual Automatic Voice Message (AVM) calls were made and 74% of calls were answered. The efficacy of the warnings was hampered however as some recipients warnings only after floodwaters (from surface or ground water sources rather than river flooding) had entered their properties.

The results published for a Defra/EA project on Improving Institutional and Social Responses to Flooding suggests that savings relating to avoiding physical damage to possessions is low and priorities lie in protecting life and then irreplaceable items and memorabilia.

Keeping Flood Forecasting and Warning dissemination as a high profile activity, including education on appropriate action, can help to maximise the benefits. However, without expenditure and education on '*what to do in the event of receipt of FWD*' there will be few beneficiaries and greater residual losses. Community effort to improve ability, availability and believe in the efficacy of FWD can increase effectiveness from as low as 5% to a target *maybe* greater but rarely more than, 50%. Community planning is fundamental to this process.

What is the impact on different interest groups?

The benefits of flood forecasting and warning services are often related to damage savings however it is suggested that in reality making people (and their homes) safe prior to each flood event is the major driver, and saving possessions with a predetermined market value is secondary. Further research into what the 13,875 AVM recipients did following the call may provide a better picture of what the true benefits were but in the absence of such information a more detailed analysis has not been progressed.

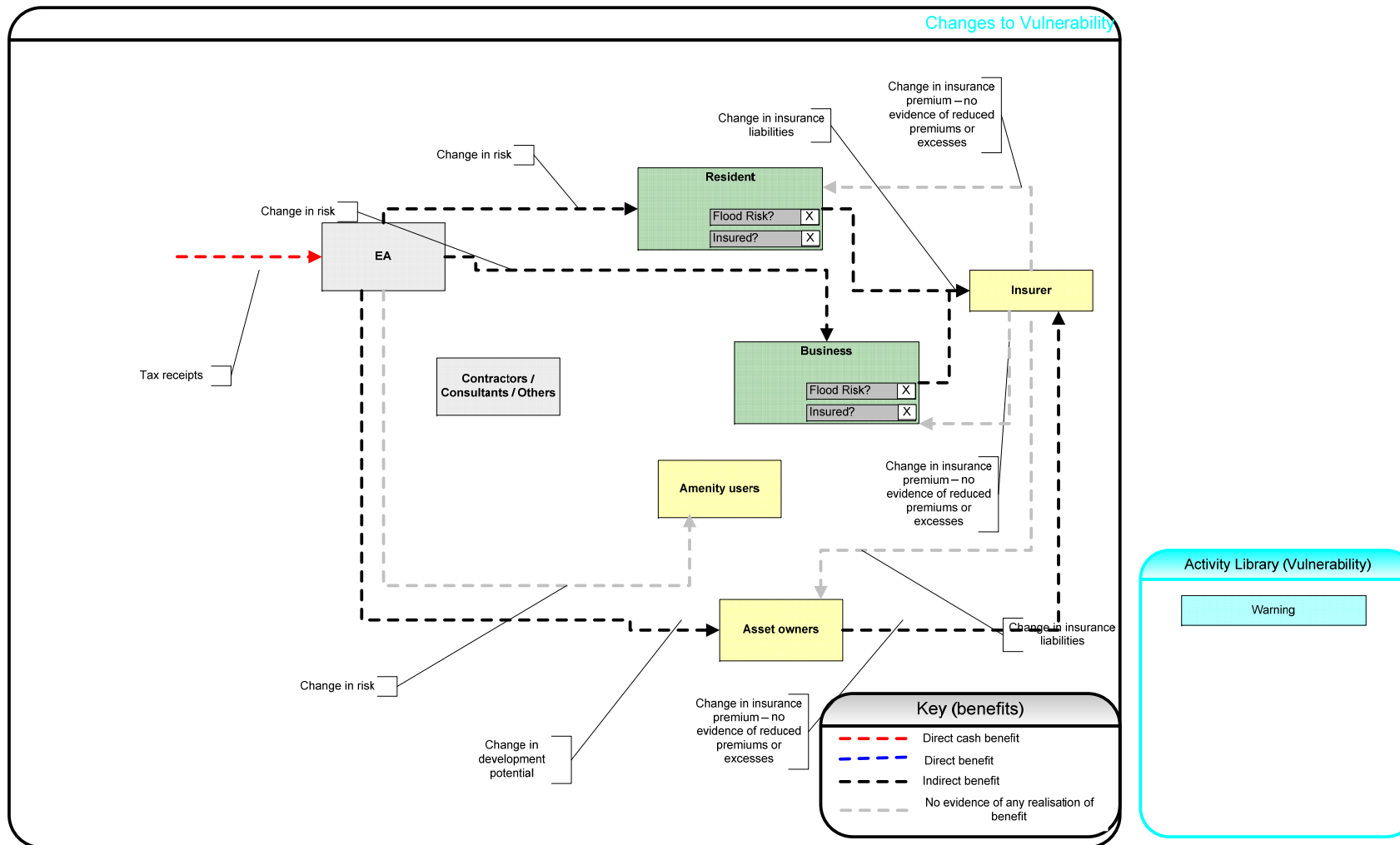


Figure 4.7 Carlisle Case Study: Beneficiary impacts – flood forecasting and warning

4.4 Carlisle Case Study – Emergency Response and Recovery

What are the characteristics of the FCERM policy/activity

Dealing with the impacts of flood events through emergency planning and response is a core FCERM activity. At the national level, Defra has the lead role in Government for flood emergencies and a lead department plan sets out the co-ordination arrangements at local, regional and central levels for flooding from rivers or the sea. The Government has set up regional resilience teams in each of the English regions to enhance the co-ordination of planning for wide impact events, such as major flooding.

What are the likely impacts of these measures?

Emergency planning and response aims to minimise the risk to life of flood events, to provide rapid response to events, and to aid post-flood recovery.

Who are the funders of these measures: those who pay for flood and coastal risk management.

Neither the City of Carlisle nor Cumbria County Council Emergency Planners (including Fire and Police) have a budget reserved for flood emergency response and recovery, or for that matter dealing with any unforeseen disaster e.g. foot and mouth or a plane crash. Thus an estimate of direct and indirect cash flows is not appropriate. Under the Civil Contingencies Act there is a statutory responsibility on Local Authorities to prepare for and act on an emergency and there is therefore no difference in contingency funding set aside for emergency services and recovery programmes either prior to a flood event, during a flood event or after the standard of service of flood alleviation measures is raised. Quite simply there is no budget.

It is only the local authority reactive maintenance budget that may be tapped into to offset emergency and recovery costs prior to any claim to Central Government for reimbursement. The County Highways budget of £20 millions includes a £1.2 million reactive budget which is the main source of emergency funding and direct labour the main source of manpower. Drawdown on these resources during a flood event can leave road maintenance underfunded with a negative effect on the County road user in subsequent years.

For Carlisle City, Environmental Services have a capital and revenue budget to cover food safety, environmental health, waste collection etc. and in the event of the need to draw on this budget to cover emergency response and recovery, then the costs come from the general revenue budget also at the future expense of other budgeted expenditure.

There are three ways Carlisle City Council or Cumbria CC attempted to re-coup flood emergency planning and response costs. Following the January 2005 floods, mechanisms included:

- Insurance cover on local authority property
- The Bellwin fund
- Costs met from the City's Revenue budget

Of the £7.9 millions the flood cost the City Council directly (not the wider community), the Insurance settlement negotiated amounted to £6.65 million, the Bellwin formula, negotiated with ODPM yielded a further £0.41 million leaving £0.866 million to be funded through the Council's own revenue budget.

Of the total costs of the flood to the City Council, 83.9% were met through insurance re-imburement, 5.2% through the Bellwin scheme and 10.9% (from £1.07 million set aside) funded through the City Council Budget Allocation.

Of the insurance claim, 56.2% covered damage to buildings, 29.0% covered damage to contents – including losses to personal items belonging to members of staff - (of which two thirds covered computer contents) and 14.3% covered Business Interruption losses. The level of excess totalling £36,000 borne by the City was relatively modest in relation to the size of the claim. The flood increased the City Council's insurance premium costs in 2005/06 by over £100,000. The gross insurance claim represented over 40% of the authority's estimated net annual revenue budget for 2005/06.

The Bellwin Scheme of Emergency Assistance to Local Authorities was the second source of funding available to meet the costs of the flood and its aftermath. The essence of the scheme, which is administered by the ODPM (as was), is that it covers additional costs incurred by authorities in dealing with emergencies and other situations out of its control that would not normally be covered by insurance. There is a threshold below which no costs can be claimed and in the case of the City Council this sum was just over £27,000. Expenditure above this sum can be claimed at a rate of 85% which means that an authority has to bear £15 out of every £100 spent above the threshold as well as all costs below it.

The Carlisle floods of January 2005 are thought in total to have generated the largest overall insurance losses in this country since the October 1987 hurricane that devastated the South of England. As such Carlisle City did receive a special discretionary grant of £1.5m from the ODPM (as was) that was used for a variety of programmes to assist in the alleviation of housing conditions in the flood affected areas of Carlisle.

Who are the gainers and losers from these measures? What is the value of these gains and losses?

Carlisle's special awards by ODPM set a precedent for others (eg Hull) and presumably any future flood emergencies, so the tax payer through central Government will pick up a major future share of flood emergency and recovery financing. However, these awards/funds may:

1. Not be granted, and
2. May or may not cover the full costs of response and recovery.

There are therefore two ways to balance the budget:

1. Raise Council Tax (an unpopular manoeuvre; council services are generally monopolistic with no opt out and/or alternative sourcing)

2. Reduce the planned expenditure on non-statutory services such as leisure services, cultural activities, parks and recreation

Some 5,400 people took advantage of the ODPM awards of £278 per head but, should this emergency and recovery funding not have been supported by Central Government (the general tax payer) the whole population of Carlisle (106,000) including the flood victims would have lost out on £1.5 million of non statutory-services (Parks maintenance, swimming pools and other leisure activities, reduced library hours, informal cultural activities, e.g the November firework display) foregone or £14 per person (representing a net gain for flood victims of £264). Likewise had the £7,927,378 had to be funded through Carlisle's revenue budget alone without the National (Bellwin) and Insurance safety nets then the 106,000 population of Carlisle could have foregone future services to their community worth some £75 per head.

Anecdotal evidence shows that road maintenance is suffering because funds are restricted as money used in emergency response and recovery is clawed back by the Council. Road and pavement maintenance was the first service to suffer. However the impact of this is difficult to measure as cutbacks in some services may be to allow increased expenditure on, for example, increased adult care. What is more, some services affected by flooding e.g. car parks are still losing income as the public are still putting their confidence in the security of other car parking sites often private, used in the aftermath of the flood event.

The actual shortfall over and above the Bellwin and Insurance reimbursement at £866,115 equates to just over £8 per head of the City population for recovery costs paid directly from the City's revenue budget and therefore the potential cost per head of foregone for non-statutory services.

Bellwin only covers immediate emergency costs but not long term recovery costs including clean up and restoration of the many local authority properties and services (fire and police station and civic buildings). Long term recovery was generally done using direct labour diverting them from normal duties thus affecting the quality of civic services. If labour for recovery was outsourced at competitive market rates then the compounded effect on future reduction of services would be more grave than this exercise describes.

The Voluntary (Charitable) sector (Help the Aged, Red Cross, Salvation Army etc.) were fundamental to the recovery effort with up to 450 volunteers working over 2 years. It is relevant that the resources necessary to support these voluntary sectors is factored into emergency response and preparedness costs and benefits. An important initiative in Carlisle was to promote this voluntary aid under one branded name – Communities Reunited – to avoid conflict and channel all volunteer efforts. The resources involved should not be underestimated with £300,000 spent in 2 years, besides the administrative infrastructure of £200,000.

What is the impact on different interest groups?

Emergency planning and response is a complex issue with respect to *Who Benefits?* The above analysis is centred on costs and benefits as a result of a

major flood event. As no funding is specifically set aside for such services, it is only largely as a result of a significant flood event that costs are incurred and benefits or disbenefits felt.

In theory, FCERM activities to reduce flood risk will:

- reduce costs to local authorities for emergency response
- bring further benefits to local authorities through avoidance of uninsured losses, increase premiums and increased excesses
- reduce insurance company liabilities and payouts
- bring wider benefits to the local community by maintaining budget allocations for other vital services
- benefit national tax payers by reducing the draw on central Government emergency funding, such as the Belwin fund.

Due to the complex and site specific nature of these different factors a quantitative distributional impact analysis has not been prepared.

4.5 Carlisle Case Study – Additional assessments

Case study findings from Carlisle revealed some of the wider benefits that FCERM activities can bring. Additional assessments were undertaken related to utility services that help to demonstrate aspects of business interruption due to flooding and to highlight how even those living outside of flood risk areas can suffer from flood events.

4.5.1 Urban drainage improvements

Flooding in Carlisle is complex as improvements to the flood defence standard of service without improvements to the urban drainage system will create a potential for exacerbated localised sewer flooding as outfalls are ‘flood locked’ when flood water is high within improved embankments of the Eden, Peterill and Caldew.

United Utilities (UU) have taken a responsible and proactive attitude to improving the local sewerage as part of their commitment to Making Space for Water. United Utilities are undergoing a £20 million upgrade of about 10km of sewers and associated pumping stations in the City. The work was not done as part of OFWAT DG5 (UU set aside £100 million for this purpose) nor part of the AMP4 business strategy (circa. £1.5 to £2 billion in UU’s area). Drivers for the work include enhancing the company profile and reputation, as a commitment to Making Space for Water, but the works will increase the asset base and add to the Company valuation.

The funding for the improvements is provided ultimately by bill payers to UU’s services. Table 4.7 summarises those benefiting from the improvements to urban drainage:

Table 4.7 Urban drainage improvements

	Willowholme Area	Warwick Road Area
Flooded in January 2005	10	40
Benefiting in wider drainage area	200	1500

Thus in crude terms the £20 million capital improvements to urban drainage equals a £400,000 per property flooded if one considers only those affected by the 2005 flood but £11,765 per property if the costs are spread to the wider drainage area.

4.5.2 Impacts on services and utilities

The wider consequences of electricity, water and wastewater outage as a result of flood are demonstrated below based on an analysis of the impacts of the 2005 flood in Carlisle. FCERM activities that reduce such flood risk are clearly benefiting a wider hinterland of groups beyond those in flood risk areas alone.

Power Outage

In 2005, the winds and floods caused supplies to be lost to some 178,000 customers, with some customers being without supply for seven days. Some 60,000 of these customers were without electricity because of flooding incidents alone and the windstorm accounted for a further some 118,000.

River levels rose by 11 to 12 feet submerging the Carlisle 33kV BSP under 3 feet of rapidly moving water. The flooding had two main effects on the local power distribution system; firstly, the loss of the main power infeed to the city of Carlisle, Carlisle Bulk Supply Point, and secondly, flooding of many 11kV and LV voltage assets in the Civic Centre area. Carlisle BSP is situated adjacent to the banks of the river Eden on the site of the old Carlisle Power Station. The substation comprises three 60MVA Grid Transformers, associated 132kV equipment and the main 33kV GIS switchboard. The floodwater did not penetrate any primary apparatus and damage was limited to secondary control wiring and protection relays. The floodwater caused this secondary equipment to short circuit, which resulted in all of the 33kV circuit breakers on the site tripping. This directly disconnected the 60,000 customers. The equipment had been extensively damaged and had suffered significant corrosion of the delicate components by the sewage contaminated water. The switchboard was re-energized at 20:00 on Sunday the 8th and supplies progressively restore. By 23:00 supplies had been restored to all areas outside of the city centre; which was still submerged.

Clearly customers in the first 4 days without supply were suffering significant anxiety for being quite literally left in the dark.

Before electricity could be restored to flood damaged property, meters and wiring had to be checked and approved. UU staff carried out cut-out and meter repairs at each property and reconnected supply once the internal wiring had

been checked. Some 150 properties suffered such extensive damage that UU was unable to restore supply; in many cases properties were subsequently demolished.

Under regulatory license conditions the storm was of such a magnitude that service standard exemptions known as the 'Interim arrangements' came into force. Under these, customer compensation payments are made after 48 hours without power rather than the normal 18 hours.

All of the 178,000 affected customers in Cumbria and North Lancashire received a letter from UU by Friday 21st January to apologize for the inconvenience caused by the power outages and to explain the scale and complexity of the incident. and our response to it. By February 2005, UU had received around 22,000 claim forms and of these around 10,000 had been fully processed with a total value of £752,632. Additional costs to UU included up to 45 staff working within the Customer Liaison Team to process compensation claims for loss of service. At the height of the flood some 99 staff were drafted into Carlisle alone to manage the clean up and reconnection process.

Box 1: Power outage in Carlisle (2005)

- 250 high and 400 low voltage faults were reported (*direct damage*)
- 250,000 customer were without power at height of outage (*indirect damage*)
- 175,000 customers restored the same day (*short outage for majority; longer for few*)
- 1,000 staff involved until return to normality (*high additional resource costs*)
- Willowholme 132 kV sub station under 4 feet of water cutting off 60,000 Carlisle customers including businesses (*direct damage*)
- 13 other Carlisle sub stations flooded (*direct damage*)
- 60,000 customer calls about loss of supply (*stress and anxiety*)
- 3,000 sandbags filled to 'protect' Willowholme (*resource cost*)
- £4.5 million spent restoring supply to Carlisle alone (*resource cost*)
- £16.8 million to be spent area wide to provide future resilience (*direct cost to UU*)
- Remote control operations will speed up future repair time

Waste Water and Water Treatment

The most significant asset base affected was Carlisle WwTW. Located on Willowholme industrial estate and adjacent to the River Eden. The treatment works was engulfed, with all phases of treatment affected significantly. The site was inaccessible for 2 days after which attempts at process recovery began. Some 117 waste water treatment facilities were affected to some degree by flooding.

The impacts of the flooding on the availability of power at the sites affected by flooding was significant. Typically low lying and adjacent to watercourses, in many cases the reinstatement of a power supply was not sufficient to reinstate process. Field Service Engineers needed to be deployed to dry and replace switchgear, motors and panels damaged by water. This was a significant task, to meet this challenge an extra 30 or so Field Service Engineers were deployed from the region to support the Cumbria incident.

The immediate and major effects associated with the above were failure to comply with numerical and descriptive discharge consents at WwTW and unconsented discharges at WwPS. Any risks to public health would be associated with the conveyance of dilute Wastewater in flooded areas. It is unlikely that the flooding / power loss issues at WwTW further exacerbated any risks already prevalent as a result of network surcharge in residential areas.

Repair costs for pumping stations were £170,000, excluding additional costs for Willowholme Waste Water Treatment works. There were 18 Primary Water Treatment Works and associated assets impacted upon. Some were flooded, others affected by power failure and some inaccessible as a result of flooding. A further 47 booster/pumping stations on the network were also affected. Process damage and network damage amounted to around £250,000. 1664 properties went without a water supply for a period in excess of 12 hours and this incurred compensation payments of £41,939.

Box 2: Waste Water Treatment Summary for Carlisle (2005)

- 137 WWT works 'potentially affected' in Cumbria (physical damage and environmental impact)
- Generators supplied
- All but handful back working in 3 days
- All working in 10 days
- Numerous pumping stations damaged – panels and pumps replaced
- Willowholme treating 100 million litres per day under 8 to 12 feet
- River level higher than works outfall
- Pumping by Fire Brigade (part of emergency services additional resource costs)
- Administration buildings out of action for 3 months
- Multi-million pound investment required to improve the performance of the sewerage system in Carlisle
- 20,000 people sought claims against UU's guaranteed Standard of Service. £1.5 million paid out to customers

4.6 West Bay Case Study – Coastal Defence and Harbour Improvement

What are the characteristics of the FCERM policy/activity

The West Bay Coastal Defence and Harbour Improvement Scheme was designed to address a range of issues affecting West Bay:

- Coast protection: safeguarding the West Bay frontage against coastal erosion.
- Flood defence: providing flood defence for households, commercial properties, and amenities
- Harbour: improving harbour access and facilities.
- The amenities of West Bay: maintain and enhance the facilities.

What are the likely impacts of these measures?

The likely impacts are anticipated to follow those of the associated a change in probability of flooding.

Who are the funders of these measures: those who pay for flood and coastal risk management?

The ultimate source of funding for the scheme is derived from national and local council tax payers. It has not been possible to establish what proportion of WDDC's funding for the scheme drew on revenue raised via council tax (ie from local residents and businesses) and what proportion came from central government (ie from national tax payers) under this present project. However, the local authority did indicate this could be achieved given sufficient time and resources for local authority accountants to access the data.

The Project drew on multiple funding sources (see Table 4.8) according to the administrative responsibilities and the project was considered by the DTI to be a good example of partnership working. These included:

- The Environment Agency (EA): is responsible for flood defence management on the East Beach.
- The local authority, West Dorset District Council (WDDC), is the responsible Harbour Authority
- WDDC is also responsible for coastal protection and flood defence on the West Beach
- The EA is responsible for fluvial flood defence on the River Brit.
- Defra allocated a Fishing Harbour Grant to cover 50% of the costs of the harbour improvement

Table 4.8 Breakdown of contributions

Contributor	%	January 2006 (VO 4 application) £
Defra fishing harbour grant	3	609,580
Defra coast protection grant	14	2,840,644
Defra flood defence grant	33	6,630,200
WDDC capital budget	3	609,580
WDDC revenue budget	34	6,930,927
Environment Agency	13	2,698,408
TOTAL	100	£20,319,339

Who are the gainers and losers from these measures? What is the value of these gains and losses?

The following key groups were considered in the analysis:

- People: residents and commercial property owners whom the scheme aimed to protect from flooding

- Service providers (conduits) such as consultants, contractors and others carrying out the work
- Development and regeneration benefits
- Harbour users
- commercial fishing boats
- leisure boats
- Amenity users of West Bay facilities
- Local tourism and other businesses
- Insurance industry

Increased usage of the Harbour also had potential to act as a catalyst for the regeneration in the area.

Direct monetary beneficiaries

Approved and requested grant sums and expenditure are given in the table below. The figures show the direct payments by WDDC as the Project Manager to other beneficiaries.

Table 4.9 Breakdown of contributions

	March 2002 £	Sept.2003 (VO 1) £	June 2004 (VO 2) £	January 2005 (VO 3) £	January 2006 (VO 4) Requested £
Contractors	11,642,800	14,895,750	16,820,354	17,592,742	18,400,000
WDDC staff fees	200,125	360,997	398,278	453,000	453,000
Engineers					
Consultants fees	983,400	724,391	917,650	1,036,000	1,036,000
Solicitors fees	-	-	65,339	65,339	65,339
Compensation/Supplies	41,326	72,692	72,456	140,000	300,000
E.Beach CCTV	-	-	-	65,000	65,000
Flood Risk Assessment	-	-	-	-	-
Rates-Site offices	-	-	-	13,370	Inc. above
Contingencies	1,164,280	-	-	-	-
TOTAL	14,031,931	16,051,116	18,274,077	19,287,881	20,319,339

Source: WDDC – Technical Services Division West Bay Harbour Improvements Scheme Situation Report January 2005 (January 2006)

Contractors

The contractors, were the main direct monetary recipients/beneficiaries of the funding flow. The resources flow was passed on to others as shown below:

Table 4.10 Breakdown of costs items

Element	£ value	What was covered	Resource flow back to national government?
Contractor's plant and equipment	£1,345,601	Hire of contractor's and others equipment	-
Design fees:	£701,499	Salaries, expenses and overhead (possibly 25%)	Income tax on salaries at 25%
Materials	£5,678,184	Rock, sheet piling, concrete etc	-

Element	£ value	What was covered	Resource flow back to national government?
Labour	£1,519,327	Labour costs	Income tax on wages/ salaries at 25%
Site overheads including management and supervision	£3,061,454	Salaries of site/project managers and supervision *	Income tax on salaries at 25% or more
Sub-contractors	£4,582,358	A number of different specialist contractors e.g for concrete, electrical and mechanical, material moving: machinery hire, labour, salaries, overheads and profits	Income tax on wages/ salaries at 25%+
Fee percentage (9.25%)	£1,562,179	Offsite overheads and profit	Income tax on offsite office salaries at 25%+
Pain/gain	£-71,329	Shared loss to cover final costs exceeding target costs	-
Total	£18, 379,274		

Returns to central government

Without a more detailed breakdown, it is impossible to estimate the value of resource flows back to central government. If we assume that 50% of the starred elements were for wages and salaries incurring income tax at 25%, and that 100% of the labour element incurred income tax, the resource flow back to national government in income tax would be an estimated £2,562,490. Materials and supplies would also attract VAT. This is an area that in general would benefit from further research as taxation and returns to government can be significant.

Flood protection benefits anticipated and achieved

The Engineer's Report outlines the property values and the present value damages for seven affected areas in West Bay. For most areas the probability of damage was assessed on joint probabilities of more than one failure event occurring at one time. The models assume that once the flooding occurs the properties are written off because of repeated flooding.

Table 4.11 Flood protection benefits (PVD)

Area	Description	Property value March 2001 values	Number residential	Number commercial	Present Value	Failure resulting in damage
1	Pier Terrace	£2, 540,000	24	1	£2,000,208	a) b)
2	East of Harbour	£40,558,000	254	35	£31,938,747	a) b)
3	Base of West Cliff	£ 1,830,000	12	0	£1,562,701	c)
4	Old Shipyard	£6,600,000	85	13	£5,635,971	c)
5	The campsite	£2,000,000	0	5	£2,399,165	c)
6	West Cliff Estate*	£22,500,00	130	0	£2,,362,450 *	c)
7	River Brit Basin **	£520,000	5	1	£409,491	a) b)
Total		£76,548,000	510	55	£46,308,733	

- Note:
- a) Failure of Piers
 - b) Breach of East Beach Sea Defence Bank
 - c) West Beach/Cliff Sea Wall Failure
- * isolation of area not flooding: cost of restoring access via a link road
** isolation of area but property would be written off as not practical to restore access

Intangible benefits: peace of mind and reduced worry (indirect benefit)

This was considered to be a major benefit to residents and businesses in the area by many of those interviewed. The caravan park management felt that this was the main benefit of the scheme to caravan owners.

Increased property prices and sales (indirect benefit)

Three Bridport estate agents with interests in West Bay were interviewed to establish what impact the scheme might have had on house prices and on the saleability of homes in West Bay. The consensus view was that the scheme had not had a noticeable effect on either prices or sales. The area had experienced property price rises but those in West Bay were regarded as in line with those occurring in Bridport and the rest of Dorset.

Although all felt that the scheme had improved the area to some degree, there was no clear evidence that it was very noticeably easier to sell properties at risk from flooding after the coastal defence scheme was installed. Flood risk was not seen as a major barrier to sales: people were conscious of the issue and asked about it. But there were risks all along the coast and some people were prepared to trade off the risk against a sea view and an attractive environment.

Insurance premiums and excesses (indirect benefits)

No evidence was obtained to support the idea that residents and businesses benefited from reduced premiums or excesses. Since the most recent major flood events affecting West Bay had occurred in the 1970s (1974 and 1979) it is possible that the flood risk was not a live consideration for insurers.

Development and regeneration benefits (indirect benefits)

The Harbour Improvement Scheme could potentially provide benefits to land owners and developers in West Bay in the following ways by:

- Encouraging developers to buy land and seek planning permission for development there
- Making WDDC readier to grant planning permission because of the increased flood protection afforded by the scheme
- Making the EA less likely to object because of the increased standard of protection

Two major site developments took place in West Bay after the initiation of the scheme and both were developments by a small local development company and were within a high flood risk zone. On of these schemes cannot be seen as a clear benefit or disbenefit of the Harbour Improvement Scheme. Outline planning permission had been given to an earlier application and the developers had shown an interest in developing the site in the years prior to the Harbour Improvement Scheme. Other development options have been largely squashed as it coincided with a time when planning policy guidance related to

development in the floodplain was being strengthened through PPS25 and other mechanisms.

Harbour improvements

Harbour benefits aimed to improve safety of access to the Harbour for users, to increase number of days on which the Harbour could be used, to improve slipway access, to increase number of moorings, and to improve Harbour facilities. It was assumed that fishing boats would be able undertake fishing on an increased number of days and choose to go out on 75% of the extra operational days made available. The benefit in terms of increased landings of fish is a PV of £1,517,000 and further benefits due reductions in damage to boats and other factors resulted in a total PV benefit to fishing of £3,047,000.

The benefit calculations were all based on the assumption that the 15 full time commercial fishing boats would continue to operate but by 2008, the West Bay fishing fleet had dwindled to about 10-12 boats of which 5 or 6 were thought to be full time commercial fishing boats. This loss of benefit has however been compensated for by an increase in visiting commercial boats from elsewhere (mainly fishing boats) using the improved harbour facilities.

WDDC had anticipated an increase in revenues with the Harbour Improvement Scheme. During the construction period 2003-2004 annual revenue was £48,000 - £50,000 but this has increased only marginally to £65-70,000.

Amenity benefits

Specific amenity objectives were:

- To maintain current access to all areas and to provide replacement structures where there is current access.
- To use soft structures such as beaches for defence where possible and to ensure no loss of amenity beach.
- To ensure that beach recharge material was appropriate for an amenity beach
- To design structures to maintain existing views
- To provide adequate seating, and provision for disabled/wheelchair users.
- To protect the large number of buildings to the east of the Harbour that are listed buildings and structures

Amenity value for the enhanced enjoyment of West Bay was calculated at £600,000 per year and this would result in a PV of £9 million. Sea Anglers appear to have been specialist losers of the scheme as they can no longer fish directly from the old West Pier.

Benefits to local businesses and the local economy

Over recent years, there has been a complex picture of change which makes it difficult to attribute gains and losses directly to the West Bay Coast Defence and Harbour Improvement Scheme.

What is the impact on different interest groups?

A summary of the distributional impacts is presented in the template diagrams below.

West Bay - Capilla Scheme

Template:

FCERM Activity Type: Changes to **probability**

FCERM Activity Measures Flood defences & coastal protection works

Stakeholder		Impact			Evidence	Comments		
Type	Sub-class	Benefit Type	Source	Value (examples in £ Million)				
Funder	Resident	Direct Monetary (Cash)	Change in Tax receipts	20.319	Initial funding for scheme from national and local council tax payers	Initial funding for scheme from national and local council tax payers. There were no developer contributions.		
	Business							
	Land Owner							
Conduits	Funding conduits / contributors	Direct Monetary (Cash)	Provision of funding	10.119	Breakdown given in Engineer's Report.	Combination of various grants and resources.		
				EA			2.700	
				WDDC			7.500	
	Construction & services		Contractors	Provision of services	18.400	Breakdown given in Approved and Requested Grant Sums (WDDC)	Further breakdown of contractors costs according to fees, labour, materials, etc. available in Contractor's Final Account. Sums include resource flows back to Govt. (eg income tax estimated at ~£2.5M)	
					Consultants			1.036
					Other			0.883

Receptor	Resident	Household	Direct	Change in level of risk	38.500	Engineers Report. 550 homes protected (average £70k PV write off per property assumed)	Also intangible benefits from peace of mind/reduced worry. No noticeable impact on house prices and saleability reported.
	Business	Commercial			7.700	Engineers Report. 55 commercial properties protected (average £140k PV write off per property assumed).	Also intangible benefits from peace of mind/reduced worry
	Resident	Household	Indirect	Change in insurance premiums	?	No evidence was obtained to support the idea that residents and businesses benefited from reduced premiums or excesses.	Most recent major flood events occurred in the 1970s and it is possible that the flood risk was not a live consideration for insurers
	Business	Commercial			?	No evidence was obtained to support the idea that residents and businesses benefited from reduced premiums or excesses.	Most recent major flood events occurred in the 1970s and it is possible that the flood risk was not a live consideration for insurers
Opportunist	Asset Owner	Land owners & Developers	Indirect	Change in development and regeneration potential	?	Old Shipyard/West Quay site & Forty Foot Way/Driftwood site developments.	WDDC and private landowners/developers continue to explore further proposals for redevelopment.
		Tourism facilities		Change in visit numbers	2.107	Various: caravan Park; angling shops; hotels; restaurants; cafes; arcades; etc.	Complex range of factors makes it difficult to clearly attribute gains and losses to the scheme. But, benefits are local rather than regional or national.
	Amenity User	Harbour users	Direct	Change in level of risk	3.000	Main benefits to commercial fishing boats and leisure craft. Anticipated benefits not fully realised but compensated for by increase in visiting commercial boats.	Intangible benefits include enhanced safety and convenience.
		Visitors & sea anglers			9.000	Increased enjoyment by current and new users	Overall, visitors benefit although sea anglers
Insurer		Indirect	Change in insurance liabilities	46.200	Reduction in liabilities due to reduced level of risk to domestic and commercial stock.	Assumed equal to savings from flood and coastal erosion avoided.	
Wider benefits	Economic				Yes	Minor	
	Social				No	No evidence was obtained	
	Environmental				No	No evidence was obtained	

Figure 4.8 West Bay - Beneficiary impact template – Coastal flood defence and harbour improvements

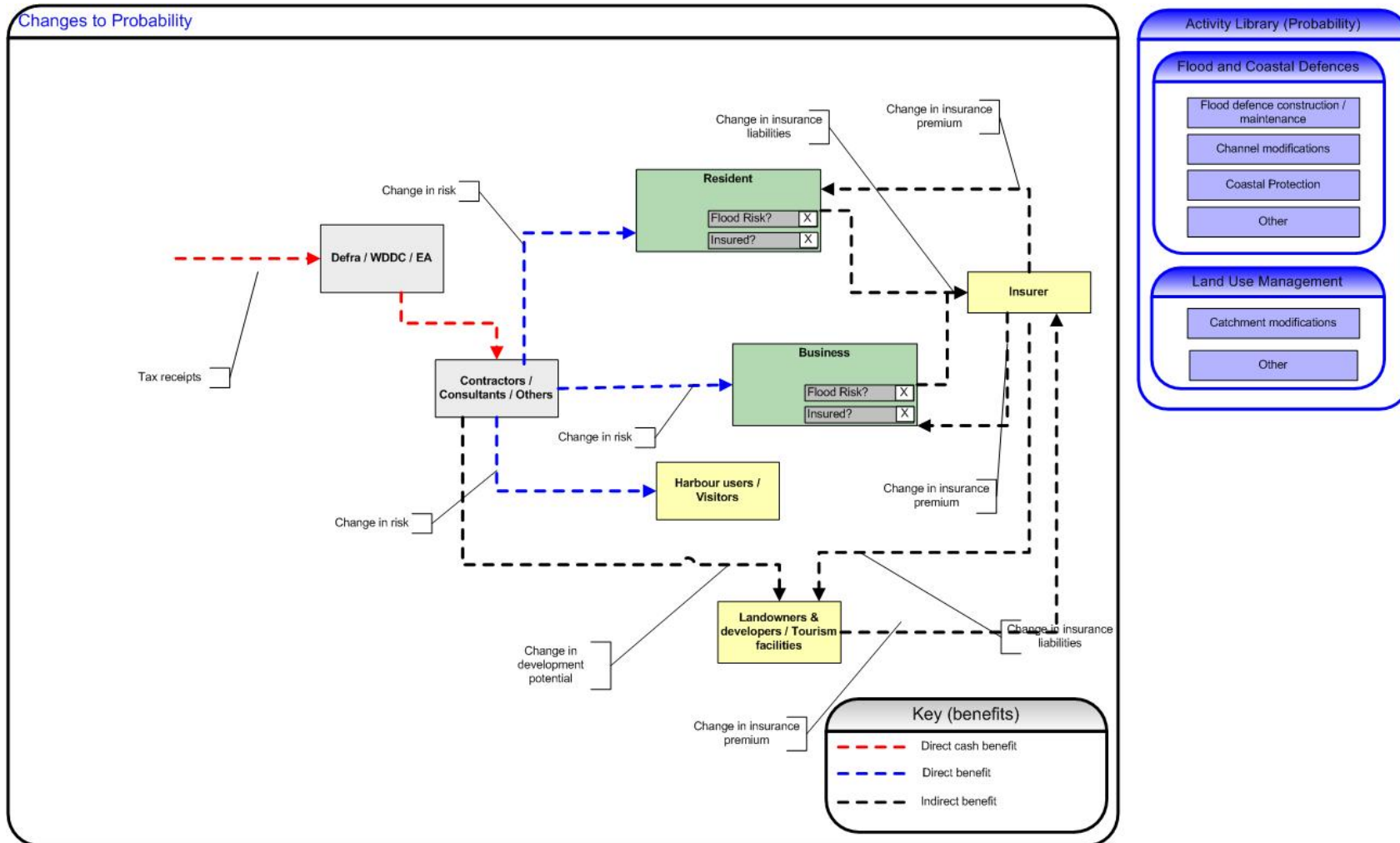


Figure 4.9 West Bay – Beneficiary impacts

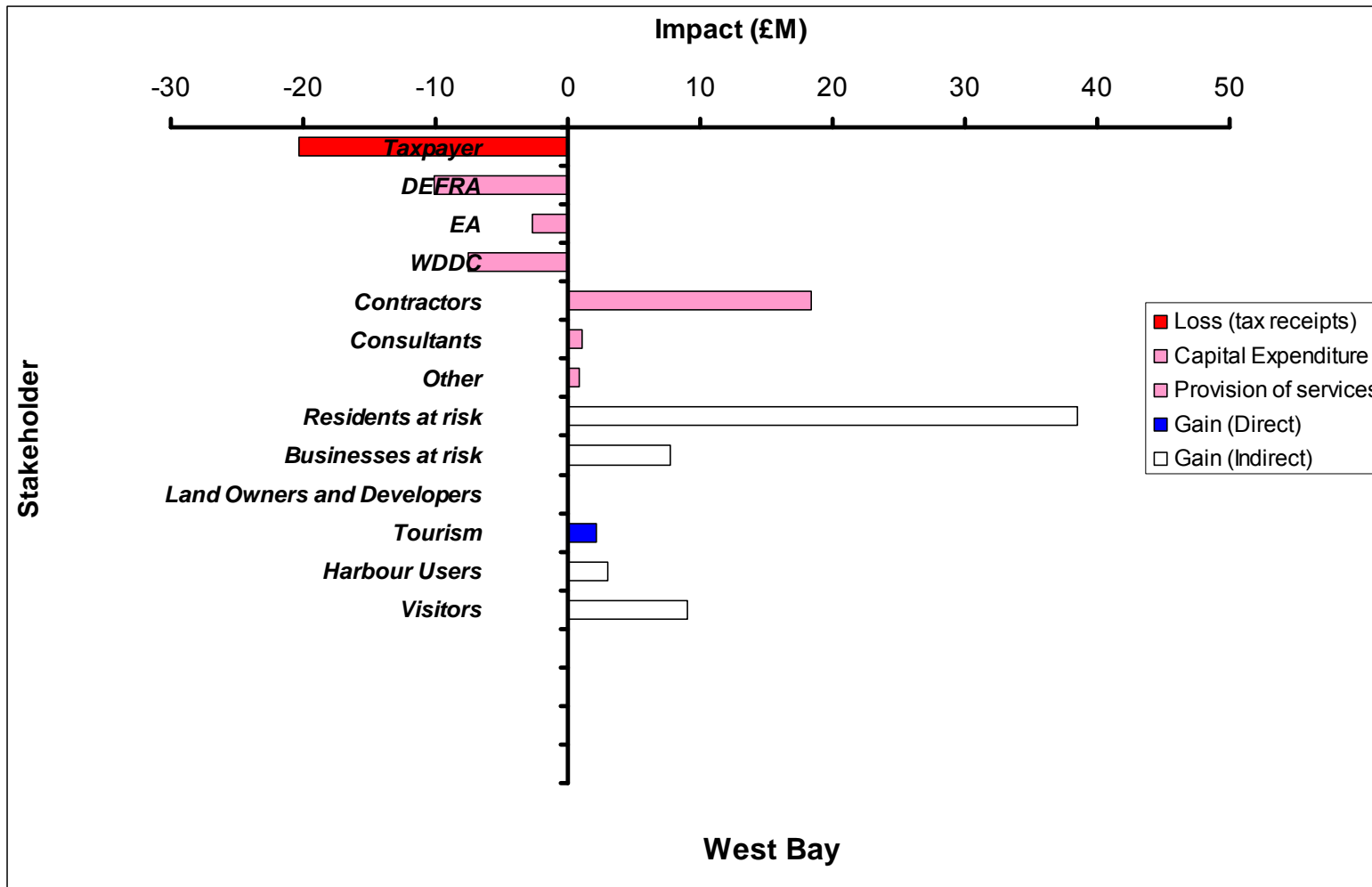


Figure 4.10 West Bay – Distributional impacts

What gaps in our knowledge/data limit the above analysis?

Examining the benefits and disbenefits of the West Bay scheme involves looking for changes over time: either predicting them as in the Engineers Report and the Harbour Improvements Economic Appraisal or looking back on the changes that followed from the scheme, as can be done to some extent in this report. However, what is needed is good 'pre-' and 'post-' information and in many respects that is lacking in this case study.

Furthermore, as with any natural experimental situation, the experimental factor may not be the only factor to change, so that perceived changes that might be seen as benefits/disbenefits of the schemes may be due to other factors. These could include:

- The generally buoyant state of the economy affecting tourism and other businesses, harbour use, and property values.
- Promotional activity of tourism organisations including those arising from the granting of World Heritage Site status to the Dorset and East Devon Coast in December 2001, opened in October 2002 by Prince Charles with West Bay being promoted as the Gateway to the Jurassic Coast.
- Timing of the investigation: the completion of the works is relatively recent (December 2004). It may be too soon for some benefits to be identified.
- Tourism and leisure activities are very weather dependent and this may complicate the picture regarding the recreational, amenity and business benefits of the scheme over the period from 2001 - 2008

In many ways, the West Bay Coastal Defence and Harbour Improvement Scheme is exemplary in the thoroughness with which it examined a range of potential benefits and sought to place money values on them. The key area in which there are gaps in the data are:

- Amenity benefits to local, day and staying visitors. There is a need to quantify the number of these beneficiaries. The car park ticket issue figures used to quantify the benefits are of limited value. There is a need for systematic collection of visit numbers so that the value of these benefits can be properly assessed
- There is a need too for a contingent valuation survey data to assess the benefits that these visitors gain from the enhance Harbour and seafront.
- Not enough is known about the leisure boat users who are significant users of the harbour both in terms of the number of trips they make each year and the value they attach to the improvements to the harbour: a contingent valuation survey could provide this data.
- The impacts on the local tourism and other businesses have not been assessed. A survey of businesses would be needed to provide this information.
- Significance is attached by economists to increases in property values as a mechanism by which those protected from flooding benefit. However, in this study it was not possible to find any evidence of this being the case. A systematic study to clarify whether this mechanism does ever operate would be helpful.

A second observation is that looking back on the appraisals carried out in 2000-2001 it is possible to see that some of the actual benefits may be falling short of the anticipated benefits indicated in the documents. This reflects the inherent difficulty of predicting these in advance, and the challenge of assessing 'whole life' benefits based on a relatively short record of post-scheme conditions. Due care needs to be taken when using pre-intervention assumptions and suggests that reviews of benefits may need to take place 10 or 20 years following an intervention to get a really good idea of the true impacts.

What are the conclusions as to how the gains and losses are distributed?

The benefits were primarily focused on local beneficiaries including 550 households and 55 commercial properties. Anticipated benefits to commercial fishing were not fully realised but are compensated for by an increase in visiting commercial boats from elsewhere.

The local commercial tourism sector benefits from increased day and staying visitors and the FCERM activities are a contributory factor to this. Local communities also benefit from the improved amenity benefits and due to day trippers from Dorset or Hampshire and staying visitors from further a field (London, the South East, and East and West Midlands) visiting the area.

No evidence was available to substantiate reductions in insurance premiums and excesses but no change is assumed then the insurance industry gains through a decrease in liabilities associated with anticipated reductions in estimated annual damages from insured households and businesses that were at greater risk prior to the scheme implementation.

The wider society benefited through the employment available as a result of the work to contractors and sub-contractors, most of whom operated at a national level. More would need to be known about where they resourced their labour from in order to assess how widely these potential benefits were spread in the society.

4.7 Lyth Valley Case Study – Flood and land drainage management

What are the characteristics of the FCERM policy/activity?

The Lyth Valley Flood Risk Management System is predominantly rural and is located at the northern end of Morecambe Bay with the River Kent Estuary Special Area of Conservation running along its southern boundary.

The River Kent Estuary is tidal and has embanked defences and tidal gates that provide protection to the valley floor. The River Gilpin, Sampool, Foulshaw and Meathop tidal defences were all improved between 1979 and 1989 as part of the Lyth Valley Improvement Scheme. The design criteria for the tidal defences was to provide a 1% probability threshold of overtopping.

Within the system there are:

- 133km of watercourses designated as Main River,

- 20 km of fluvial raised defences,
- 11km of raised tidal defences,
- A network of man-made drainage channels
- 5 land drainage pumping stations,
- 3 tidal gate structures located on the River Gilpin; Levens Catchwater; and Levens Main Drain,
- 4 water level control gates on Levens Main Drain; Lyth Main Drain; Black Beck; and Brigsteer Catchwater.

In addition to works on the tidal defences carried out as part of the Lyth Valley Improvement Scheme between 1979 and 1989, improvements to both the high and low level systems were also carried out. The scheme was designed to provide improved drainage and reduce flooding to 1853ha of pasture land based on flows of a 4% probability of occurrence in any one year. For the high level system the improvements included increasing the level of protection provided by the raised defences and in some locations increases in channel capacity.

For the low level system many channels were regraded and widened, some new drainage channels, or extensions to the existing drains were constructed, and 5 land drainage pumping stations were also built. The pumping stations are designed to work in combination with the existing gravity system and pump water at times of high water levels, thus reducing water logging of the valley floor particularly during the winter period. The pumping stations at Pool Bridge, Johnscals, and Sampool all pump water from the low level system into the high level system, whilst the Levens Catchwater and Ulpha station pump directly into the River Kent Estuary.

What are the likely impacts of these measures?

The “Land Drainage” management activities in rural areas of the 1970’s and early 1980’s reflected the overriding flood risk management policy of the time: to provide improvements to main river systems to allow arterial drainage systems to manage water levels primarily to the advantage of the farming community. Benefits to rural settlements and roads (through a reduction in flood frequency) were often incidental to the potential for agricultural improvements. Furthermore benefits to environment through managing water levels to promote biodiversity were largely unknown. The Lyth Valley bears the legacy of this agriculturally orientated policy where some 20 or more years later, maintenance activities are promoted to maintain the standard of defences, channel conveyance capacities and associated pumping regimes.

Who are the funders of these measures: those who pay for flood risk management?

The ultimate funders are national tax payers. The funding of the annual maintenance and operational activity comes from EA’s Grant in Aid programme. None of the funding comes from Local Levy funding.

Table 4.12 Projected whole life system costs

Lyth Whole Life Costing (estimated Spend Profile)									
Year (£thousands)	Baseline 0	Short Term			Medium Term			Long Term	
Financial Year	2007/08	1	2	3	4	5	6 to 10	11 to 20	21 to 50
		2008/09	2009/10	2010/11	2011/12	1012/13	2013/14 to 2018/19	2019/20 to 2028/29	2029/30 to 2058/59
Frequent Maintenance	120	111	113	119	116	118	579	1,157	3,472
Intermittent Maintenance	-	50	80	65	70	82	401	808	2,360
Replacement	-	-	5	53	48	80	80	579	1,620
Other	-	61	172	-	-	-	-	-	-
Sub-Total (not discounted)	120	222	370	237	234	280	1,060	2,544	7,451
DISCOUNTED COSTS	120	214	345	214	204	236	778	1,519	2,648
	%	%	%	%	%	%	%	%	%
Frequent Maintenance	100	50	31	50	50	42	55	45	47
Intermittent Maintenance	-	22	22	28	30	29	38	32	32
Replacement	-	-	1	22	21	28	8	23	22

Discounted costs over 50 years are £6.258 million with, after 2007/08, a maintenance spend of in excess of £200,000 per year, largely in the early years on frequent maintenance of channels, structures and defences.

Who are the gainers and losers from these measures? What is the value of these gains and losses?

Although the progressive 'land drainage' schemes were primarily constructed to improve agricultural production in the Lyth Valley, the raising of the defences provided flood protection to the isolated properties (42 residential and 18 non residential), primarily in Sampool (Gilpin Bridge).

The system is maintained to avoid semi-permanent flooding of the valley floor and from a flood risk management perspective the properties within the flood risk area are protected by raised defences and these defences and associated structures are therefore viewed as critical assets. Historically the most likely mechanism causing flooding to property is from overtopping or failure of the tidal defences. At some locations 3rd party assets are integral to the Agency maintained defences, (road bridges and the raised railway line at Meathop). These 3rd party defences and structures are also viewed as critical assets.

Properties

The 60 properties are within Flood Zone 3 (0.1% fluvial, 0.5% tidal probability). Table 4.13 gives the breakdown of the number of properties at risk 'with' and 'without' defences.

Table 4.13 Properties at risk

Without defences				
Impact Zone		Residential	Non Residential	Total
<i>Significant Likelihood</i>	>1.3% flooding	41	18	59
<i>Moderate Likelihood</i>	>0.5%<1.3%	1	0	1
<i>Low Likelihood</i>	<0.5%	0	0	0
	Total	42	18	60
With Defences				
Impact Zone		Residential	Non Residential	Total
<i>Significant Likelihood</i>	>1.3% flooding	17	6	23
<i>Moderate Likelihood</i>	>0.5%<1.3%	16	1	17
<i>Low Likelihood</i>	<0.5%	9	11	20
	Total	42	18	60

Maintaining the current flood defence infrastructure does not eliminate all flooding but does reduce the impact. Without defences all but 1 property will be at significant risk from flooding and result in a large increase in the probability of flooding for each impact zone and lead to greater depths of flooding. A 'walk-away' scenario may ultimately lead to this but in reality such a change would be gradual over many years.

Table 4.14 Estimated defended annual benefits

EAD (£)	Agriculture	Property		Total
		Res	NRP	
With Defences		11,668	3,324	14,992
Without Defences		653,620	228,503	882,124
Defended Benefits	377,990	641,952	225,179	1,245,121

The defended annual benefits per property are £15,285 per house or £457,000 discounted over 100 years and £12,510 per NRP or £374,000 discounted over

100 years. An assumption to 'write off' the properties would substantially reduce the total benefit value.

Agriculture

A mixture of intensive and extensive arable production and intensive grazing activities has usually been assumed when determining benefits of the scheme. In reality, there has been little agricultural take up from the drainage works and allocation of Agricultural Land Classification (ALC) 3 to nearly 99% of the drained area (2,279 hectares) appears over optimistic. Inspection of the valley suggests that Agricultural Land Class (ALC) Grade 4 is more closely associated with the actual land use and based on this assumption the defended agricultural benefits would reduce substantially to EAD £22,800.

Environment, habitat & heritage

The decline of breeding wading birds throughout Britain was highlighted in the 2002 RSPB Breeding Waders of Wet Meadows survey and the *Cumbria Breeding Atlas* confirms a reduction in the range of population of waders across the lowlands of the county. Much of the recent loss has been driven by agricultural improvement, particularly the draining of wet grassland in areas such as the Lyth Valley.

Some 30% of the Lyth system (563.16ha) is within environmentally designated sites and the Lyth System is very rich in Sites of both European and International importance.

Table 4.15 Designated sites of interest

Site Designation	No. of 'combined' environmental designation	Area (ha) of combined designation
Ramsar, SAC, SPA, SSSI	14	102.49
SAC, SSSI	5	449.72
SSSI	2	10.98
By individual designation		
Ramsar		102.49
SAC		552.21
SPA		102.49
SSSI		563.19

The River Kent SAC bounds the southern edge of the site with an Estuary Management Plan produced in 2001 although the plan does not contain any specific management actions that would influence current or future maintenance of the existing tidal defences. Within the system there are also 3 areas which

are designated as SSSI and SAC, (Meathop Moss, Foulshaw Moss, and Nichols Moss). All the sites are lowland raised mires (peat bogs) and have Water Level Management Plans (WLMPs), the last review of which was completed in December 2006. As a result of that review Nichols and Foulshaw Mosses have action plans which identify works that are to be completed by 2010. The reviews of the WLMPs are also supplemented with an Investigation into the Effects of Agency Land Drainage Maintenance on the Raised Mire Sites which was carried out in 2002. The Lyth Valley is viewed by Natural England and RSPB as a prime site for developing new BAP habitat sites through wetland creation and other similar wetting up projects.

Wider benefits

The only major infrastructure that is directly at risk of flood within the system are parts of the A590 which are within the tidal flood risk area. The A590 is the only viable link road between the M6 and Barrow in Furness and therefore there are considerable benefits in maintaining flood free access to this vital link road. In terms of underground services, a major gas supply pipe and water main cross the southern part of the system at High Foulshaw.

What are the distributional effects of the FCERM activities?

A summary of the distributional impacts is given in the template figures below.

Lyth - Maintenance Scheme

Template:

FCERM Activity Type: Changes to probability

FCERM Activity Measures Flood and land drainage management

Stakeholder		Impact				Evidence / Comments	
Type	Sub-class	Benefit Type	Source	Value (examples in £M per annum)			
Funder	Resident	Direct Monetary (Cash)	Change in Tax receipts	0.00	Initial funding for scheme from national and local council tax payers.		
	Business						
	Land Owner						
Conduits	Funding conduits / contributors	Direct Monetary (Cash)	Provision of funding	0.00	Grant in Aid schemes		
				Defra		0.20	
				EA		0.00	
	Construction & services		Contractors	Provision of services	?	Breakdown of costs not obtained.	
					Consultants		?
					Other		?

Receptor	Resident	Household	Direct	Change in level of risk	0.64	42 residential properties
	Business	Commercial			0.23	18 non-residential properties
	Business	Agriculture			0.38	Figure assumes ALC Class 4
	Resident	Household	Indirect	Change in insurance premiums	?	No evidence of insurance costs obtained.
	Business	Commercial			?	No evidence of insurance costs obtained.
Opportunist	Asset Owner	Land owners & Developers	Indirect	Change in development and regeneration potential	?	No evidence of significant benefits
	Amenity User		Direct	Change in level of risk	?	Some benefits to locals, visitors, etc.
	Insurer		Indirect	Change in insurance liabilities	0.87	Assumes residential and NRP reduction in damages only
Wider benefits	Economic				No	No major wider benefits
	Social				No	Some - sense of community, etc.
	Environmental				Yes	Maintenance balanced with WLMPs for SSSI and SAC sites

Figure 4.11 Lyth Valley - Beneficiary impact template – Flood and land drainage management

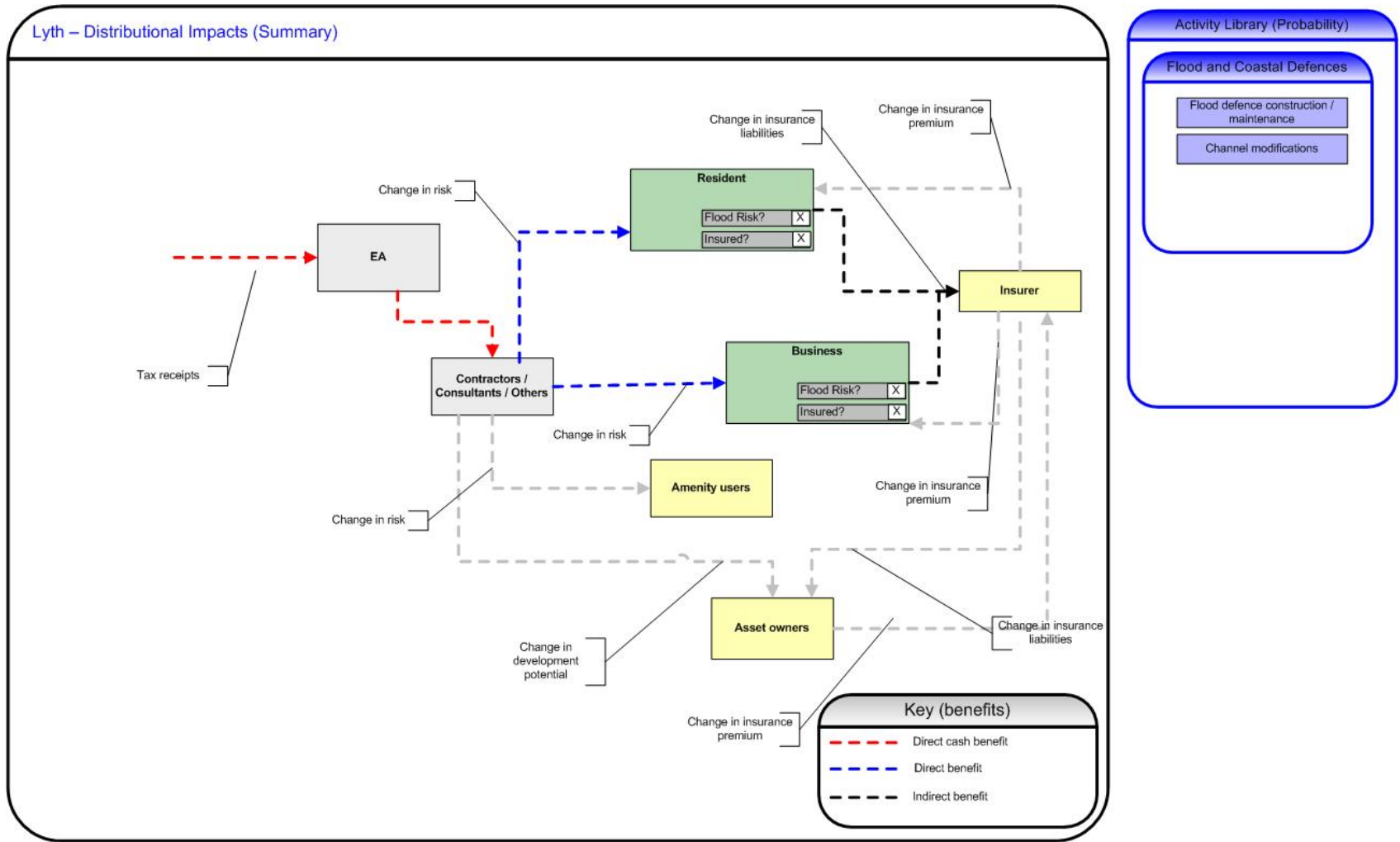


Figure 4.12 Lyth Valley – Beneficiary impacts– Flood and land drainage management

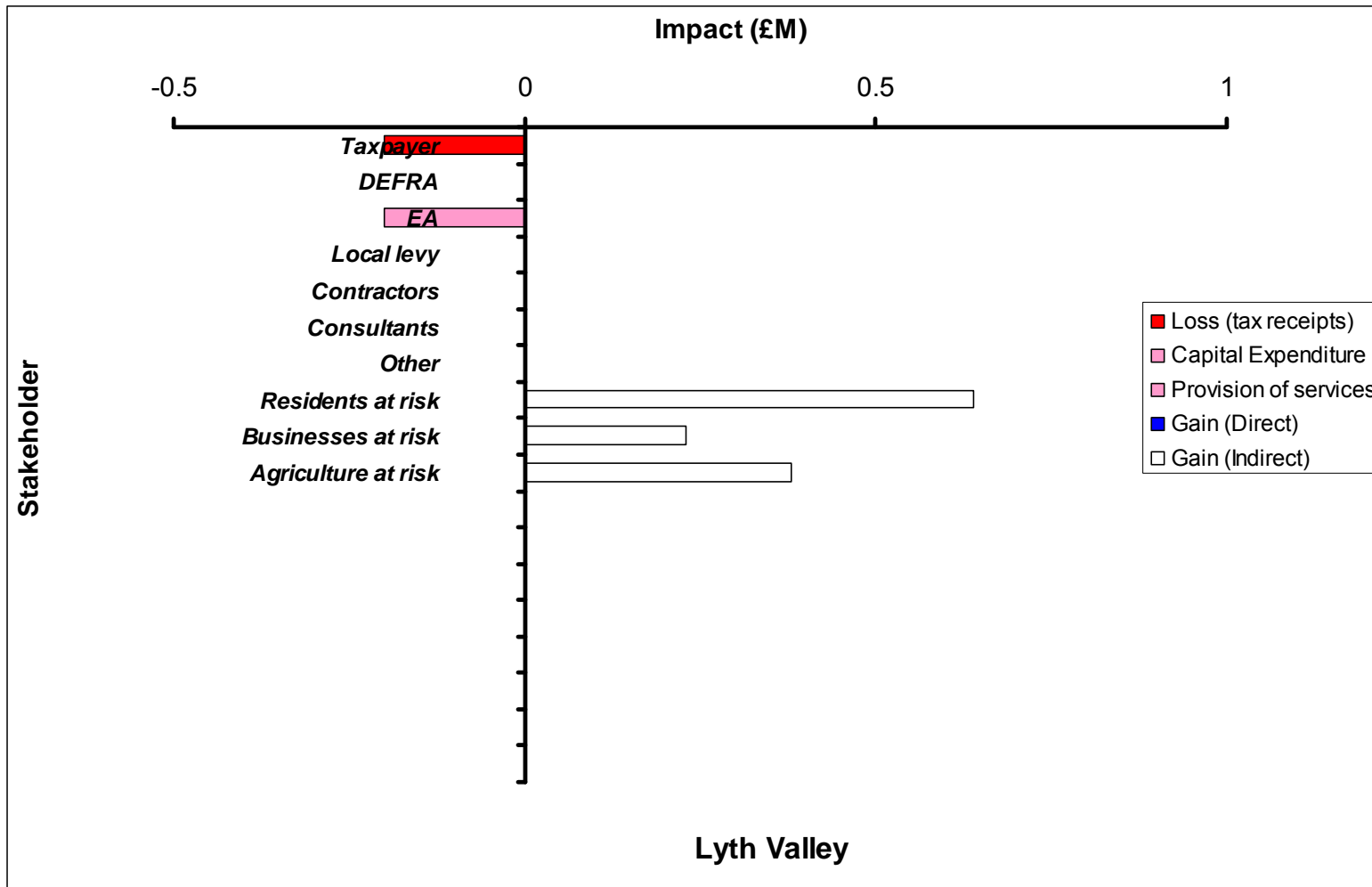


Figure 4.13 Lyth Valley – Distributional impacts– Flood and land drainage management

What gaps in our knowledge/data limit the above analysis?

The issue of beneficiaries associated with the effect of agricultural subsidies has not been addressed in this limited analysis. However, it would be interesting to explore in future stages of the research who benefits from these subsidies, and the resource flows they create.

The analysis of environmental, recreational and heritage aspects have been kept qualitative and an analysis of the effect of promotion of agri-environmental schemes on the changing nature of the Lyth was considered outside of the scope of the research. However, this could be a useful area of research in the future.

What are the conclusions as to how the gains and losses are distributed?

Justification of maintenance from a benefit quantification perspective concentrated originally on the importance of prevention of property and agricultural flood losses. However, both benefits are considered lower than originally anticipated.

The take up of agricultural improvement and the proposed economic benefits to the farming community have either long since dissipated or never materialised. Re-assessment of the ALC suggests agricultural benefits from damages avoided are now limited and a small number of properties (~60 residential and non-residential) are becoming a more dominant beneficiary group.

There is slightly more benefit to residential rather than non-residential property owners. However, prevention of property flood losses comes at a relatively high cost to the general tax payer. A reduction of residential and non-residential property damages should lead to a reduction in insurance liabilities. The degree to which this is passed on to customers has not been ascertained.

The Lyth Valley is viewed by Natural England and the RSPB as a prime site for developing new BAP habitat sites. On-going FCERM activities contribute to a decline in wetland creation and a decline in associated environmental and habitat benefits.

Finally, there are benefits to transport users on the A590 as this is the only road linking Barrow in Furness to the M6 and diversions during regular flooding would be circuitous, slow and incur disbenefits to transport users.

4.8 Insurance

What are the characteristics of the FCERM policy/activity?

The Environment Agency (EA) estimate that the expected annual damage from flooding in England is £1.1 billion a year, excluding the risk of damage to transport infrastructure, agricultural land and any environmental or social costs. Individual flood events can far exceed estimated annual averages and as an example the summer floods of 2007 generated an estimated 135,000 insurance claims and total insured losses were around £3 billion. With the onset of climate change, average annual damages in the UK could escalate toward £20 billion a year by 2080 (NAO, 2007).

The sheer scale of flood insurance risks and liabilities means flood insurance is a major *activity* in managing flood and coastal erosion risk. For those insured, flood insurance provides a risk transfer mechanism to reduce receptor vulnerability to flooding. To ensure flood insurance cover remains available to as many people as possible, the Government has agreed a “Statement of Principles” with the Association of British Insurers (ABI) whose members provide most domestic insurance covering flood risk in England.

The Statement sets out the commitments made by the insurance industry to maintain flood cover for the majority of domestic and small business properties at risk, in association with commitments made by the Government on flood risk management. Under the Statement of Principles, insurers provide cover if they estimate the risk of flooding as less than once in every 75 years. If the risk is more than one in 75 years, and no defences are planned, insurers will examine the risks case by case and work with owners to see whether the property can be made insurable.

The Statement of Principles distorts the market place somewhat by placing an obligation on the industry to insure against flood risk and it has been suggested by ABI that many insurance companies would opt out of the flood risk market if this were an open option.

The insurance industry invests in improving its understanding of flood risk and individual companies strive to increase their knowledge and to identify unique risk factors. At a household level, understanding individual household risk, rather than the wider spatial definition of risk at a postcode level (say), should enable individual insurers to offer lower premia than their competitors and therefore to increase market share. Evidence of previous flood is part of the evidence base and provides additional information on exposure to risk. There is growing recognition of pluvial (surface) flood risk as a major cause of damage, in addition to the more traditional fluvial and coastal flood risks, and this is often harder to quantify in terms of risk.

What are the likely impacts of these measures?

On the face of it, resource flows for insurance appear simple and have a number of elements including total premia, policy excesses, insurance claims and payouts, insurance administration costs, and company profit elements.

Insurance premia are reported by ABI to be based on risk pricing and to reflect the level of flood risk. Risk pricing *per se* reflects a beneficiary pays approach to risk management and as a concept should provide a fair distribution of costs and benefits in the longrun, although short-term gains and losses may distort this balance.

Who are the funders of these measures: those who pay for flood and coastal risk management?

Insurance holders themselves provide funding for insurance services through insurance premiums. Flood insurance comes bundled as a package under buildings and contents insurance and cross-subsidisation within the insurance market widely spreads the cost of insurance liabilities whereas the benefits

(through insurance claims and payouts) are attributed to a much small number of insured property owners in areas at risk of flooding.

Who are the gainers and losers from these measures? What is the value of these gains and losses?

ABI estimate the take-up of insurance in the UK (based on various Government statistics, Household Expenditure Survey (HES) and evidence from ABI members) is broadly as follows:

- 93% of all homeowners have Home Buildings insurance in place, although this falls to 85% of the poorest 10% of households owning their own home (this insurance is a standard condition of a mortgage)
- 75% of all households have Home Contents insurance in place; although half of the poorest 10% of households do not have Home Contents insurance.

Experience in Carlisle

Flood waters damage belongings, such as soft furnishings, carpets and electrical goods, affect the building itself (such as plasterwork and wood fittings) and can cause structural damage. The flood water can become contaminated with sewage or chemicals, and householders will typically have to move into temporary accommodation while their home is cleaned, allowed to dry out and repaired. Material losses are generally covered by insurance and flood repairs can cost up to £45,000 per household..

In Carlisle, the span of post flood recovery was over 2 years for many of the 2,000 residential properties (5,400 people) affected by the flood. Only 75 properties in Carlisle were uninsured and virtually no local authority owned household properties were affected.

For the restoration of flood damages by the insured this figure was split as £45,000 per building for building fabric losses (approximately £90 million) and £15,000 to £25,000 per building for inventory losses (approximately – upper limit - £50 million).

The degree to which costs are covered by insurance and for which people/groups benefit from cover, not only for tangible costs such as property losses but also for other effects such as health, is key however to understanding who benefits and who loses.

Evidence from Carlisle suggests insurance does not cover the full costs of recovery for all flood victims and that SMEs are major losers in flood events with many being under-insured and/or failing to recover after a major flood incident. Imbalances between 'insured sum' and actual 'benefits' can arise from a number of different reasons and discussion with flood victims and flood recovery agencies in Carlisle identified some of the following reasons for differences:

- Intangible losses:

- Flood insurance provides cover for repair and replacement of material loss and temporary accommodation but does not cover health and social costs, leading to an imbalance between estimated and actual losses.
- The stress and inconvenience to households from a flood is difficult to measure and although previous research suggests that it equates to an average £6,000 per household, this may be an undervaluation where health care and stress related illnesses are dominant factors experienced by flood victims.
- Under-insurance
- Some 200 home owners were actually underinsured and these people were left with seriously sub-standard workmanship:
 - Shortfall in building fabric
 - The biggest reason for repairs exceeding either the legitimate re-build cost or the shortfall value as a result of underinsurance was largely due to escalating builder's costs. An independent review by Carlisle City Council Quantity Surveyors suggests supply/demand imbalances led to a 400% increase in labour costs in the immediate post-flood aftermath.
 - Insurance companies often work on a 60%/40% split between downstairs and upstairs restoration costs. Once the 60% downstairs value of the insured sum is reached then the work has to stop, be continued at the owners expense or corners are cut to meet the insured value.
 - It was estimated that the shortfall between building fabric claim and actual amount agreed was between £15,000 and £25,000 per property. Using a mean value of £20,000 suggests the total shortfall for insured properties may be around £40 millions.
- Inventory items & loss adjustment
- Most policies are 'new for old' and therefore there is a significant degree of post flood betterment. However there is an imbalance with respect to cash flow with cheques from insurance companies not coinciding with purchases.
- Half of all insurance companies operate a Vouchers scheme or send replacement goods directly and have purchasing powers to replace items at well below high street retail prices. This process is felt to dis-empower the flood victims who wish to purchase replacement items themselves as when they first chose the items, giving ownership rather than feeling that the replacement is gifted.
- With often no evidence of pre-flood materials used, such as photographic records or specification of standards, it was reported that loss adjustment led to cheaper replacement items
- Premiums and excesses
- Prior to the flood most household insurance (averaging £250 per annum) included as a matter of course flood cover. After the flood, premiums reportedly rose by between 50% and 100% (taking an average of 75% this represents a total annual rise of over £360,000 for the insured flood victims. Additionally, excesses which prior to the flood would have been around £1,000 have been raised to between £5,000 and £10,000 per

property. The worst premium rise reported in Carlisle was for a shop/residence combined whose premium reportedly rose from £250 to £50,000.

- For 25% of all properties flood cover has been refused altogether. This blacklists these properties from future cover by any another company and exposes them to covering all future losses and increasing anxiety levels.
- Business and SMEs
- Flood recovery for small businesses is variable and the ABI estimate that some 50-60% of Small to Medium Enterprises (SMEs) do not recover from serious flood damage.
- Contributory factors include accrued losses exceeding insured losses due to under-valuation of assets (eg failure to maintain an up-to-date valuation of assets), business disruption, loss of client confidence, client base shifting to alternatives service providers.
- Indeed, AXA research in 2006 suggested 69% of all SMEs had no contingency plan to cope with serious events that might affect their business, 41% had no business continuity or loss of earning insurance, and 90% of SMEs were underinsured for buildings cover.

What are the distributional effects of the FCERM activities?

Most flood risk management investment (c. £600m p.a.) is based on future economic flood losses avoided by the nation. Most of these flood losses are insurable and most are indeed insured. Investments in reducing flood or coastal erosion risk should result in a decline in flood losses and hence insurance insured claims should be fewer and/or lower and likewise should insurance payouts. But how, and indeed if, these benefits are transferred to insurance customers is uncertain.

In a risk based market, these benefits would be transferred selectively to those insured living in the impacted flood risk area. However, if the insurance market is not risk-based this is not necessarily the outcome and one possibility could be a modest improvement in terms of insurance spread across all insured property-owners. A relevant empirical test would be to focus on the relationship between residual flood risk and average terms of insurance across all property-owners. However, commercial sensitivity has also restricted access to insurance premia and we therefore have no substantial evidence one way or the other.

When invoked, insurance payouts are likely to result in surges in post-flood sales but the distribution of this among the local and national economy has not been ascertained. It may be assumed however that major national retailers of furniture, white goods and electrical goods benefit most. Similarly, insurance payouts also result in opportunities for the local and national construction industry for repair and restoration. On the other hand, reduced flood risk and reduced damages could be said to result in a loss of opportunity for these industries.

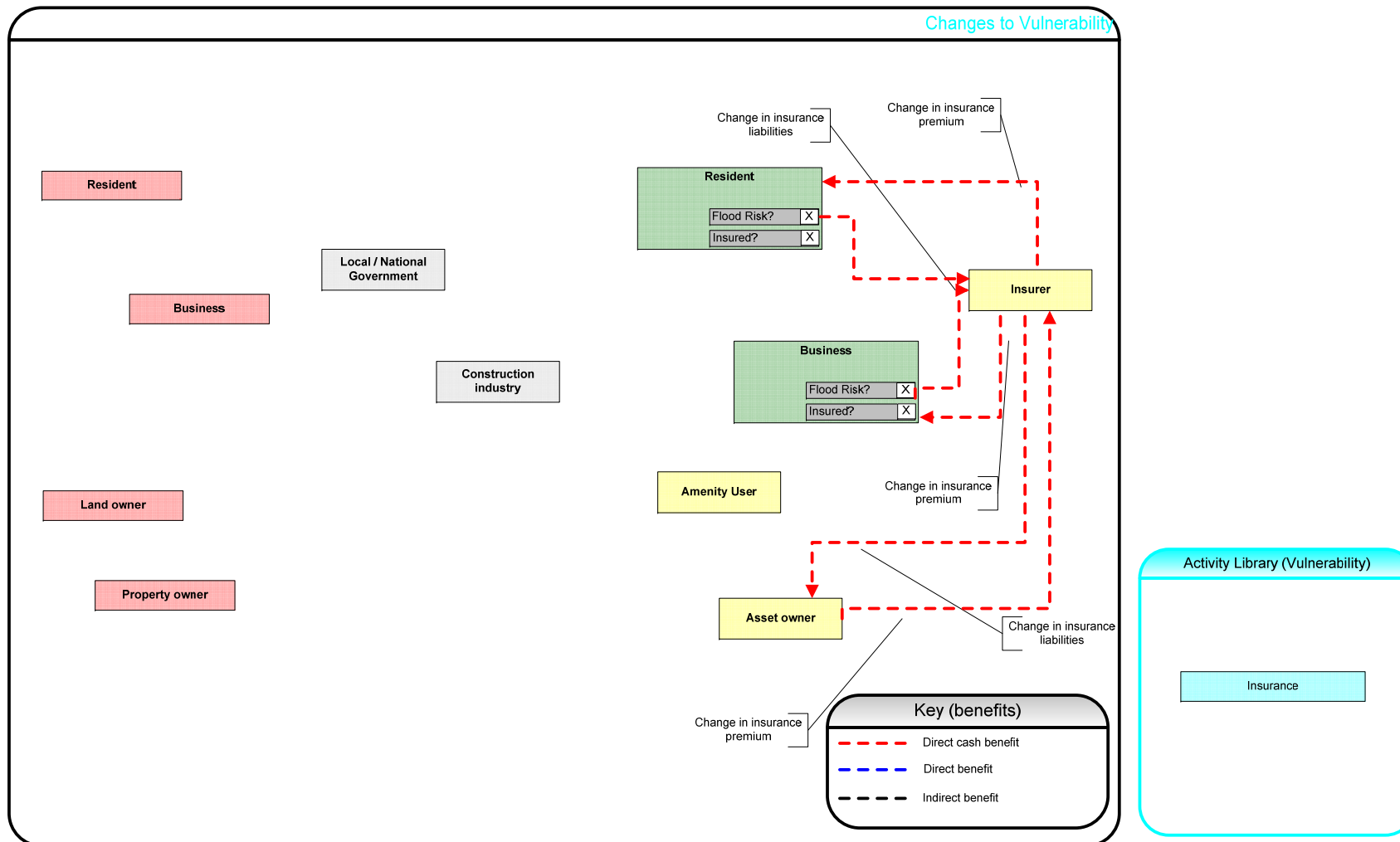


Figure 4.14 Beneficiary impacts - Insurance

What gaps in our knowledge/data limit the above analysis?

No evidence was obtained to support the idea that residents and businesses benefited from reduced premiums or excesses following construction of the West Bat scheme. However, since the most recent major flood events affecting West Bay had occurred in the 1970s (1974 and 1979) it is possible that the flood risk was not a live consideration for insurers. This is therefore a case-specific finding and extrapolating such findings to other locations is neither valid nor sensible.

Flood insurance is bundled as a package under buildings and contents insurance, and can be difficult to isolate and disaggregate the flood risk aspects from this broader risk portfolio. It is important however to get a better understanding of the costs and benefits of flood insurance their relative distribution among the industry and customers alike. This would require access to commercially sensitive information and require close collaboration with the insurance industry.

What are the conclusions as to how the gains and losses are distributed?

FCERM activities which reduce vulnerability, probability or exposure to flood and coastal erosion risk usually reduce estimated future damage losses and should lead to reduced or lower insurance claims. The scale of these savings and whether the benefits are passed on to customers as reductions in premia and excesses has yet to be verified.

5. Findings and lessons learned

5.1 Selected findings supported by case study evidence

Selected findings from the case study assessments are summarised below. The findings respond to the key issues flagged in the original specification (see Section 4.1) and highlight evidence and examples from the case studies where appropriate.

Distribution of costs and benefits

- The costs for FCERM activities are widely spread through society in the form of national and local tax payer contributions.
- Direct benefits are largely to property (domestic and non-domestic) accruing to private individuals and business concerns. The case studies highlighted varying degrees of benefit across these groups.
- In a largely urban context (eg Carlisle), reduced EAD benefits for the non-residential property sector can far outweighed reduction in EAD benefits to the domestic sector with, in some instances, a large majority of overall benefits going to a select few business concerns.
- Environment and amenity gains were evident in case studies such as West Bay but the value of these benefits remain relatively low in comparison with the benefits to property at risk.
- There was little evidence to show long-term adverse impacts on house prices for properties in flood prone areas (eg Carlisle), however it is difficult to extrapolate this finding beyond the case study areas themselves
- Benefits calculated from EAD assumptions can exceed those for simple write-off costs (eg Lyth Valley) and may inflate benefit estimates.
- The consultancy and construction industry provide services for the design and construction of flood defence schemes and an element of profit will be factored into such services. For the case studies under investigation, Consultant costs varied between 5% and 12% of total costs and Contractor costs between 58% and 90% of total costs.
- A significant proportion of FCERM costs incur taxation and result in resource flows back to central government. Tentative estimates for West Bay suggest over £2.5M of the £18.3M Contractor's total costs alone were incurred as income tax. Further returns to central Government are incurred through VAT on supplies, materials, etc.

Wider benefits

- FCERM activities can be a major catalyst for local regeneration and/or development on the floodplain where significant risk of flooding has been mitigated. Successful regeneration has wider benefits on employment and regional development.
- As an example, Carlisle Renaissance aims to transform Carlisle in to the north west's prime regional centred and to attract enhanced and new institutions (regional university) and commercial sectors to the city. On the other hand, in West Bay there was little evidence of development opportunities driven directly by the FCERM activities.

- Reduced vulnerability of key infrastructure services (eg water, wastewater, electricity, and transport) and avoidance of outage is of benefit to large numbers of domestic and non-domestic customers, many of whom may not be directly located in a flood risk zone.

Insurance

- Most flood risk management investment is based on future economic flood losses avoided and most of these flood losses are insurable.
- Investments in reducing flood or coastal erosion risk should result in a decline in insurance claims/payouts, but it has not been possible to ascertain how these benefits are re-distributed among the insurance industry and its customer base.
- Cross-subsidisation within the domestic insurance market widely spreads the cost of insurance liabilities but the benefits (through insurance returns) are attributed to a much smaller number of insured property owners in areas at risk of flooding.
- Flood insurance provides cover for repair and replacement of material loss and temporary accommodation but does not cover health and social costs. An imbalance between estimated and actual losses was also evident (eg in Carlisle) with insurance not covering the full costs of recovery for all flood victims.
- When invoked, insurance payouts result in surges in post-flood sales for goods and building services, but the distribution of this among the local and national economy has not been ascertained.
- SMEs are reported by the ABI to be major losers in flood events, with many being under-insured and/or failing to recover after a major flood incident.

5.2 Reflecting on the methodology and its application

A number of gaps and limitations have been identified in the application of the methodology and the development of the evidence base. These raise issues on the future direction of the research as well as questions that this research has raised but not resolved.

5.2.1 Application issues

There has been considerable debate as to whether the research should in the development of a methodology consider the *anticipated* or the *realised* benefits. This question highlights the fact that the 'actual benefits' will depend to some extent at least on the point in time at which an attempt is made to assess them. There is greater uncertainty at the project appraisal stage whereas at later stages there is more chance that other intervening factors apart from the FCERM activities may influence the apparent benefits and this also should be understood.

The methodology aims to highlight *actual benefits* and beneficiaries but this depends on the point in time at which the methodology is applied and the data on which it draws. Data on actual benefits at a particular point in time rather

than predicted benefits is often difficult to obtain and requires significant effort to elicit from different information sources.

Timing may impact on investigations of benefits in a number of ways. If a scheme is very recent, complete data may be as yet unavailable. If it is relatively long completed, data may be archived and memories may be fading, and therefore it may be more difficult to obtain data. Benefits may be immediate (e.g., where flood defences are installed) or they may take longer to be realised (e.g. effective flood warning services). Thus the point in time in relation to the completion of a FCERM programme or project may be influential in terms of the benefits identified and how these may change over time

The methodology was applied to a number of FCERM schemes some of which were completed some years earlier and it was therefore possible to identify 'actual' benefits at a point in time rather than the predicted or anticipated benefits of the scheme. There will always be a substantial degree of *uncertainty* about potential benefits and beneficiaries and the application of the methodology has demonstrated that benefits expected from a scheme prior to its implementation may not always be realised.

In applying the methodology, it is important to report on possible benefits and beneficiaries that do not materialise. For example, where there is no evidence of increases in property values and saleability to resident or commercial property owners as this negative finding is important within the net impacts of particular stakeholder groups.

For both pre- and post-project assessments of the beneficiaries of capital projects, the PAR will inevitably be an important part of the evidence and a starting point. For post-project assessments of benefits/beneficiaries it will be necessary to consider whether the benefits have been realised as anticipated and if not the benefits and beneficiaries should be reconsidered for the time of the assessment.

The costs for FCERM activities are attributed to national and local tax payer contributions. Due to time and resource constraints, the split between local council tax and national tax contributions was not ascertained under the present project but discussion with local authorities (eg in West Bay) did suggest the information could be made available by the local authority accountants if time were made available.

5.2.2 Gaps and data constraints

Obtaining accurate data on the numbers of beneficiaries and the monetary value of their benefits can be problematic. For example, where FCERM activities lead to recreation and amenity benefits, as in West Bay, there are serious difficulties in attaching numbers and monetary values to these benefits. Data is usually sparse and a lack of baseline data results in difficulties in estimating pre- and post- situations when assessing differential benefits.

Many benefits lie in the changes that may be brought about by the FCERM activity. Therefore good information is needed on these changes through *before* and *after* information. Even then, it is necessary to be aware of other intervening factors that may be the explanatory factors for change rather than or in addition to the FCERM activities.

Data availability and resourcing constraints does limit analyses. Proxies are often required and preferred methods too expensive and/or difficult to carry out. These difficulties may be addressed but the resulting estimates will inevitably be a matter of judgement and of variable quality.

The project adopted a rapid appraisal approach to the case study work. The aim was to '*illustrate*' who the beneficiaries were and how they benefited with a focus on distributional impacts rather than detailed quantification and qualification of individual impacts. The research methods deployed a mix of fieldwork and desk study activities maximising the use of readily available information and this approach achieved a reasonable degree of success. In some instances, greater effort may have led to more detailed information but there are likely to be diminishing returns in terms of information forthcoming and effort deployed. In spite of the rapid appraisal approach, the skills required in obtaining data on beneficiaries, including through in-depth interviews, should not be overlooked.

Communicating the purpose of the work and the getting buy-in to the process of developing a *Who Benefits?* analysis from a diverse range of stakeholders – many of whom hold the key to vital data sources - has been variable. Many datasets and information are not readily attuned to such analyses and therefore require stakeholder effort to extract, often without any perceived direct benefit to the stakeholders themselves.

Some of the case study results are *light* on hard quantitative information. This is because: some data is confidential to its holders, and is not easily extracted (e.g. insurance data), some data for schemes implemented some time ago is simply now not available, and some data is simply not often collected (e.g. the benefits of amenity changes). Lessons can be learned as to which data items are most easily extracted and what is not, but the difficulty in obtaining data and information should be a consideration in taking this research further.

For example, some FCERM activities leads to environmental gains but a question remains as to who are the beneficiaries of such gains? They could just be local people, related to a particular scheme, but it could also be argued that the whole national gains from better environments locally. There are national targets for biodiversity, so local changes make a national contribution here. So, in any distributional analysis it is not clear who are the beneficiaries of these gains that particular investment.

5.3 Scaling up

The findings from the case study assessments cannot be used directly to 'scale up' to the national scale and to gauge the beneficiaries, losers and distributional

affects from the national spend on FCERM. A scaling-up exercise is likely to include a combination of approaches including case supported evidence, grossed up local or regional investigations (such as CFMPs/SMPs/PARs) and the combination and interrogation of combined national datasets.

Detailed pilot studies could be used to provide a quantified distributional (by stakeholder group) analysis of 'unit' impacts for a range of FCERM activities (e.g. reduced liability per protected insured property). National scale analysis and data, including that undertaken for projects such as NaFRA could then be used to 'scale-up' these 'unit' impacts to a national scale based on an analysis of the number of stakeholders affected by FCERM activities nationally. This would then provide a national scale distributional (by stakeholder group) analysis of who benefits from FCERM activities and the magnitude of such benefits.

The national scale data that is either already available (through NaFRA) or which could be determined using a combination of existing datasets include:

- Number of households (differentiated into different socio-economic groups) protected by flood defences (classified by Standard of Protection);
- Number of households (differentiated into different socio-economic groups) protected by flood warning service (classified by Standard of Service);
- Number of businesses (differentiated into different business types) protected by flood defences (classified by degree of protection provided);
- Number of businesses (differentiated into different business types/scales) covered by flood warning services (classified by Standard of Service classifications);
- Key Infrastructure and environmental/heritage assets protected by flood defences.

The national scale data that is available for property (through FHRC's 'Multicoloured Manual' and the Dundee data on insurance claims NaFRA) or which could be determined using a combination of these existing datasets include:

- Property direct damage and loss can be scaled up from local or regional investigations because property values are known for the whole country and loss data is available nationally;
- Resource flows that result from a typical house that is flooded to enable the impacts that result from replacement and repair to items, renovation of the building fabric, and building clean-up to be distributed across a range of beneficiaries at several levels (first order, second order, etc.)

On the expenditure side, national scale information that would be of value includes:

- Annual expenditure on implementing and operating a flood warning service;

- Annual expenditure on constructing and maintaining flood and coastal defences;
- Annual expenditure on emergency response in relation to flood events;
- Annual expenditure on implementing property-level flood resilient and resistance measures;

Other factors present greater challenges:

- Insurance data – number of properties insured / proportion of premiums allocated to providing ‘flood’ insurance / how flood FCERM measures are taken into account when setting premiums/excesses.
- Environmental and amenity gains from FCERM activity is highly site-specific and no way is current seen whereby these benefits and their distribution could be grossed up to a national scale without making gross assumptions.
- Local, site-specific, issues such as tourism, amenity use and urban development would need to be carefully considered when scaling up impacts identified as part of the detailed case study work.
- Indirect benefits such as the reduction of traffic disruption or the loss of value added in flooded non-residential properties is very site-specific but might be ‘grossed up’ if nationally available data were available on the properties and communication links at risk nationally (probable but not guaranteed);

As a result of the above ‘scaling-up’ exercise, the losses and gains experienced by each different stakeholder groups (and potentially disaggregated into socio-economic and business type classifications) could be investigated, and potential distributional imbalances identified.

6. Conclusions and recommendations

6.1 Conclusions

The research contributes to a better understanding of who benefits from FCERM activities and provides evidence of distributional effects in selected case study assessments. The research considered benefits from both structural and non-structural measures and beneficiary groups beyond those normally associated with project appraisals: for example, reflecting on potential benefits to contractors, consultants and the insurance industry.

The findings re-affirmed that the majority of costs for FCERM activities are widely spread through society yet direct benefits are to few. The direct benefits of FCERM activities are largely to property (domestic and non-domestic) accruing to private individuals and business concerns. Intended benefits of FCERM activities are not always realised and a true measure of sustainable benefits may only be evident many years after the implementation of policies and programmes. Wider benefits accrue from opportunities provided by reduced flood risk but the take-up of these opportunities is influenced by many factors such as the buoyancy of the economy and its effect on the development, business, and housing markets.

A methodology for assessing *Who Benefits from Flood Management Policies?* has been developed to provide a systematic way of considering a wide range of potential beneficiaries, to organise information, and to provide a consistent structure for assessing the size and scale of the benefits they receive. It has shown promise as an analysis tool and further stages of the research should consider developing the approach to provide a more detailed analysis tool supported by appropriate methods and user guidance.

In general, it proved easier to evaluate benefits associated structural flood defence schemes rather than non-structural measures. Information on the costs and benefits of such schemes are often readily available, albeit in an *ex-ante* context, and supplementary analyses to re-confirm benefits can be relatively straightforward. On the other hand, non-structural measures were more difficult to assess as information is often fragmented and not readily available, if at all. However, this should not detract from the importance non-structural measures play in maintaining and reducing flood and coastal erosion risk and the benefits they bring.

In view of the complexity, and despite best endeavours, the study was unable to amass sufficient evidence to conclusively prove one way or the other which specific sectors and/or interest groups benefit at a national-level. The research has also encountered a number of barriers and lessons learned must be used to determine what this means for future research and the problems faced in taking the work forward. Some of the original research questions remain unanswered or partly answered and for such an important question as *who benefits from FCERM policies* it is essential that the present research is not an end, but a start.

6.2 Wider considerations and issues

Based on the findings of the research, the following points are raised to stimulate discussion and debate:

- The vast majority of FCERM costs are widely spread through society yet direct benefits accrue to relatively few. Is this a fair use of national and local tax-payer contributions?
- There are distributional imbalances in the costs and benefits of FCERM activities. How could individual gains and losses be balanced against wider local, regional and national benefits?
- Defra do not have an explicit policy on what the beneficiary mix should be although the broad priorities are embedded in a number of ways such as use of outcome measures for setting targets, and appraisal processes. Would such a policy be helpful in targeting FCERM activities and/or increasing the added-value of FCERM activities across society?
- Opportunities to benefit from FCERM activities can be realised by a range of stakeholders (eg developers, asset owners, etc.). Could, and indeed should, a mechanism be put in place to secure contributions for FCERM activities and to share costs in-line with the benefits commensurate with a beneficiary pays principle?
- Where potential benefits of FCERM activities were foreseen but not realised, how should FCERM policies/activities be realigned to balance costs and benefits across different groups?
- Measures to reduce flood and coastal erosion risk often lead to reduced estimated annual damages. How are these benefits shared among the insurance industry and its customers and what evidence is there to show this?
- Returns to central government from FCERM spend can be significant. What are the resource flows associated taxation, VAT, etc. and what percentage of overall FCERM spend do they represent?

6.3 Recommendations on the way forward

This early stage research into '*Who Benefits from Flood Management Policies?*' has focused on the development of an outline methodology and its application to a range of case study assessments as a basis for improving understanding and providing an evidence base on actual winners and losers. A number of gaps, limitations and issues have been identified and the direction of future research should take these into account.

Policy interpretation and implementation

At an early stage, the research team noted the difficulty in dealing with the notion of 'policy' as this varies significantly in its authority (intent, guidance, desire, etc.) and in its interpretation. For the purpose of this work, it was agreed to interpret policy in terms of its translation into FCERM activities on the ground, whilst acknowledging that there is not a one-to-one correlation of between a 'policy' and an 'activity'. There are many different ways of achieving higher-

order policy outcomes and the present research has endeavoured to capture this through setting the methodology, and the interpretation of FCERM activities, within a broader risk-based framework. This is likely to better meet the needs of higher-level policy analysis, rather than localised scheme specific analysis, and should be retained in any future research work.

Application and focus

A key question to resolve before moving the research forward is to establish more thoroughly the intended application of a methodology as this should drive further development needs. The framework for the methodology is generic but its application, the selection of data sources, the analyses undertaken and the methods used will be dependent upon whether it is intended to assess *actual benefits* (at this point in time) or whether its main function is to assess *future potential benefits* (arising from policy change).

Scale of analysis

During the case study assessments, the methodology has been applied primarily at a local case study level. Further work is needed to assess the application of the methodology at a CFMP and SMP level and to investigate the use these scales of analysis as a basis for achieving a national picture of distributional effects.

Scaling-up to a national-level

Scaling up to a national-level should recognise that some benefits of FCERM activities and policies can be 'grossed up' from local or regional investigations but that others cannot. Property direct damage and loss can be scaled up because data is available nationally whereas other aspects are very site specific, such as environment and amenity gains or the avoidance of disruption to transport and other services.

Linking to other assessment tools

Potential exists to link the assessment procedure more closely to existing analysis tools. The tools developed under the NaFRA programme, in conjunction with other datasets, provide a means of assessing flood risk and potential benefits at a range of levels as well as disaggregating information according to levels of protection, different socio-economic groupings, business types, and assets at risk. The accuracy of the results will be dependent upon the accuracy of the data captured within NaFRA (and other) datasets, but on-going refinement, calibration, pilot verification and ground-truthing means the quality of such results is constantly improving.

Skills and resources

The skills required to obtain and analyse data on beneficiaries, including through in-depth interviews, should not be overlooked. Future stages of the research could more explicitly consider the skills of the proposed user community and provide appropriate guidance not only on the application of the methodology but also on the assessment methods implicit in its application, and include training in these where appropriate.

Data and information constraints

Lessons have been learnt through the case assessments as to which data items are most easily extracted and what is not. The difficulty in obtaining data and information and the level of detail required should be key considerations in deciding how to move the research forward.

Gaps in the Insurance analysis

This stage of the research has been unable to satisfactorily unravel the complex role flood insurance plays in managing flood risk, and indeed which stakeholder groups ultimately benefit or disbenefit from reduced flood risk and associated reductions in damages avoided. Continued collaboration with the insurance industry is encouraged to ensure any future analysis is based on transparent and robust data and information.

Communication and collaboration

Communicating the purpose and value of this work and gaining commitment from relevant stakeholders to support the undertaking of a *Who Benefits?* analysis is essential to ensure full collaboration and access to key datasets, many of which are not readily attuned to such analyses and may require stakeholder input and resources to make information available in a usable format.

Other aspects

Resource flows that result from a typical house that is flooded would enable the impacts of insurance claims and payouts to be estimated at several levels. Flood damage results in replacement and repair to items, renovation of the building fabric, and building clean-up and there are a range of beneficiaries at several levels (first order, second order, etc.) who benefit directly or indirectly as a result of flood damage to properties.

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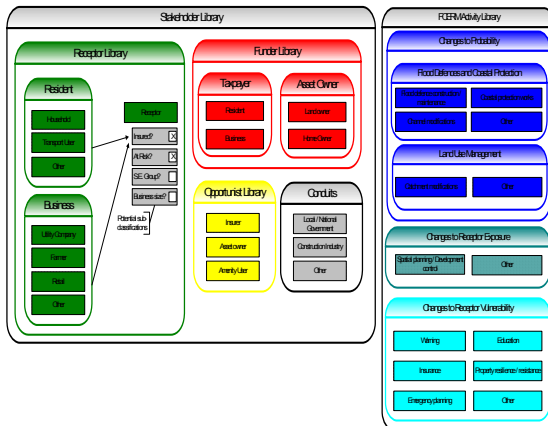
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Annex

Annex 1 Application of the methodology

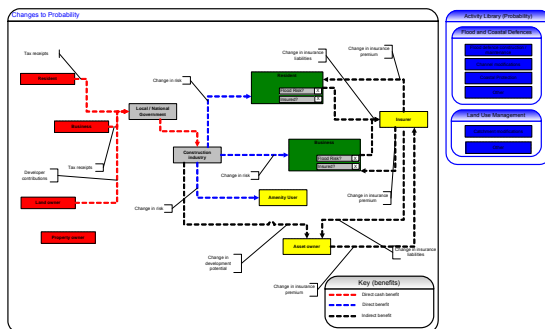
- 1 What are the **characteristics** of the FCERM policy/activity that we are examining?

The characteristics of different measures are determined by the *FCERM Library*. A portfolio of measures may result in a combination of characteristics encapsulating more than one characteristic.



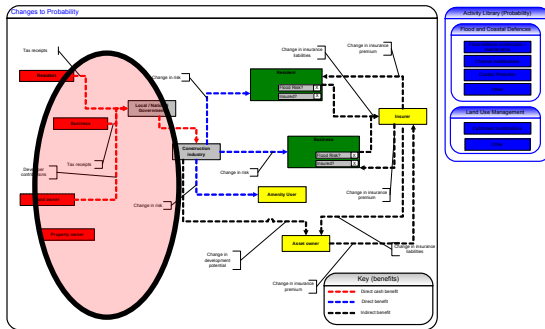
- 2 What are the likely **impacts** of these measures?

The likely impacts for different FCERM activities are depicted in the generic *beneficiary impact diagrams*. These provide a guide as to the likely beneficiary groups and beneficiary impacts.



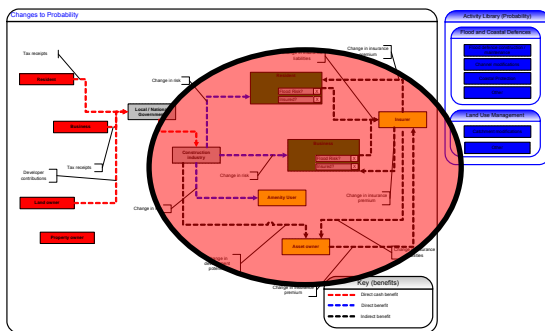
- 3 Who are the **funders** of these measures: those who pay for flood and coastal erosion risk management (the “losers”)?

In a Case Study assessment, specific funders are to be identified in place of the generic funders highlighted in the diagrams. The groups identified are also entered into the generic template (or data entry sheet) into which case specific processed data are to be entered (see Step 5).



4 Who are the **gainers and losers** from these measures: those who benefit and/or disbenefit from flood and coastal erosion risk management?

Similarly, specific gainers and losers (including opportunists) are to be identified in place of the generic groups highlighted in the diagrams and entered in the template.



5 What is the **value** of these gains and losses from FCERM activities?

Measurement techniques can include:

- Market prices
- Contingent valuation of recreational/amenity gains and losses
- Hedonic methods for changes in property values
- Reductions in estimated annual losses
- Changes in tax receipts
- etc.

6 What are the **distributional effects** on different interest groups?

The template is used to enter and record processed data for the Case-specific analysis and distributional impacts presented. The completed template enables different combinations of information to be extracted and analysed.

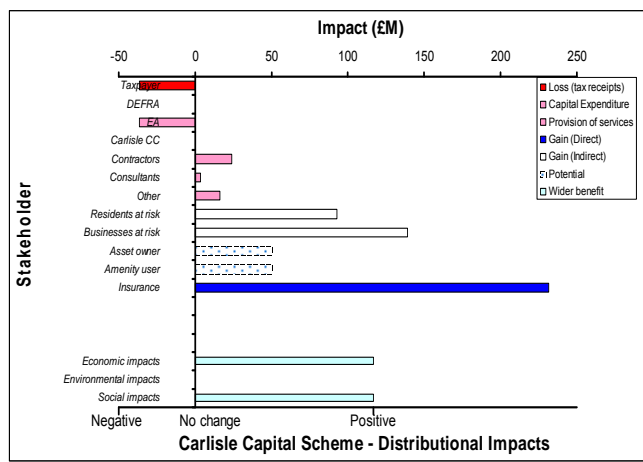
WHO BENEFITS FROM FLOOD MANAGEMENT POLICIES

Topic: Carlisle

FCERM Activity Type: Changes to land use

FCERM Activity Measure: Flood defence schemes

Stakeholder	Benefit/loss				Impact	Notes	Comments	Data Source
	Type	Sub-type	Benefit/loss	Notes				
FLOODING	Residence	Loss	Loss	Loss	Loss			
	Business	Loss	Loss	Loss	Loss			
	Land/owner	Loss	Loss	Loss	Loss			
COMMUNITY	Other	Gain	Gain	Gain	Gain			
	Other	Gain	Gain	Gain	Gain			
	Other	Gain	Gain	Gain	Gain			
PROPERTY	Residence	Gain	Gain	Gain	Gain			
	Business	Gain	Gain	Gain	Gain			
	Land/owner	Gain	Gain	Gain	Gain			
ECONOMY	Residence	Gain	Gain	Gain	Gain			
	Business	Gain	Gain	Gain	Gain			
	Land/owner	Gain	Gain	Gain	Gain			
ENVIRONMENT	Residence	Gain	Gain	Gain	Gain			
	Business	Gain	Gain	Gain	Gain			
	Land/owner	Gain	Gain	Gain	Gain			
SOCIAL	Residence	Gain	Gain	Gain	Gain			
	Business	Gain	Gain	Gain	Gain			
	Land/owner	Gain	Gain	Gain	Gain			
OTHER	Residence	Gain	Gain	Gain	Gain			
	Business	Gain	Gain	Gain	Gain			
	Land/owner	Gain	Gain	Gain	Gain			



7 What **gaps in our knowledge/data** limit the above analysis and therefore how robust are the results?

For the Case Study, identification of gaps due to lack of information and/or limitations of the methodology.

8 What are our **conclusions** as to how the gains and losses from the FCERM policy/activity are distributed in society?

Finally, conclusions are drawn on the gains and losses, their size and scale, and distributional impacts resulting from the FCERM policy/activity.

Ergon House
Horseferry Road
London SW1P 2AL
www.defra.gov.uk

