Environment Agency

Evidence

Choice of policy instruments for modern regulation

Report: SC070063/R1

Better regulation programme

Evidence Directorate

The Environment Agency is the leading public body protecting and improving the environment in England and Wales.

It's our job to make sure that air, land and water are looked after by everyone in today's society, so that tomorrow's generations inherit a cleaner, healthier world.

Our work includes tackling flooding and pollution incidents, reducing industry's impacts on the environment, cleaning up rivers, coastal waters and contaminated land, and improving wildlife habitats.

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Evidence at the Environment Agency

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The work of the Environment Agency's Evidence Directorate is a key ingredient in the partnership between research, policy and operations that enables the Environment Agency to protect and restore our environment.

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- **Setting the agenda**, by informing our evidence-based policies, advisory and regulatory roles;
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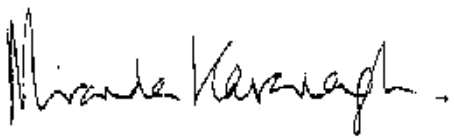
- **Carrying out research**, either by contracting it out to research organisations and consultancies or by doing it ourselves;
- **Delivering information, advice, tools and techniques**, by making appropriate products available to our policy and operations staff.



Miranda Kavanagh

Director of Evidence

Executive summary

In January 2007 the Environment Agency commissioned a consortium of WRc, Metroeconomica and Andy Gouldson from the University of Leeds to undertake project SC070063: Choice of policy instruments for modern regulation.

The overall objective of the project was to improve the Environment Agency's capacity to influence cost-effectively the environmental performance of businesses in England and Wales by using combinations of policy instruments.

The consortium produced its evidence base using case studies and developing a guidance document for Environment Agency staff to support their work to improve business compliance and environmental outcomes from business practices.

Theory from existing literature suggests that better outcomes – as measured against key criteria such as efficacy and efficiency – can be secured by applying a combination of policy instruments rather than delivering individual policy instruments on their own (Gunningham and Sinclair, 1999; Pizer, 2002; Gouldson, 2008).

To illustrate, the imposition of a tough regulatory standard, but without any effort to raise awareness among those affected and ensure they have the capacity to comply with the regulations, is likely to reduce both the efficacy and the efficiency of policy.

Whilst implementing agencies such as the Environment Agency do not select policy instruments, they do choose how to apply them. They can also choose to adopt complementary approaches to improve policy outcomes at a more local level. Both choices can have a significant effect on both the costs of implementation and the costs of compliance. We therefore distinguish between *instruments* and *approaches* throughout this report.

Focusing on decisions that are within the remit of the Environment Agency, this report considers how different mixes of instruments and approaches are being (or might be) combined. We also look at the actual and prospective effects of these mixes. The report includes insights, derived from three cases, into the implementation of successful combinations. The report has also considered how the findings of this project might be evaluated and how they might provide an evidence base for practical guidance in approaches to policy implementation.

Theory from literature

A number of different categories of policy instruments are available (regulations, economic instruments, information based approaches, capacity building measures, etc.). Each type of instrument has its own strengths and weaknesses. Stimulating changes in behaviour, whether that of individuals or businesses, is complicated; although this is an under-researched area, there is some consensus that change is best pursued through a range of complementary instruments and approaches.

Figure 1 illustrates this multi-level approach. It suggests that change is most achievable where there is a level of awareness, where there are capacities for change and where there are mutually reinforcing imperatives and incentives for change. This mix of policy signals can come from one or more instruments and approaches – and the sequencing of these signals (as depicted in the numbers assigned to each) can be an important element of successful implementation.

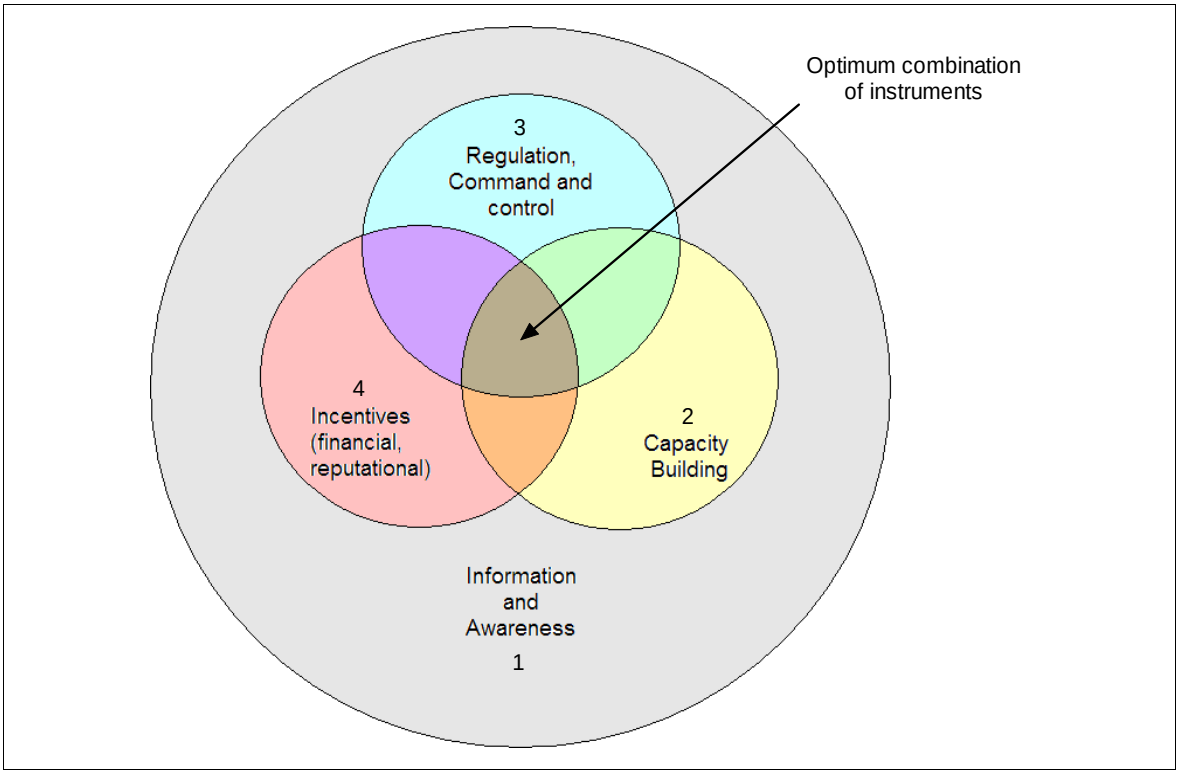


Figure 1 Optimum combination of policy instruments and sequencing.

Combinations of instruments in practice

The three cases studied for this project (reduction of waste to landfill, waste crime and catchment-sensitive farming) suggest that instruments and approaches are being combined in some instances, but not always in a systematic or well structured way. Key stakeholders firmly believe that the combinations of instruments and approaches that have been applied have led to better (i.e. more effective and efficient) policy outcomes. However, data is scarce and formal evaluations are unusual, so it is therefore not possible at this stage to complete full quantitative analysis.

The three case studies highlight some good examples where practice reflects the theory outlined above. They highlight some areas where guidance would perhaps be useful to enable a more formal and systematic approach to be taken in the processes of 'mixing' policy instruments and approaches.

The landfill case study is a good example of the benefits that a balance of policy instruments can bring. The market for recyclate has fallen recently, so it is unlikely that the environmental objectives of landfill policy would have been achieved through recycling alone. However, because instruments such as allowances schemes and the Landfill Tax are also used, this has in turn encouraged recycling activity to continue

The waste crime case study provides a good example of instruments being applied in a dynamic and responsive way, as the instruments used for each Business Resource Efficiency and Waste (BREW) campaign were tailored to the area. In addition, initiatives to target illegal waste sites use a risk-based approach to decide which instruments to use in different situations.

Using the national intelligence model (NIM) approach to tackle illegal waste export has allowed the Environment Agency to adapt and change its responses to the situation on an on-going basis according to the intelligence received.

The three cases have also shown that sometimes instruments do not work well when applied in combination. In the landfill case study we found that different instruments had competing objectives and had a negative influence on one another. For instance, one instrument targets biodegradable municipal waste while others target all municipal solid waste. Some activities, for example the collection of glass for recycling, can adversely affect landfill allowances. Such negative interactions were not identified in either the waste crime or the catchment-sensitive farming case studies.

The importance of implementing instruments in the correct order to achieve the most cost effective results was highlighted in the waste crime study. As court action is the most expensive form of enforcement, it should only be carried out in cases of greatest environmental risk i.e. when compliance with legislation does not occur even after awareness raising and capacity building activities have been carried out.

In all three cases the Hampton principles (e.g. using risk assessment to concentrate resources, being accountable for efficiency and effectiveness, not carrying out inspections without a reason, etc.) appear to have been well applied in the selection of policy instruments. We therefore recommend that these principles continue to be used as a key source of information during the design stage of an initiative.

All three cases highlight good practice in terms of understanding the target audience. The waste crime study is exceptional in that specific research was commissioned before campaigns to raise awareness were started. In some cases the ‘start’ position (i.e. how much fly-tipping was taking place, knowledge of the scale of illegal waste exporting, etc.) should be better understood as this will aid evaluation of success at later stages of a project by allowing progress to measured.

The studies also highlight some of the difficulties encountered when trying to embed practices used during ‘trial’ projects into the day-to-day work of both policy and operational staff. Short-term funding, staff turnover and the investment needed to set up good working relationships with partners were all highlighted as issues here.

The final key message highlighted by the case studies is that monitoring and evaluation appear to be applied inconsistently and with varying levels of quality. Monitoring and evaluation was often thwarted because projects has difficulties accessing appropriate data, identifying baselines and counterfactuals, measuring outputs (particularly those of a longer-term or more diffuse nature) and with understanding causal links between indices.

Future evaluation

Combinations of instruments and approaches could be evaluated in a number of ways (i.e. quantitatively, qualitatively, across a large sample, in a smaller number of in-depth case studies, at different timescales) and against a number of criteria (efficacy, efficiency, fairness, political feasibility, administrative viability, etc.).

There are also some common methodological problems in the ways that the choice of instruments and approaches are highlighted. These include the selection of appropriate cases and control cases to provide a counterfactual comparison; data availability and quality; the lag time between cause and effect; the presence of both discrete monetised costs and diffuse non-monetised benefits.

A mixed method approach that combines quantitative analysis based on the selection of appropriate cases and control cases and the construction of robust data sets for larger sample sizes could usefully be combined with more in-depth qualitative analysis based on experiential evidence from key stakeholders. This method of evaluation provides a more detailed, nuanced understanding of causal links and preconditions, etc.

Recommendations

There is sufficient insight from theory, backed up with supporting evidence from case studies, to recommend a more consistent and systematic application of combinations of instruments and approaches as per Figure 1.

The study suggests that raising awareness and capacities to help people to change their behaviour, or comply with regulations, should be executed before incentives (financial or reputational) and/or regulatory standards are applied. Incentives and standards should pull in the same direction towards common policy goals.

The Environment Agency should seek to formalise and standardise the ways in which it adopts combinations of instruments and approaches, and it should engage with other public agencies to encourage them to adopt instruments and approaches that further common objectives.

The evidence base needs to be developed to document exactly how, and to what extent, combinations of instruments and approaches might improve policy outcomes. A few in-depth, multi-method evaluations of carefully controlled pilots with clear counterfactual cases in place are needed to underpin the broader argument that combinations of instruments and approaches can lead to better policy outcomes.

Such experiments can be designed into the policy process – either in advance where pilots can be adopted and evaluated, or *ex post* where initiatives can be in place for a fixed term (i.e. by designing sunset clauses into the selection of initiatives) before being formally evaluated.

Acknowledgements

We would like to acknowledge the input we received from many Environment Agency contacts and thank them for their time they spent speaking with us face-to-face or via telephone and communicating via email as we gathered information for the case studies presented in this report.

Contents

1 Introduction

1.1 The project

In January 2007 the Environment Agency commissioned a consortium of WRc, Metroeconomica and Andy Gouldson from the University of Leeds to undertake project SC070063: Choice of policy instruments for modern regulation.

The overall objective of the project was to improve the Environment Agency's capacity to influence cost-effectively the environmental performance of businesses in England and Wales by using a combination of policy instruments.

The consortium produced its evidence base using case studies and developing a range guidance documents for Environment Agency staff to support their work to improve business compliance and environmental outcomes from business practices.

The project was undertaken in two phases, outlined in Sections 1.1.1 and 1.1.2.

1.1.1 Phase 1 objectives

1. To review eight to 10 sectors (or issues) where combinations of policy instruments are being used actively, or where the Environment Agency believes a mix of instruments may be appropriate to influence business.

2. To develop case study selection criteria (e.g. level of evidence from data or reports, availability of staff to co-operate) and provide an initial assessment of the different combinations of instrument for further review within the project.

3. To recommend two or three case studies for deeper analysis within phase 2 of the project.

1.1.2 Phase 2 objectives

1. To develop a methodological approach to assess the effects that combinations of instruments may exert over relevant time scales. The methodology should take account of external factors that may have an impact on the business sector under scrutiny in this more detailed phase and other wider considerations (e.g. unintended effects of the instrument). The approaches and tools used within the methodology must be fully justified and explained.

2. To use this methodology to undertake a deeper analysis of selected case studies (as identified in phase 1) and describe the most cost-effective combinations of instruments and approaches. Specifically, this analysis should:

    - demonstrate the effectiveness of regulations as they are currently applied at different levels;
    - explain the most important interactions between the specific applied instruments;
    - analyse the macro, meso, and micro level effects of applied policies;

- describe the unintended environmental and socio-economic consequences of current policies;
- assess how well these regimes contribute towards the values and environmental goals of the Environment Agency;
- identify potential instruments that could be developed and applied in the future.

3. To provide a record of the project including broad guidance on the principles of using combinations of instruments. This guidance should illustrate how combined instruments may be used in practice by policy and operations staff. Specifically, the output of the project should:

    - describe potential improvements of the links between theory and practice;
    - suggest options for further behaviour change options , including new ways of public engagement;
    - explain the implications of different combinations of instruments for managing compliance.

During the research phase of this project we were able to observe some of the consequences of behaviour that was compliant and non-compliant with the current regulatory regime in selected business sectors. The analysis and the presentation of these findings did not form part of the initial objectives of the project, but emerged as the importance of these observations became apparent. With this in mind, the research captures views from a range of target groups including those who are typically compliant and those often found to be non-compliant. The project therefore identifies how target groups have responded to policy instruments and approaches; we have captured compliant and non-compliant responses.

1.2 This report

This document is the final output from the project. It contains details of both phases of the study and is a complete record of the project. The report summarises:

- the study's aims;
- a literature review;
- a brief review of 15 case studies;
- three detailed case studies;
- overall conclusions and findings from the study.

2 Concepts and definitions

The focus of the work was to examine the ways in which different policy instruments may be combined to deliver modern (i.e. better) regulation. Before embarking on any primary research the project team first defined all the terms that would be used during the study.

The term ‘policy instruments’ is used in many different ways; it means different things to different people. For this study it was necessary agree precise definitions and eliminate any differences in the interpretation of terminology.

The following terms, with their definitions, are used throughout this study:

Policy areas e.g. air, climate, water, waste, etc.

Policy initiatives e.g. EU waste strategy, UK waste strategy, Climate Change Programme, etc.

Policy instruments Interventions that are chosen by governments (e.g. regulations, economic instruments, information-based approaches, voluntary and negotiated agreements, etc.) – see Figure 2.1.

Policy approaches Actions that are adopted by implementing agencies as they:

- decide how to interpret, apply, monitor and enforce the instruments adopted by governments;
- choose whether and how to apply a range of complementary measures (i.e. awareness raising or capacity building measures);
- decide how to interact with the targets of regulation, other governmental agencies and the broader range of stakeholders.

The term ‘policy approaches’ therefore relates both to what implementing agencies *do* and to the *way that they do it*. Implementing agencies have discretionary powers to choose how to meet statutory objectives and how to balance the wider range of priorities that they are expected to address. The actions adopted by an agency are widely held to have a significant effect on policy outcomes – including the costs of implementation and the costs of monitoring and enforcing compliance.

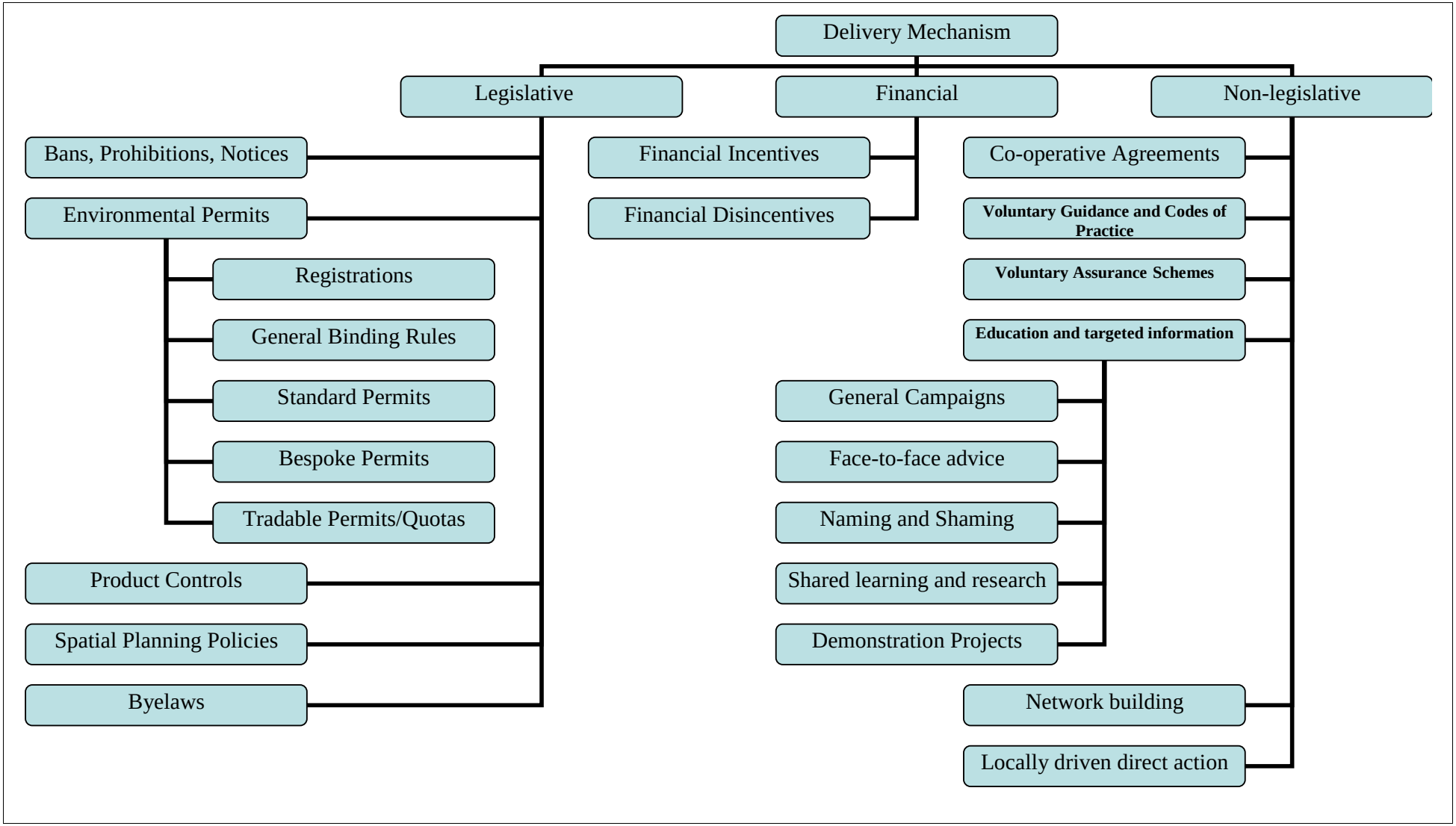


Figure 2.1 The 'Box of Tools': types of environmental policy instruments.

At the most fundamental level, the successful implementation of any policy measure depends on those responsible for causing an issue of environmental concern (i.e. the target audience) being addressed to change their behaviour. In the publication *Securing the Future: Delivering UK Sustainable Development Strategy*, Defra defined four categories of instrument that could catalyse changes in behaviour. These instruments were presented in a diagram which has since become known as the 'Defra Diamond' (see Figure 2.2).

Essentially, the diagram highlights how the implementation of policy helps people to change their behaviour in four different ways:

i. **Engage**
First, instruments can *engage* different actors in new initiatives – for example through the creation of new relationships, the strengthening of existing relationships, and the accumulation of trust and mutual understanding within these relationships. These engagements can allow actors to take better decisions and to work together more effectively in the future.

ii. **Enable**
Instruments can also *enable* – for example by educating and raising awareness and by building the capacity of different groups to participate in deliberations and to contribute to the realisation of policy goals. This kind of facilitation is typically achieved through education and the provision of different forms of support and assistance. However, the provision of facilities and infrastructure can also enable behavioural change (e.g. distribution of recycling bins, water meters, etc.).

iii. **Encourage**
It is also important to *encourage* – for example by offering incentives for more desirable forms of behaviour and disincentives for less desirable forms of behaviour. Typically, this has been done through economic or tax-based instruments, although it is also possible to recognise and reward 'good behaviour' with positive publicity. Probably a stronger interpretation of this need to encourage is to that some instruments are designed to *ensure* that minimum standards are met – for example by promoting compliance with regulations or, where other instruments and approaches have been proved to be ineffective, by enforcing compliance with regulations.

iv. **Exemplify**
Finally, some approaches are designed to *exemplify* – those who are trying to drive a change in behaviour also set a good example in the way they conduct their business and they are recognised for their action.

Delivery mechanisms are more effective when they simultaneously ***exemplify, engage, enable*** and ***encourage***. The knowledge that regulators can ultimately act to ***ensure*** that minimum standards are met is often an important pre-cursor to the effective application of other instruments (Environment Agency, 2005).

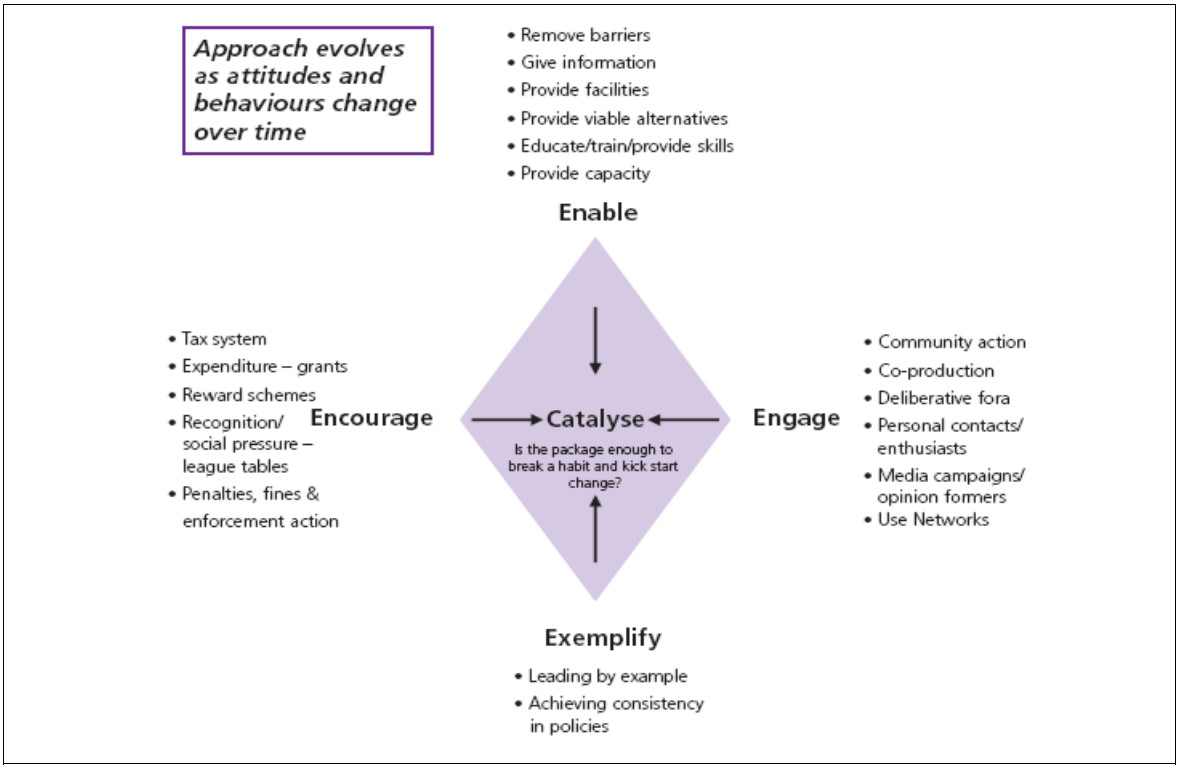


Figure 2.2 UK sustainable development strategy model for behavioural change (the 'Defra Diamond') (HMSO, 2005).

Policy instruments can also be distinguished broadly in three categories reflecting their legal basis:

i. **Regulatory**
Regulations (e.g. environmental permits, product controls and, at a more local level, byelaws) seek to promote compliance with particular standards. They require an infrastructure to adopt, implement, monitor and enforce these standards, be it by promoting compliance or by sanctioning non-compliance with the standards.

ii. **Economic**
Financial instruments (e.g. user charges, tradable permits or grants) seek to establish incentives for more desirable forms of behaviour, for example by introducing or altering tax levels or by setting up systems for buying and selling permits that allow some form of activity. Like regulations, economic instruments require an infrastructure to adopt, implement, monitor and enforce compliance, in this instance by ensuring that actors pay the correct amount or tax or that they comply with the requirements of a permit.

iii. **Non-regulatory**
Instruments with no legal or statutory basis include a wide range of approaches, notably information-based instruments, voluntary or private regulations or capacity building instruments. These do not require legislation to be introduced or the presence of an implementing agency with a legal mandate. They tend to require the presence of relationships between regulators, target groups and stakeholders such as community groups or pressure groups. Within these broad categories, there are many different mechanisms that give governments and regulatory agencies a considerable toolbox from which they can select the most appropriate approach.

This project focused primarily on the internal operational policy approaches that are adopted by the Environment Agency. It explored how these could be used in combination, given the policy instruments available, to improve the environmental performance of business in a cost-effective manner.

However, the policy approaches available to the Environment Agency rarely operate in total isolation from other interventions, or the activities of other agencies (e.g. HSE, local authorities, etc.). Therefore, we also considered the extent to which Environment Agency influences the choices made by government when selecting and designing policy instruments, and the scope for increased coordination with the approaches adopted by these other agencies.

The scope of the study is represented in Figure 2.3.

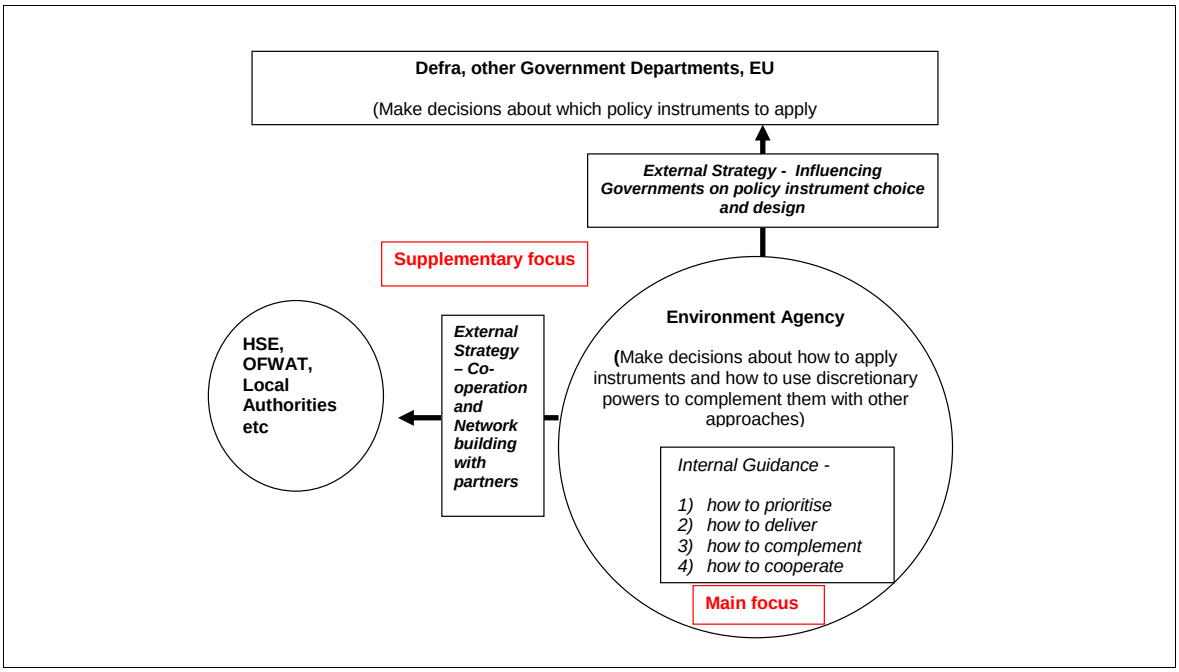


Figure 2.3 Focus of the study in terms of the scope the Environment Agency's influence.

The study focused on a few specific policy areas. We have evaluated the combinations of approaches that have been, or could have been, adopted in these policy areas, asking whether they could have been more effective (i.e. secure greater environmental outcomes) and/or more cost-efficient (i.e. reduce total costs). On the basis of this evaluation, the study also provides the Environment Agency with guidance on how to best combine and implement policy approaches to deliver cost-effective environmental improvements.

The guidance that has been produced from this work has been written primarily for those within the Environment Agency who make decisions about the selection, design and implementation of policy approaches, or who liaise with government on the choice and design of policy instruments. Other implementing agencies may also be interested in the guidance as they seek to coordinate their approaches with the Environment Agency. The target audience for the guidance therefore includes:

- policy staff trying to influence the government or the EU about instrument selection and design;

- policy and process staff translating policy goals into guidance on how to act;
- frontline operational staff who deal with the regulated community at a local level and who make decisions on the best ways work with their communities within the frameworks set by the policy-makers.

2.1 Relevant costs

Cost effectiveness is a key determinant of whether a combination of policy instruments or approaches is deemed appropriate. But the costs of environmental policy can be measured from different perspectives, for example the perspective of implementing agencies and regulators, of the targets of regulation (e.g. industry, farms, households, etc.) and of society at large. The choice of perspective influences which costs are relevant to the task at hand, and how they are defined and measured.

The *total social cost* of achieving a particular environmental outcome is the sum of the *opportunity costs* incurred by society to comply with the new policy. Opportunity costs are the sum of:

- the value of the goods and services foregone by society due to scarce resources and the need to comply with, and implement, the policy;
- any costs associated reductions in output.

Total social costs comprise the following five components.

i. **Direct resource compliance costs**
These costs are typically make up the bulk of total social costs. They arise from a variety of actions involved in achieving compliance.

   - purchasing, installing and operating new pollution control equipment or more efficient equipment;
   - changing a production process by using different inputs or different mixtures of inputs;
   - capturing waste by-products and selling or re-using them.

   These direct-resource costs also include un-priced resources that have opportunity costs associated with them, such as extra administrative costs associated with compliance (e.g. obtaining permits and preparing required monitoring reports).

ii. **Regulatory costs**
These costs are incurred by government or their implementing agencies and include costs associated with monitoring, administration, enforcement and litigation. When economic instruments are used within a regulatory regime, costs will also be incurred to set up a new market (especially for tradable permit schemes). The costs are typically calculated in terms of staffing requirements, expressed as full-time equivalent employees (FTEs). Ultimately, these costs are borne by taxpayers, unless other regulatory costs are reduced to accommodate a new policy. Regulatory costs can be either opportunity costs that arise from the discontinuation or reduction of other activities (because budgets are fixed or the actions become redundant) or the private costs imposed on taxpayers to support the increased expenditure by government necessary to implement the new policy.

iii. **Social welfare costs**

These costs are the net losses in consumer and producer surpluses associated with any rise in the price (or decrease in the output) of goods and services, either induced by the policy or when additional regulatory costs result in higher taxes passed on to the consumer. The extent to which the private direct costs are passed through to the consumer is determined by the market structure, and the elasticities of demand, supply and income.

iv. **Transitional costs**

These costs include the value of resources that are displaced when a policy induces reductions in output (where relevant), and the private resource costs of reallocating those resources. Key transitional effects include:

- plant closings and associated unemployment;
- resources shifting to other markets;
- transaction costs associated with setting up incentive-based policies;
- disruptions to production.

In theory, these costs may be offset by policy-induced increases in private resource use in both primary and related markets (e.g. more workers and equipment may be needed for pollution control). Transitional costs will vary, depending on the length of the time period examined (i.e. short-run effects will differ from long-run effects).

v. **Indirect costs**

These costs include the effects that policies may have on product quality, productivity, innovation and changes in markets indirectly affected by the policy. All of these effects may have impacts on net levels of measured consumer and producer surplus throughout the economy. They are also known as general equilibrium effects.

3 Literature review

We conducted a literature review to support our identification of relevant policy areas that would provide appropriate material for case studies. The literature review also helped us to develop the methodology performing in-depth evaluations of the case studies.

We evaluated general literature The literature review comprised an evaluation of general literature covering policy initiatives, instruments and approaches. We also evaluated publications on specific general topics which influence several case studies (e.g. enforcement in environmental regulation, risk approaches).

The documents were reviewed to:

- extract key messages about the use of combinations of policy instruments;
- identify factors or approaches which should be considered in the design of the phase 2 analysis;
- identify material about specific case studies identified in phase 1 (see Chapter 4);
- determine whether sufficient information would be available for an in-depth case study analysis.

3.1 General aspects and single policy instruments

A wide range of literature deals with the definition and classification of policy instruments and their combinations in the environmental sector. Much less published work addresses the influence of policy approaches, although there are various studies which evaluate the influence of regulatory agencies and regulatory styles on the implementation and impact of environmental policy.

Historically, the most widely adopted policy instruments have been regulations or economic instruments; these continue to play an important role in some settings. For example, regulations are often needed where minimum standards have to be guaranteed; economic instruments are often seen to be an efficient way of shaping behaviour over the longer term.

If a ‘single-aspect’ environmental problem can be targeted directly, a ‘first-best optimum’ can be achieved with the use of a single instrument. This approach assumes that there are no non-environmental market failures in relevant markets (e.g. well-defined property rights exist, all actors have full information and perfect foresight, and no buyer or seller is large enough to influence outcomes alone). If these assumptions hold, then the use a single policy instrument could be preferable to a mix of instruments.

However, relevant markets do not always function perfectly. In such cases, combinations of instruments, which mutually underpin each other, will be required in order to address the non-environmental ‘failures’ in the markets in which an environmental policy instrument operates. These failures could be insufficient information, poorly-defined property rights, an imbalance of power in a market, etc.

In the presence of ‘informational failures’, for example, a labelling scheme can enhance the responsiveness of businesses to an environmentally-related tax, while the existence of the tax itself helps to draw attention to the labelling scheme. Indeed,

according to Lipsey and Lancaster (1956), one policy instrument will be needed per market failure.

In general, any single policy instrument should only be implemented if policy-makers are reasonably confident that this instrument will enhance the total welfare of society. Equally, mixes of policy instruments should only be introduced if there is a reasonable expectation that a specific combination of instruments will add to the total welfare of society. In an environmental policy context, for an individual instrument or combination of instruments to increase total social welfare, at the margin *the disadvantages of implementing a specific instrument mix must be less than the advantages* ('cost-benefit' criterion).

In addition to the cost-benefit criterion, governments can reasonably expect the instruments to be 'efficient'. In other words the resulting environmental gains must be as high as possible ('environmental effectiveness' criterion) and the cost of introducing the specific mix must be as low as possible ('cost-efficiency' criterion).

The OECD (2007) study recommends that as well as from the perspective of environmental effectiveness and economic efficiency, policy-makers should apply instruments that address a given environmental problem as broadly as possible. Further, they should provide similar incentives at the margin to all producers that contribute to the problem in question. Economic instruments can 'automatically' provide equal marginal abatement incentives, but a variety of regulatory instruments can – at least partially – also do the same job.

For 'multi-aspect' environmental problems, policy-makers should supplement instruments that address total amounts of pollution with instruments that address the way a certain product is used, when it is used, where it is used, etc. In many cases, regulatory instruments, information instruments, training, etc. can be better suited to address these dimensions than, for example, a tax or trading system.

It is advisable that social concerns are addressed primarily with non-environmental policy instruments (e.g. the social security system or the tax system), rather than by modifying environmental policy instruments. This approach will *inter alia* make it easier to provide an incentive at the margin for low-income households to behave in environmentally benign ways.

Where policy-makers wish to address any negative impacts on the competitiveness of certain sectors that arise from environmental policies, it is again important to provide an incentive at the margin to abate emissions. Such incentives can, for example, be provided through emission trading systems and through environmentally related taxes – possibly with tax revenues being recycled back to the sectors of concern (OECD, 2007).

It can also often be preferable to address primarily non-environmental market failures (e.g. market power, incomplete property rights, split incentives, etc.) with non-environmental instruments, such as competition policy instruments, improvements to patenting systems, deregulation of the housing markets, etc. (OECD, 2007).

A study by the GTZ (2006) gives a good overview of selected policy instruments within the sector of sustainable consumption and production (SCP). The study builds on the recent discussions and practical experience with these instruments. It gives detailed profiles of instruments that public authorities have at hand to promote resource efficiency. These instruments do not only relate to traditional regulatory or 'command and control' approaches, but include a much wider array of tools such as economic, informational, co-operation and educational instruments. This compendium introduces a broad range of policy instruments that have successfully increased resource efficiency and promoted SCP patterns in a number of jurisdictions. However, the study does not make recommendations about which policy mixes to apply.

3.2 Combinations of policy instruments

When combinations of policy instruments are being considered, it is important to remember that instruments commonly need to be applied in a dynamic way, reflecting and responding to changing circumstances. Indeed, in many respects the concept of modern regulation demands the adoption of a risk-based approach, instead of a 'one size fits all' approach (Gouldson, 2007). This approach enables risks to be managed and outcomes to be secured more efficiently by regulating worse performers or higher risks more intensively or, alternatively, by regulating lower risks and better performers with a lighter touch.

Such a responsive, risk-based approach, could combine instruments, for example by initially adopting a regulation based approach for higher risk activities but with the promise of negotiated agreements or voluntary and information-based approaches for the better performers who demonstrate commitment and a capacity to manage risks effectively over time. When policy-makers consider the possibility of combining instruments, they should not be concerned only with one-off decisions at the policy design stage. They must also assess whether combinations will be appropriate and effective for on-going decisions throughout the lifetime of the policy issue as regulators such as the Environment Agency encounter changing circumstances and variable responses from target actors.

A number of reasons have been suggested for using *combinations* of policy instruments to address a *specific* environmental problem, as opposed to an individual instrument (OECD, 2007; see also Gunningham and Sinclair, 1999; Pizer, 2002; Gouldson, 2008). The OECD study evaluated the impact on environmental effectiveness and economic efficiency of using an 'instrument mix' rather than a single instrument to address a given environmental problem.

As the OECD describes, many environmental problems have complex, multi-aspect nature. For example, in the case of chemical pollution, the total amount of pollutant released into the environment is not the only factor that affects its environmental impact. It can also matter where emissions take place, when they occur, how the polluting product is applied, etc.

The OECD also observes that certain instruments can mutually underpin each other. For example, when a labelling scheme enhances the responsiveness of firms and households to an environmentally related tax, the existence of the tax helps draw attention to the labelling scheme. Often, a mix of instruments is required in order to address non-environmental 'failures' (e.g. a lack of information, ill-defined property rights, market power, etc.) in the markets in which environmental policy instruments operate. Sometimes such mixes can also limit compliance-cost uncertainty, enhance enforcement possibilities and reduce administrative costs (OECD, 2007).

Policy instruments, when used together, can have a number of positive interaction effects, which may serve to:

- limit compliance-cost uncertainty;
- address split-incentives;
- increase the invention and diffusion of 'clean technology';
- enhance enforcement possibilities;
- reduce administrative costs.

Mixes of policy instruments can also have a number of negative interaction effects. In some cases one instrument may inadvertently hamper the flexibility of businesses or

households to find least-cost solutions to a problem which could have been provided by another instrument were it used on its own. In other cases instruments in a mix may simply be redundant (i.e. overlap with one another) thereby increasing total administrative costs with no compensatory gain in effectiveness (OECD, 2007).

A further factor affecting the cost effectiveness of instrument mixes being applied in a given environmental situation is the level of coherence between different policies. Co-ordination is not only needed between environmental policies (e.g. to avoid transferring pollution between different environmental media), but also with other related policies (e.g. so that they reinforce each other).

Except for situations where mutual reinforcement between instruments is clear and well-established, or when the instruments address different 'aspects' of a given problem, policy-makers should generally avoid introducing overlapping instruments. Such overlaps tend to reduce the flexibility and create unnecessary administrative costs (OECD, 2007).

A recent study on 'second-best theory and the use of multiple policy instruments' (Snyder *et al*., 2007) highlights that in many cases policy-makers employ multiple instruments to address a single environmental problem. However, much of the economics literature on instrument choice tends to compare the properties of single policy instruments. Snyder *et al*. argue that under a fairly broad set of circumstances the use of multiple policy instruments can be justified as optimal in a 'second-best world'.

The study examined two broad categories of second-best policy-making:

- cases with multiple market failures, but not all of the failures can be corrected at the same time;
- cases with exogenous (often political) constraints that cannot be removed.

The use of multiple policy instruments can be justified economically in both of these scenarios, but there is no implication that all multiple instruments employed in actual practice are economically justified.

Other research (e.g. Gouldson, 2008) acknowledges that the behaviour of target actors can be changed more effectively and more efficiently if different policy instruments are combined. For example, if regulations are applied in contexts where regulated actors do not have the capacity to comply (e.g. when they target SMEs), then costs are likely to be higher and environmental outcomes lower than they might have been if regulations were combined with capacity building measures.

Similarly, if there are incentives that encourage actors to go in the opposite direction from that required by regulation, then again costs are likely to be higher and outcomes lower. For these reasons, it is often accepted that a combination of instruments that introduces mutually reinforcing incentives, imperatives and capacity building measures can lead to better outcomes.

Much of the existing research focuses on how to combine policy instruments in a 'complementary policy mix', but it is rarely acknowledged that implementing agencies have a dramatic effect on policy outcomes: they can adopt a range of complementary approaches as they deliver the policy instruments that in theory are 'handed down' to them by government. Gouldson and Murphy (1997), for example, found that the *regulatory style* adopted by the Environment Agency had a significant effect on the costs of compliance. They found that the Environment Agency enabled many firms to find low cost ways of improving environmental performance by adopting a co-operative approach that sought to:

- raise awareness;

- change cultures;
- build capacities for compliance;
- transfer best practice between firms.

Gouldson and Murphy suggested that the alternative approach – i.e. the adoption of a more 'arm's length' approach that sought only to detect and sanction non-compliance – would have led to higher costs and lower levels of environmental improvement. As comparatively little substantial research has been done on the influence of such approaches to policy performance, this project is exploring issues that are poorly understood or are under-researched.

3.3 Policy instruments and their combinations in areas other than those covered by the case studies

Commonly used criteria for judging environmental policy instruments are (environmental) 'effectiveness' and (static) 'cost-efficiency'. An instrument that is ineffective in reaching the policy goals is clearly deficient. On the other hand, an instrument that meets the policy goals at excessive cost is wasting societal resources that might better be used for other purposes.

A number of additional criteria have been proposed by the OECD (2003) for evaluating the performance of environmental policy instruments, including:

- information requirements;
- dynamic efficiency (incentives for innovation);
- transaction costs;
- administration costs;
- enforceability;
- tax interaction effects;
- revenue recycling effects;
- adaptability;
- equity and fairness;
- soft effects (moral and ethical considerations).

A study on national policy instruments for the advancement of renewable energy (Sarwin *et al., 20*04) recommends a combination of policies, whether for grid-connected electricity or other uses, including production-based incentives and financing support to lower initial investment costs and reduce risk, whether real or perceived. The study's authors argue that the effectiveness of policies at promoting renewable energy will depend on their design, enforcement, how well they address needs and national circumstances, and the extent to which they are reliable and sustained.

The UBA (2006) study on policy strategies for the promotion of electricity from renewable energy sources shows that strategies differ significantly among the Member States of the European Union (EU). The amount of additional installed capacity and country-specific support costs vary between Member States. The report aims to assess

the effectiveness and the economic efficiency of the support policies in the EU based on both historical experiences and prospective model-based analysis.

The main message of the investigation is that the most effective policy instruments tend to be cost-efficient at the same time. In particular, feed-in tariff systems were identified as a successful instrument for supporting renewable energies in terms of effectiveness and efficiency, whereas quota systems still have to prove themselves in practice. The results of the study make it clear that the level of financial support is not the only reason behind the successful development of renewable energies. Besides the tariff level, a stable and constant policy framework, the reduction of investment risks and the removal of non-economic barriers all represent crucial factors which influence the success of RES-E support. Finally, the authors conclude that the opportunities and risks of EU-wide policy harmonisation should be analysed in detail, based on real-term market experiences. This analysis would help to reduce the risk of endangering market development in the evolving renewable energy sector.

In an assessment of policy instruments for reducing greenhouse gas emissions from buildings the UNEP (UNEP, 2007) provided an appraisal of the instruments available for improving energy efficiency in buildings. Its purpose was to assist policy-makers in their decision process. Twenty of the most important instruments were chosen and comparatively evaluated in this study using concrete case studies. The study concluded that since all instruments have advantages and disadvantages, their appropriate combination with other policy instruments can maximise the overall effectiveness.

The study suggested that the following policy instruments could be effectively combined:

- standards, labelling and financial incentives;
- regulatory instruments and information programmes;
- public leadership programmes and energy performance contracting;
- financial incentives and labelling.

An evaluation of policy instruments and their combination in the field of climate change was recently reported by Defra (2007). Defra's consultation on the recommendations of the climate change simplification project reviewed the EU Emissions Trading Scheme, Climate Change Agreements and the Carbon Reduction Commitment. The authors came to the conclusion that there are a number of areas of overlap between these three instruments. The focus of the paper is not only on how to manage the administrative burden of these policies on business, but more broadly on how to reduce the regulatory burden of these instruments on the economy as a whole. Defra's report provides an overview of the policy landscape; it describes each instrument, its coverage, its monitoring, reporting and verification requirements, and the estimated administrative burden.

3.4 Measuring the performance of policy instruments

As noted in Section 3.3 above, the performance of environmental policy instruments can be measured by many standards. The most common measures focus on two key questions: are the policy instruments meeting their goals, and are the goals being achieved in a cost-effective manner? It is also appropriate to assess whether the policy

instruments are consistent with broadly held values, such as equity or fairness, non-intrusiveness and public participation (Harrington *et al*., 2005).

Defra communicated in its final report on administrative burdens (2006) the results of its Administrative Burdens Measurement Exercise (ABME). The ABME forms part of the government's wider Administrative Burdens Reductions Project (ABRP). The report presents the administrative costs for Defra that arise from its regulatory responsibilities. It explains the methodology of the ABME, any variations its approach from the planned implementation and how these variations were handled. It provides a primary level of analysis of the administrative costs measured for Defra.

Core statements from the report include:

- "Internal costs by themselves were a major cost driver for the Producer Responsibility Obligations (Packaging Waste) Regulations 1997."
- "For the Producer Responsibility Obligations (Packaging Waste) Regulations 1997, the largest cost driver is the requirement for accredited re-processors and exporters to keep records of the weight of packaging waste recorded on packaging waste recovery notes (PRNs) and packaging waste export recovery notes (PERNs) that they issue. This accounts for over £7m of the £10m administrative cost associated with this regulation. The main cost driver here is the internal time cost for these businesses, with the regulation affecting a relatively small population of just under 400 accredited re-processors and exporters. Frequency is also a factor here with quarterly reporting and inspection of accredited re-processors and exporters."

There is an extensive literature on techniques in policy analysis that can be used to evaluate the performance of individual policy instruments. Different academic disciplines use different approaches. Economists, for example, tend to use quantitative data and compare efficiency levels at both the macro and micro scales. The fields of public administration and political science combine quantitative and qualitative methods to evaluate the performance of specific policies and public sector organisations. Science and technology studies tend to focus on the impacts of policy on innovation.

In all these cases, single instruments have been assessed using a range of methods including macro and micro, quantitative and qualitative, *ex ante* and *ex post* studies, etc. Observations or recommendations that a policy could be more effective or efficient if certain conditions were met are implied in many of these studies. Economic studies, for example, discuss issues relating to the 'embeddedness' or responsiveness of firms by referring to the elasticity of supply; science and technology studies discuss the preconditions for, or barriers to, innovation. Social psychology, on the other hand, discusses the attitudinal or cultural conditions for behavioural change.

Concepts such as these suggest that complementary policies could be used to increase the responsiveness of firms or consumers to different forms of policy. However, very little work has been published that explicitly uses language on the need for a combination of policy measures or a complementary policy mix.

At a macro scale it has long been recognised that there is a need for policy integration and 'joined up thinking' between different policy areas (agriculture, transport, energy, etc. and environment), but there is a lack of studies that have actually sought to evaluate the interactions between policy instruments or the need for a complementary policy mix at a micro scale. Methodologically, such micro-scale studies would require the careful construction of comparative case studies, where comparisons can be drawn across time, space, policy sphere, economic sector or social group. Thereafter a variety of scales and methods for analysis could be applied.

3.5 Policy approaches in environmental regulation

In addition to the literature evaluation, we also interviewed Keith Froud of the Environment Agency (13/02/08) to inform further our understanding on this topic. It is worth noting that this is a horizontal topic because enforcement is applied in all environmental areas.

The *Review of Enforcement in Environmental Regula*tion (Defra, 2006) focuses on the development of an effective and flexible system of environmental enforcement with closer community involvement. The review used the available evidence to identify obstacles to more effective enforcement and to develop and suggest possible solutions. The report offers evidence a mix of measures would increase proportionality, transparency, consistency and effectiveness in environmental enforcement.

The initial discussions for the review took place at the November 2004 Conference on Access to Justice in Environmental Matters. The review examined the enforcement processes in place for existing regulation. These processes ranged from the procedures followed by the courts and regulators (e.g. the Environment Agency and local authorities) to the ways in which the wider community could assist to make enforcement more effective. The review covered all the major area of environmental regulation, in particular the prevention and control of pollution, waste, water quality, noise, and wildlife and habitats.

The Hampton report on *Reducing Administrative Burdens* (2005) set out a vision for a modern, risk-based approach to regulatory-led inspection of business. A key pillar to this was the removal of unnecessary regulation and 'old style' routine inspection. The report recommended that, to focus on the greatest risks to society, regulations needed to be 'fit for purpose' and that all enforcement should be risk based. It stated that a risk-based approach would make the most efficient use of resources, decrease the cost on compliant businesses and provide better protection for the individual.

Implementing Hampton: from Enforcement to Compliance details the actions taken to date by a variety of regulators to enact the Hampton Report. This publication outlines the powers in the Legislative and Regulatory Reform Act (LRRA) and offers thoughts on the way forward.

The LRRA contains powers to enable the Hampton principles to be established in UK law through a statutory Regulators' Compliance Code (RCC). Regulators will be legally obliged address the Hampton principles when deciding their policies and principles, and in setting standards and in giving advice. The RCC came into force in April 2008. It will oblige all regulators (both national and local) to have regard to the following Hampton principles, namely that:

- regulators, and the regulatory system as a whole, should use comprehensive risk assessment to concentrate resources on the areas that need them most;
- regulators should be accountable for the efficiency and effectiveness of their activities, while remaining independent in the decisions they take;
- no inspection should take place without a reason;
- businesses should not have to give unnecessary information, nor give the same piece of information twice;
- the few businesses that persistently break regulations should be identified quickly;

- regulators should provide authoritative, accessible advice easily and cheaply;
- regulators should recognise that a key element of their activity will be to allow, or even encourage, economic progress and only to intervene when there is a clear case for protection.

The Macrory report recommends that the government should make changes that will create a 'sanctioning regime' that is effective and credible. The report surmises: "Most breaches identified in a risk based system, should face penalties that are quicker and more proportionate to the offence, while there will continue to be tough criminal sanctions for those offenders who persist in rogue trading activity". The report envisages giving regulators who can show they comply with Hampton a flexible toolkit of sanctions that they can use.

The Macrory report recommends a sanction should:

- aim to change behaviour;
- aim to eliminate any financial gain or benefit from non-compliance;
- be responsive and consider what is appropriate for the particular offender and regulatory issue, which can include punishment and the public stigma that should be associated with a criminal conviction;
- aim to restore the harm caused by the regulatory non-compliance, where appropriate;
- aim to deter future non-compliance.

Regulators should:

- measure outcomes, not just outputs;
- follow up enforcement actions where appropriate;
- enforce in a transparent manner;
- be transparent in the way in which they apply and determine administrative penalties.

The Regulatory Enforcement and Sanctions Bill (RES Bill) was introduced in November 2007 and establishes:

- the Local Better Regulation Office (LBRO) to promote greater consistency amongst local authorities, and between them and central government, helping them work together to keep the burdens of regulation on compliant businesses to a minimum;
- a 'primary authority principle', overseen by LBRO, to deliver the government's commitment to place home and lead authority principles on a statutory footing;
- a framework for a range of new administrative sanctions which will allow regulators to tackle non-compliance in ways that are transparent, flexible, and proportionate to the offence;

- powers to allow ministers to impose a duty on regulators who require additional focus to meet the requirements of the government's 'better regulation' agenda.[1]

3.6 Summary

In summary the literature study found that:

- if a single-aspect environmental problem can be targeted directly, an optimum effect can potentially be achieved with the use of a single policy instrument;
- if the relevant markets do not function perfectly, combinations of instruments, which mutually underpin each other, would be required to address non-environmental 'failures' in the markets in which an environmental policy instrument operates;
- it is advisable to address social concerns primarily with non-environmental policy instruments (e.g. the social security system or the tax system), rather than by modifying environmental policy instruments;
- when considering appropriate combinations of policy instruments, it is important to remember that instruments commonly need to be applied in a dynamic, responsive way to reflect changing circumstances;
- mixes of policy instruments may be disadvantageous because they can have a number of negative interaction effects, for example the mix may hamper the flexibility of businesses, which could have been provided by another instrument were it to be used on its own.
- instruments in a mix may be redundant and thereby increase costs with no compensatory gain in effectiveness;
- the performance of environmental policy instruments should be measured to assess whether the policy instruments are meeting their goals, and whether the goals are being achieved in a cost-effective manner;
- the performance of policy instruments should also assessed that they are consistent with broadly held values, such as equity or fairness, non-intrusiveness, and public participation;
- the Hampton and Macrory reports and the RES Bill, together with their implementation documents, provide overall guidance for the application and evaluation of enforcement.

These findings present the theory against which the case studies will be evaluated. The case studies will provide evidence to support the theory or otherwise. They will provide knowledge to further develop the theory and provide examples from which guidance may be developed on the practical steps that need to be taken to further test the theory.

[1] The duty will require any specified regulator to review the burdens they impose in the delivery of their objectives, to reduce those that are found to be unnecessary and unjustifiable, and to report on progress annually.

4 Case studies – phase 1

The objective of phase 1 was to identify eight to 10 sectors (or issues) where combinations of instruments are being used actively, and review these areas to provide an initial assessment of different combinations of instrument. Selection criteria were then developed to enable three case studies to be recommended for deeper analysis within phase 2 of the project.

4.1 Introduction

Fourteen potential case studies were identified:

1. Catchment-sensitive farming.
2. Food and drink.
3. End of life vehicles (ELV) and small transfer sites.
4. New approaches to waste enforcement.
5. Waste crime.
6. Cement.
7. Water industry.
8. Chemical users (not manufacturers).
9. Fishing.
10. Packaging.
11. LATS (Landfill Allowance Trading Scheme).
12. WEEE (Waste Electronic and Electrical Equipment) Directive.
13. EU ETS (Emissions Trading Scheme).
14. Flood risk management.

For each area we held an interview with a key Environment Agency contact to discuss the quantity and quality of data available and whether the area could be selected for a deeper analysis in phase 2 of the project.

We were unable to hold an interview with the named contact for the fishing case study despite many attempts. For a further four case studies, interviewees quickly considered them to be inappropriate for phase 2 analysis because of the lack of an obvious initiative or policy implementation, or lack of information. These four areas were:

- ELV and small transfer sites;
- chemical users;
- the Landfill Allowance Trading Scheme (LATS);

- the WEEE Directive.

By contrast, a number of additional case studies were mentioned as possibilities for analysis, namely:

- the Reservoirs Act 1975;
- landfill;
- The Hazardous Waste Reduction Programme.

These additional case studies were investigated briefly. We include our findings in Section 4.2, but we did not have enough time to investigate fully their suitability for phase 2 analysis.

4.2 Review of case studies

4.2.1 Catchment-sensitive farming

The interview for this case study was carried out with Emma Blunden on 15 February 2008.

Scope: The objective of the England Catchment-sensitive Farming Delivery Initiative (ECSFDI) is to raise awareness of diffuse water pollution from agriculture (DWPA) and to encourage early voluntary action by farmers to tackle DWPA in 40 priority catchments. It is a two-year initiative funded by Defra and delivered by Natural England working in partnership with the Environment Agency. It focuses at a local level and pulls together farmers, farm advisors, conservation bodies, water companies and a wide range of other interest groups.

Its aims are delivered through three policy instruments, specifically:

- a national grant scheme applied in a uniform manner across the catchments;
- dedicated catchment officers working one-to-one with farmers (an average of one officer per catchment);
- various local actions (e.g. workshops, seminars, farm demonstrations and other extension activities) to raise awareness and share technical knowledge.

ECSFDI was designed to work alongside agri-environment schemes, such as Environmental Stewardship which comes under the Rural Development Plan for England by encouraging pro-environmental behaviours among farmers.. ECSFDI is therefore part of a basket of measures aimed at reducing pollution from agriculture.

Information Availability: The project has had a specific budget to monitor progress and has just submitted reports for the last two years. The analysis appears to be complete; progress is being monitored both in terms of farmers' attitudes and improvements in water quality. There is good information about the costs of the approaches adopted and their effectiveness. Emma's focus has been on the project itself with little time to assess the extent to which lessons learnt in this project could be transferred to the rest of the Environment Agency. She believes that this project could complement the analysis she has carried for the ECSFDI project.

4.2.2 Food and drink

Two interviews were carried out for this case study, with Paul Evans and Jon Foreman on 13 and 15 February 2008, respectively.

Scope: This case study is not about a specific initiative, but covers a range of policy instruments applied to the food and drink sector (manufacturers, wholesalers, retailers and food service providers). The sector has some interesting new developments around industry-led voluntary agreements. The policy instruments which would be captured by a detailed analysis are:

- the authorisation of larger plants under the Pollution Prevention and Control (PPC) Regulations;
- single media licensing for smaller units (i.e. providing consent to discharge to water under the Water Resources Act 1991 and licensing of waste management and disposal under the Waste Management Licensing Regimes);
- capacity building and research and development support under schemes such as BREW, NISP, and WRAP;
- voluntary initiatives promoted by the sector, although initially suggested by sector plans, especially the Food Industry Sustainability Strategy (FISS) and the Food and Drink Federation's 'Five-fold ambition' statement;
- novel policy approaches, for example Environment Agency account managers talking directly to company directors about their environmental performance and how to improve it.

Information Availability: Information is available on individual policy instruments applied to the food and drink sector, but these have not been analysed to determine the specific impact on the sector. Counterfactual analysis could be undertaken by comparing units within the PPC regime and those falling outside of it.

The 2006 report on the FISS, drawn up by Defra with the aid of stakeholders, sets out how all those involved in the food and drink industry beyond the farm gate (i.e. manufacturers, wholesalers, retailers and food service providers) in this country can, through widespread adoption of best practice, help achieve sustainable development. The report gives a broad overview of the sector and the policy instruments in place. In addition, the Food and Drink Federation (FDF) published in 2006 a paper on 'The Environment - Making a Real Difference - The Five-Fold Ambition'. This document gives information on the environmental aims of the sector such as the reduction of CO_2, how to tackle food and packaging waste, reduction in the level of packaging reaching households, reduction in water use and how to embed environmental standards in transport practices. This paper also includes several case studies that could be used for further study, but the information is rather general and further investigation would be needed.

4.2.3 End-of-life vehicles (ELV) and small transfer sites

The interview for this case study was carried out with Dave Bliss on 15 February 2008.

Scope: The EC Directive on end-of-life vehicles (ELVs) aims to reduce, or prevent, the amount of waste produced from ELVs and increase the recovery and recycling of ELVs. The End-of-Life Vehicles Directive passed into European law in October 2000 and was due to be transposed into national law in all Member States by 21 April 2002. The End-of-Life Vehicles Regulations 2003 came into effect in the UK in 2003. The

regulations require operators to hold a site licence if they accept vehicles which have not been 'de-polluted'. The regulations also set new minimum technical standards for all sites that store or treat ELVs.

Information availability: The interviewee felt that it was too soon to try to evaluate the approaches, but suggested we talked to others working in this area. Eventually this line of enquiry led us to a project looking at a new approach to waste enforcement (see Section 4.2.4 below).

4.2.4 New approach to waste enforcement

The interview for this case study was carried out with Arwyn Jones on the 25 February 2008.

Scope: The waste enforcement project aimed to develop a multifaceted communication approach that would build awareness of fly-tipping and demonstrate the benefits of waste disposal and carrying waste. The project targeted waste carriers, households and other companies dealing with waste. The Environment Agency worked in co-operation with others to disseminate information and undertake crime analysis (i.e. the 'Bristol Hot Spot Map'). The Environment Agency also co-operated with local authorities to share knowledge, and worked with the media to publish motivational campaigns and advertising. The project ran as a three-year R&D programme that would evaluate the most effective tools.

Approaches adopted included:

- traditional regulation and enforcement;
- awareness raising;
- use of registers;
- duty of care requirements;
- motivational campaigns.

Information availability: The first findings from the project were documented in December 2007 in a short review by Encams and the Environment Agency entitled 'Trade Waste Carriage and Disposal'. Current practices and possible alternatives were evaluated and along with research studies carried out in some regions such as Blyth, Darlington and Stockton.

Another report, and statistics related to the incentives and measures (Programme Report for BREW programme), was published in March 2008.

These reports provide reviews of waste statistics and indicators such as registers and police information. A cost evaluation was also carried out, but the details are not yet available.

The project also aimed to take account of, and thereby reduce, the administrative burden of the different approaches, so information on this aspect of regulation should also be available from this project.

4.2.5 Cement

The interview for this case study was carried out with Jeremy Stephens on the 6 March 2008.

Scope: This case study, like the food and drink sector, would not cover a single initiative, but the range of policy instruments applied to this sector to limit the environmental impacts of the cement industry. The cement industry contributes £775 million annually to the UK economy. It comprises 14 plants (four of which are major manufactures) and produces around 12 million tons of Portland cement a year (about 90 per cent of the cement sold in the UK). It is a major energy user.

Key policy instruments affecting this sector are:

- the PPC Regulations;
- the voluntary sector plan.

The cement industry could make an interesting case because emissions from cement works garner high levels of local interest; the involvement of stakeholders and pressure groups is higher than average in this sector.

Information availability: Key documents would be the Environment Agency's sector plan and sector report for the cement industry (published November 2005) and the progress report for 2006. There are also several publications from the UK cement industry such as the progress reports on 'Working towards Sustainability' (second report from the UK, 2006) and 'Reduction in CO_2 Emissions' (2007).

4.2.6 Water

An interview was held with Keith Davis on 19 February 2008.

Scope: As with other sector-based case studies, this case study looks at the range of policy instruments aimed at reducing discharges from sewage treatment works (STWs) into receiving waters. It would include a number of policy instruments, including:

- the regulatory powers under the Water Resources Act 1991 which prohibits pollution of receiving waters and gives powers to establish the regime for discharge consenting and enforce compliance;
- the financing scheme under the Asset Management Planning (AMP) process;
- voluntary agreement in the proposed water sector plan;
- the potential 'name and shame approaches' made possible through the Pollution Inventory and financial incentives under OFWAT's Operator Performance Assessment Scheme.

There is a single target audience in a special position compared to other industry sectors.

Information availability: There are long-term datasets showing trends in discharges from STWs and the resulting water quality (chemical and microbiological) which in particular show the benefits of the AMP process. Information on the regulatory costs to the Environment Agency to implement these schemes would need to be established using business planning figures.

4.2.7 Chemical users

The interview for this case study was conducted with Nick Cartwright.

Scope: Users of chemicals are governed by media based policy instruments, such as discharge consenting and environmental protection legislation. They are also regulated through legislation covering the marketing and use of chemicals. This latter legislation is a blunt instrument. It is applied by the EU; the Environment Agency's role is to influence users and enforce the legislation, but with limited freedom to change or adapt its approach. There is currently no systematic way of co-ordinating or combining approaches to tackle specific chemical problems. In the future Pollution Reduction Plans (PRPs), currently in development, will help to fulfil this role; it may be appropriate at a later date to investigate the way that PRPs are developed and applied.

4.2.8 Packaging

The interview for this case study was carried out with Adrian Harding on 13 February 2008.

Scope: This case study looks at a single instrument – the Packaging Regulations – that introduces an interesting trading regime. The regulations were introduced in conjunction with the Essential Requirements Regulations to reduce the production of packaging. They are part of a wider basket of instruments to increase recycling which includes initiatives to increase public awareness about recycling, more kerbside recycling collection, the imposition of recycling targets on local authorities, along with the influence of market factors such as economic growth. Together, these instruments could be viewed as a policy and a suitable candidate for this project to review and evaluate which instruments or combinations of instruments have been most effective at increasing recycling rates and reducing the volume of packaging waste going to landfill. Growth in the volume of packaging has not yet been curbed (the primary objective of the Essential Requirements Regulations).

The approaches to implement the regulations are determined nationally and include published advice, site visits and a policy for 100 per cent prosecution with high fines. This last punitive approach, associated with an effort to publicise prosecutions widely, has highlighted the incentives for freeloaders to join, and is of particular interest in this current project.

Waste producers are the main target audience for the policy instruments. Large companies tend to operate their own compliance schemes; smaller operators usually join a group scheme.

Information availability: Good information is available on the regulatory costs of implementing these regulations, published in an annual monitoring report. These figures show the breakdown between costs for guidance and site visits, etc. (from 1997). Comparisons could be made with similar schemes in other Member States, particularly Germany. The DTi/BERR also commissioned a report on the way the Directive had been implemented in other Member States. Other sources of information include:

- the report commissioned by the European Commission on the implementation of Directive 94/62/EC on packaging and packaging waste and its impact on the environment, as well as on the functioning of the internal market (SEC, 2006);
- an SQW Consulting report published by Defra exploring the relationship between environmental regulation and competitiveness (A case study on

Extended Producer Responsibility (EPR) and the UK Packaging Waste Regulations. Defra, 2007);

- ProEurope (www.proeurope.be), providing information on and from PRO EUROPE, the umbrella organisation for 22 European packaging and packaging waste recovery and recycling schemes and two co-operation partners in the UK and Canada;
- Perchards (www.perchards.com), the information platform of a public affairs consultancy to monitor and assess legislative developments at national and EU level and to help private sector clients adopt politically aware corporate policies.

A series of Regulatory Impact Assessments (RIAs) could provide indicative costs-benefits of implementing packaging instruments and the impacts of altering recovery targets.

4.2.9 Landfill Allowance Trading Scheme (LATS)

The interview for this case study was carried out with Fran Lowe on 29 February 2008.

Scope: The Landfill Allowance Trading Scheme (LATS) is the government's key initiative to meet the demands of the European Landfill Directive in England (the LAS in Wales). LATS was launched on 1 April 2005. Tying in with the targets of the Landfill Directive, the LATS system sees progressively tighter restrictions on the amount of biodegradable municipal waste (BMW) – defined as paper, food and garden waste – that disposal authorities can send to landfill. The LATS (or the LAS in Wales) system works by councils (or waste disposal authorities in two-tier areas) being set allowances for the amount of biodegradable material they can dispose to landfill.

These allowances are tradable, so that authorities disposing of large quantities of waste to landfill can buy more allowances if they expect to landfill more than the allowances they hold. Similarly, authorities with low landfill rates can sell their surplus allowances. Councils will then be fined £150 for every tonne they landfill beyond the limit set by the allowances they hold.

Information availability: A study by Defra on how the first target was met and an operational review of the policy, focusing on how to improve the process and procedures, will be published soon. *Guidance on the Landfill Allowance Schemes: Municipal Waste* was published by Defra in 2006.

4.2.10 WEEE

The interview for this case study was carried out with Adrian Harding on 13 February 2008.

Scope: The EU Directive on Waste Electrical and Electronic Equipment (WEEE) aims to reduce the quantity of waste from electrical and electronic equipment and increase its re-use, recovery and recycling. The Directive affects producers, distributors and recyclers of electrical and electronic equipment – household appliances, IT and telecoms equipment, audiovisual equipment (TV, video, hi-fi), lighting, electrical and electronic tools, toys, leisure and sports equipment. Estimates suggest the UK produces around 900,000 tonnes of WEEE per year from domestic sources alone. Additional WEEE arises from shops, offices and industrial premises. Fridges and freezers are already processed and a high percentage of large domestic appliances (e.g. cookers, washing machines, etc.) are recycled, but the majority of items,

especially televisions and small electrical items, have traditionally been sent to landfill without treatment.

Information availability: There are several publications on the WEEE, in particular:

- Defra's Guidance on Best Available Treatment Recovery and Recycling Techniques (BATRRT) and treatment of Waste Electrical and Electronic Equipment (WEEE), 2006;
- the Environment Agency's note on its priorities for enforcing the WEEE regulations (4 pages, 2007) which summarises the Environment Agency's priorities for enforcing the WEEE Regulations 2006 and states that any action taken by the Environment Agency will be in line with the published Enforcement and Prosecution Policy;
- the WEEE case study (page I.5 onwards) in the report published by GTZ and co-authors: *Policy Instruments for Resource Efficiency, Towards Sustainable Consumption and Production* (2006);
- the European Commission communication published by Division WA II 3 Product Responsibility, Avoidance and Recovery of Product Wastes: *Harmonisation of WEEE Registers, German Presidency Workshop, Brussels, 4 May 2007* (108 pages, 2007).

4.2.11 EU Emissions Trading Scheme

An interview was undertaken with Andrew Hitchings on the 15 February 2008.

Scope: The EU Emissions Trading Scheme (EU ETS) is a single instrument which introduces a market-based scheme so that greenhouse gas emissions can be traded, based on allowances set at an EU level. The scheme applies only to selected major industries, but it is used nationally and includes monitoring, reporting and verification. It is part of a basket of initiatives directed at mitigating climate change (see Defra's climate change review programme) including IPPC, and Climate Change Agreements.

Information availability: An early RIA will provide information on implementation costs-benefits; there has also been work to estimate the administrative costs of EU ETS as part of the Defra's work to reduce administrative burdens and as part of an initiative to introduce a *deminimus* to reduce the administrative burden on some small emitters. There are also IMPEL reports comparing the implementation of the EU ETS in different Member States.

4.2.12 Flood risk management

An interview was held with Steve Biddle on 20 March 2008 which provided most of the information for this case study. Other contacts from flood risk management (FRM) that were interviewed prior to main interview were Steve Merrett, Aiden Kerr and Emma Hayes.

Scope: FRM employs a wide range of policy instruments to manage the risk of flooding in England and Wales. Policy instruments include:

- flood incident management, including setting up and manning incident centres to provide support during a flood event;
- issuing flood warnings via flood line and also sending out individual flood warning alerts;

- public awareness campaigns;
- regulation and enforcement of the Reservoirs Act 1975;
- catchment flood management plans (CFMPs) which plan strategic FRM activities on a catchment basis (these are expected to be completed by December 2009);
- consultation on development control via local authorities;
- regulation and enforcement of land drainage consents;
- direct operation activity (e.g. building flood defences).

These approaches are applied nationally.

Information availability: In general the level of information about approaches to FRM is best described as 'patchy' for the purposes of phase 2 case study selection. Good sources of information would be outputs from business planning documents that would provide details on the allocation of FTEs to different activities to deliver specified service levels. The usefulness of this information would be limited because it would provide forecast figures only and it would rely on measured activities being aligned with the activities we wanted to compare. It may therefore be more useful to focus on one aspect of FRM, for example reservoir safety (see Section 4.2.13 below).

4.2.13 The Reservoirs Act 1975

Scope: The Reservoirs Act 1975 requires owners of reservoirs to carry out stated levels of inspection and maintenance depending on the size of the reservoir. The Environment Agency has a 'hands-off' auditing role; it provides advice and guidance on necessary levels of inspection and maintenance, but the monitoring and maintenance is undertaken by private operators. The Environment Agency is now implementing procedures to bring reservoirs within the regime, for example by identifying reservoirs and their owners and raising awareness of the owner's legal obligations. Prosecutions have been pursued where operators then fail to meet requirements.

Information availability: This distinct activity has been well documented. A report has been published which covers Environment Agency activities over the last two years and their impacts.

4.2.14 Landfill

Scope: This case study was suggested by Nic Parr who felt that the waste sector could be too complex and big in scope for a single case study. Controls on landfill could provide a focus and would include policy instruments such as:

- the landfill tax;
- allowance trading (LATS and LAS);
- PPC sites (operational sites only);
- information campaigns associated with the EU directive to bring about a progressive ban of specified materials from landfill disposal.

4.2.15 The Hazardous Waste Reduction Programme

Scope: The Hazardous Waste Reduction Programme (HazRed) is funded under EU Life; full details about its costs, benefits and outcomes are available for analysis. The programme has just finished and final reports are available. HazRed aims to demonstrate the benefits of setting hazardous waste reduction targets and developing hazardous waste reduction plans in partnership with key industry sectors. As a project it focuses on sharing the outcomes, methodology and materials across the EU to help inform effective sector-based hazardous waste reduction strategies in other Member States.

Key elements of the programme are:

- working with regulators, industry, policy-makers and trade associations to develop hazardous waste reduction plans (HazRed plans) to include reduction targets;
- recruiting 120 SMEs across six priority industry sectors in the UK and Ireland;
- working with participating businesses to implement waste reduction plans;
- monitoring and evaluating reductions in hazardous waste arisings, cost savings and best practice;
- disseminating the project outcomes as widely as possible.

Information availability: The project has recently reported results for the last two to three years. It was not possible to obtain a copy for review, although we believe it contains full cost and effect details.

4.3 Criteria for selecting case studies

The overall objective of this project is to provide the Environment Agency with guidance on how to combine and implement policy instruments and approaches to deliver cost-effective environmental improvements in specific areas.

Good guidance must be based on sound evidence. Therefore our choice of case studies analyse in depth for phase 2 of this project was based on several key issues. For each of the candidate case studies outlined in Section 4.2 we asked:

- Is the information likely to be available for analysis of the case study sufficiently sound, relevant and rich?
- Does the case study permit the type of analysis that is necessary to comment on the cost effectiveness of instrument / approach mixes?
- Is the coverage of the case study sufficient to enable the findings to be representative of a broad range of a) instrument / approach combinations, b) types of target audience, and c) environmental objectives?
- How well aligned is the case study to the Environment Agency's priority policy areas?

The selection of the case studies for detailed analysis involved seeking the best overall balance between these issues. Criteria used to help answer these questions were:

Quality of information

- the availability of complete and robust information for quantitative analysis;

- the accessibility of supporting qualitative data from industry and Environment Agency staff;

Nature

- the possibility of cost effectiveness analysis from the information;
- the possibility of counterfactual analysis;
- the ability to assess causal links between regulatory activities and environmental outcomes;
- the possibility to demonstrate the balance of intervention with the regulated community and the illegal community (i.e. finding out whether the Environment Agency focuses too much time on the compliant, regulated community rather than on those operating illegally and assessing what can be done to address problems of illegal operators).

Nic Parr in the Modern Regulation Team also identified two further key issues (the coverage of instruments and their alignment to Environment Agency interests) that the Environment Agency has been asked to address following the Hampton Implementation Review. These two additional criteria addressed:

Coverage

- the coverage of different instrument combinations;
- the coverage of different types of target audience types;
- the coverage of a range of sectors or of different environmental issues;

Level of alignment to core Environment Agency interests

- the level of current political interest in the case study;
- the extent to which implementation of these policy instruments was central to the role of the Environment Agency;
- the extent to which the Environment Agency could influence and/or adapt instruments and approaches and thereby 'make a difference'.

4.4 Initial assessment of case studies according to the criteria

This section describes how case studies scored against the criteria outlined in Section 4.3. It focuses on the case studies that were originally highlighted by interviewees as worthy of further study (i.e. it does not include LATS, WEEE, ELV or chemical users). However, we also provide, where possible, an indication of how these later additional case studies might score.

4.4.1 Availability of information

Generally for all of the case studies (except those discounted initially), Environment Agency contacts indicated that they would be able to support the investigation themselves and that they had external contacts who would also be supportive of the project. Therefore the availability of information would not make a difference; the nature of the available quantitative information would effectively define the selection of the

case studies for phase 2. Table 4.1 ranks the case studies, putting those with the most complete data sets first.

Table 4.1 Case studies ranked by information availability.

Level of information	Case studies	Comments
High (information on regulatory costs, admin burden and effectiveness of approaches from different perspectives)	• Catchment-sensitive farming • New approach to waste enforcement	Project based initiatives with monitoring to assess cost effectiveness of approaches from a range of perspectives
	• Hazardous Waste Reduction Programme	Funded under EU Life; full cost, benefit, outcome details
	• Reservoirs Act	Distinct initiative within FRM with bundled costs and effects
Medium (some aspects of data sought are missing)	• EU ETS • Packaging	Missing different perspectives on implementation effectiveness
	• Water industry	Missing regulatory costs but large historical data set linking activities to environmental outcomes
Low (information on only a few of the aspects sought)	• Cement • Food and drink	Would need to piece material together from assessments on each policy instrument individually

4.4.2 Nature

When assessing the nature of the case studies, four questions were asked to determine whether the case study would enable us to undertake:

- a cost effectiveness analysis;
- a counterfactual analysis;
- an analysis to demonstrate the causal link between regulatory activities and the environmental outcomes of interest;
- an analysis to demonstrate the balance of intervention between the regulated community and the illegal community.

Cost effectiveness analysis

In most cases, an analysis of cost effectiveness against environmental outcomes would not be possible because the environmental objectives in each case study were different.

However, cost effectiveness could be evaluated using:

- an intra case study analysis of the ECSFDI, where different approaches were used from catchment to catchment within the initiative;
- an intra case study analysis of the waste enforcement project in which several approaches were employed to address the same problem;
- an inter case study comparison of approached used in the ECSFDI versus the water industry to reduce nutrient loading to rivers.

It should also be possible in all cases to analyse the costs incurred to achieve certain levels of policy take up (i.e. 'buy-in' or compliance) since this is a common objective of all approaches. All case studies would score equally when cost effectiveness is viewed in this way.

Counterfactual analysis

We found that counterfactual analysis would be possible in many cases, although the basis of the analysis would vary due to:

- different approaches across regions or catchments in England and Wales – as in the ECSFDI and the waste enforcement project;
- differences approaches taken by Member States – as in the implementation of packaging regulations and the EU ETS;
- differences within a sector that arise when some actors fall within a regime and some fall outside – as occurs in the food and drink sector, ECSFDI and the EU ETS;
- the presence of external factors, such as in the ECSFDI, waste enforcement project and packaging regulations, which makes the 'before and after' comparison difficult.

Demonstrating links between environmental outcomes and activity

Good causal links between regulatory activities and environmental outcomes could be demonstrated in:

- the ECSFDI;
- sector-based case studies – food and drink, cement and the water industry in particular where the data set is covers a substantial time span;
- the packaging case study, albeit indirectly through the reduction in the quantity of packaging going to landfill.

Demonstrating activity with the illegal community

The possibility of demonstrating the balance of intervention between the regulated community and the illegal community would best be carried out using four case studies, namely:

- packaging waste;

- new approaches to waste enforcement;
- the Reservoirs Act;
- fishing.

4.4.3 Coverage

To assess the coverage of the case studies, we looked at the audience targeted by the approaches in each case study and the range of policy instruments and policy approaches being used.

Target audience

Scope of policy instruments and policy approaches

Table 4.3 shows the types of policy instrument according to the three broad categories of financial, regulatory and non-regulatory instruments; it lists some interesting approaches adopted for each of the case studies.

Among the sector-based case studies, only the the water industry and landfill cases include policy instruments from all three categories of instrument. With the exception of the EU ETS and HazRed cases, all case studies include instruments from more than one category.

There are a wide range of approaches employed within the case studies. It would be impossible to capture all of the approaches in only three case studies, but our discussions helped us to select: from discussions those that appear to be of particular interest were:

- the ECSFDI and waste enforcement cases because they include a range of engagement tools aimed at individuals and SMEs;
- the food and drink case study because they involve account directors engaging with major industry players and some of the big waste companies;
- the packaging trading scheme and the Reservoirs Act 1975 due to the use of tough prosecution regimes for freeloaders or those reluctant to be included in the schemes.

Table 4.2 indicates the broad categories of 'audience' targeted by the Environment Agency's activities under each of the case studies. The table shows without further analysis of the policy instruments within a policy area (e.g. looking at recycling or greenhouse gas emissions), no single case study covers all the possible target audiences.

One option would be to focus all the case studies on a particular target audience (for example, ECSFDI and fishing both concern individuals); this would provide a robust analysis for that target audience. Alternatively, we could select case studies that work with a range of target audiences on the basis that this would lead to the most widely applicable guidance.

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Table 4.2 Target audiences for the case studies.

Case study	Target Audience		
	Major industry	**SMEs**	**Individuals**
Catchment-sensitive farming			X
Food and drink	X	X	
New approach to waste enforcement		X	
Cement	X		
Water industry	X		
Fishing			X
Packaging	X	X	
Emissions Trading Scheme	X	X	
Flood risk management		X	X
Reservoirs Act	X	X	
Landfill	X	X	
HazRed	X	X	

Table 4.3 Key types of policy instrument and policy approach adopted in the case studies.

Case study	Policy instruments			Novel approaches
	Financial	Regulatory	Non-regulatory	
Catchment-sensitive farming	Grant-scheme		Catchment Sensitive Officers, advice	Range of advisory schemes
Food and drink		PPC Regs, single media legislation	Capacity building and R&D, industry voluntary initiatives	Key accounts
New approach to waste enforcement		Waste management licensing, duty of care	Advice, awareness raising, motivational campaigns	Hot spot maps, co-operation with police, media and others
Cement		PPC Regs	Voluntary sector plan	Key accounts
Water industry	AMP, OFWAT performance scheme	WRA91	Proposed voluntary sector plan	Financial planning
Packaging	Trading scheme			Tough prosecution approach, working with media and judges to increase disincentives
Emissions Trading Scheme	Trading scheme			
Flood risk management		Development controls (indirect), Reservoirs Act 1975; land drainage consents	Flood incident management, Awareness campaigns (e.g. via flood line and individual alerts), CFMPs, Direct action	
Landfill	Landfill allowance trading scheme, landfill tax	PPC Regs	Information campaigns	
Reservoirs Act		Requirement to inspect and maintain	Identification and awareness raising	Auditing role
HazRed				Working closely with SMEs

4.4.4 Other factors of interest to the Environment Agency

The selection criteria in this area had a high degree of subjectivity. Case studies thought to be of highest political interest were ETS (as part of climate change mitigation), FRM, ECSFDI, waste enforcement and packaging.

The Environment Agency (rather than Defra or the EU) was thought to have a key role in the areas of waste enforcement and fishing.

The Environment Agency has the highest degree of freedom to adopt the approaches it considers most appropriate in the large industry sectors (food and drink, cement, and the water industry), waste enforcement and fishing.

Overall those scoring highest in terms of 'interest to the Environment Agency' were:

- waste enforcement;
- FRM (although Defra is also a key player);
- fishing (but of low political interest);
- ECSFDI (but the Environment Agency's freedom to adopt its own approaches is limited by Defra's framework of policy instruments).

4.5 Summary of scores against criteria

A summary of how the case studies scored against the criteria is provided in Appendix A. The appendix also summarises the pros, cons and recommendations in terms of each case study going forward into phase 2.

The original case studies were ranked in order of those scoring highest against the most number of criteria (out of 15). The top six case studies in this ranked list were:

- new approaches to waste enforcement (12/15)
- CSFDI (9/15);
- Packaging (7/15);
- EU ETS (6/15);
- Food and drink (6/15);
- Water industry (6/15).

4.6 Additional selection criteria

4.6.1 Scope of initiative

The case studies can be categorised into three models.

i. **Model 1: Single policy instrument case studies.**
This model covers the Packaging Regulations, LATS, the WEEE Directive and the EU ETS. In many cases a single approach is adopted across the UK; any comparison with alternative approaches would need to consider

approaches taken in other countries where similar schemes often differ in design and application.

ii. **Model 2: Defined policy initiatives involving a small number of policy instruments with the Environment Agency choosing approaches to implement these instruments.**
The BREW initiative on fly-tipping would fit this model and was provided as an example in the project specification. Of the case studies identified in the first project board meeting only the ECSFDI and the waste enforcement case studies fit this model. SUDS is another potential case study of this model which not been analysed at present.

iii. **Model 3: Broader combinations of instruments where the Environment Agency chooses to adopt complementary approaches or chooses how to implement instruments introduced by others such as Defra or the EU.**
Sector-based case studies (i.e. fishing, water industry, food and drink, cement and waste) tend to fall within this model. For these cases the coverage tends to be wider, but the information, where available, appears to more sparse, less consistent or incomplete.

iv. **Model 4 (adapted from Model 1): A basket of single policy instruments applied to a policy area.**
For this model we could analyse a basket of instruments, including the single policy instruments studies in Model 1, to see how effectively these instruments have been applied as part of the basket (i.e. broadening the case studies under Model 1, for example to look at recycling or emissions of greenhouse gases. If we did this, the research would focus on the *choice* of policy instruments, which in many cases falls to organisations other than the Environment Agency. The information available is likely to be patchy and more difficult to use than for the initiative-based case studies.

4.6.2 Views from the Modern Regulation Team

Members of the Modern Regulation Team expressed their thoughts on the best case studies for phase 2. The advised that the best case studies would be:

- ECSFDI;
- landfill (manageable area of waste);
- the Reservoirs Act (because of its unusual auditing approach);
- EU ETS (due to the high level of political, industry and regulatory interest).

The WEEE regime was also thought to be of political interest. The team felt that ‘waste’ would be too broad to cover in a single case study.

4.6.3 Climate change mitigation

The Environment Agency asked us to include ‘adaptation to climate change’ as one of the high level environmental outcomes under scrutiny. We were also asked to map the types of instruments used by different Environment Agency units that could be linked ot the delivery of this outcome.

It was thought that this process may help to identify which impacts of climate change require adaptation (e.g. heat-waves, droughts, floods and coastal erosion) and illustrate how policy approaches relate to them.

For example for floods, adaptation may be required in infrastructure investment, early warning systems and in the way housing growth is planned. For droughts it would be important to at water metering, information and regulation to promote water efficient appliances.

The effectiveness of these approaches could not be assessed as part of this project because no performance indicators or monitoring data for climate adaptation was available for the case studies. Such indicators were being scoped in a project for Defra; it could be interesting in the future to look at the findings from this study and see how they apply to climate change adaptation policies.

4.7 Selection of case studies for phase 2

Phase 2 involved a deeper analysis of three cases from those reviewed during phase 1. To select the phase 2 case studies, we took into consideration the scores, pros and cons of the individual case studies and selected three case studies that would give the best overall balance to meet the project's objectives. We also took account of the views of the Modern Regulation Team and the possibility of having climate change adaptation as a case study or broadening the scope of the originally proposed case studies.

Some of the possible options for combining case studies are described below, together with the pros and cons or such combinations. Before selecting a 'hybrid' case study for phase 2 analysis we had to decide whether we should consider:

- defined initiatives (with the most complete information sets to allow detailed analysis of policy approaches, but with less coverage of the breadth of policy instruments) or wider policy areas (with higher political interest and a broader focus on policy instruments, but less complete information and often one-step removed from Environment Agency decision making);
- focusing on one target audience (using a robust case study) or cover all target audiences with less confidence;
- using strict cost effectiveness analysis or just analyse the costings of interesting policy instrument and approach combinations.

When combining case studies we could:

- focus on policy initiatives with the most complete information;
- focusing on political hotspot areas;
- focusing on approaches for specific target audiences (individuals and SMEs);
- combine case studies to cover a wider spectrum of target audiences;
- choose case studied for cost effectiveness analysis using environmental outcomes.

Following discussion with the Environment Agency, the decision was taken to use three case studies during phase 2. These were:

- the reduction of municipal solid waste to landfill;

- waste crime – covering the reduction of illegal waste disposal (including fly-tipping and the operation of illegal waste sites), waste export and waste transport;
- the reduction of diffuse water pollution from farming.

The key characteristics of these three selected cases are provided in Table 4.4.

Table 4.4 Phase two case study overview.

Case study	Policy Instruments	Interest to the Project	Anticipated Perspectives
The reduction of municipal solid waste to landfill	Municipal solid waste (MSW) regulation and the Landfill Allowance Trading Scheme	A government fiscal regime to reduce the amount of MSW going to landfill to meet EU targets. Local authorities are subject to the regime which is administered by the Environment Agency. Trading of allowances allowed and financial penalties apply where targets are not met.	A strategic look at how a fiscal instrument has worked in combination with a regulatory regime.
The reduction of illegal waste disposal (including fly-tipping and the operation of illegal waste sites), waste export and waste transport	Wide range of approaches to tackle waste crime	The activities of the waste crime and enforcement team and the waste enforcement project had the objectives to develop a multifaceted communication approach, to demonstrate benefits, to build awareness and to combat fly-tipping, carrying waste and illegal waste disposal. An interesting range of approaches has been developed to tackle this difficult issue and effectiveness has been assessed from a number of viewpoints.	A practical look at a complex area that has strategic and tactical problems. The analysis of successful combinations will provide an interesting view of how to measure success and work with a different target audience from the CSF case study below.
The reduction of diffuse water pollution from farming	Advice and guidance to the agricultural sector via the England Catchment-sensitive Farming Delivery Initiative (ECSFDI)	A politically sensitive sector, difficult to regulate using traditional methods so the focus has been on advice and guidance. The CSFDI has been introduced by the government but the Environment Agency has had freedom to use the policy approaches it thinks best within a framework. There is good information available on the approaches used and their effectiveness.	A review of how advice and guidance has worked in a sensitive policy area. This will provide a more practical view of how well approaches have been applied uniformly and consistently across the country. It will also show which combinations of approaches have worked most effectively from a number of perspectives.`

5 Methodology for gathering case study information

5.1 Potential data gathering approaches

Three approaches to data gathering were considered, specifically:

- rapid appraisal methods;
- conjoint analysis;
- action-based research approaches.

5.1.1 Rapid appraisal methods

Rapid appraisal methods offer a quick and efficient way to gather the views and feedback from all types of stakeholder. They can be used to:

- provide rapid information for decision-making;
- provide qualitative understanding.
- aid understanding of quantitative data collected by more formal methods.

The main advantages of this approach is the low cost, the speed and the flexibility to explore new ideas. However, there are also disadvantages; findings usually relate to specific communities or localities (thus it is difficult to generalise) and the information is less valid, reliable and credible than data collected through formal surveys, for example through conjoint analysis (see Section 5.1.2 below). Rapid appraisal methods include in-depth interviews and focus group discussions.

5.1.2 Conjoint analysis

Conjoint analysis is a statistical technique used to reveal the relative importance of a set of defined attributes that make up an individual product or service.

A study sample is presented with a series of attributes to rate, rank or choose between. It is then possible to use statistical techniques to reveal the implicit valuations for each of the attributes. Conjoint analysis has been used for market research purposes since the 1970s, but it is now also commonly used in social sciences and applied sciences, including product management and operations research, and in environmental economics. Conjoint analysis is also sometimes called discrete choice modelling.

The use of conjoint analysis to determine the preferences of policy-makers for different combinations of instruments is possible, but it is time consuming and would need careful specification. It would be necessary to define clearly the objective of the policy under scrutiny (for example, it could be to reduce greenhouse gasses, or in the case of water, to meet certain water quality objectives in a given river basin). This specification would have to be exact because, in defining each set of instruments, the policy-maker must be provided with a measure of how the ‘package’ performs with respect to these objectives. In addition, the information provided would have to include data on changes

in government spending (positive or negative), the 'acceptability' of the package to different stakeholders and so on.

Although collecting this information is possible, it was thought to be too difficult and impractical to collect within the time and budget constraints of the present project.

5.1.3 Action-based research

Action-based research is also known as participatory research. The technique involves people actively analysing their own actions and identifying ways to resolve, and repeat the process[2].

Participants are asked to study a problem systematically and ensure that their intervention is informed by theoretical considerations. The technique aims to turn the people involved in a problem into researchers trying to solve the problem.

This project allows an element of action-based research to be undertaken. Techniques were used within interviews to encourage participants to analyse the instruments and the decision-making processes involved in their implementation. This approach falls into the simple model of the cyclical nature of typical action-based research (Figure 5.1). Each cycle has four steps: plan, act, observe, reflect.

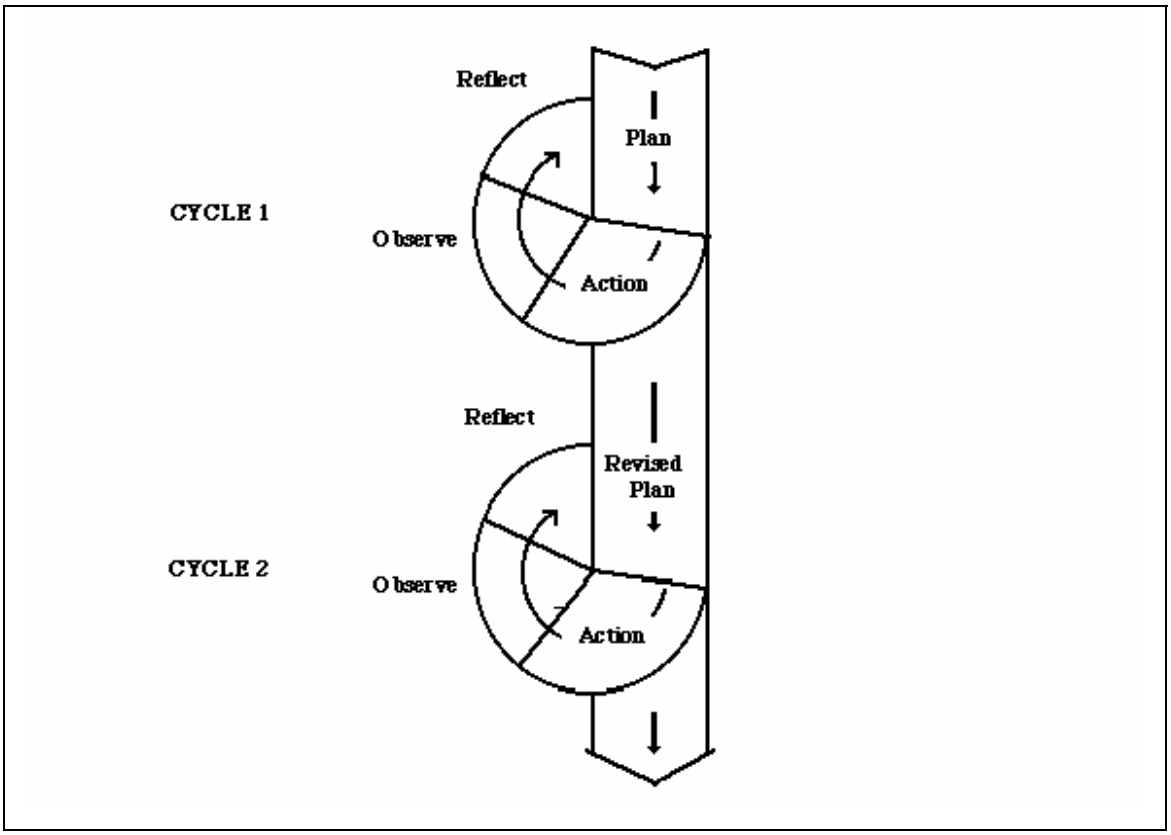

Figure 5.1 Simple action-based research model (from MacIsaac, 1995).

[2] Thomas Gilmore, Jim Krantz and Rafael Ramirez, "Action Based Modes of Inquiry and the Host-Researcher Relationship," Consultation 5.3 (Fall 1986): 161 found at http://www.web.net/~robrien/papers/arfinal.html

Action-based research provides a good model for the in-depth interviews with people who were involved in the planning and implementation of the case study initiatives.

These interviews were structured to reflect the four stages of the action-based model. Interviewees were asked to:

- explain what happened in the planning and implementation phase of their initiative (i.e. the phase under observation in this project);
- reflected on what has been achieved;
- summarise what has been learned;
- consider what they would do differently for during a second cycle of planning and implementation (i.e. “If you knew then what you know now, what would you change?”).

5.1.4 Selection of data gathering approach

Given the timescales and budget available, rapid appraisal methods were deemed to be the most suitable way forward. Some action-based research was possible as part of this process (described in Section 5.1.3 above).

5.2 Evaluation methodologies

When identifying the data gathering approaches and the evaluation methods for this project, we also considered:

- the need for baseline assessment and insights into counterfactual circumstances (i.e. what would have happened in the absence of intervention);
- the outcomes envisaged for the case studies, including intended and unintended environmental and business (e.g. reputation) impacts;
- criteria for assessing the effectiveness of instrument mixes (with regard to the overall project objective).

Our choice of evaluation methodology took account of the availability of data and information. We recognised that we might need to adapt it in light of further information that might come to light as the study progressed

Methods used to assess the design of the intervention in each case study were:

- logical framework approaches;
- theory based evaluation – problem/solution trees;

Methods used to assess the overall performance of the combination of instruments were:

- comparison of performance indicators;
- cost-benefit and cost effectiveness;
- impact analysis.

These methods are all explained in the following sections.

5.2.1 Assessing the design of the intervention

Logical framework approaches

A logical framework (logframe) can help to clarify the objectives of any project, programme or policy. It helps to identify expected causal links (programme logic), outcomes and impacts. It can also identify performance indicators at each stage in this chain, as well as risks which might impede the attainment of objectives.[3]

An example of a logframe is given in Table 5.1.

Table 5.1 General structure and content of a logframe matrix.

Activity description	Indicators	Means of verification	Assumptions
Goal or Impact The long term development impact (policy goal) that the activity contributes to at a national or sectoral level	How the achievement will be measured – including appropriate targets (quantity, quality and time)	Sources of information on the Goal indicator(s) – including who will collect it and how often	
Purpose or Outcome The medium term result(s) that the activity aims to achieve – in terms of benefits to target groups	How the achievement of the Purpose will be measured – including appropriate targets (quantity, quality and time)	Sources of information on the Purpose indicator(s) – including who will collect it and how often	Assumptions concerning how the Purpose is linked to the Goal
Component Objectives or Intermediate Results This level in the objectives or results hierarchy can be used to provide a clear link between outputs and outcomes (particularly for larger multi-component activities)	How the achievement of the Component Objectives will be measured – including appropriate targets (quantity, quality and time)	Sources of information on the Component Objectives indicator(s) – including who will collect it and how often	Assumptions concerning how the Component Objective is linked to Output
Outputs The tangible products or services that the activity will deliver	How the achievement of the Outputs will be measured – including appropriate targets (quantity, quality and time)	Sources of information on the Output indicator(s) – including who will collect it and how often	Assumptions concerning how the Output is linked to the Component Objective

[3] World Bank. Operations Evaluation Department, Washington, DC: Monitoring and Evaluation: Some Tools, Methods and Approaches, 2002

The logframe can be used to:

- improve the quality of project and programme designs—by requiring the specification of clear objectives, the use of performance indicators and the assessment of risks;
- summarise the design of complex activities;
- assist the preparation of detailed operational plans;
- provide an objective basis for reviewing, monitoring and evaluation the activity.

The construction of a logframe for each case study may be a useful tool to facilitate discussions about the design of the instruments within the case study and the way in which performance is currently assessed.

5.2.2 Assessing overall performance

Comparison of performance indicators

Performance indicators used in development projects, programmes and strategies to measure inputs, processes, outputs, outcomes and impacts. If information is available to demonstrate results, the use of indicators is a good way to evaluate effectiveness quantitatively[4].

For the purposes of this study, we identified a suite of relevant indicators, following the logic model shown in Figure 5.2.

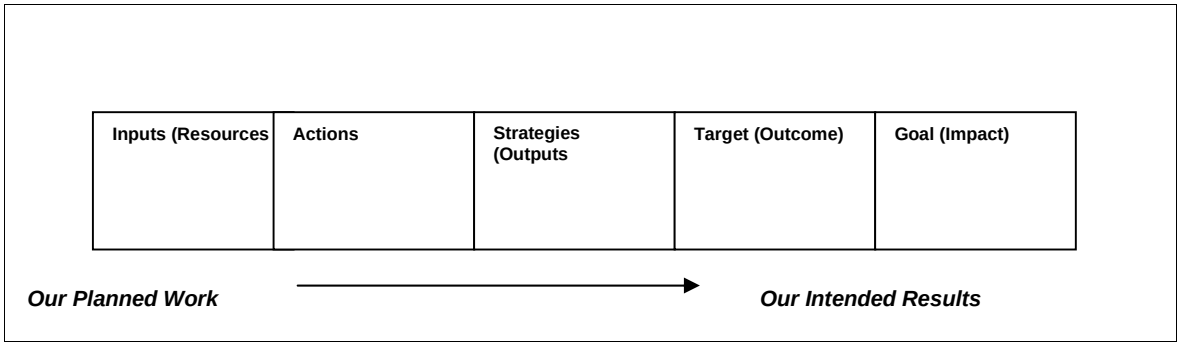

Figure 5.2 Basic logic model.

Using the logic model allows assessment of whether monitoring for these indicators is performed and if so, whether the results indicate good or bad performance. It also provides an indication of the extent to which key stakeholders were involved in defining indicators; this is important because stakeholders are more likely to understand and use indicators for management decision-making if they have been involved in selecting the indicators in the first place.

[4] World Bank. Operations Evaluation Department, Washington, DC, 2002. Monitoring and Evaluation: Some Tools, Methods and Approaches.

In addition to the criteria of the logic model, the policy instruments could be evaluated using some or all of the criteria in Figure 5.3[5].

The selection and assessment of policy instruments can be done by asking and answering the following questions, all conditioned by the special circumstances of the policy objective concerned.

Environmental Effectiveness: Will the instrument(s) achieve the environmental objective(s) within the specified time span and what degree of certainty can be expected? If the environmental outcome is somewhat uncertain and different instrument levels (e.g. charge levels) are needed, how acceptable is deviation from the set goal?

Cost effectiveness: Will the instrument(s) achieve the environmental objective(s) at the minimum possible cost to society? The social cost of a policy instrument(s) comprises three elements: (1) abatement or compliance costs + (2) regulatory costs + (3) transactions costs.

Flexibility: Is the instrument(s) flexible enough to adjust to changes in technology, resource scarcity, and market conditions?

Dynamic Efficiency: Does the instrument(s) provide incentives for developing and adopting new environmentally cleaner and economically more efficient technologies? Does it promote development of an environmentally sound infrastructure in general?

Equity: Will the costs and benefits of the instruments be equitably distributed? Who gains and who loses?

Ease of Introduction: Is the instrument(s) consistent with the legislative framework? If new legislation is necessary, how feasible is it? Does the relevant branch of government have the administrative capacity to issue the necessary regulations and administer the instruments? What is the administrative opportunity cost given limited administrative resources?

Ease of Monitoring and Enforcement: How difficult or costly will monitoring and enforcement be?

Predictability: Does the instrument(s) combine flexibility and predictability?

Acceptability: Is the instrument(s) understandable by the public, acceptable to economic agents and politically sellable? Does the instrument(s) agree with certain moral and ethical precepts.

Figure 5.3 Some criteria for evaluating environmental policy instruments.

Cost-benefit and cost effectiveness analysis

The Environment Agency, as an implementing agency for government, has a societal duty to allocate public funds appropriately in order to maximise environmental improvement within its budgetary constraint. Therefore, it is important for the Environment Agency to understand the relative cost effectiveness of the different combinations of operational approaches it adopts. Assuming that effectiveness is measured in a common metric and that sufficient information is available, an *ex post* evaluation of different combinations of policy instruments and approaches will show which combination offers the highest rate of return on investment.

Cost-benefit and cost effectiveness analyses are tools used to evaluate the success or desirability of an outcome, taking into account the cost of an activity. These tools help policy-makers decide whether or not the costs of an activity can be justified based on the outcomes and impacts.

Cost-benefit analysis measures both inputs and outputs in monetary terms. Cost effectiveness analysis estimates inputs in monetary terms and outcomes in non-monetary quantitative terms (such as improvements in performance indicators)[6].

[5] Metroeconomica and WRc, 2006. Deriving the costs and effectiveness of delivery mechanisms. Final report to Defra.

[6] World Bank. Operations Evaluation Department, Washington, DC: Monitoring and Evaluation: Some Tools, Methods and Approaches, 2002

Providing sufficient information is available, these analyses will be key in determining which instruments and approaches offer the highest rate of return on investment. Results will need to be interpreted with care.

In cost-benefit analysis, the net present value (NPV) is the primary criterion for deciding whether or not the benefits of a project or scheme justify the costs. The NPV of a projected stream of net benefits is estimated as the summation of the difference between the annual discounted benefits and costs over the period of analysis. A scheme is considered as cost-beneficial where its NPV is non-negative.

Impact evaluation

Impact evaluation involves the systematic identification of the effects of interventions against an identified counterfactual scenario (e.g. a baseline in time or an alternative location where interventions are not made). This project will make impact evaluations on the basis of data gathered using small-scale rapid assessment methods.

Identifying an appropriate counterfactual to enable this evaluation is essential; this is discussed in more detail in Chapters 6, 7 and 8 as part of each detailed case study analysis.

5.3 Methodology summary

The key data collection approaches used in this study are:

- data gathering and analysis from literature sources – to provide context and to extract existing information on costs and/or effectiveness, particularly any quantitative information available;
- the collection of more information from a series of one-to-one interviews with stakeholders – to fill gaps in the literature, probably with more qualitative information, and to gain views on, for example, lessons to learn (possibly involving action-based research with those previously involved in designing and implementing the case study initiatives);
- the collection of information and reflection on outcomes and the process from focus group sessions – this would include a ‘bottom-up’ analysis.

A specific approach combining these methods was derived for each of the case studies in consultation with key Environment Agency contacts. A common template was used as a basis for all the interviews and focus groups which we carried out, although focus was given to the most relevant sections depending on the situation. This template can be found in Appendix B.

6 Case study 1: Catchment-sensitive farming

The England Catchment-sensitive Farming Delivery Initiative (ECSFDI) is part of Defra's Catchment-sensitive farming (CSF) Programme, which aims to tackle diffuse water pollution from agriculture (DWPA) as required under the Water Framework Directive (WFD). The ECSFDI is also contributing to the achievement of other environmental targets, in particular the 2010 Public Service Agreement (PSA) targets for Sites of Special Scientific Interest (SSSI).

At its launch in 2006, the first phase of the ECSFDI was a two-year initiative funded by Defra and delivered by Natural England working in partnership with the Environment Agency. It targeted 40 priority catchments. The second phase of the initiative has now been approved and is expected to continue through to 2010–11. Its scope has been extended; 10 further catchments have been added and the boundaries of seven existing catchments have been expanded.

The main aim of the ECSFDI is to encourage farmers and landowners to adopt CSF practices and ultimately to reduce diffuse water pollution from agriculture. CSF is defined as "land management that keeps diffuse emissions of pollutants to levels that are consistent with the ecological sensitivity and uses of rivers, groundwaters and other aquatic habitats, both in the immediate catchment and further downstream."

CSF requires farmers to adapt their practices. The ECSFDI supports farmers to:

- to adopt best practice in the use of fertilizers, manures and pesticides;
- promote good soil structure to maximise infiltration of rainfall and minimise run-off and erosion;
- protect water courses from faecal contamination (e.g. with fencing and live-stock crossings), and from sedimentation and pesticides (e.g. with buffer strips);
- reduce the density of stock and the intensity of grazing on their land;
- revert to grassland.

The ECSFDI focuses on raising farmers' awareness of DWPA and encourages early voluntary action by farmers to tackle DWPA in priority catchments. Its aims are delivered through three policy instruments:

i. **Awareness raising**
   Various local actions to raise awareness and share technical knowledge through workshops, seminars, farm demonstrations and other extension activities.

ii. **Capacity building**
   Dedicated catchment officers work one-to-one with farmers (an average of one officer per catchment).

iii. **Financial incentive**
   A national grant scheme is applied in a uniform manner across the catchments.

The ECSFDI is part of a basket of measures aimed at reducing pollution from agriculture. The initiative is designed to work alongside agri-environment schemes (e.g.

Environmental Stewardship under the Rural Development Plan for England). The ECSFDI target catchments were selected on the basis of water bodies at risk of failing the objectives and the quality measures of the WFD. Good farming practices and direct regulation were insufficient to tackle diffuse pollution from farming and further measures were required.

This initiative focuses at the local level pulling together farmers, land owners, farm advisors, conservation bodies, water companies and a wide range of other interest groups and stakeholders. The Pesticides Voluntary Initiative has also agreed to provide technical support in priority catchments where pesticides are a key water quality issue.

Associate CSF projects are also being run outside the priority catchments; here the ECSFDI provides advice on how to tackle DWPA, but there is no access to the capital grant scheme.

The initiative has a specific budget to monitor progress; it has submitted evaluation reports for the first two-year phase of the project and has produced a project initiation document for the second phase. The analysis appears to be complete: progress is monitored both in terms of farmers' attitudes and water quality improvements (although the latter is a long-term objective which cannot provide conclusive results in the short-term). There reports provide information about the costs of the approaches adopted and their effectiveness. The lessons learnt from this project should usefully complement the horizontal analysis of the three selected case studies.

For our ECSFDI case study we gathered information through an extensive literature review, supplemented with consultation with key Environment Agency representatives.

The combinations of approaches that have been used in the ECSFDI are plotted against the axis of the 'Defra Diamond' in Figure 6.1. The ECSFDI combines policy instruments and delivery mechanisms which simultaneously encourage, enable, engage and exemplify.

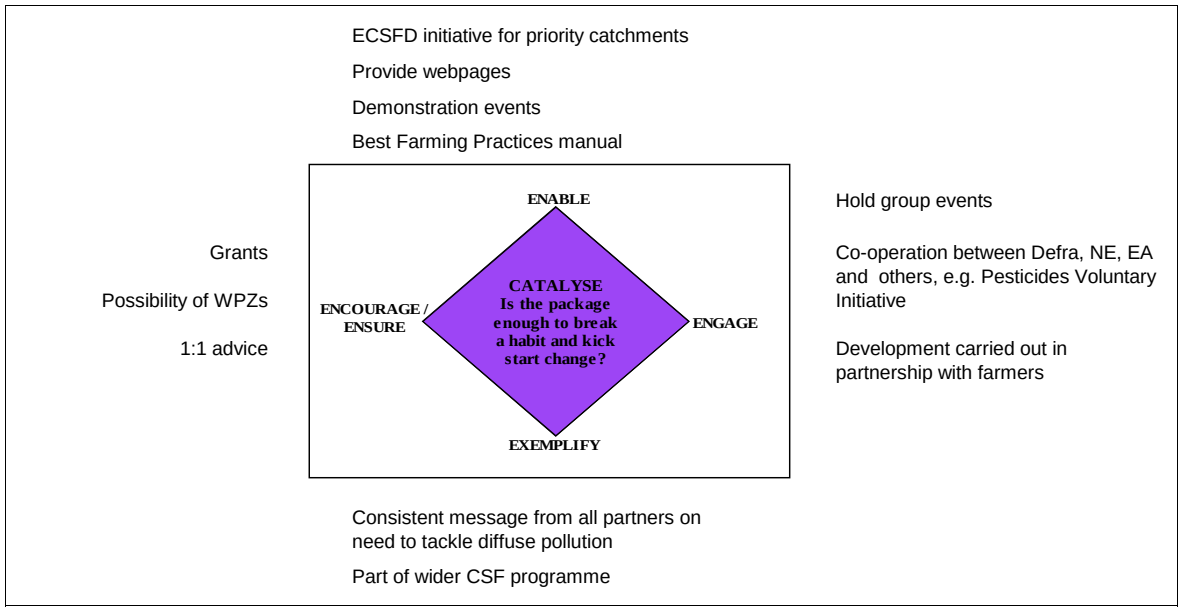

Figure 6.1 A 'Defra Diamond' for the ECSFDI case study.

6.1 Logical framework approaches for CSF

The logical framework (logframe) approach is described in Section 5.2.1. A logframe for the ECSFDI is given in Table 6.1.

Table 6.1 indicates that a logical approach was applied in designing the ECSFDI. A combination of policy instruments (awareness raising, capacity building and financial incentives) were used to inform farmers about the issue of diffuse pollution from farming activities. The initiative gave advice on suitable measures to reduce diffuse emissions from farming, whilst also enabling farmers to introduce new measures by providing know-how and grant money.

Recognising that farming was a politically sensitive area, with farmers often feeling under heavy pressure, the instruments and a wide range of approaches were carefully designed to engage with farmers. It was possible to build trust between CSF officers (CSFOs) and farmers because the CSFOs were aware of local conditions and listened to farmers' needs and concerns.

Performance indicators were identified along with appropriate ways to assess this performance at different stages. The ECSFDI included money specifically allocated for measuring progress. During the first phase of the initiative success was evaluated in terms of the number of events held (workshops, seminars, farm visits and one-to-one advice provided by CSFOs), the number of working partnerships with other stakeholders, farmer engagements (new measures planned, introduced, grant applications) and water quality modelling from estimated reduced emissions.

The ultimate goal is to improve water quality (reduce nutrient and pesticide concentrations, sediments (reduced soil erosion) and faecal contamination). But this is not easy to assess in the short term, not least because other factors – weather patterns and the application of other policy instruments (i.e. regulation such as the establishment of Water Protection Zones and Nitrate Vulnerable Zones) – also have an influence. Furthermore, other measures, such as changes in farm management not associated with the initiative or other policy instruments, may also affect water quality.

Certain intervention measures will take time to become established which also leads to a 'lag phase' between the initiative and its effects on water quality. For example, it may take several seasons for vegetation to grow and form a riparian buffer strip; it will take considerable time to show such an effect of such measures, especially on the quality of groundwaters.

To maximise the possibility of identifying effects over a short time period, the targeted water quality monitoring programme was supplemented with modelling studies. These models were used to identify statistically significant reductions in pollutant loads associated with particular measures.

Table 6.2 lists indicators from the logframe that could be applied to the ECSFDI. It also presents the indicators which were used in practice, the monitoring that was undertaken for these indicators, and a brief assessment of performance.

Table 6.2 shows the success of the initiative, as far as it can be measured in the short term. Awareness among farmers increased, there was a high level of grant uptake and implementation of mitigation measures, and pollutant emissions and resulting diffuse pollution (as estimated through modelling) were reduced.

Table 6.1 A logframe matrix for the ECSFDI.

Activity description	Indicators	Means of verification	Assumptions
Goal or Impact			
In 50 priority catchments reduce levels of diffuse water pollution from agriculture to meet the water quality objectives of the Water Framework Directive.	Pollution levels reduced in priority catchments (for nutrients, pesticides, sediment and faecal indicators).	Modelling of water quality from estimated input reductions (short-term) (Environment Agency).	Modelling using estimated reductions in pollutant inputs can give interim indications of improved water quality.
	Targets are met for SSSIs affected by water quality.	Targeted water quality monitoring programme (long-term) (Environment Agency). Assessment of compliance with WFD water quality objectives.	Measures to reduce pollutant inputs will impact on water quality but may take a long time to show as improvements, especially in the case of groundwater or SSSIs.
Purpose or Outcome			
Farmers will adopt relevant CSF practices in priority catchments.	Farmers' awareness is raised and their approach to CSF is positive. Farmers adopt measures to reduce DWPA and there is a reduction in the inputs of pollutants. Improved water quality	Data recorded by CSFDI officers (Land Manager Recording Database, LMRD) (Natural England and Environment Agency). Water quality modelling and monitoring programme (Environment Agency) and compliance assessment.	Farmer engagement, attitudes and implementation of control measures form suitable surrogate indicators. Better farming practices that reduce diffuse pollution will continue when the ECSFDI ends in 2011. Water quality improvements happen because of CSF practices rather than other factors, e.g. drier than average weather.

Table 6.1 continued overleaf

Table 6.1 continued

Activity description	Indicators	Means of verification	Assumptions
Component Objectives or Intermediate Results			
Raise farmers' awareness of catchment sensitive farming practices and build their capacity to reduce water pollution by providing advice and financial support.	Farmers' awareness is raised and attitude to catchment sensitive farming is positive.	CSFO record keeping. Catchment steering groups established and functioning successfully.	Actions by farmers will result in reduced pollution, lead to better water quality and make a real contribution to meeting the WFD standards.
Fund a network of catchment officers to carry out farm visits to provide one-to-one advice to farmers and undertake other initiatives to promote CSF.	Sufficient officers have been appointed.	Farmer surveys and questionnaires carried out to collate information.	
Develop a partnership approach to working between Defra, the Environment Agency and Natural England to deliver the initiative. Other partnerships will be developed, e.g. with the Pesticides Voluntary Initiative in those catchments where pesticides are the main source of pollution.	Partnership set up and steering group meetings are held.	Financial records show that the available grants and other financial support is being used (grant applications exceeded the budget).	
Select priority catchments using good evidence based on existing monitoring data.	Catchments are agreed through general consensus.		
Establish a targeted water quality monitoring programme to assess environmental outcomes.	Monitoring programme is established.		
Hold events in priority catchments to promote CSF and the initiative.	Events held.		
Financial support is available via Defra	Financial support became available.		

Table 6.1 continued overleaf

Table 6.1 continued

Activity description	Indicators	Means of verification	Assumptions
Outputs			
Establish a CSF programme.	CSF programme established.	Defra webpage provides sufficient information and links to other sources of information.	CSF approaches lead to a reduction in diffuse water pollution. The approach continues after the end of the ECSFDI in 2011.
Establish a means to deliver the catchment sensitive farming programme (i.e. the English Catchment Sensitive Farming Delivery Initiative).	ECSFDI established.		
Identify the priority catchments.	Catchments are identified.		
Provide grants and other state aid to support farmers.	Financial support is available.		
Monitor and evaluate the success overall of the CSF programme on the environment. If successful, roll out CSF to other catchments based on risk of diffuse water pollution.	Mechanisms are in place to monitor the CSF programme and it is capable of identifying success.		

Table 6.2 Assessment of performance against basic logic model indicators.

Basic logic model	Appropriate indicators (from logframe and logic model)	Assessment of performance
Inputs (Resources)	Environment Agency/NE budget	Economic assessment – see Section 5.2.21
	Grant budget	
	Farmers' own investment	
Actions	Advice delivery	Measured in terms of group events (total 267) and one-to-one advice (total 3014); these advice sessions were generally highly valued.
	Awareness raising	Farmer surveys Jan/Feb 2007 and Nov 2007 indicated a very positive response from farmers to the ECSFDI and increased awareness of DWPA. Farmers were better informed about how to modify farming practices, and reported a strong intention to take action; however, there was only a slightly greater acknowledgement of the impact of agriculture on water quality.
	Grant scheme	Grant applications amounted to £8.1 million compared to a budget of £5 million; after prioritisation offers to the value of £5.4 million (108%) were allocated, but the outturn was only £4.645 million (86% of allocated funds or 93% of original budget). Although grants were welcomed and provided a significant stimulus to action, financial constraints were limiting actions (limited grant availability, and the requirement for a contribution from the farmer's own funds as grants only provide 60% of capital investment). Incomplete outturn was due to a variety of factors, e.g. insufficient time and/or adverse weather conditions, wrong season, unavailability of contractors, etc.

Table 6.2 continued overleaf

Table 6.2 continued

Basic logic model	Appropriate indicators (from logframe and logic model)	Assessment of performance
Strategies (Outputs)	Mitigation measures taken by farmers.	Measured in terms of numbers of farms and number of individual mitigation measures recommended, planned or implemented. Over 14,000 farm-specific recommendations were made and there are indications of a high level of uptake.
	Take up of agri-environment schemes (e.g. Environmental Stewardship).	Measured in terms of numbers of specific ELS (Entry Level Schemes) taken up by farmers in CSF catchments (a total 33,581 or 35% – a higher percentage than the CSF catchment which is 29.5% of the total catchment area of England.
	Reduced emissions from farms in priority catchments.	Assessment of reduced emissions (feeds into modelling water quality improvements – see below).
Target (Outcome)	Reduction in DWPA to reduce the risk of not meeting WFD objectives.	Modelling studies of reductions in pollutant emissions estimate pollution reductions in phase 1 of the project of 10% (P), 5% (N) and 7% (sediment) across the targeted areas of the 10 catchments. At the catchment scale these results are estimated as 9%, 9% and 3% (P, N and sediment, respectively).
Goal (Impact)	Improvement in water quality measured in the priority catchments.	Targeted water quality monitoring is in place but cannot show results in the short-term (phase 1 is only two years in duration). However, the modelling studies (above) do estimate pollution reductions from reduced pollutant emissions.

6.1.1 Performance in context with other factors

A water quality monitoring programme has been established and data will become available to show how successful the initiative has been. The ECSFDI has raised the awareness of farmers to catchment-sensitive farming. Other successes include the appointment of catchment officers in the priority catchments; they have been delivering appropriate advice and guidance to farmers. Defra has established a grant scheme and other means of financial support for the ECSFDI.

The farmer impact survey conducted during December 2007 and January 2008 showed an increased awareness of the ECSFDI across the 40 priority catchments compared with the baseline survey of early 2007. The ECSFDI was favourably received by those farmers who are actively engaged in CSF, although most farmers still need to be convinced that agriculture is the main contributor to pollution in the priority catchments. There were no clear indications that the initiative was having a significant effect on farmers' understanding of the impact of their activities in their local catchment.

However, the combination of local events and one-to-one visits to farmers at their convenience seem to have had an impact (one-to-one advice seems to have had a greater impact). There was some indication that greater financial incentives may be needed to encourage farmers to make more changes to prevent water pollution; better communication may also be needed to make it clear to farmers the support that is available and the benefits of CSF (e.g. reduced costs as a result of better management, as well as environmental benefits).

6.2 Analysis of the CSF case study

This analysis is based on the first two-year phase of the ECSFDI for which considerable information and measures of success are available.

It is difficult to identify the counterfactual scenario for the ECSFDI because there are so many factors that influence water quality in the 40 priority catchments. The Environment Agency's water quality monitoring programme is not yet capable of measuring any trends and the effects on water quality of CSF practices are not expected to become apparent for some years. However, modelling shows that better farming practices should lead to reductions in the pollution load to waters and better water quality.

A 'before' and 'after' study for water quality will show if water quality has changed significantly due to better farming practices. It is a concern that better farming practices will stop when the ECSFDI finishes in 2011; when focus is removed from the priority catchments it is possible that levels of diffuse water pollution will rise again.

We have compared the evidence presented within this case study to existing 'good policy criteria' and principles. The results of this comparison are provided in Appendix D.

The Hampton principles (see Section 3.5) appear, to a significant extent, to have been adhered to when tackling diffuse agricultural pollution. The Hampton principles together provide all the elements that are required for successful implementation of combinations of instruments or approaches. The Hampton principles advocate a risk-based approach to policy initiatives, along with independence, enforcement and providing advice. The application of these principles at the planning stage helps to

ensure that an initiative contains a variety of elements that reinforce each other and help combinations of instruments and/or approaches be as successful as possible.

6.2.1 Cost-benefit and cost effectiveness analysis

Cost effectiveness analysis is an economic tool that assesses whether or not the costs (inputs) of an activity can be justified by its outcomes and impacts. Cost effectiveness is most commonly expressed as the ratio of costs to outcomes (i.e. cost per unit of "effectiveness"), where outcomes are measured in quantitative, but non-monetary, terms. More information on cost effectiveness and cost-benefit analysis can be found in Section 5.2.

If, however, one can measure outcomes in monetary terms a cost-benefit analysis is possible. A cost-benefit analysis provides even better information for evaluating policies; if such analyses are possible and can be monitored and calculated with no additional cost, the cost-benefit results should certainly be reported. For the ECSFDI case study, we are able to report the net benefits of the programme along with measures of cost effectiveness.

Given that our report is trying to identify which combinations of policy instruments and approaches offer the most cost-effective/efficient use of government funds, it is appropriate to focus on the regulatory costs of mixed policy approaches[7].

Information regarding Defra's budget and actual expenditure across the first two years of the ECSFDI project are available, however we were unable to access detailed cost information for each catchment. The full set of cost information can be found in Appendix D.

The ECSFDI had four objectives against which measures of its effectiveness could be assessed. These objectives were to:

- stimulate farmer engagement (take up of) CSF practices;
- raise farmers' awareness of DWPA;
- improve soil and land management practices;
- improve the environment through reduced DWPA.

A comprehensive monitoring and evaluation framework was designed to measure success against each of these objectives. Our analysis focuses on environmental improvement (i.e. reduction in diffuse water pollution) as a measure of effectiveness.

Since improvements in actual water quality are expected to take some time to become apparent, the ECSFDI conducted some high level modelling to provide an initial estimate of the water quality improvements that might arise from the implementation of DWPA mitigation measures. Reductions in DWPA were modelled using information on recommended control measures that had been planned or implemented through the

[7] **Regulatory costs**: These costs are incurred by government or their implementing agencies and include the monitoring, administrative, enforcement and litigation costs associated with new policies. These costs also include the cost of setting up a new market when economic instruments regulations are used, in particular tradable permit schemes. The costs are typically examined in terms of staffing requirements (expressed as full-time equivalent employees (FTEs)). Ultimately, these costs are borne by taxpayers, unless other regulatory costs are reduced to accommodate any new policy. Regulatory costs can therefore be either (i) the opportunity costs of other activities that are discontinued or reduced because budgets are fixed or (ii) the private costs imposed on taxpayers to support the increased expenditure by government necessary to implement the new policy.

ECSFDI's advisory service (as recorded by CSFOs in the Land Manager Recording Database).

A pollutant baseline was modelled using ADAS NEAP-N (diffuse N) and PSYCHIC models (diffuse P and agricultural sediment) and:

- a simple quantitative assessment based on agricultural census data;
- estimates of the per capita generation rates of intestinal bacteria for humans and livestock;
- the likelihood of connectivity to surface waters (FIOs).

A tool called the Catchment Change Matrix (CCM) looked up reductions in pollutants for relevant control measure and calculated the cumulative reduction of pollutants against the modelled baseline level. The CCM used values from the Diffuse Pollution Inventory (DPI) Manual to quantify the reduction in diffuse pollutants associated with a particular control measure.

A "current" scenario modelled reductions in diffuse water pollutants based on control measures recorded in the Land Manager Recording Database as of the end of October 2007. Data were graded according to the extent to which the control measure had been completed (control measure recommended, planned or implemented) and the way in which the advice had been delivered (i.e. whether action arose from one-to-one contact with the farmer or via a group event). These factors were used to judge how confidently it could be said that the control measure had actually been implemented.

Subsequently, the data were separated into two datasets, 'optimistic' and 'pessimistic', based on this confidence level. The 'optimistic' and 'pessimistic' results are thought to represent the upper and lower limits of what has happened 'on the ground' in the catchments. 'Pessimistic' results are based on planned or implemented measures delivered one-to-one while the 'optimistic' scenario also includes advice given at events and assumes that all recommended measures are undertaken.

The modelled annual reductions in diffuse phosphorous and diffuse nitrogen in each priority catchment can be found in Appendix D.

Cost-benefit analysis

For a cost-benefit analysis, the costs of a project and the benefits that arise over time are both quantified in monetary terms. Costs and benefits that occur in different time periods are discounted to their 'present values', based on the principle that most people prefer goods and services now rather than later ('time preference').

Farming imposes costs on the environment that are not included in prices paid by consumers or producers. These 'hidden' or unpaid costs are known as external costs or damage costs. Diffuse water pollution is an externality that arises, in part, as a result of farming practices.

A study by Blottnitz *et al*. (2006) estimated the external cost of nitrogen from fertilizer as €0.3/kg. In another study, Pretty *et al*. (2000) estimated the annual total external costs of UK agriculture. This estimate included an assessment of the cost of contamination of drinking water from nitrate (£16.4 million) and phosphate and soil (£52.3 million). Based on Blottnitz's damage cost for nitrogen and the ratio of Pretty *et al*.'s estimated damage costs, the external cost of phosphate can be estimated as €0.96/kg.

Using these damage costs, the benefit of reducing diffuse water pollutants can be quantified in monetary terms, as avoided damages. Table 6.3 shows the total modelled

reductions in diffuse N and diffuse P under both the pessimistic and optimistic scenarios, and the benefit of these reductions. An exchange rate of €1.4664 /£ was used[8] to convert damage costs into pounds sterling.

Table 6.3 Benefit of the ECSFDI.

	Pessimistic		Optimistic	
	Diffuse N	**Diffuse P**	**Diffuse N**	**Diffuse P**
Total reduction (kg/yr)	2,596,895	12,533	5,147,433	34,054
Benefit in 1st year (€)	779,068	12,032	1,544,230	32,691
Benefit in 1st year (£)	531,280	8,205	1,053,076	22,294

The total benefit (in terms of reduced diffuse water pollutants) of the first phase of the ECSFDI is sensitive to the number of years that pollutant reductions are assumed to last. Without evidence on the longevity of reductions under this scheme, it could be assumed that reductions in DWPA will be maintained for any number of years. Accordingly, NPVs were calculated for a range of scenarios relating to the lifetime of pollutant reductions. Costs and benefits were discounted at the social time preference rate of 3.5 per cent; this is the recommended rate where the analysis aims to capture the preferences of society[9]. The results of these analyses are shown in Table 6.4 and Table 6.5.

Table 6.4 Cost-benefit analysis with 'pessimistic' benefits.

	Assumed time period reductions maintained			
	10 years	**15 years**	**20 years**	**30 years**
Total discounted benefit (£)	£4,643,715	£6,430,938	£7,935,732	£10,269,505
Total discounted cost (£)	£13,899,246	£13,899,246	£13,899,246	£13,899,246
NPV	-£9,255,531	-£7,468,308	-£5,963,514	-£3,629,741

Table 6.5 Cost-benefit analysis with 'optimistic' benefits.

	Assumed time period reductions maintained			
	10 years	**15 years**	**20 years**	**30 years**
Total discounted benefit (£)	£9,256,441	£12,818,961	£15,818,507	£20,470,478
Total discounted cost (£)	£13,899,246	£13,899,246	£13,899,246	£13,899,246
NPV	-£4,642,805	-£1,080,268	£1,919,260	£6,571,232

[8] HM Revenue & Custom average annual exchange rate for year ending 31 March 2006. http://www.hmrc.gov.uk/exrate/exchangerates-05-06.rtf

[9] HM Treasury. The Green Book: Appraisal and Evaluation in Central Government. http://www.hm-treasury.gov.uk/d/1(4).pdf

The uncertainty in the pollutant reduction results is reflected in the differing outcomes of the cost-benefit analysis for the optimistic and pessimistic scenarios.

Whilst the cost-benefit analysis using the pessimistic results indicates that the ECSFDI is not cost-beneficial even when the pollutant reductions are maintained for 30 years, the optimistic results suggest that the scheme is worth pursuing if benefits are maintained for at least 20 years.

These results are based on a number of assumptions, both in the pollution and catchment modelling and in the economic modelling.

The methodology used to model these reductions in diffuse water pollutants is still in development, so the results should be treated as indicative of the possible reductions that could be achieved. The people involved in the modelling work suggested that confidence is highest in the predicted reductions for phosphorus; reductions in sediment and nitrate are thought to be over estimated by the models.

The following assumptions were made to fill current knowledge gaps:

i. **A simple method of diminishing returns.**
The DPI Manual contains no information on the cumulative effect of DWPA measures. Since multiple control measures were being reported for many of the targeted areas (some CSFOs were reporting more than 20 measures on individual farms), a simple method of diminishing returns was used (e.g. Measure 1: 100 per cent efficient; Measure 2: 50 per cent efficient; Measure 3: 25 per cent efficient, etc.). There is no scientific evidence for this relationship.

ii. **Some control measures were ignored.**
The DPI Manual does not list all of the control measures which were used in the catchments. Where possible, additional measures were mapped to those in the DPI. However, a number of control measures could not be mapped to those in the DPI and so were excluded from the assessment. Therefore, some benefits may not have been captured.

iii. **100 per cent immediate efficiency.**
The DPI Manual defines the effect of measures as Effect = Reduction x Implementation x Efficiency. For this assessment it was assumed that every measure is 100 per cent efficient immediately.

iv. **Some farms excluded.**
Any measures recorded on farms which did not have a valid CPH number nor any records in the agricultural census data could not be mapped and were excluded from the assessment.

v. **Accounting for mixed land use on farms.**
The DPI Manual defines the percentage reduction for each diffuse pollution control measure according to a model of a farm system that has a defined, single land use. But most farms (and the model baselines) have mixed land use. To account for this discrepancy, we calculated a revised reduction from each measure for each grid square or farm. This calculation was based on the relative strength of relationship between the actual land use of the farm or grid and the various model farm types.

vi. **A representative location of control measures for modelling.**
Differences in the modelled 1 km land use and actual land use reported in the agricultural census data meant that reductions could not always be applied in the exact geographical locations reported by CSFOs. Reductions were therefore applied to grid squares representative of the farms where measures were actually applied. It was assumed that measures would be

applied according to the pollutant loading, with the highest pollutant loading being covered first.

Work continues to refine the CCM system and the approaches to modelling the baseline. It is anticipated that, following further refinement, the CCM will be able to estimate the cumulative effects of control measures and model the relative contributions of manure, fertilizer and soil nitrate. It would be useful to conduct further cost-benefit analysis once the uncertainty of the modelled results has been reduced.

It is possible that farmers working in catchments not covered by the scheme will have observed the initial pilot phase of the ECSFDI and consequently changed their behaviour in order to reduce diffuse water pollutants. These benefits, if they exist, will not have been captured by the monitoring and evaluation programme. It may be worth exploring at a later stage whether this 'demonstration effect' has occurred.

Cost effectiveness analysis

A cost effectiveness analysis can also be reported for the same data. In this case the present value costs of the project are divided by the reductions in emissions. Two emissions have thought to be reduced by CSF practices, so a weighted average of the two needs to be taken. In Table 6.6 the weights are based on relative values in terms of benefits, i.e. €0.3 for N and €0.96 for P. This implies one unit of P has a weight equal to 3.2 units of N. A 3.5 per cent discount rate was applied to costs and future pollutant reductions. The resulting values of 'cost per tonne of weighted pollutant removed' are given in Table 6.6.

Table 6.6 Cost effectiveness results.

	Assumed time period reductions maintained		
	10 Years	**20 Years**	**30 Years**
Cost per tonne (£) – 'optimistic' estimates	1,290	755	538
Cost per tonne (£) – 'pessimistic' estimates	2,572	1,505	1,163

An intra-case study analysis of cost effectiveness could inform future initiatives for reducing DWPA. For such an analysis, information on the approaches used in each catchment (e.g. events attended, one-to-one advice given) and the cost of these approaches would be required. The cost effectiveness of pollutant reductions could be compared across the catchments to identify which approaches worked best in combination.

Since each catchment has different physical characteristics, this spatial factor will not provide an ideal "counterfactual"; results would have to be interpreted in the light of conditions in each catchment. Furthermore, catchment-level cost data is not currently available.

6.3 Evaluation

This case study shows that a combination of policy instruments was essential. The variety of approaches worked well together – no single instrument or approach would have been appropriate. Raising awareness was an important first step to engage

farmers; targeted advice delivered the right way and the financial incentives were also essential to enable farmers to introduce suitable mitigation measures.

6.3.1 View from the target audience

The farmer surveys during January and February 2007 (base line survey) and November 2007 indicated:

- a very positive response from farmers engaged with the ECSFDI;
- increased awareness of DWPA;
- that farmers were better informed about how to modify farming practices;
- that farmers had a strong intention to take action.

The financial incentive (grants for capital investment) was generally welcomed by farmers, although they also had to make their own contributions (only 60 per cent was fundable by grant). The uptake of grants was high (initially over-subscribed, although the final grant expenditure was somewhat reduced due to a number of problems, such as delays in implementation, cash flow difficulties, adverse weather or seasonal conditions and insufficient time for implementation).

Farm visits from the CFSOs and one-to-one advice were highly valued, particularly the face-to-face relationship with their CFSOs; farmers felt it was a two-way process, that they were being listened to and their individual situations were understood. They reported that CSFOs had the right expertise to provide them with the tools to implement appropriate mitigation measures.

It must be remembered that farmers do not have unlimited time to participate in such initiatives; therefore one-to-one farm visits scheduled at the farmer's convenience were deemed most useful, not least because they were well targeted and relevant.

Farmers generally saw the ECSFDI as a provider of education and practical solutions.

The initiative has made farmers think more about what they are doing; they want to learn more and continue to make changes because they feel that CSF is in their own interests.

The free soil and slurry testing service proved to be a good approach to engage with farmers.

In many cases farmers said they benefited from the new measures in terms of cost savings. These were demonstrated in several cases.

The idea to appoint 'champion farmers' also worked well. These farmers led workshops and organised farm visits; they demonstrated their successes to other farmers and helped to get their local farming community 'on board'.

However, there was also some negative feedback and a number of inadequacies in the initiative. In particular:

- the survey indicated only a slightly greater acknowledgement of the impact of agriculture on water quality;
- farmers felt they could do more (in terms of introducing new mitigation measures) if more money was available;
- farmers felt they had been rather 'singled out' and were not convinced of their contribution to pollution;

- some farmers were reluctant to engage (too busy, fear of more bureaucracy, 'stuck in their ways', etc.).

According to the target audience, the main lessons learned were that:

- financial issues are the main hindrance to farmers from doing more to reduce water pollution;
- grant money must come through in a timely manner to allow farmers sufficient time to implement mitigation measures,
- farmers feel it is essential that the initiative gets funding to continue, otherwise it would negate what has been done already.;
- the ECSFDI could link up with other credible farming organisations to reach farmers that are reluctant to engage and so earn their trust by association;
- farmers would like to see more evidence of their contribution to water pollution and proof that making changes can have a measurable impact.

6.3.2 Views from those in policy

According to policy-makers, the main problems encountered with the initiative were as follows:

i. **A lack of continuity between the two phases of the project, due to the uncertainty of future funding.**
Several CSFOs left the project and there were considerable delays in recruiting new CSFOs. Once recruited, the new CSFOs had to be trained (a training manual and induction course was available), but where trust had been built up between farmers and specific CSFOs, this was lost, as was local knowledge gained during the pilot phase of the initiative. The poor continuity has also produced a lack of momentum as well as the loss of personnel. During Phase 1 a lot of activity was undertaken and now there has been no activity for six to nine months.

ii. **Initially the advice to farmers was not well targeted.**

iii. **Delays in the uptake of available grant money.**
It would have been more beneficial if the available grant money had been staged, i.e. a small amount initially with subsequent increases. This would have allowed the initiative to plan and target its resources better and have more time to implement the planned measures covered by the grants.

iv. **Lack of good evidence and baseline data to demonstrate success.**

v. **Only partial success with water industry participation.**
Catchment officers from the water industry were invited to attend catchment steering groups, but the uptake of this invitation was very variable.

The positive aspects to the initiative are as follows:

i. **Successful partnerships**
The ECSFDI is supported by the Pesticides Voluntary Initiative. It also interacts with pre-existing schemes, such as Environmental Stewardship (ES) and the Entry Level Scheme (ELS). The second phase of the initiative will focus more on working in integrated partnerships, including regional and national partnerships as well as improved interaction between different instruments. It will also attempt to form a national partnership between the Environment Agency and Water UK.

ii. **An improved reputation among farmers.**
To start with the Environment Agency took a very careful approach because CSF is a politically sensitive area. However, the Environment Agency found that its reputation among farmers appeared to improve during the course of the initiative.

iii. **Farmers like to know they are "doing the right thing".**
Farmers want to know whether they are complying with regulation, so there could be more emphasis on voluntary measures – not necessarily to avoid regulation, but as a preparation for regulation and the need for compliance.

iv. Low administration costs of the grant scheme.

According to Environment Agency policy-makers, the main lessons to learn are to:

- champion the success of the ECSFDI;
- integrate with other initiatives;
- embed CSF into the business of the Environment Agency as a whole;
- share lessons with the rest of the organisation;
- embrace a more regulatory approach;
- be more proactive about developing further partnerships (e.g. with the water industry);
- ensure continuity by setting budgets early;

In particular, the Environment Agency has struggled to establish regional partnerships; only a small number of other organisations and key actors in CSF have agreed to participate in joint activity. The necessary resources to work at these partnerships are currently lacking, but the Environment Agency's offer is not strong enough to get support where stakeholders are expected to match funding. Stakeholders are happy to act as deliverers if the Environment Agency provides the budget, but they are not able to provide matched funding (even in kind).

6.3.3 Other views

The most important and successful delivery mechanism for the ECSFDI has been the introduction of CSFOs working with farmers on a one-to-one basis. CSFOs must have a high level of knowledge of farm management and local situations and be trusted by the farming community. It is important to safeguard the continuity of the CSFO/farmer relationship as far as possible.

6.4 Support of the CSF case study to existing theory

The information collected as part of this case study has been used to assess whether or not various existing theories relating to the use of policy instruments, both alone and in combination, are supported by the evidence. The full assessment can be found in Appendix E.

The CSFDI case study supports the theory that it is best to build upon exiting delivery mechanisms. The initiative was specifically designed, but it built upon existing delivery mechanisms, networks and partnerships, for example Environmental Stewardship. This was achieved by working in partnership with Natural England.

The initiative also ensured the Environment Agency was clearly accountable for results. The project evaluation is available to the public which has helped to increase the confidence of farmers in the initiative and in the Environment Agency as an organisation.

We did detect a perception during our work on this case study that the approaches taken to implement mitigation measures have been inconsistent. There is a view that the items available in under the capital grant scheme are biased towards livestock farming; this is seen as unfair. In reality, this bias is offset by the options available to arable farmers through ELS, but nevertheless the perception remains.

The initiative has demonstrated a risk-based approach to its implementation. It has focused on priority catchments (i.e. those failing or likely to fail water quality objectives under the Water Framework Directive). Advisory activity and the awarding of capital grants have also been directed within catchments, based on environmental priorities and the strength of evidence.

Finally, the CSF case study demonstrates a clear focus on outcomes. The initiative focuses on supporting farmers to apply CSF practices and thereby reduce DWPA. The CSF programme has catchment-specific key performance indicators (KPIs) that are published on a quarterly basis. One of these indicators (KPI 4) is the ‘reduction in agricultural phosphate load’; it is clear that environmental outcomes are central to both the planning and assessment of performance.

Overall it is clear that many elements of existing theory have been using during the planning and implementation of the two-year pilot phase of the ECSFDI. By using combinations of instruments, the initiative has been able to target its delivery, work in partnership and deliver the most cost effective instruments possible.

6.5 Conclusions from CSF case study

6.5.1 Key findings relating to initiative design

Overall the logframe shows the success of the ECSFDI, as far as it can be measured in the short term. It has increased awareness of CSF issues and practice among farmers and there has been a high level of grant uptake and implementation of mitigation measures. This should lead to reductions in pollutant emissions and thereby lower diffuse pollution (as estimated through modelling).

However, there were no clear indications that the initiative was having a significant effect on increasing farmers’ understanding of the impact of their activities in their local

catchment. There was an indication that greater financial incentives may be needed to encourage farmers to make more changes in their behaviour and agricultural practice to prevent water pollution. Better communication about what action they may need to take and the support available to them may be required. This communication should also highlight the benefits of CSF, such as the reduced costs that arise from better land management.

These outcomes support the use of a logical approach to the design of such initiatives, for example by using a logframe. A logical design should ensure that objectives are clearly defined and that appropriate monitoring techniques are considered at an early stage. Giving full consideration to the assumptions governing the design should minimise any 'unintended consequences' that might occur once the policy is implemented.

To measure the 'counterfactual', a 'before' and 'after' study of water quality would show if water quality has changed significantly due to better farming practices. Policy-makers are concerned that better farming practices will stop when the ECSFDI finishes in 2010/11 and that levels of diffuse water pollution might rise. The Environment Agency might wish to conduct this analysis when the ECSFDI has concluded.

6.5.2 Key findings relating to initiative implementation

Overall the case study shows that it was essential to a combination of policy instruments and a variety of approaches. They worked well together – no single instrument or approach would have been appropriate. Raising awareness was an important first step to engage farmers, whilst the delivery of targeted advice and financial incentives were essential to enable farmers to introduce suitable mitigation measures. It is unlikely that an awareness campaign on its own would have provided sufficient incentive for action to be taken.

The most important and successful delivery mechanism for the ECSFDI has been the introduction of CSFOs working with farmers on a one-to-one basis. CSFOs must have a high level of knowledge of farm management and local situations and be trusted by the farming community. It is important to safeguard the continuity of the CSFO/farmer relationship as far as possible.

6.5.3 Key findings relating to initiative monitoring and evaluation

The CSF programme is monitoring its progress using a variety of key performance indicators. The monitoring activity includes targeted water quality monitoring (mainly long-term assessment which is directly linked to the desired environmental outcome) and the monitoring of interim progress (e.g. surveying farmers' attitudes, counting the number of implemented mitigation measures, etc.). Reporting on progress and success is an integral part of the initiative and resources have been allocated for this purpose.

The CSF programme has catchment-specific key performance indicators (KPIs) that are published on a quarterly basis. WFD targets and timescales also apply. The use of KPIs means that monitoring techniques have been included as a central part of initiative design; KPIs allow the effectiveness of the initiative to be assessed fully in terms of environmental goals. Monitoring should take place before, during and after the implementation of measures in order to fully assess the effectiveness.

7 Case study 2: Landfill

This case study looked at how a variety of instruments have been used to reduce the amount of waste sent to landfill. We assess here whether combinations of instruments offer the most effective way of addressing this environmental problem.

In the past the UK relied heavily on landfill for waste disposal, but this method of waste disposal has several significant environmental impacts, not least the release of methane (a potent greenhouse gas) from biodegradable waste and pollution of surface water, groundwater and soil from leachate. Both of these processes can affect human health as well as harm the environment.

A number of policy instruments are in place to try and address these impacts by reducing the amount of waste sent to landfill; these approaches include regulations, the Landfill Tax, allowance schemes and educational campaigns.

The Landfill Tax was introduced through the Landfill Tax Regulations (1996). It acts as a financial disincentive. The tax is charged according to the weight of waste sent to landfill, so waste producers work to reduce the quantity of waste to avoid the charges and also extract value from the waste through activities such as recycling or composting. The tax is applied at two rates: the standard rate applies to active wastes while inert or inactive wastes are charged at a lower rate. In April 2008 the standard rate of tax increased from £24 per tonne to £32 per tonne; this will increase to £48 per tonne by 2010/11 to make alternatives such as recycling more cost-effective. The tax is levied by HM Revenue and Customs.

The Landfill Allowance Trading Scheme (LATS) is the government's key measure in England to meet the demands of Council Directive 1999/31/EC of 26 April 1999 which tackles the disposal of waste to landfill. LATS began on 1 April 2005; in Wales, the Landfill Allowance Scheme (LAS) began on 1 October 2004. The schemes were designed by Defra and the Welsh Assembly Government respectively, in consultation with the Environment Agency which is responsible for monitoring local authorities on their compliance with the regulations (i.e. Landfill Allowances and Trading Scheme (England) Regulations 2004 and Landfill Allowances Scheme (Wales) Regulations 2004).

Both the LATS and LAS systems involve progressively tighter restrictions on the amount of biodegradable municipal waste (BMW) – defined as paper, food and garden waste – that disposal authorities can place in landfill sites. There are three target years by which the disposal of BMW to landfill must be reduced to a given percentage of that disposed in 1995. These targets tie in with the targets within the Landfill Directive so that by:

- 2010 the quantity of waste disposed to landfill should be 75 per cent of that in 1995;
- 2013 the quantity should be 50 per cent of the 1995 level;
- 2020 the quantity should be 35 per cent of the 1995 level.

The achievement of these targets is supported through the LATS and LAS schemes. Local councils are set limits for the amount of biodegradable material they can send to landfill, but their allowance decreases over time.

In the LATS system, allowances can be traded between authorities or banked for use in future years. If necessary, up to 5 per cent can also be borrowed from future years. An authority with a high cost of diversion may find it difficult to stay within its allowances, but it can also buy additional allowances from an authority with a surplus.

This provides flexibility for councils to pursue the most cost-effective solution in their area while the total allowance across England is maintained (and set to comply with the targets). Banking is not permitted in target years but trading is allowed. Councils will be fined £150 for every tonne they landfill beyond the limit set by the allowances they hold.

In the LAS system, allowances cannot be traded or banked, and the fine is £200 per tonne over the allowance limit. Both schemes therefore contain financial disincentives.

In England, an operational review of LATS, which included a section looking at how to improve the process and procedures, was published in November 2008. Guidance on the "Landfill Allowance Schemes: Municipal Waste" was published by Defra in 2006. The purpose of this guidance was to clarify the approach of Defra and the Welsh Assembly Government to the waste . Under LATS and LAS authorities have to report on their waste disposal activities. These data, which include figures on how much waste was sent to landfill, are published annually.

Both England and Wales are also subject to targets for recycling and composting. In England, national targets were set in the Waste Strategy (2007). There are targets for the:

- re-use, recycling and composting of household waste (by at least 40 per cent by 2010, 45 per cent by 2015 and 50 per cent by 2020);
- recovery of municipal waste (by at least 53 per cent by 2010, 67 per cent by 2015 and 75 per cent by 2020).

In Wales, there is no target for recovery of municipal waste, but the target for recycling and composting was set in 'Wise about Waste: The National Waste Strategy for Wales' (2002). Levels of recycling and composting of municipal waste must reach at least 40 per cent by 2009/10, with at least 15 per cent each of recycling and composting (only composting of source-segregated material will count).

Other regulations are in force that also aim to reduce the quantity of waste going to landfill. The Environmental Permitting Regulations (England and Wales) 2007 replaced many previous pieces of legislation in order to merge and simplify pollution prevention and control (PPC) permitting and waste management licensing (WML). The regulations are enforced by the Environment Agency and local authorities. Under the regulations, wastes such as liquids, flammable or infectious waste and tyres are banned from landfill sites. Waste that is sent to landfill must be treated first, through physical, thermal, chemical or biological processes.

Alongside regulations and formal instruments such as the Landfill Tax and the allowance schemes, education campaigns and advisory services also work to reduce the amount of waste sent to landfill. In England, these activities are delivered mainly by the Waste and Resources Action Programme (WRAP), which was established in 2000 and is funded by government with income from the Landfill Tax. WRAP's work "helps individuals, businesses and local authorities to reduce waste and recycle more, making better use of resources and helping to tackle climate change" (WRAP, 2008). For example, WRAP co-ordinates the national *Recycle Now!* campaign in partnership with local authorities in an effort to change consumer behaviour. As part of waste prevention campaigns WRAP supplies local authorities with subsidised home compost bins. It also runs the *Love Food Hate Waste* website which provides advice on how to reduce the amount of household food waste.

In Wales, Waste Awareness Wales (WAW) has been funded by the Welsh Assembly Government since 2002 to provide information to the public on reducing, re-using and recycling waste. Activities include media campaigns (e.g. adverts promoting recycling), along with work on areas such as real nappies and home composting. WAW is about to start focusing on the issue of residual waste and plans to inform the public through a

national campaign in Wales on the need for new waste facilities. Local authorities in Wales have also had their own separate communication campaigns to encourage the public to recycle more.

The policy instruments outlined above influence different parts of the waste sector, but their overall aim is the same: to reduce the environmental impact of landfill sites. The rest of this report examines how they work together operationally and whether the combination of instruments addresses the environmental issue in the most effective way. We compare the differences between the English and Welsh system to provide a counterfactual; the main difference between the two is that trading of landfill allowances is not possible in Wales. The two allowance schemes are discussed in detail, although the focus of the evaluation is to assess how well they interact with other instruments.

The instruments and approaches mentioned above are plotted against the axis of the 'Defra Diamond' in Figure 7.1.

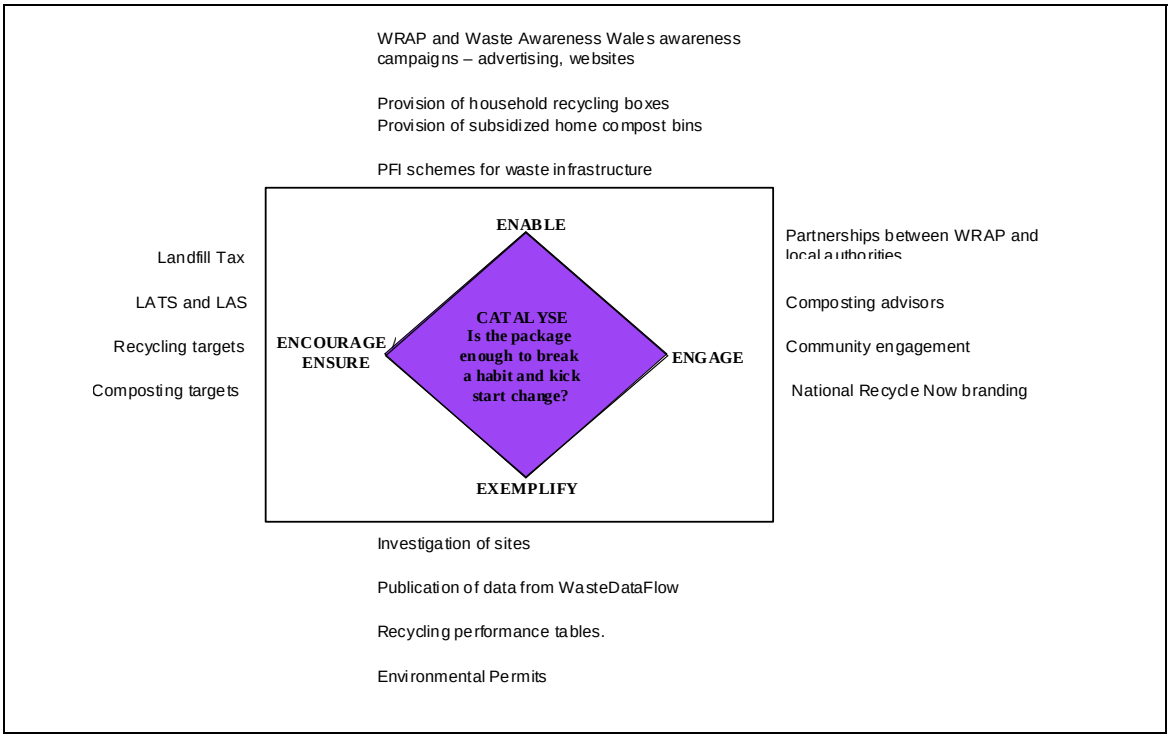

Figure 7.1 The 'Defra Diamond' for the landfill case study.

7.1 Logical framework approaches for landfill

The logical framework (logframe) approach is described in Section 5.2.1. A logframe for landfill is given in Table 7.1; this was developed by the project team and further reviewed and commented on by key Environment Agency contacts.

Table 7.1 A logframe matrix for landfill.

Activity description	Indicators	Means of verification	Assumptions
Goal or Impact Prevent or reduce the environmental effect of placing waste in landfill.	Reduced the environmental impact of landfill sites on leachate, surface water, groundwater and potential gas emissions.	Statutory monitoring of landfill sites	
Purpose or Outcome Reduce the amount of waste sent to landfill sites.	Targets set by EU Landfill Directive to reduce the amount of biodegradable municipal waste sent to landfill to given percentages of baseline level in 1995 i.e.: - 75% by 2010; - 50% by 2013; - 35% by 2020. Government targets in Waste Strategy (2007): Recycling and composting of household waste to reach: - 40% by 2010; - 45% by 2015; - 50% by 2020. Recovery of municipal waste to reach: - 53% by 2010; - 67% by 2015; - 75% by 2020.	Municipal waste data is recorded via a web-based tool called WasteDataFlow. This includes waste arisings, treatment and disposal, whether by landfill, recycling, composting, incineration or recovery.	Sending less waste to landfill will reduce the environmental impact of landfill sites. Sufficient resources available to divert waste via alternative routes. Waste will stay within legitimate waste cycle. Landfill operators still need to make a return on the municipal waste they process.

Table 7.1 continued overleaf

Table 7.1 continued

Activity description	Indicators	Means of verification	Assumptions
Component Objectives or Intermediate Results Landfill allowances (LATS/LAS) – placing limits on the amount of waste local authorities can send to landfill. WRAP: awareness campaigns, advisory service for local authorities, subsidised home compost bins. Waste Awareness Wales: awareness campaigns. Landfill Tax – standard rate is £24 per tonne. Environmental Permitting Regulations ban certain wastes from being sent to landfill.	Number of tonnes of total and biodegradable municipal waste sent to landfill (number of allowances used). Measured or estimated diversion of waste e.g. as a result of home composting activity or recycling. Measurement of waste recovered (energy from waste or refuse-derived fuel). Total number of tonnes of waste sent to landfill. Monitored waste streams should not include banned wastes	Allowances used – as calculated from the amount of waste entered in WasteDataFlow. Data is validated by the Environment Agency in Wales and Enviros in England. Surveys of sample populations to estimate effect of WRAP's work. Landfill Tax returns completed every quarter, based on records kept by those registered for landfill tax. Sites may be visited or records requested by HMRC for checking. Environment Agency monitors waste streams and takes enforcement action as necessary	Relevant legislation in place. Amount of residual waste that is biodegradable: mass balance calculation identifies the biodegradable component of each type of waste collected (e.g. 68% of residual waste in England and 61% in Wales). Introducing allowances will drive local authorities to change systems and behaviour in their area. Awareness campaigns will have an effect on public behaviour. Data in WasteDataFlow is compared with returns from landfill operators as verification – assumption that 10% leeway is a suitable threshold.

Table 7.1 continued overleaf

Table 7.1 continued

Activity description	Indicators	Means of verification	Assumptions
Outputs			
Landfill Tax escalator (tax will increase from £24 per tonne to £48 per tonne by 2010/11).	Number of tonnes of waste landfilled.	Record of taxes.	Financial penalties are a sufficient incentive to drive changes in behaviour.
Trading of allowances between authorities in England.	Number of allowances traded.	Records of trades made.	Trading does not prove overall success. The overall number of surplus allowances is the mark of success.
Fines imposed on authorities exceeding BMW allowances (£200 per tonne in Wales, £150 in England).	Number of authorities fined and level of fine.	Records of fines imposed	
Recycling initiatives in local authority areas. Co-ordinated recycling marketing outputs e.g.: - advertising (on television, in public buildings, local and national press, etc.); - websites; - use of national *Recycle Now!* branding by local authorities and retailers.	Uptake of recycling initiatives – number of local authorities working with WRAP, number of households recycling. Kerbside recycling and green waste collection schemes in place.	Surveys of local authority and household level recycling activity.	

It is clear from Table 7.1 that the policy instruments for reducing the amount of waste sent to landfill were designed using a logical approach. The combination of policy instruments was designed not just to place limits on the quantity of waste that could be sent to landfill, but also to provide incentives for alternatives such as recycling and composting. A comprehensive suite of approaches was employed rather than just a single policy instrument.

The logframe also shows that specific indicators were identified at the design stage. These indicators address the overall policy objective and each component objective; each indicator has a clear means of verification. For example, WasteDataFlow was designed to minimise the time it took municipal authorities to report their waste data by avoiding the need for repetitive data entry or duplicate reporting. The online system also provides an accurate and comprehensive record of waste disposal activity. In Wales, these data are validated by the Environment Agency whereas in England this is process is completed by Enviros. This independent validation provides greater confidence in the data.

Many of the assumptions identified within the logframe have also been addressed. For example, the mass balance calculation characterises the biodegradable component of waste. However, some assumptions are not addressed directly within the policy instruments; there are no measures to ensure that waste stays within a legitimate cycle. This would require links with other areas of policy, such as waste crime.

In terms of the combinations of policy instruments, this logframe shows that the indicators for the different instruments vary considerably. The Landfill Tax applies to all types of waste and all types of producer, whereas the allowance schemes focus solely on biodegradable waste from municipal sources. Recycling and composting activities are complementary, but fit with the other instruments in different ways depending on what type of waste is being considered.

The performance indicators used for this landfill case study, together with an assessment of performance in this policy area, are provided in Table 7.2 based on the simple progression defined by the basic logic model (see Figure 5.2).

Table 7.2 lists the relevant indicators identified by the logframe analysis in Table 7.1. It also describes:

- the monitoring that was undertaken for these indicators;
- whether the results indicate good or bad performance;
- who selected the indicators;
- the key stakeholders who were involved in defining the indicators.

This assessment of performance against logic model indicators highlights that the combinations of policy instruments seem to be achieving their goals so far. However, the allowances schemes and the recycling and composting targets involve ever tightening restrictions. These particular instruments will be more fully tested in future years.

Figure 7.2 and Figure 7.3 illustrate the trends in waste arisings and disposal over time, as recorded in the Municipal Waste Management Surveys. The graph for England shows that total MSW increased until 2002/03, but since then has fluctuated. There has been a clear downward trend in the amount of MSW sent to landfill since 2002/03, which corresponds with an increase in the number of tonnes recycled or composted. Available data for Wales shows a similar overall pattern. Total MSW peaked in 2004/05 and has decreased each year since then; the amount sent to landfill has also decreased during the same time period. Recycling and composting have increased steadily since 2001/02.

Table 7.2 Assessment of performance against basic logic model indicators.

Basic logic model	Appropriate indicators (from logframe and logic model)	Assessment of performance
Inputs (Resources)	Costs to Environment Agency for administering and monitoring the LAS and LATS.	No data available
	Costs to HMRC for administering and monitoring the Landfill Tax.	No data available
	Costs to WRAP and Waste Awareness Wales for education, advice and provision of materials.	No data available
Actions	Implementation of landfill allowances schemes.	Schemes have provided a focus for local authorities but have not yet been fully tested.
	WRAP and Waste Awareness Wales: awareness campaigns and other work.	Public awareness of issues around landfill and what individuals can do to help has increased. WRAP is meeting or is close to meeting its own targets for impacting recycling and waste reduction in the UK.
Strategies (Outputs)	Total number of tonnes of waste sent to landfill. Number of tonnes of MSW sent to landfill.	Number of tonnes being sent to landfill is decreasing.
	Number of allowances traded.	Some authorities have traded, but the limits are not yet tight enough to really test the system.
	Number of authorities fined and level of fine.	No authorities have been fined in either England or Wales.
	Uptake of recycling initiatives – number of local authorities working with WRAP, number of households recycling.	All local authorities recycle some kinds of waste; trials are ongoing for e.g. food waste. 90% of councils in England use WRAP's *Recycle Now!* campaign materials and levels of recycling are increasing.

Table 7.2 continued overleaf

Table 7.2 continued

Basic logic model	Appropriate indicators (from logframe and logic model)	Assessment of performance
Target (Outcome)	Amount of waste sent to landfill. Amount of waste recycled or composted.	WasteDataFlow shows the amount of MSW in England being sent to landfill decreased from nearly 20 million tonnes in 2004/05 to 15.5 million tonnes in 2007/08. This is going in the right direction, but BMW must decrease further to meet the 2010 target. In Wales MSW sent to landfill reduced from 1.5 million tonnes to 1.2 million and BMW is within the target for 2010.
Goal (Impact)	Environmental impact of landfill sites in relation to leachate, surface water, groundwater and gas emissions.	Results from monitoring not available.

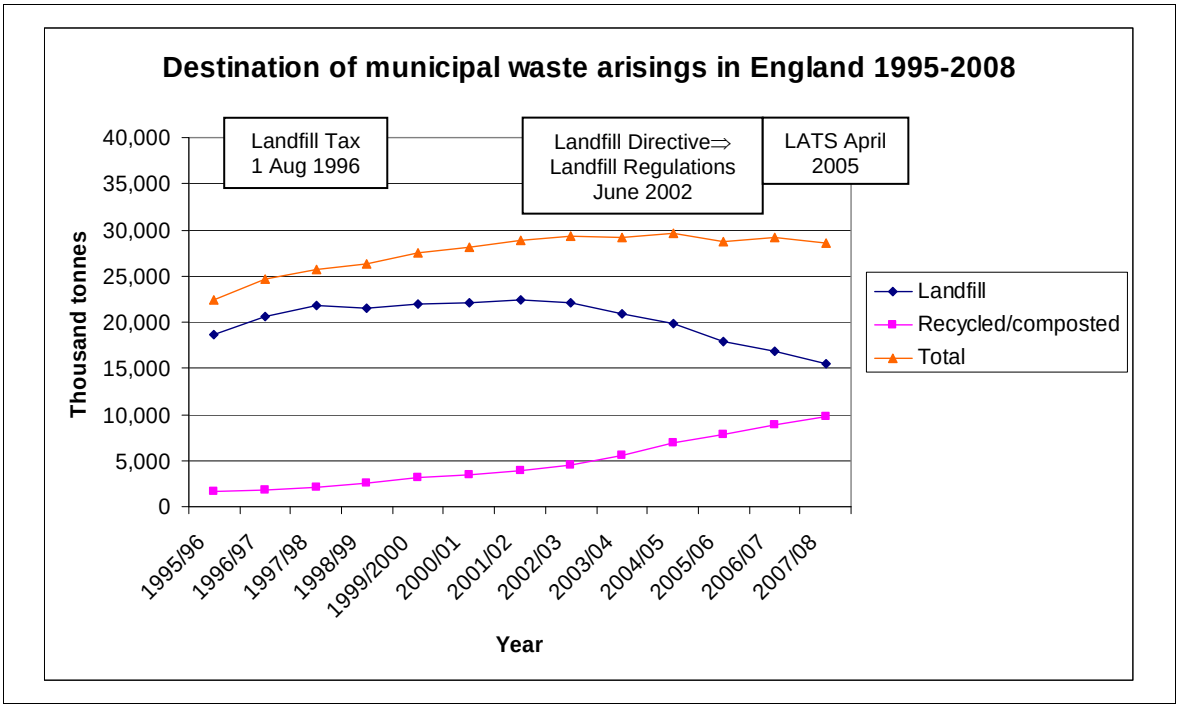

Figure 7.2 Performance over time for landfill indicators – England.

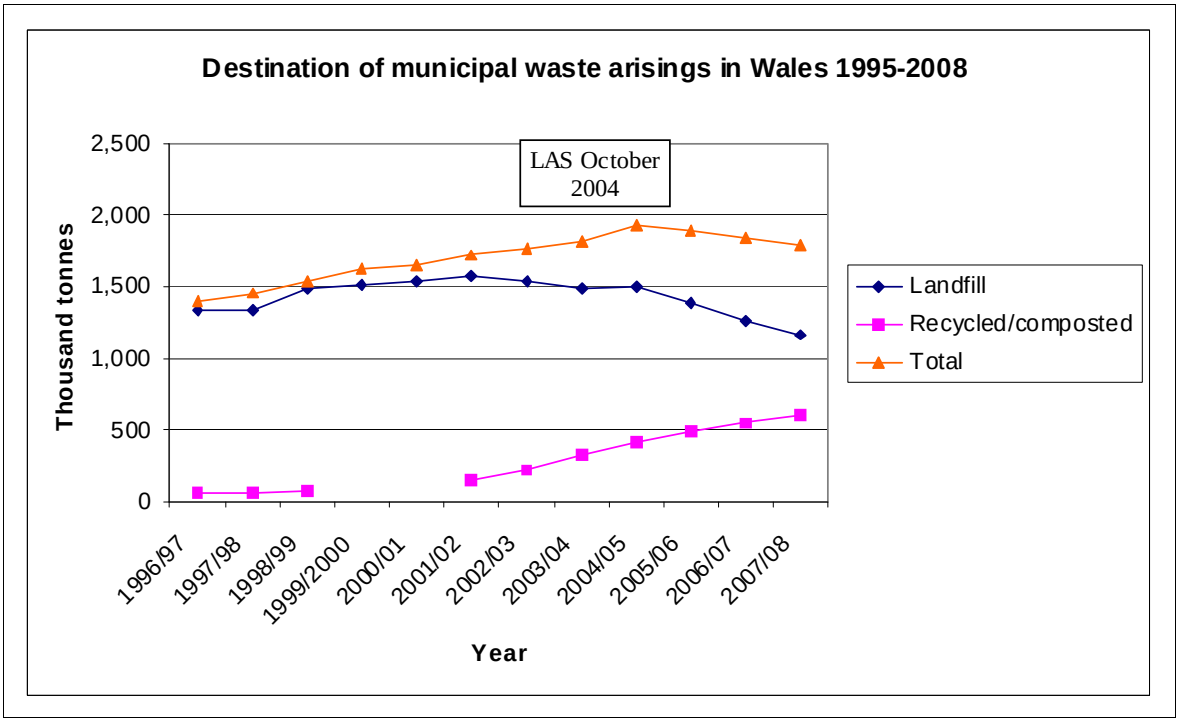

Figure 7.3 Performance over time for landfill indicators – Wales.

7.1.1 Performance in context with other factors

We held a number of focus groups as part of this case study. The views expressed by participants in these groups reinforced our findings that the policy instruments were having a positive effect on reducing the amount of waste being sent to landfill.

However, the groups were able to put these views in the context of relevant political, social and economic factors.

Although the focus group facilitator put forward some themes for discussion, aim of the groups was to obtain the views of the participants without prompting. Thus the discussions have a bias towards what the participants wanted to talk about; certain instruments were discussed in more detail than others.

In England, the focus group participants identified a number of reasons to explain why the amount of municipal waste sent to landfill has fallen. These included:

- financial incentives (including LATS and the Landfill Tax) – the primary drivers for local authorities;
- educational campaigns – both national campaigns (e.g. WRAP's *Love Food Hate Waste* and *Recycle Now!* campaigns) and local activity, such as work by the Wildlife Trust on home composting and real nappies;
- changes in the weight of packaging as a result of the EU Packaging and Packaging Waste Directive;
- initiatives by retailers to reduce the number of single-use carrier bags – action that has occurred without the need for legislation.

The main issues raised in focus groups by representatives of local authorities in England were as follows:

i. **LATS may undermine recycling rates**
Recycling rates have increased, but the pressure to achieve LATS targets can undermine recycling of materials such as glass which are not biodegradable. In two-tier authorities, waste collection authorities (WCAs) play a key role in encouraging recycling, but incentives are focused on the disposal authority.

ii. **Conflicts between green waste collection and home composting**
LATS has driven collections of green waste and some local authorities have started collections of some green wastes for the first time. These collections could conflict with campaigns to encourage households to compost waste at home, but LATS favours the collections of garden waste. Several studies have investigated whether home composting could be connected with LATS, but this is not done in any EU country and is unlikely to happen in the UK.

iii. **LATS trading has not been tested**
One authority within the focus group had bought additional allowances, but overall the participants felt that the trading mechanisms of LATS had not yet really been test. Authorities said they were unlikely to rely on trading to meet their allowances; the inflexible limits on allowances provided greater certainty for them to plan their infrastructure. It was argued that if the Landfill Tax escalator had begun sooner, it would have been easier for authorities to implement better recycling systems. These would have had a more significant environmental impact because authorities would have had to keep their focus on all MSW rather than just the biodegradable component.

iv. **Infrastructure investments are needed to meet targets**
Infrastructure, such as treatment plants, might be established at a regional level with authorities working together, but this kind of cooperation is difficult politically. The council in which the treatment plant is located would

be likely to face opposition from local people who do not want waste from elsewhere coming into their area. However, with councils all acting independently, it is likely that there would be redundant capacity in the infrastructure.

v. **Municipal waste is not defined consistently across policies**
At present the definition of MSW is not consistent between policies. For example, in the Waste and Emissions Trading (WET) Act 2003 the definition limits MSW to 'waste from households and other waste that is similar to waste from households'. The LATS and LAS regulations include all waste under the control of local authorities. At present, these inconsistencies add to the uncertainties experienced by local authorities, but Defra is working towards clarification.

In Wales, the amount of municipal waste sent to landfill has also decreased. The focus groups identified two main reasons for this trend, specifically:

- guidance from the Welsh Assembly Government;
- financial incentives (i.e. Landfill Tax and LAS).

The Landfill Tax has had a greater influence to date, especially since the tax escalator will increase authority costs if they do nothing to minimise waste.

Comments and concerns voiced by the Welsh focus groups including the following:

i. **The LAS will have a bigger influence in the future**
The LAS is the most significant change in approaches to waste disposal and recycling in recent years, but its effect is likely to be greater in the future as allowances become tighter.

ii. **No trading mechanism is a weakness of LAS**
The lack of a trading mechanism and the possibility to 'bank' allowances was thought to be a weakness in the LAS, at least in the short-term. The focus group participants pointed out that there was no incentive for authorities to go below their allowance limits. However, it was acknowledged that the scheme will drive changes in the infrastructure in the long-term.

iii. **Activity to recycling more and landfill less BMW not always complementary.**
Recycling rates have increased across Wales, although some authorities are performing better than others. Activities to increase recycling do not always complement initiatives to reducing the amount of BMW sent to landfill (and vice versa). Some authorities have a disparity in their performance in these two areas.

iv. **Inflexible policy**
There is little flexibility within Welsh Assembly Government policy on how waste is collected and treated. It is difficult for local authorities to adjust these processes to suit their local needs better.

Local authorities see that a number of policy instruments in England and Wales are playing a key role in reducing the amount of waste sent to landfill. The overall objective of the combination of instruments is being achieved, but not without some issues surrounding how well the instruments combine. In some cases the objectives of the individual instruments are not complementary (e.g. the allowance schemes aim to reduce only BMW whereas some other instruments include a wider range of types of

waste). These inconsistencies may have an impact on the success of the instruments by reducing their effectiveness.

7.2 Analysis of landfill case study

We found it far from straightforward to identify a counterfactual scenario for this case study. However, as the landfill allowances schemes in England and Wales are different, the non-trading aspect of the Welsh scheme does provide a make it possible to make comparisons between the countries.

We compared the evidence presented within this case study with existing 'good policy criteria' and principles. The results of this comparison are provided in Appendix D.

This counterfactual analysis highlights areas where implementation has been successful, but also areas where adaptations could improve their performance. Some of the criteria used in this analysis link directly with the overall policy objectives. Evaluating environmental effectiveness, for example, is important to measure the broad overall objective to reduce the environmental impact of landfill sites (as specified in the logframe in Table 7.1). Other criteria, such as dynamic efficiency, are not explicit aims of the policy instruments, but they are certainly a beneficial secondary consequence.

The analysis shows that the main problem areas in this case study concern:

- the ease by which the instruments were introduced;
- the easy by which monitoring was instigated;
- predictability;
- acceptability.

Although awareness campaigns encourage members of the public to dispose of waste in different ways, it is perceived that in some parts of local councils there is little acknowledgement that disposal of waste to landfill is an environmental issue. This apparent lack of awareness could perhaps be addressed with more targeted awareness campaigns. The analysis also shows that although LATS scores highly in terms of flexibility, this may not always be an advantage because it also limits the predictability of the scheme. This can be a serious issue for local authorities when it comes to setting forecasts for future budgets.

7.2.1 Cost effectiveness analysis

The Landfill Allowance Scheme (LAS) and Landfill Allowances Trading Scheme (LATS) are allowances schemes (in Wales and England, respectively) which cap the annual volume of biodegradable municipal waste (BMW) that each waste disposal authority (WDA) can send to landfill. In Wales, local authorities that exceed their allowances are subject to a fine (currently £200 per tonne of BMW in excess). In England, under LATS, local authorities are permitted to trade allowances in order to meet their quotas. Following trading, if authorities in England still exceed their allowances then they will be fined (currently £150 per excess tonne).

LATS was designed to enable local authorities to meet their obligations (for BMW to landfill) in the most cost-effective way. Our analysis for the purposes of this project considered the cost effectiveness of introducing trading to an allowance scheme. The full detail of our calculations can be found in Appendix D.

Several costs are associated with both the LAS and LATS, namely:

- regulatory costs (i.e. the costs of operating the scheme, for example the Environment Agency's start-up costs and staff costs);
- administrative burdens of the scheme (costs to local authorities, waste operators and waste disposal authorities to run the scheme);[10]
- compliance costs (i.e. the cost to local authorities of meeting the targets, for example the cost of infrastructure for waste diversion , or the cost of paying a fine).

Trading, banking and borrowing of allowances are recorded on a web-based allowance register, known as the LATS Register. The trading element of LATS has additional costs, specifically:

- the cost to Defra of managing the trading system (i.e. start-up costs and the hosting overheads);
- the regulators' staff costs associated with managing the LATS register;[11]
- the additional administrative burdens on local authorities associated with trading (i.e. the cost of submitting monitoring information quarterly (rather than annually) and the costs associated with the requirement to register any trading, banking or borrowing on the electronic register. There are also real resource costs associated with recording the weight of each load of MSW accepted at landfill).

The purpose of the trading scheme is to enable local authorities to meet their obligations in the most cost-effective way. The cost of diverting waste from landfill will vary across local authorities, but trading aims to reduce the overall cost of meeting a given target. In theory authorities will sell allowances where the marginal cost of diverting waste (e.g. through recycling) is less than the price of an allowance; conversely, they will purchase allowances where it is cheaper to do this than to divert waste from landfill. Following an allotted trading period, if authorities do not hold enough allowances to cover the waste they sent to landfill then they will be fined.

Table 7.3 Reduction in BMW attributable to allowances schemes.

	Total BMW to landfill in year prior to start of scheme (tonnes)	**Total allowances in 1st year of scheme**[12]	**Apparent reduction in BMW to landfill due to scheme**
England	13,478,960	12,380,966	8.15%
Wales	1,017,960	550,000	-8.06%

In Wales, where no trading is allowed, the difference between the amount of BMW allowed and how much was generated before the scheme would be a measure of the reduction attributable to the scheme. This reduction could then be costed, using estimates of the costs of reducing waste in the Welsh local authorities. The data, however, do not indicate that any reduction was in fact recorded by the local authorities

[10] Data on the administrative cost of the scheme to participants are only available for England.
[11] A representative from the Environment Agency [Fran Lowe] suggested that the additional resource time for the Environment Agency would be negligible.
[12] One allowance is required for each tonne of BMW.

in Wales (see Table 7.3[13]). Therefore a cost effectiveness estimate for these authorities is not possible (unless further information can be provided to indicate that the scheme did in fact reduce the quantity of waste generated).

For England a similar analysis is required. Information is needed on the amount of waste reduced as a result of the scheme and some measures of what it cost to make the reductions. In this case, however, the scheme can be credited with the benefits from the trading. Authorities that buy credits save the difference between the price of the credits and the costs of abatement in their systems, while those that sell credits incur a cost equal to the costs of additional abatement in their systems. Since this information is not available, a cost effectiveness analysis cannot be carried out at present.

7.3 Evaluation

7.3.1 Evaluation – what worked and what did not

View from the target audience

Local authorities are primarily driven by financial incentives and this means that instruments such as the Landfill Tax and the allowances schemes fit well within existing approaches to achieving goals. The fiscal instruments have been successfully complemented by alternative approaches such as educational campaigns that aim to change the behaviour of the public. Overall, the instruments are achieving their objective: the amount of municipal solid waste (MSW) being sent to landfill is falling.

However, it is felt among local authorities that the allowance schemes have not yet been fully tested; this will happen once the allowance limits become tighter. In England, there are concerns over the uncertainty surrounding LATS and the differing definitions of MSW employed in different instruments. In Wales there is greater certainty because the targets are completely fixed until 2010, although uncertainty still exists further into the future.

The combination of education and advice with recycling targets is also having an impact. Recycling rates have improved in both England and Wales, although there are some areas where the public is not yet recycling all types of waste. Maintaining educational campaigns and targeting specific local areas may help resolve this issue.

The recycling and the allowance schemes do not always work well together. For example, LATS and LAS are focused on biodegradable municipal waste (BMW); increases in home composting or recycling of materials such as glass may therefore have a negative effect on BMW targets. This is a significant weakness in the combination of instruments as approaches implemented for one instrument (e.g. increasing separate collections of non-biodegradable recyclable materials) are in direct conflict with the purpose of the other instrument.

[13] Allowances were only issued for the last two quarters of 2004/05. Therefore, the reduction in waste was calculated on the assumption that, had allowances been introduced at the beginning of 2004/05, double this number of allowances would have been issued for the entire year.

Views from those in policy

In England, there are a number of policy instruments that aim to reduce the amount of waste sent to landfill, but it was felt among policy-makers that they may not be particularly well connected. For example, there are different definitions of waste used within LATS and the Landfill Tax – an issue also highlighted by local authorities. However, in general, policy-makers felt that LATS is functioning effectively and the suite of instruments is working well towards achieving the primary goal.

The Operational Review, published in November 2008, contained a number of recommendations for ways in which LATS could be improved; these are being implemented where possible.

Trading of allowances was not included within the Welsh LAS in order to drive environmental benefits at an earlier stage. Recycling is the main alternative disposal method and recycling activity is expected to reach sufficient levels for Wales to me*et* all its targets.

In both England and Wales, the Landfill Tax pre-dated the landfill allowances schemes. These two instruments were not designed to directly interact, however both have an effect on reducing the amount of BMW sent to landfill so they do complement each other to some extent.

7.3.2 Overall lessons to learn

View from the target audience

In England, local authorities would prefer not to have trading in the allowances scheme as it introduces uncertainty, making future planning and budgeting difficult. The Landfill Tax is a more straightforward and predictable instrument to implement; it was even suggested that if the escalator had been introduced sooner, it could have had a very significant environmental impact.

It was also felt that recycling initiatives would have been set up differently had LATS been in place earlier, as collections of kitchen waste would have been given a high priority. Investments made prior to LATS now make it difficult to introduce kitchen waste collections at this stage. Furthermore, the legislation on animal by-products means that any kitchen waste collections must be separate from existing collections for garden and green waste.

Lastly, waste disposal authorities (WDAs) in two-tier areas would like fiscal incentives to apply to waste collection authorities (WCAs) as well. However, even where waste managers in WCAs would like to implement such schemes, council members are inclined not to release the budget required to do this as there is no economic incentive.

In Wales, the view was held that having flexibility in allowances would be an advantage. Even if trading were not introduced, authorities would like the option to be able to bank surplus allowances for future years. Authorities also suggested the need for further incentives to drive authorities to reduce waste well below their allowances rather than just meet the targets. Additionally, authorities feel they do not have enough time (one month) to complete their quarterly reports; they point to England where local authorities have three months to submit their reports. The short deadline Wales can lead to inaccurate submissions.

Views from those in policy

England still has some way to go before it meets the EU targets for reducing biodegradable waste going to landfill. The 'hot debate' is whether household should be offered incentives to recycle more and waste less – for example, the so-called 'pay-as-you-throw' idea where households are charged differently depending on the amount of waste they produce. So far this concept has proved controversial, with critics raising concerns that such a scheme would charge households for collections they already pay for via council tax, or that it would lead to an increase in fly-tipping or other illegal activity. Local authorities also feel that a 'pay-as-you-throw' scheme would add to the current administration burden of waste collection and disposal.

In Wales, the published Waste Strategy takes a different approach. It is hoped that recycling activity will be enough to meet the targets. The LAS is working well and all authorities are within their limits. All authorities are unitary so there are no issues regarding relationships between WCAs and WDAs, although some authorities have had problems obtaining data from contractors on time.

Regarding the purpose of this project, we note that there seem to be more issues surrounding the combination of instruments in England than there are in Wales, but this may change as targets get tighter in the future. In England, instruments work towards similar goals, but they were not specifically designed to work together. Consequently when investments are made to meet the objectives of one instrument, it is often more difficult to meet the slightly different objectives of an instrument that was introduced later. In Wales, there are also similar issues, but policy-makers seem confident that the existing mix of instruments will continue to work well.

For both England and Wales it would be worthwhile evaluating whether changes could be made to bring the objectives of different instruments closer together. More synergy could improve the overall outcome and reduce the waste sent to landfill even further.

7.4 Support of the landfill case study to existing theory

The information collected as part of this case study has been used to assess whether or not various existing theories relating to the use of policy instruments, both alone and in combination, are supported by the evidence. The full assessment can be found in Appendix E.

The landfill case study demonstrates that policy instruments should complement and mutually underpin each other. Recently the market for recyclate has dropped significantly; had instruments used recycling targets alone to reduce the amount of MSW going to landfill, it is more than likely that the environmental objectives would not have been achieved. However, the addition of the fiscal stimuli of the Landfill Tax and allowances schemes has resulted in a continued reduction in the disposal to landfill of MSW.

Nevertheless, the combination of policy instruments without common objectives can have drawbacks, as identified in this study. The majority of the policy instruments (i.e. Landfill Tax, recycling targets) target all MSW. However, landfill allowances specifically target biodegradeable municipal waste (BMW). Good performance in terms of landfill allowances can have negative effects elsewhere. For instance, a separate collection for glass recycling helps meet recycling targets, but it has adverse consequence on landfill allowances for BMW. This perhaps reflects a situation where policy instruments have been effectively combined but direct coordination was not a deliberate part of the design.

Our landfill case study also highlights how highly flexible instruments and more rigid ones may have different effects. Whilst there is scope for the redistribution of landfill allowances in Wales, there are negative consequences to this action – for instance inequality and problems with long-term planning. The use of trading within LATS is a better solution because local authorities can apply the instrument in a dynamic way to suit their individual circumstances whilst still achieving the same overall environmental objective of reducing BMW to landfill.

Finally, the case study shows that importance of have solid objectives against which progress can be measured. The objective here was clear: reduce the number of tonnes of waste sent to landfill. This is measurable through reported information in WasteFlowData. The objective was set to be realistic, although challenging, and was time bound to three years.

7.5 Conclusions from the landfill case study

7.5.1 Key findings relating to initiative design

The evidence from this case study suggests that a logical approach was taken during the design of appropriate policy approaches and instruments to reduce the quantity of waste sent to landfill. The combination of policy instruments appears to have been designed to place limits on the amount of waste that could be placed in landfill, but these limits were complemented with incentives for alternatives such as recycling and composting.

Specific indicators were identified at the design stage to address both component and overall objectives of the initiatives. Many of the assumptions that we identified during our evaluation were addressed at the design stage, for example the use of the mass balance calculation to characterise the biodegradable component of waste. However, some were not addressed directly, for example approaches to ensure that waste stays within a legitimate cycle (this would require links with other areas of policy such as waste crime).

In this instance, the use of a logical approach (e.g. a logframe) at the design stage would have allowed all the assumptions to be identified and fully considered. This would have helped to minimise any ‘unintended consequences’ that might occur once the policy is implemented.

7.5.2 Key findings relating to initiative implementation

The combination of instruments employed to reduce the amount of waste being sent to landfill included awareness and information campaigns to underpin the regulatory instruments. Combining recycling incentives, allowances schemes and the Landfill Tax has helped to divert waste away from landfill even as the market for recylate material has fallen. However, it is important that there are common objectives to all instruments. At present the allowances schemes focus on biodegradeable waste only which is undermining the effectiveness of other approaches, especially separate recycling schemes. Policy instruments used in combination should be consistent with one another; their objectives, key definitions and the way that they are delivered could be complementary.

7.5.3 Key findings relating to initiative monitoring and evaluation

The objectives of the instruments employed to reduce waste to landfill are measured in terms of the number of tonnes of waste accepted for landfill; these figures are reported by local authorities through the central WasteDataFlow system. This bespoke tool has been set up to minimise the effort required for authorities to report their municipal waste data.

Tonnage targets are set and WasteDataFlow is used to assess progress. Targets span a three-year time boundary. The Environment Agency has a service delivery team that carries out monitoring, sends reminders and notices to authorities and implements the mass balance calculation. The evidence presented in this case study demonstrates the importance of building a monitoring programme into policy initiatives at the design stage; this makes it easier to gather data in the most cost effective manner.

8 Case study 3: Waste crime

Illegal handling, processing and disposal of waste, including fly-tipping, waste transport, and illegal waste disposal sites and waste export, can:

- pose a risk the environment;
- pose a risk to human health;
- have connections to organised crime;
- have an impact on legitimate business;
- pose a risk to the Environment Agency's reputation.

The Environment Agency has a vision for a rich, healthy and diverse environment for present and future generations. Such an environment would be able to provide, for example:

- a better quality of life for people;
- an enhanced environment for wildlife;
- cleaner air for everyone;
- restored, protected land with healthier soils;
- a greener business world;
- improved and protected inland and coastal waters.

An increase in waste crime over recent years is thought to be linked to a number of factors including:

- increasing costs of legitimate waste disposal;
- widespread ignorance of waste controls such as the 'duty of care';
- a real, or perceived, reduction in the number of available legitimate waste management facilities;
- the greater availability of sites where illegal activities can take place;
- the lack, or perceived lack, of deterrents – fines and other punishments are perceived as insignificant and perhaps 'worth the risk'.

Tackling waste crime is therefore a priority for the Environment Agency. The National Enforcement Steering Group has prioritised several areas of illegal activity at a national level, specifically:

- illegal waste sites;
- illegal dumping;
- illegal exports;
- producer responsibility;
- hazardous waste mis-description.

This case study focuses on three aspects of recent work to tackle waste crime, outlined Section 8.1.

8.1 Focus of case study

This case study focuses on three aspects of recent work to tackle waste crime, outlined in the following sections.

8.1.1 Illegal waste sites

An illegal waste site is defined as a "site operating without the appropriate permit for the activity being carried out where multiple loads of waste are deposited, treated, stored or disposed of, and where the activity is, or appears to us to be, taking place in an organised manner. The activities at the site will generally (but not always) be known to the landowner or the legal occupier of the site and will often be run as a business".

Recent work has focused on tackling sites that pose the highest risk and therefore attain the greatest environmental benefit. As this initiative has only been underway for approximately six months, only initial indications of the success of the approach are available for analysis.

8.1.2 Business Resource Efficiency and Waste (BREW) campaigns

Defra's "Review of England's Waste Strategy: A consultation document" (Defra, 2006) highlighted the possibility of a significant increase in all forms of illegal waste activity, including fly-tipping, as legitimate forms of waste management become more complex and more expensive. The document explores a range of actions that could help to improve enforcement, instigate preventative measures and gather evidence to demonstrate how different waste collection services affect levels of fly-tipping.

Funding was made available for a programme of work to reduce, or limit, waste crime. The Environment Agency's BREW programme focused on reducing waste crime by:

- tackling illegal dumping;
- encouraging more sustainable management of business waste;
- improving the support and advice offered to businesses regarding the regulation of waste carriers.

The BREW programme set up nine case study areas in which different approaches would be taken, based on local requirements and priorities. This project looks in depth at the work of the BREW campaign in Northumbria.

8.1.3 Illegal waste export

A three-year project is currently underway (approximately nine months have elapsed at the time of writing) that aims to tackle the problem of illegal export of waste. For this case study on waste crime we will analyse the different approaches instigated to deal with this illegal activity; we will also identify any lessons learnt from the project so far. The project is still at an early stage, so it is not possible to determine fully the effectiveness of the project at this time.

8.1.4 Combinations of instruments

A suite of instruments has been used to tackle waste crime, from education to permits. It is clear that each of the approaches we have analysed for this project has helped to reduce incidents of fly-tipping, numbers of illegal waste sites and volumes of waste being illegally exported. They have also encouraged the licensing of waste carriers.

One of the aims of this case study, however, was to evaluate the interaction between the instruments and approaches; we therefore also try to determine whether the instruments and approaches are – or could be – complementary.

Relevant legislation relating to waste crime includes:

- Clean Neighbourhoods and Environment Act 2005 (CNEA);
- Environmental Protection Act 1990 (Part II) s.33;
- Environmental Protection Act 1990 (Part II) s.34;
- Environmental Protection Act 1990 (Part II) s.59;
- Control of Pollution (Amendment Act) 1989 ss.1, 2 & 5.

A protocol[14] document has been introduced to support the joint Environment Agency and Local Government Association/Welsh Local Government Association memorandum of understanding 'Working Better Together'. This document sets out eight agreed protocols that these organisations will follow to help coordinate their work. Protocol No. 6 is entitled "Fly-tipping and illegal waste activities"; it sets out how each of the organisations should respond to these illegal waste activities. However, the document is flexible and allows local authorities and the Environment Agency to make specific agreements to suit local areas.

In general it is agreed that local authorities will deal with most small-scale types of fly-tipping while the Environment Agency should respond to the 'big, bad and nasty'. These are incidents which involve organised crime or hazardous waste, or large-scale incidents; these have much greater potential to damage the environment.

[14] http://www.environment-agency.gov.uk/static/documents/Research/protocol6fly_tip05_1567953.pdf

The combinations of policy instruments and approaches that have been used to tackle waste crime are plotted against the axis of the 'Defra Diamond' in Figure 8.1.

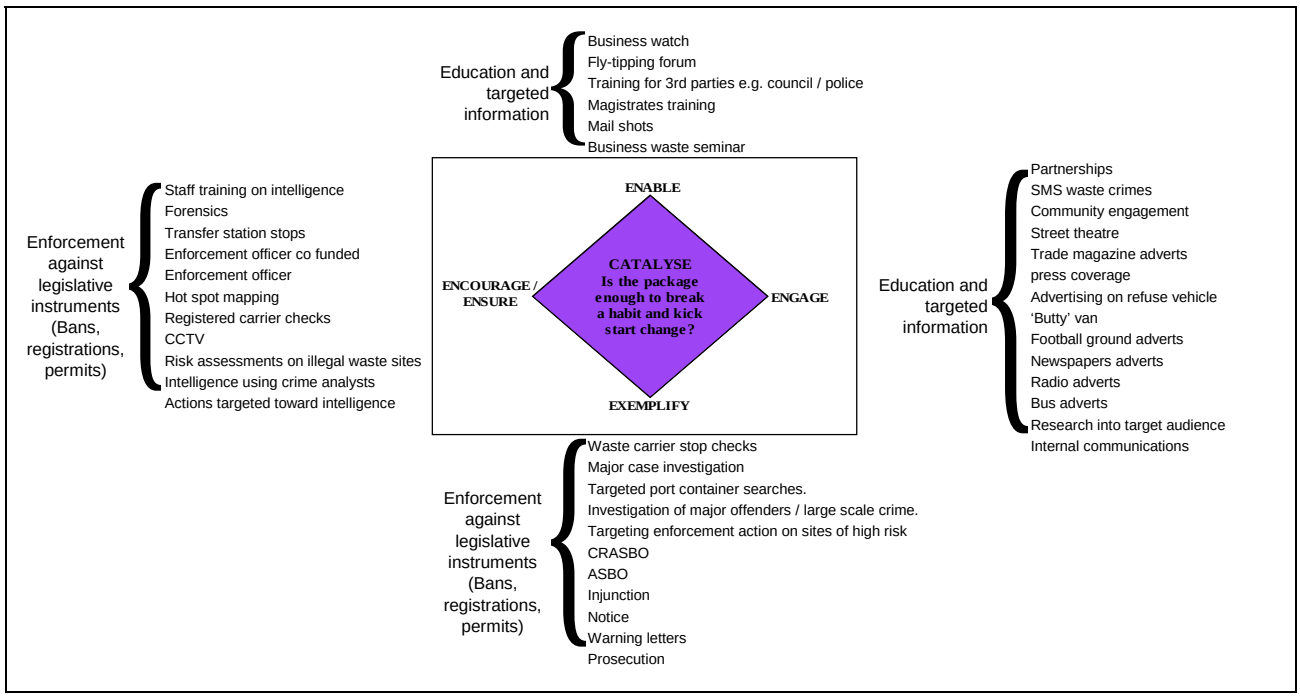

Figure 8.1 'Defra Diamond' for the waste crime case study.

8.2 Logical framework approaches for waste crime

A logframe for waste crime is given below, this was developed by the project team and amended after it had been reviewed and we had received comments from key Environment Agency contacts. The use of logframes is described in Section 5.2.1.

There are gaps in the logical progression of the waste crime case study. In particular, either indicators of success are lacking in some areas, or the means of verification of success is not clear. This situation usually arises when there is baseline data for an illegal activity is unavailable – waste crime is, by its very nature, an 'illegal' activity so it is hard to measure.

Even where tangible evidence is available – for example, the number of fly-tipping events reported – the indicator of success (a reduced number of incidents) is complicated by other factors. For example, a greater awareness of the problems of fly-tipping (which is one aim of the BREW campaigns) results in an increase in the number of fly-tipping events reported. This phenomenon is known as the 'Hawthorne effect' and must be considered when the indicators are analysed and results are evaluated.

In the area of illegal waste exports, the success is measured by the volume – or rather the value – of illegal waste that returns to the legitimate waste cycle. Again this is hard to measure because other factors are likely to affect the total volume of waste within the legitimate cycle; these factors could easily outweigh the impact of returning illegally exported waste to the correct system. By concentrating on large-scale illegal exports, however, it is hoped that significant volumes of waste will be involved. The intelligence gathered from these operations will be used to inform the estimation of illegal expert activity.

It appears that, in general, monitoring appears to have been overlooked or not fully considered for all areas of waste crime. Illegal waste site monitoring, with its risk-based approach, is perhaps ahead of the game: monitoring progress involves quarterly comparisons against the baseline at the beginning of the quarter. This ensures that success at closing or legitimising illegal sites is not confused by success at 'identifying new sites' (dealt with separately). Even with this approach, however, there is no way of ensuring that the new sites identified have not arisen directly as a result of the closure of another illegal site.

A significant amount of follow-up assessment work was carried out following BREW campaigns to gauge reaction from SMEs on whether or not they had been influenced by campaigns. Although this is a measure of the performance, it is qualitative and gives no indication of whether the changes in behaviour suggested by the research might be sustainable. This qualitative data can be coupled with quantitative data to provide more evidence of success (e.g. the number of registered waste carriers in a campaign area).

'Crime displacement' is a recurring problem that is highlighted by the logframe approach. Whether one is dealing with illegal waste sites, fly-tipping, unregistered waste carriers or illegal waste export, there is no disincentive for individuals who are 'caught' not to just move their business to an alternative location or, for instance, use a different vehicle for their activity. The NIM approach could help to tackle the problem among 'big, bad and nasty' offenders. Others have also suggested that by regulating waste 'sites' rather than the waste 'chain', there are obvious gaps in knowledge which illegal operators use to their advantage.

The aim of this project is to evaluate how operational policy approaches could be used in combination, given available policy instruments, and how combinations could be more effective and/or more cost effective. This logframe highlights how it is extremely difficult to measure success if appropriate monitoring mechanisms are not in place. The logframe analysis shows that monitoring and analysis methods must be considered when an initiative that uses a variety of policy approaches is being planned or considered. If these measures are in place, success can be monitored and operational approaches can be adjusted, according to the observed and measured results.

The performance indicators used for this waste crime case study, together with an assessment of performance in this policy area, are provided in Table 8.2 based on the simple progression defined by the basic logic model (see Figure 5.2).

Table 8.2 lists the relevant indicators identified by the logframe analysis in Table 8.1. It also describes:

- the monitoring that was undertaken for these indicators;
- whether the results indicate good or bad performance;
- who selected the indicators;
- the key stakeholders who were involved in defining the indicators.

Table 8.1 A logframe matrix for waste crime.

Activity description	Indicators	Means of verification	Assumptions
Goal or Impact			
To reduce the environmental impact and risk that waste crime activities have, including: - risk to environment; - risk to human health; - connections to organised crime; - impact on legitimate business; - risk to the Environment Agency's reputation.	Whether or not the environment significantly improves due to dealing with illegal waste activities. No targets are set for waste crime as a whole although fly-tipping, illegal waste sites and waste export are monitored separately.	Information on fly-tipping is collated on '*FlyCapture*' by the Environment Agency and local authorities. Information on illegal waste sites is collated by the National Enforcement Service. Information on illegal waste export is collated by the National Enforcement Service. This has included research to try and establish the size of the problem to provide a baseline.	It is currently assumed that once an illegal waste incident has been dealt with that an improvement to the environment will be seen. However, only limited information is currently collected on whether or not, for example, illegal waste sites are cleared after being closed. This is related to the 'end-of-pipe' approaches being taken, although this situation is being improved by using a NIM approach.

Table 8.1 continued overleaf

Table 8.1 continued

Activity description	Indicators	Means of verification	Assumptions
Purpose or Outcome Reduce the number of fly-tipping incidents.	The number of fly-tipping incidents recorded in *FlyCapture* at the level of local authorities or a region.	Local authorities and the Environment Agency record information on *FlyCapture* database.	Assumes that the number of fly-tipping incidents reported on *FlyCapture* is linked to the level of fly-tipping actually occurring. However, the *FlyCapture* data may also represent other factors e.g. awareness of the issue and therefore more reported incidents (Hawthorne effect).
Increase awareness that waste carriers must be registered and have a 'duty of care.	The number of registered waste carriers.	The Environment Agency holds regional information on registered waste carriers; there is also an online database.	
Reduce the number of illegal waste sites, focusing first on those that pose the highest environmental risk.	The number of illegal waste sites that of which the Environment Agency is aware, and the overall risk score associated with those sites.	The National Enforcement Service collates information on illegal waste sites, including their risk scores and when they are closed or legitimised.	Assumes that illegal waste sites are closed or legitimised for good. In reality it is possible that another site opens shortly after one site closes. 'End-of-pipe' approaches may merely displace the problem.
Reduce the volume of waste (in particular WEEE waste) being illegally exported.	The estimated volume of waste being exported illegally and/or an estimation of the volume of waste returned to legitimate routes.	The National Enforcement Service plans to estimate the volume of waste or value of waste returned to legitimate routes.	Assumes that once an illegal export operation has been stopped, the waste is returned to legitimate routes, rather than an alternative illegal route. Regulation that takes a 'waste chain' rather than 'site' approach may avoid this.

Table 8.1 continued overleaf

Table 8.1 continued

Activity description	Indicators	Means of verification	Assumptions
Component Objectives or Intermediate Results (policy instruments)			
Conduct risk assessment on identified illegal waste sites. Focus enforcement activity on those sites with the highest risk scores.	All sites identified are assessed and compiled together. The sum of the risk scores for each quarter is monitored. The target is to reduce overall risk by 20%, of which 70% should come from high risk sites by the end of the year (FY 2008/09).	For illegal waste sites the risk assessment scores are derived by field officers. Scores are reviewed if there are changes at the site.	Assumes that the total risk applied to any component of the risk assessment is relative to the overall risk that the component contributes. If risk from one component is very high, but all other risks are low, then the site might not be prioritised (this situation is unlikely in reality).
Use NIMs approach to gather intelligence on illegal waste export. Full intelligence is gathered in partnership with e.g. police), enforcement is then used to shut down operations.	No formal targets have been set relating to illegal waste export. The Environment Agency expects about 3–4 major prosecutions during the three-year project.	Information regarding the volume and type of waste being exported would be collated /estimated during the process of intelligence and information gathering to carry out prosecutions relating to illegal waste export. The value of the operation would also be estimated to claim money back through Proceeds of Crime Act (POCA).	Assumes that intelligence makes it possible to carry out enforcement activities on the biggest players in the criminal network. There is a risk that the illegal activity may just be displaced or that other individuals take over the activity. Also assumes that gathered intelligence will lead to a successful prosecution and costs claimed back through POCA.

Table 8.1 continued overleaf

Table 8.1 continued

Activity description	Indicators	Means of verification	Assumptions
Component Objectives or Intermediate Results (continued) Conduct campaigns to raise awareness of duty of care and need for waste carriers to be licensed.			
Employ enforcement officers to bridge the gap between LA and Environment Agency responsibility to gather intelligence and tackle fly-tipping.	A target has been set to reduce fly-tipping from the 2005/06 levels by 10%.	The Environment Agency and local authorities are responsible for entering information regarding fly-tipping, and prosecutions relating to fly-tipping into the fly capture database.	Assumes that the level of fly-tipping recorded is linked to the campaign activity in the area and that there are not more significant underlying factors influencing the level recorded incidents.
	Each BREW campaign had separate goals relating to registered waste carriers, raising awareness, and reducing fly-tipping.	Throughout the BREW campaigns the project team in each area was responsible for gathering information relating to the waste carriers in their area. ENCAMS carried out research relating to the impact of campaigns.	

Table 8.1 continued overleaf

Table 8.1 continued

Activity description	Indicators	Means of verification	Assumptions
Outputs (policy approaches) - Business watch - Fly-tipping forum - Partnerships - SMS waste crimes - Education and enforcement - Training for third parties e.g. council / police - Radio adverts - Bus adverts - Newspapers adverts - Football ground adverts - Magistrates training - 'Butty' van - Advertising on refuse vehicle - Mail shots - CCTV - Press coverage - Registered carrier checks - Business waste seminar - Hot spot mapping - Major case investigation - Waste carrier stop checks - Co-funded enforcement officer - Enforcement officer - Research into target audience - Trade magazine adverts - Transfer station stops - Street theatre - Internal communications - Community engagement - Staff training on intelligence - Forensics.	Qualitative methods are used to measure achievement of communications campaigns. The difference in reported behaviour before and after a campaign is an indicator of its success, along with the proportion of respondents who are aware of legislation, etc. The number of successful prosecutions for fly-tipping is also an indicator for both the Environment Agency and lo9cal authorities. The number of registered waste carriers and the number of unregistered waste carriers of which the Environment Agency is aware.	ENCAMS has been used to gather information before, during and after various BREW campaigns, asking households and SMEs about their response to campaigns. Analysis has been carried out for some campaigns on the likely reach of various advertising materials e.g. newspaper readership, footfall at events, etc. The Environment Agency and local authorities input information about fly-tipping into the *FlyCapture* database. The number of registered waste carriers is held in an Environment Agency database.	There is a large number and wide range of activities to raise awareness, so it is difficult to identify if any particular activity is most responsible for any observed/measured changes in behaviour. Assumes that any change in behaviour or awareness arise from campaigns. Assumes that awareness raising has the desired effect and does not promote alternative 'illegal' waste disposal routes to people who are currently disposing of their waste legitimately.

Table 8.1 continued overleaf

Table **8.1 continued**

Activity description	Indicators	Means of verification	Assumptions
Outputs (continued)			
Intelligence using crime analysts. Actions targeted toward intelligence. Investigation of major offenders and large-scale crime. Targeted port container searches. Stop notices issued. Risk assessments on illegal waste sites.	Achievements from intelligence gathering activities are more difficult to measure. They might be based upon gathering evidence to fill gaps in knowledge and piece together crime maps. This applies to actions, container searches and stop notices.	'Memex' is the Environment Agency's intelligence database for waste crime information. This information is analysed by crime analysts. Individual intelligence officers have responsibility for gathering information based on 'actions' assigned to them.	Assumes that once intelligence is collected it is analysed in an appropriate way and suitable actions arise from the analysis.
Targeting enforcement action on sites of high risk using: - Notices - Warning letters - Injunctions - Prosecutions - Formal warnings - CRASBOs - ASBOs - Fixed penalty notices	For each enforcement action for illegal waste sites, the indicator would be whether or not the site is subsequently legitimised or closed. Ongoing monitoring is therefore required to determine this outcome. A site is described as 'stopped' only after it has been inoperative for three months or more, or as soon as it becomes licensed or registered as exempt.	Field officers are responsible for verification of the current situation of any given illegal waste site. Team leaders check the assessments being forwarded on to the environmental crime team.	Assume that if a site 'stops' trading, it does not immediately relocate, although there is currently no disincentive to doing this.

Table 8.2 Assessment of performance against basic logic model indicators.

Basic logic model	Appropriate indicators (from logframe and logic model)	Assessment of performance
Inputs (Resources)	Costs to the Environment Agency for tackling illegal waste sites. Costs to the Environment Agency for implementing 'securing compliant waste export' project. BREW funding (£2 million).	Not available Additional funding in kind was received through free-media coverage. Additional funds were received to continue work in some locations (e.g. North East). The work and finance has a value of approximately £1.24 million.
Actions	Qualitative methods are used to measure achievement of communications campaigns. The difference in behaviour before and after the campaign is an indicator of success, along with the proportion of respondents who are aware of legislation, etc. The number of successful prosecutions for fly-tipping is also an indicator (figures from both the Environment Agency and local authorities.	37% of SMEs who had seen the advertising changed their waste practices[15] Campaigns have meant that businesses now have 'clearer policy for dealing with waste' and that 'contact is effective in raising awareness of waste disposal responsibilities'. The total amount of waste reported in *FlyCapture* has not fallen on, but the Environment Agency is likely to have made a significant contribution to preventing it from increasing further[16]. In some areas reported waste crime has dropped by up to 12%, with 178,000 tonnes of waste diverted from landfill nationally[17].

Table 8.2 continued overleaf

[15] Taken from the BREW Programme Board Communications Evaluation paper

[16] BREW Metrics Results - BREW waste crime metrics 2006/07

[17] BREW Programme Board – Project closure paper

Table 8.2 **continued**

Basic logic model	Appropriate indicators (from logframe and logic model)	Assessment of performance
Actions (continued)	Number of registered waste carriers and number of unregistered waste carriers (of which the Environment Agency is aware).	In the North East there was a 250% increase in the number of registered carriers.
	Achievements from intelligence gathering activities are more difficult to measure. They might be based upon gathering evidence to fill gaps in knowledge and piece together crime maps. This applies to actions, container searches and stop notices.	Not available
	For each enforcement action for illegal waste sites, the indicator would be whether or not the site is subsequently legitimised or closed. Ongoing monitoring is therefore required to determine this outcome. A site is described as 'stopped' only after it has been inoperative for three months or more, or as soon as it becomes licensed or registered as exempt.	At the start of 2008/09 there were 859 illegal waste sites operating with a total risk score of 77,717. By the end of Q2 activity at 369 of these sites had stopped (of which 70 had been brought into regulation). This was a risk reduction of over 30% (25% high risk). During Q1 and Q2 385 new sites were opened or identified, however the overall risk score once these sites have been added is still 1.4% lower than at the start of the year.
Strategies (Outputs)	All sites identified are assessed and compiled together. The sum of the risk scores for each quarter is monitored. The target is to reduce overall risk by 20%, of which 70% should come from high risk sites by the end of the year (FY 2008/09).	At the start of 2008/09 there were 859 illegal waste sites operating with a total risk score of 77717. By the end of Q2 activity at 369 of these sites had stopped, of which 70 had been bought into regulation. This was a risk reduction of over 30% (25% high risk).During Q1 and Q2 385 new sites were opened or identified, however the overall risk score once these sites have been added is still 1.4% lower than at the start of the year.
	No formal targets have been set relating to illegal waste export. The Environment Agency expects about 3–4 major prosecutions during the three-year project	Information relating to illegal waste export is not currently available.

Table 8.2 continued overleaf

Table 8.2 **continued**

Basic logic model	Appropriate indicators (from logframe and logic model)	Assessment of performance
Strategies (continued)	A target has been set to reduce fly-tipping by 10% from the 2005/06 levels.	The total waste amount of waste reported in *FlyCapture* has not fallen, although the Environment Agency is likely to have made a significant contribution to preventing it from increasing further.[18]
	Each BREW campaign had separate goals relating to registered waste carriers, raising awareness, and reducing fly-tipping.	Information on waste carriers not available.
Target (Outcome)	Reduced fly-tipping	The total waste amount of waste reported in *FlyCapture* has not fallen, although the Environment Agency is likely to have made a significant contribution to preventing it from increasing further.[19]
	Increased number of registered waste carriers (decreased number of unregistered carriers).	
	Reduced risk from illegal waste sites.	By the end of Q2 2008/09 FY, it was believed that the Environment Agency was on course to achieve the 20% reduction in risk scores, with 70% of the reduction coming from the stopping of high risk sites by end of year. Every region had achieved the 8% risk reduction target set for Q2, although three regions had not met their high risk targets.
	Decreased volume of illegally exported waste.	No data is currently available on waste diverted from illegal export routes. It is too early in the three-year project to see results.

Table 8.2 continued overleaf

[18] BREW Metrics Results – BREW waste crime metrics 2006/07.

[19] BREW Metrics Results – BREW waste crime metrics 2006/07.

Table 8.2 **continued**

Basic logic model	Appropriate indicators (from logframe and logic model)	Assessment of performance
Goal (Impact)	Reduction in waste crime activities. Increased waste in legitimate waste hierarchy.	Estimation from BREW campaign of overall new, legitimate waste businesses is valued at £28.6 million. It is also estimated that 178,801 tonnes of waste were diverted from landfill (equivalent to £11.19 for every tonne diverted). Against a baseline of £0 new business and 0 tonnes of waste diverted, this result could be considered as 'good' performance. No information available for other aspects of waste crime at this time.

This assessment of performance against logic model indicators highlights just how difficult it is to measure 'success' if appropriate monitoring mechanisms are not in place. The evidence also indicates the problem of assessing the impact of the approaches being taken against a fluctuating baseline – or when other instruments and approaches having an impact and may also influence an indicator.

For instance, *FlyCapture* theoretically provides quantitative information. Such monitoring and analysis systems and methods must be considered when an initiative that involves a variety of policy approaches is being planned or considered. If these monitoring and assessment systems are in place, success can be measured; implemented approaches can be adjusted if necessary, according to the observed results.

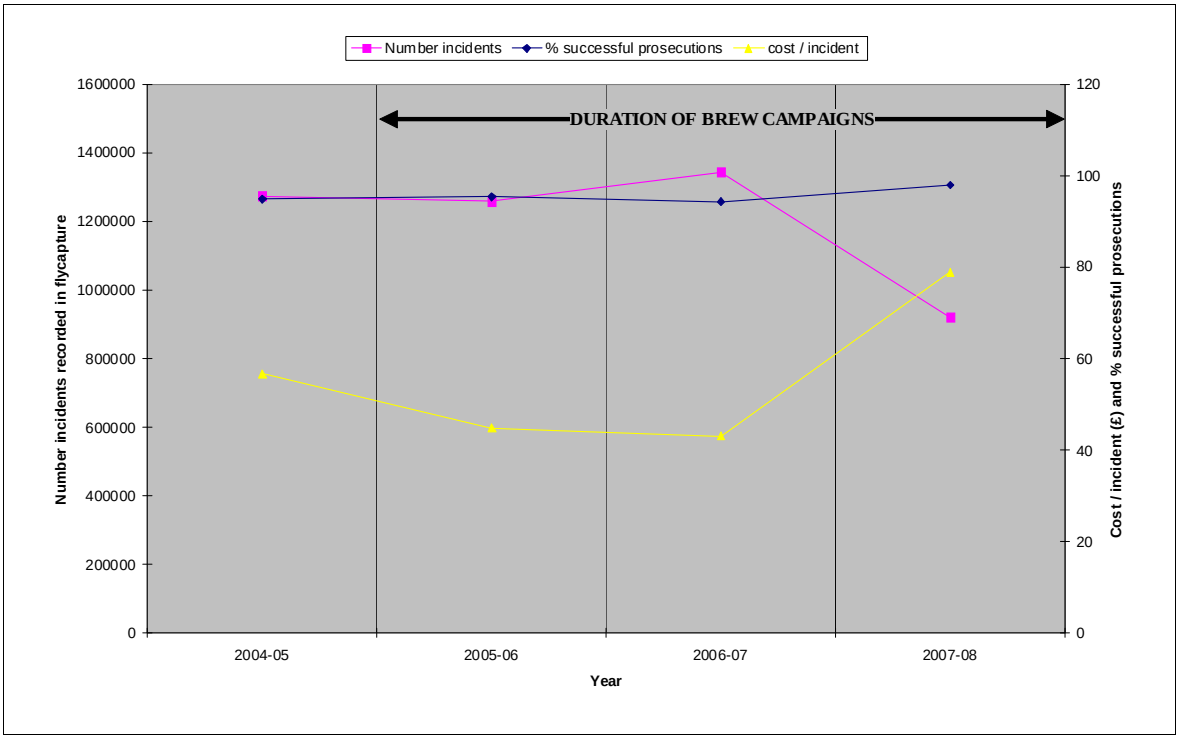

Figure 8.2 *FlyCapture* data (excluding Liverpool County Council) for 2004/05 to 2007/08.

Figure 8.2 indicates the change in the number of fly-tipping incidents recorded in *FlyCapture* over time. These are the incidents recorded by local authorities. Although the data does not indicate a steadily decreasing trend over the duration of the BREW campaigns[20], it is perhaps encouraging that the proportion of successful prosecutions is rising. This result could also means that, as the cost per incident is rising, very small incidents of fly-tipping are not being reported or are not even occurring, so that local authorities are able to focus on larger, nastier incidents in line with the Environment Agency's focus.

[20] National data is shown here, although BREW campaigns took place only in certain locations.

The Environment Agency also reports data in *FlyCapture*. The headline findings relating to the Environment Agency's involvement in this area are that:

- the Environment Agency dealt with a total of 700 illegal waste dumping incidents (a drop from 982 in 2006/07);
- it is estimated to have cost the Environment Agency £94,000 to clear up incidents of illegally dumped waste;
- the Environment Agency took 183 prosecutions forward in relation to illegal waste activities, resulting in over £401,000 in fines (an increase from 161 prosecutions in 2006/07);
- the average fine per prosecution was £2,900 where a fine was the outcome (a slight decrease from £3,200 in 2006/07);
- the Environment Agency prosecutes in over 25 per cent of the incidents it investigates (an increase of 16 per cent from last year).

Again, these results are encouraging: the Environment Agency is trying to target its action on the 'big, bad and nasty' and these results seem to show that this approach is being successful. More cases are leading to prosecution and the total number of incidents is falling.

The overall aim of this project is to look at how different approaches in operational policy can be effectively used in combination. The evidence presented here in this case study, particularly from the Environment Agency, would suggest that the concerted effort to use a combination of awareness and enforcement activity is having the desired performance impact. The number of illegal waste dumping incidents has dropped (owing to raised awareness), while the number of prosecutions has risen (evidence of increased enforcement activity). These outcomes also suggest that the approaches taken within the BREW campaigns, and the partnering agreement which enables the Environment Agency to focus on the 'big, bad and nasty', are successful.

8.2.1 Performance in context with other factors

Data on fly-tipping are available for each of the BREW campaign areas. The figures show some variation between areas in the percentage reduction or percentage increase of fly-tipping over time. There are many other factors which could influence the number of fly-tipping incidents recorded on *FlyCapture* including:

- the Hawthorne effect (i.e. more awareness of the issue could encourage more people to report fly-tipping incidents and hence inflate the data and produce an apparent increase in fly-tipping);
- the closure of civic amenity sites during the campaign period.

It is thought that SMEs in the building trade are probably responsible for a significant proportion of fly-tipping events. Economic factors that affect this industry sector will therefore also have an influence on the level of fly-tipping reported in *FlyCapture*. For example, during times when trade is busy (and more building waste is produced) there is likely to be more fly-tipping than during, for instance, the current economic downturn when trade could be less busy. Alternatively, as work becomes scarcer for small builders and trade becomes harder, cost-cutting measured are employed to keep SMEs afloat: fly-tipping may be an attractive, cheaper alternative to using registered waste carriers and waste management centres for disposing of waste.

It has not been possible to speak to SMEs as part of this study. However, there is evidence in literature – including research by ENCAMS prior to, during, and after the

various BREW campaigns – to indicate that economic pressures are likely to be the main driver for fly-tipping. Other factors that may have an influence on the level of fly-tipping in an area include the distance that someone may have to travel to find a suitable, legitimate disposal site and widespread ignorance of waste controls such as the duty of care.

8.3 Analysis of waste crime case study

It is difficult to find a counterfactual for the waste crime case study because so many factors influence the number of waste crime incidents in an area – and these factors may be different in different areas.

However, it is possible to evaluate the effect of different combinations of policy instruments in BREW campaigns; they are the only campaigns targeting waste crime for which results and measures of success are available.

It was therefore decided to compare the effects of the campaigns across their designated areas. Although the ideal counterfactual scenario would be to compare data over time (i.e. 'before' and 'after' a campaign), very limited information is available on the situation 'before' the campaigns started. Indeed lack of baseline ('before') data is true in the other main area of focus on waste crime (i.e. illegal waste sites and illegal waste exports). Recent work is only just beginning to identify the scale of the problem.

It is important to identify monitoring techniques when projects are being planned for the implementation of policy instruments. The logframe method highlights that monitoring is a weakness in approaches to waste crime. Some of the current gaps in available information are now quite clear, and this knowledge should provide a framework for future work as consideration can be given to how work will be monitored to enable evaluation at a later date. Without monitoring, it is impossible to say whether any project or policy implementation is being successful; are the policy targets being achieved, and is this happening in a cost-effective and efficient manner?

Our analysis was based on a comparison of the evidence presented within this case study to existing 'good policy criteria' and principles. The results of this comparison are provided in Appendix C.

The analysis highlights areas where approaches have been implemented well and areas where further thought is required. Approaches that score particularly highly are those where a risk-based approach is being taken to target action; this increases cost effectiveness and environmental effectiveness. In addition, it is clear that the success of awareness raising campaigns depends on identifying and researching the target audience so that the initiative reaches the intended population.

Cost and environmental effectiveness are also improved when targeted action is intelligently planned and coordinated and when knowledge is shared between organisations and within different departments of the same organisations.

We have also found that awareness raising on is effective when it is accompanied not just with enforcement activity, but also with efforts to raise people's awareness of the enforcement activities. When people know that enforcement is taking place they will not assume that they can 'get away' with committing an environmental crime. Press coverage of prosecutions, for example, helps to raise this awareness; when high profile prosecutions are complemented with readily available information on legitimate, legal behaviour, you are likely to observe the greatest impact of a campaign and see waste crime fall.

It is useful to couch this approach in terms of generic instruments and approaches. In the area of waste crime we find a combination of different regulations. They are applied

in a risk-based manner, accompanied with relatively effective enforcement (at least of compliant businesses) and disincentives through fines, naming and shaming. All this regulatory and enforcement activity is coupled with general awareness and information campaigns and efforts to build capacity, targeted towards key actors. On the face of it, this is a useful combination of instruments and approaches.

We conclude from the evidence that the Hampton principles have been followed, to a significant extent, for tackling waste crime. However, different elements of the principles have been used for different aspects of the problem; no single waste crime initiative meets all of the principles.

The Hampton principles together provide all the elements that are required for the successful implementation of combinations of instruments or approaches: the adoption of a risk-based approach, accompanied by retained independence, enforcement, and advice giving. The use of these principles at the planning stage would help ensure that an initiative contained all the necessary components to combine instruments and approaches in the most successful way possible.

8.3.1 Cost effectiveness analysis

As discussed in the preceding sections, there are a number of activities and initiatives under scrutiny in this case study that have been introduced to try and tackle the problems of waste crime. However, for the majority of these initiatives, there are insufficient data to carry out cost effectiveness analyses. No cost information is available for activities targeting illegal waste sites. Cost information is available for the project targeting illegal waste export (£4 million over three years), but it is currently too early to measure the success of the project as it had only been operational for 9 nine months at the time the work for this report was carried out. Therefore, our cost effectiveness analysis focuses entirely on the BREW campaigns.

Using the revenue generated from increased landfill tax rates, Defra developed the Business Resource Efficiency and Waste (BREW) programme, a package of work to encourage businesses to send less waste to landfill and to assist them in achieving this objective. In 2005, the Environment Agency received funding from Defra to deliver projects over three years to tackle waste crime under the BREW programme. Nine BREW campaigns ran across England between 2005 and 2008; three of these were one-year pilot studies and the remaining six were two-year projects. A range of approaches were used across the campaigns.

Cost information relating to the regulatory costs associated each of the BREW campaigns were obtained for both the smaller campaigns carried out in the first year of the BREW programme (Preston, Luton, Stoke) and the larger campaigns carried out in the second and third years of the programme (Bristol, Chester, Derby, Liverpool, London and the North East).

An ENCAMs evaluation of the BREW campaigns[21] noted that project objectives were broad and, generally, not clearly defined. Furthermore, these objectives varied across the project areas, making it difficult to identify an obvious metric for effectiveness. However, some common aims and objectives included:

- raising awareness of waste crime and responsibility (particularly for businesses);
- working in partnership to tackle waste crime;

[21] ENCAMs (November 2007): 'Evaluation of the Business Resources Efficiency & Waste (BREW) Programme'.

- enhancing the credibility of Environment Agency as a fair and firm regulator;
- environmental improvement through reduced illegal disposal of waste.

The nature of these objectives meant that on the whole a qualitative assessment of how much they were met most appropriate.

Since the BREW campaigns ultimately aim to reduce waste crime, a reduction in fly-tipping incidents (a component of waste crime) in regions where campaigns took place is a suitable measure of effectiveness. National data on the number of fly-tipping incidents and the associated clear-up costs are collected and entered into *FlyCapture*, a database set up by Defra, the Environment Agency and the Local Government Association in 2004. *FlyCapture* records incidents dealt with by the Environment Agency and local authorities across England.

FlyCapture data for incidents dealt with by local authorities in England were available from 2004/05[22]. The average number of incidents before and during the campaign, and associated clearance costs, in each BREW campaign area were identified (full information on this can be found in Appendix D). Fly-tipping incidents increased in all campaign areas over this period, except for the North East, where there was an 8.8 per cent decrease in incidents. Across all the campaign areas, reported fly-tipping incidents increased by 920 per cent, compared with an average increase of 36 per cent in non-campaign areas. However, it is clear that the Liverpool campaign, where the understanding of a "unit of fly-tipping" was different, has skewed these results. With Liverpool excluded from the analysis, the increase in fly-tipping incidents in campaign areas drops to 34 per cent, indicating that the increase was smaller in campaign areas than in other areas. The increase in clearance costs in campaign areas (with Liverpool excluded) is marginal (0.9 per cent) whilst there is an increase of 29 per cent in non-campaign areas.

Regression analyses were carried out to determine if any of the two-year BREW campaigns had a significant effect on either the number of fly-tipping incidents or the clearance costs. Confounding factors were controlled by including variables to take account of time (year) and the economic activity of an area in the regression.

The results indicate that reductions in fly-tipping incidents in the years of the campaign could not be detected at a statistically significant level. The effect of the campaigns on the costs of clearance was not statistically significant either. This lack of significance may be due to the incomplete nature of the data set (see below). Certainly further analysis is merited.

Had there been evidence that some or all of the BREW campaigns had produced a reduction in fly-tipping, it would be possible to compare the cost effectiveness of these campaigns. The counterfactual analysis would then have compared the approaches across the geographical range.

Since *FlyCapture* data was only available for local authorities, the measure of the number of fly-tipping incidents and associated clearance costs was incomplete. Had it been possible to include data from incidents dealt with by the Environment Agency, a significant effect may have been identified. Whilst local authorities are responsible for smaller scale incidents of fly-tipping, the Environment Agency deals with 'big, bad and nasty' incidents (where there is often an element of organised criminal involvement).

The increase in clearance costs is much lower in campaign areas (0.9 per cent) than non-campaign areas (29 per cent) whilst the increase in fly-tipping incidents is similar

[22] Note incidents dealt with by the Environment Agency were not included in the analysis

(34 per cent and 36 per cent respectively). This suggests that local authorities in campaign areas are dealing with smaller incidents, perhaps as a result of more effective working partnerships between local authorities and the Environment Agency. However, further statistical analysis with an expanded data set (including incidents dealt with by the Environment Agency) would be required to attribute this success to the campaign.

The number of fly-tipping incidents was thought to be the best measure of effectiveness for this analysis. It is reasonable to assume that publicity and awareness raising will have increased the number of incidents reported. Therefore, fly-tipping incidents are not an ideal measure of effectiveness and further work with an expanded dataset would be required to measure the success of the campaigns.

8.4 Evaluation

8.4.1 View from the target audience

It has not been possible to speak directly to the 'target audience' for this waste crime case study, but evidence is available from literature relating to the effectiveness of the BREW campaigns. The following description is based upon follow up research conducted by ENCAMs and reported in 2008 (Environment Agency, 2008).

Relevant statistics from this report include:

- 48 per cent of respondents remembered seeing advertisements on refuse trucks and wagons;
- television and news programmes relating to waste were recalled by 37 per cent;
- press articles, direct mail and leaflets from the Environment Agency, television adverts, press adverts and posters relating to waste were recalled by between 31 per cent and 26 per cent of people;
- only 12 per cent remembered being visited by the Environment Agency and only seven per cent recalled phone calls from the Environment Agency;
- other events were recalled by only three to four per cent including 'dirty' calendar, sporting events, butty vans and street theatre;
- the main message taken from the advertising is that 'your waste is your responsibility' (55 per cent);
- SMEs who said they had contact with the Environment Agency were less likely to be unsure of what the main message of the advertising or publicity was (18 per cent compared to 29 per cent);
- overall a quarter of businesses claimed to have changed their waste practices as a result of seeing or hearing publicity in general (this increases to 37 per cent when considering only those businesses that had seen or heard advertising);
- just over one quarter (27 per cent) of SMEs felt there had been an increase in fly-tipping in their area, while only eight per cent feel that it has decreased (exactly half felt that there has been no change);

- the proportion of SMEs that believe fly-tipping is a serious problem has dropped from 62 per cent to 49 per cent, illustrating that area campaigns have had a positive impact on SMEs perceptions of fly-tipping in their area.

It appears from this evidence that the approaches taken to raise awareness are quite well remembered. Less focus has been given to the enforcement side of the BREW campaigns, so it is difficult to determine whether the evidence presented here can provide information on the combination of instruments, or the combination of approaches taken to deliver those instruments.

8.4.2 Views from those in policy

Feedback from people involved in policy-making mentioned that the actions that worked well in the area of waste crime included:

- getting the Environment Agency to focus on the 'big, bad and nasty' (i.e. large-scale incidents and/or those involving certain hazardous wastes or organised crime), although the role of the Environment Agency needs to be clearly defined and documents such as the fly-tipping protocol are required;
- capturing a 'baseline' against which progress can be recorded (e.g. the *FlyCapture* database and the risk assessment score at the start of 2007/08 for illegal waste sites);
- target setting to help focus planning and actions;
- working with partners (e.g. the partnership between the Environment Agency and local authorities laid out on the Memorandum of Understanding);
- the effective combination of awareness, prevention campaigns and enforcement activity (as run in the BREW campaigns).

These people also indicated that several aspects of waste crime policy and initiatives have not worked as well as envisaged. They particularly cited the amount of time and effort being spent on 'end-of-pipe' approaches. It is only since the Environment Agency has been able to focus on waste crime at a national level that it has been able to take a more intelligence led approach.

In the context of the overall aims of this project, the views expressed by people from the policy side of waste crime are valuable; they should be taken into account when considering the best approaches to take to make combinations of instruments, and combinations of approaches to deliver those instruments, work effectively together.

It is possible for the Environment Agency to focus on the 'big, bad and nasty' incidents because the instruments for raising awareness have been targeted to a wide audience whilst enforcement has been risk-based. Enforcement activity is more resource intensive than awareness raising, and therefore time simply cannot be spent taking enforcement action against individuals who only need a gentle nudge to comply with regulations and legislation.

As for the approaches taken to implement these instruments, people in policy believed that the clear definition of the role of the Environment Agency and its areas of activity in waste crime were particularly helpful. The use of a central database to capture data and from which a baseline for measuring progress could be produced was also thought to be a good approach. Policy-makers expressed their view that target setting is essential in order to focus the mind. Working in partnership with other organisations, both on the enforcement and the awareness raising side is also thought to be essential.

Partnerships help to share costs and employ a wider range of approaches and, in some cases, instruments.

8.4.3 Operational views

Feedback from people involved in the operational side of tackling waste crime mentioned that the actions that worked well included:

- using the National Intelligence Model (NIM) approach and implementing it fully with the right team;
- employing the right staff with the right skills to do the job (e.g. crime analysts and ex-policemen);
- looking at the waste chain, not individual waste sites, and taking a cradle-to-grave perspective;
- carrying out internal and external communications campaigns, but only once the right people are in place to deal with the resultant influx of information;
- using required enforcement action (port inspections) to aid intelligence gathering, rather than random inspections;
- building partnerships and spending time fostering those partnerships (including setting up joint steering groups to give partners equal status);
- undertaking research into target audiences and fully understanding the target audience before implementing campaign work;
- identifying gaps in current regulation and finding ways to fill these gaps (for example, by creating co-funded enforcement officers to fill the gap between Environment Agency and local authority responsibility in fly-tipping);
- engaging with partners and ensuring all partnerships are working towards a common goal;
- using PR alongside enforcement and timing these two activities to minimise costs (by doing the PR first, people who are willing to comply come forward so they don't need to be targeted for enforcement action).
- activities and communications that show enforcement is happening.

These people also highlighted area which they thought did not work so well, including:

- the lack of continuity between the work of projects and the day-to-day operations of the Environment Agency (project work needed to be better integrated into everyday activity);
- problems associated with loopholes and gaps in regulations (for example, where a site is operating legally with an exemption, but actually causing an environmental problem);
- using NIM where there is poor understanding of the requirements for interpreting intelligence data;
- the inability to identify where waste crime is merely being displaced (producing skewed statistics);

- running projects from year-to-year, because it takes time to build partnerships and this is not possible when projects have to be rushed through in 12 months.

In the context of the overall aims of this project, the views expressed by people from the operations side of waste crime are valuable; they should be taken into account when considering the best approaches to take to make combinations of instruments, and combinations of approaches to deliver those instruments, work effectively together.

From an operational perspective it is important to have staff with the right skills if instruments are to work effectively. Internal as well as external communications are also important so that barriers are not created internally through a lack of awareness among staff. The timing of implementation for different instruments is also critical to their success. Again, working in partnership was also highlighted as critical to the successful implementation of initiatives.

8.5 Support of waste crime case study to existing theory

The information collected as part of this case study has been used to assess whether or not various existing theories relating to the use of policy instruments, both alone and in combination, are supported by the evidence. The full assessment can be found in Appendix E.

The biggest driver of waste crime is the economic value of waste and/or the cost of legitimate disposal. The most cost effective approach appears to be a combination that involves:

- raising awareness of waste regulation (allowing the uninformed time to legitimise their waste disposal activity);
- raising awareness of enforcement actions taking place (to ‘scare’ others into compliance);
- followed by enforcement action on the hardened criminals.

The main driver of waste crime is financial, so the value of compliance has to be demonstrated to waste criminals before they are likely to comply with regulations. In addition, enforcement activity has to be applied (and later described) in such a way to show that it is not worthwhile taking the risk of being caught.

In terms of the approaches taken, work to understand the target audience has been an essential preliminary to awareness campaigns; a good knowledge fo the target audience helps the campaigns to be more effective, using language and messages that will have greatest effect.

Another key to success in tackling waste crime was the partnership aspects of the work, especially between the Environment Agency and local authorities. Partnerships help to implement combinations of instruments and use a variety of approaches for individual instruments. Partnerships meant the most effective instrument of approach could be taken for any given aspect of the waste crime problem – using powers which the Environment Agency might not ordinarily be able to use.

The waste crime study has demonstrated the value of applying instruments in a dynamic way to reflect the needs of a particular situation. Each of the BREW campaigns implemented tailored their own approaches to deliver policy instruments which suited the requirements of the local area. In addition, by using the national intelligence model approach to tackle illegal waste exports allows authorities to

constantly change their response to criminal waste activity based on the intelligence received.

The waste crime study did not highlight any examples of instruments interacting negatively with each other. The study did however show the importance of sequencing policy instruments and approaches correctly to gain the most cost effective results from implementation. As court action is the most expensive form of enforcement, it should only be carried out in cases of greatest environmental risk i.e. when compliance with legislation does not occur even after awareness raising and capacity building activities have been carried out. By targeting only hardened offenders, money is saved; it is possible to take highly targeted legal action, rather than targeting people who are not aware of the need for licences, etc. and who would comply if they had the correct information and capacity to comply.

8.6 Conclusions from the waste crime case study

8.6.1 Key findings relating to the design of a policy initiative

Many aspects of the various waste crime initiatives have been well thought through at the design stage in an attempt to implement the most cost effective initiatives. For instance, target audiences for awareness and information campaigns were carefully researched, time was invested in building partnerships and intelligence was gathered to enable the most appropriate policy instruments to be used when enforcement action was required.

The logframe analysis indicated, however, that there were elements of design which were more overlooked, in particular relating to monitoring and evaluation. Because a ‘baseline’ was difficult to identify, targets and objectives in relation to the desired environmental outcome were sometimes unclear.

This evidence supports the concept of taking a logical approach, such as through the use of a logframe, during the planning and design of policy initiatives. A logframe would help to identify assumptions from the outset and allow monitoring and evaluation techniques to be made and incorporated properly into the design.

8.6.2 Key findings relating to them implementation of an initiative

The waste crime study has indicated that it is extremely important to implement policy instruments in the optimal order as this will contribute to their success and cost effectiveness. Enforcement action is more resource intensive than raising awareness, so time and money should not be spent taking action against individuals who would respond to an information campaign.

The study showed the success of working in across all policy initiatives. In particular, for tackling fly-tipping, the clearly defined objectives for the Environment Agency and the local authorities enabled them to work together effectively without duplicating effort.

8.6.3 Key findings relating to monitoring and evaluating an initiative

The use of a ‘rolling’ baseline for the illegal waste sites allows progress to be measured against the original base, but also enables subsequent events that affect the original

baseline to be included. This approach shows the importance of thinking through methods for monitoring and evaluating initiatives from the outset.

Our study of work targeting illegal waste sites did highlight the importance of setting environmental outcome objectives, and developing a method for monitoring the success of an initiative based on the environmental objectives. Currently, although it is known when an illegal site is shut down, there is no follow up to see whether the site is then cleaned up (and hence the environmental risk is removed).

The evidence from the BREW programme highlighted the problems that occur when it is assumed that the benefits will occur over the course of the implementation project. But numerous external influences also exert an effect at the same time, and may mask the results of an initiative. The recorded number of fly-tipping incidents during the BREW campaigns did not indicate any behavioural change; yet changes have now been observed in areas that have continued monitoring beyond the duration of the campaigns themselves.

9 Conclusion and recommendations

The theory identified from the literature review (see Chapter 3) suggests that the use of a combination of policy instruments could secure better outcomes, as measured against key criteria such as efficacy and efficiency, than individual policy instruments delivered on their own (Gunningham and Sinclair, 1999; Pizer, 2002; Gouldson, 2008). To illustrate, the imposition of a tough regulatory standard, but without any effort to raise awareness among those affected and ensure they have the capacity to comply with the regulations, is likely to reduce both the efficacy and the efficiency of the tough regulatory regime.

Whilst implementing agencies such as the Environment Agency do not select policy instruments, they do choose how to apply them. they can also choose to adopt complementary approaches to improve policy outcomes at a more local level. Both choices can have a significant effect on both the costs of implementation and the costs of compliance. We therefore distinguish between *instruments* and *approaches* throughout this report.

Focusing on decisions that are within the remit of the Environment Agency, this report has considered how different mixes of instruments and approaches are being (or might be) combined. We have also looked at the actual and prospective effects of these mixes. The report includes insights, derived from three cases, into the implementation of successful combinations. The report has also considered how the findings of this project might be evaluated and how they might provide an evidence base for practical guidance in approaches to policy implementation.

9.1 Conclusions

A number of different categories of policy instruments are available (regulations, economic instruments, information based approaches, capacity building measures, etc.). Each type of instrument has its own strengths and weaknesses. Stimulating changes in behaviour, whether that of individuals or businesses, is complicated; although this is an under-researched area, there is some consensus that change is best pursued through a range of complementary instruments and approaches.

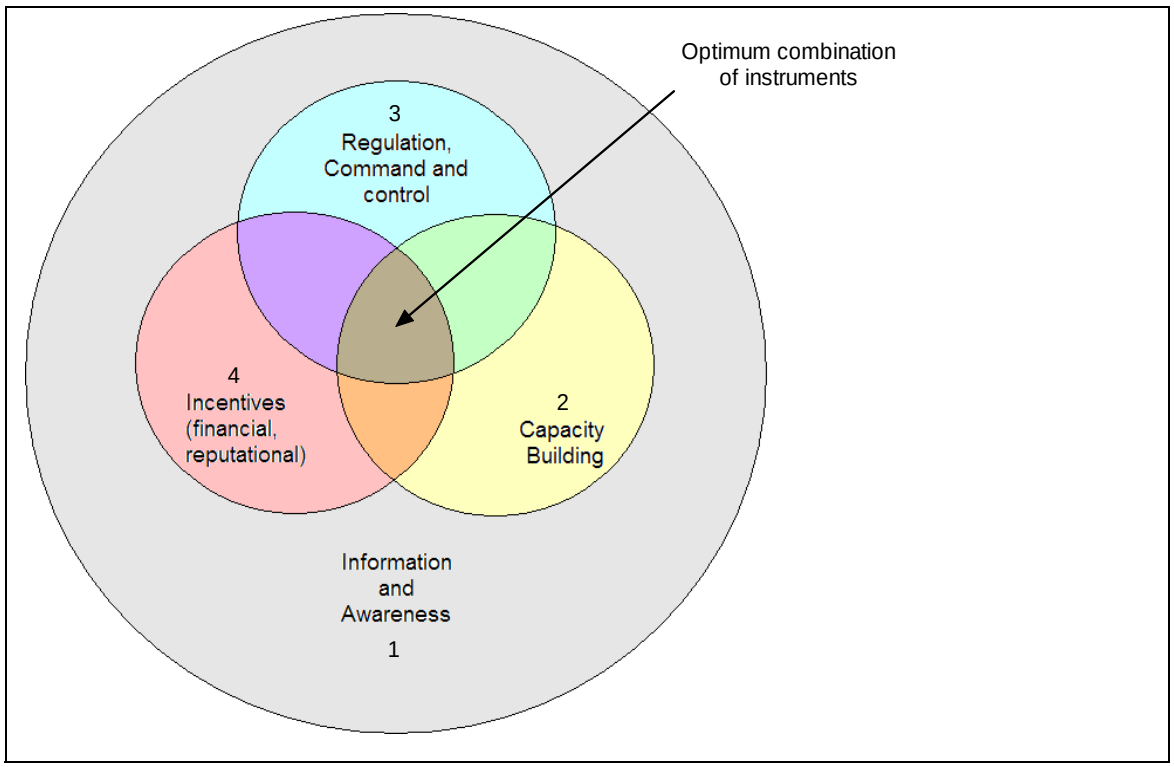

Figure 9.1 illustrates this multi-level approach. It suggests that change is most achievable where there is a level of awareness, where there are capacities for change and where there are mutually reinforcing imperatives and incentives for change. This mix of policy signals can come from one or more instruments and approaches – and the sequencing of these signals (as depicted in the numbers assigned to each) can be an important element of successful implementation.

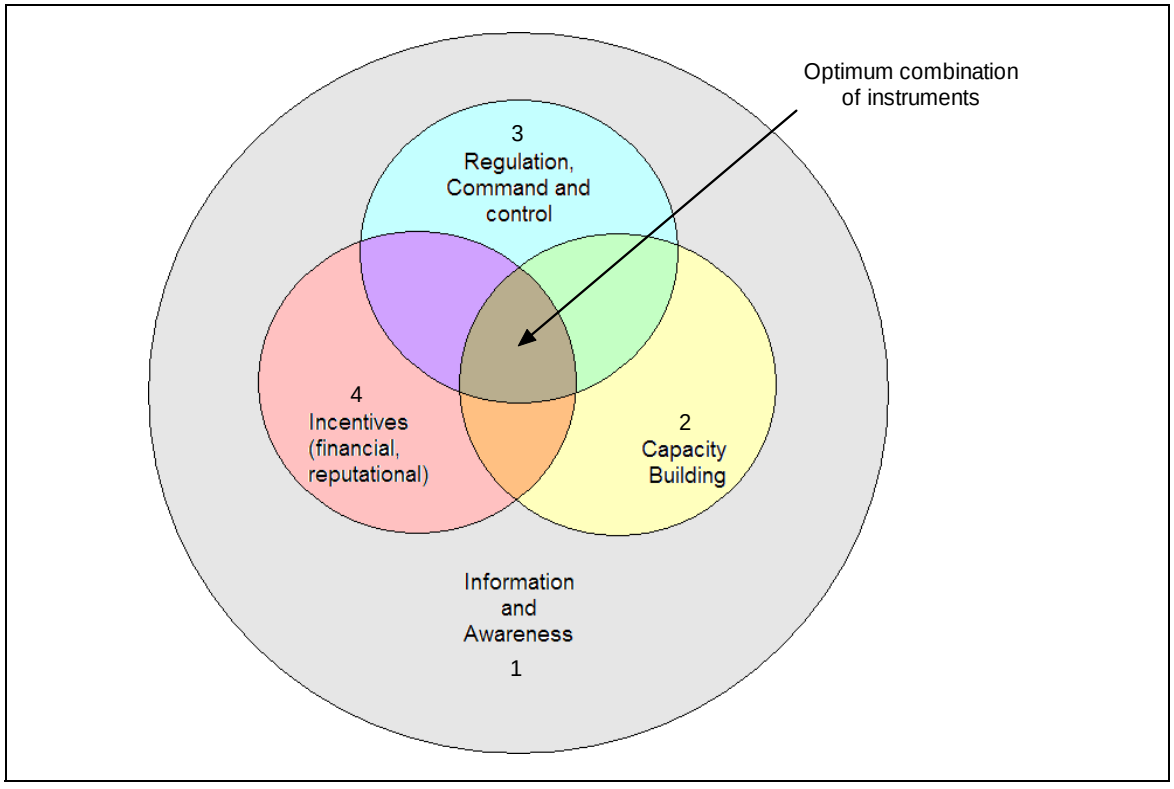

Figure 9.1 Optimum combination of policy instruments and sequencing.

This study has shown that the Environment Agency is combining instruments and selecting a mix of approaches in a range of settings. However, in the absence of guidance, this process has sometimes been done in a relatively *ad hoc* way and there has been comparatively little formal evaluation of the influence on outcomes (efficacy, efficiency, etc.). There is certainly a need to strengthen the evidence base and develop further guidance based upon this work in the future.

The three cases studied for this project (i.e. landfill, waste crime and catchment-sensitive farming), suggest that instruments and approaches are being combined in some instances, but not always in a systematic or well structured way. Even though data is scarce and formal evaluations are unusual, key stakeholders firmly believe that the use of combinations of instruments and approaches has led to better (i.e. more effective and efficient) policy outcomes. It is therefore not possible at this stage to complete a full quantitative analysis.

The three case studies have highlighted some good examples where the practice reflects the theory in support of mixes of complementary instruments and approaches. They have also highlighted some areas where guidance would perhaps be useful to embed a more formal and systematic approach when designing implementation initiatives.

The landfill case study is a good example of the benefits that a balance of policy instruments can bring. The market for recyclate has dropped recently, so it is unlikely that the environmental objectives of landfill policy would have been achieved through recycling alone. However, because instruments such as allowances schemes and the Landfill Tax are also used, this has in turn encouraged recycling activity to continue.

The waste crime case study provides a good example of instruments being applied in a dynamic and responsive way, as the instruments used for each BREW campaign were tailored to the area. In addition, initiatives to target illegal waste sites use a risk-based approach to decide which instruments to use in different situations.

Using the NIMs approach to tackle illegal waste export has allowed the Environment Agency to adapt and change its responses to the situation on an ongoing basis according to the intelligence received.

The three case studies have also pointed to the need for initiatives to be carefully designed, not least because too much flexibility can cause problems for long-term planning and potentially lead to inequalities.

The three cases have also shown that sometimes instruments do not work well when applied in combination. In the landfill case study we found that different instruments had competing objectives and had a negative influence on one another. For instance, one instrument targets biodegradable municipal waste while others target all municipal solid waste. Some activities, for example the collection of glass for recycling, can adversely affect landfill allowances. Such negative interactions were not identified in either the waste crime or the catchment-sensitive farming case studies.

The importance of implementing instruments in the correct order to achieve the most cost effective results was highlighted in the waste crime study. As court action is the most expensive form of enforcement, it should only be carried out in cases of greatest environmental risk i.e. when compliance with legislation does not occur even after awareness raising and capacity building activities have been carried out. By targeting only hardened offenders, money is saved; it is possible to take highly targeted legal action, rather than targeting people who are not aware of the need for licences, etc. and who would comply if they had the correct information and capacity to comply.

In all three cases the Hampton principles (e.g. using risk assessment to concentrate resources, being accountable for efficiency and effectiveness, not carrying out inspections without a reason, etc.) appear to have been well applied in the selection of

policy instruments. We therefore recommend that these principles continue to be used as a key source of information during the design stage of an initiative.

All three cases highlight good practice in terms of understanding the target audience. The waste crime study is exceptional in that specific research was commissioned before campaigns to raise awareness were started. In some cases the 'start' position (i.e. how much fly-tipping was taking place, knowledge of the scale of illegal waste exporting, etc.) should be better understood as this will aid evaluation of success at later stages of a project by allowing progress to measured.

The studies also highlight some of the difficulties encountered when trying to embed practices used during 'trial' projects into the day-to-day work of both policy and operational staff. Short-term funding, staff turnover and the investment needed to set up good working relationships with partners were all highlighted as issues here.

The final key message highlighted by the case studies is that monitoring and evaluation appear to be applied inconsistently and with varying levels of quality. Monitoring and evaluation was often thwarted because projects has difficulties accessing appropriate data, identifying baselines and counterfactuals, measuring outputs (particularly those of a longer-term or more diffuse nature) and with understanding causal links between indices.

We note that combinations of instruments and approaches can be evaluated in a number of ways, for instance:

- quantitatively;
- qualitatively;
- across a large sample;
- in a smaller number of in-depth case studies;
- at different time scales.

They can also be evaluated against a number of criteria, for instance:

- efficacy;
- efficiency;
- cost effectiveness;
- fairness;
- political feasibility;
- administrative viability.

There are some common methodological problems that make monitoring and evaluation difficult. Generally, these are:

- the selection of appropriate cases and control cases (i.e. counterfactual scenarios for comparison);
- data availability;
- data quality;
- the lag between cause and effect;
- the presence of both discrete monetised costs and diffuse non-monetised benefits.

A mixed method approach combines quantitative analysis (based on the selection of appropriate cases and control cases and the construction of robust data sets for larger sample sizes) with more in-depth qualitative analysis (based on experiential evidence from key stakeholders). This method of evaluation provides a more detailed, nuanced understanding of causal links and preconditions, etc.

If a policy instrument is to be effectively evaluated, information is needed on both the costs of the policy as well as on its actual achievements. This necessitates the collection of data:

- prior to the implementation of the policy;
- during its implementation;
- after the policy has been concluded (if relevant).

As this study has shown, the evaluation of an instrument can be compromised due to a lack adequate data arising from a lack of sufficient and timely monitoring.

To design an appropriate and powerful basis for evaluating an instrument or initiative, the first task is to establish as clearly as possible a baseline – one which provides data on environmental impacts in the region where the policy is to be introduced as well as in other comparable regions **prior** to the introduction of the policy. This should cover all indicators of the environmental burden caused by the problem being addressed, as well economic data on the costs of any mitigation measures that are currently in place. Such a baseline is critical to the evaluation of any policy.

The second task is to collect data on the same variables during the implementation of a programme. In some cases the programme is introduced gradually, in which case the degree of enforcement over time should be recorded. If the programme has a regional aspect, it is extremely helpful to continue collecting data in similar areas where the instrument is not being invoked. This makes it possible to use econometric techniques based on spatial matching, an approach that is becoming increasingly effective for comparing 'policy' areas with areas where the policy is absent.

Both these monitoring exercises need to be planned well in advance and before the policy instrument is implemented. The monitoring needs to continue for the entire duration of the implementation programme as well as well after the programme has ceased its operations.

The third task is to collect a comprehensive data set on the instrument itself and its administration. Data will include the costs of compliance for the affected parties, as well as the cost of its administration and monitoring. Such costs may include capital and variable costs (in which case an estimate of annualised costs will need to be constructed from the primary data).

If these steps had been taken, the evaluation of the instruments reviewed in this study would have been much more complete. In the case of the ECSFDI we managed to get most of the relevant data, but even in this case a number of assumptions had to be made where monitoring had not been carried out. For the second case study (landfill), information was missing on the amount of waste reduced as well as the costs of abatement. With such information it would have been possible to perform a cost effectiveness analysis. Finally for the fly-tipping case study we would need more data on confounding factors that determine the level of fly-tipping, especially in areas outside the programme. Furthermore, as noted earlier in this report, the impacts of waste crime programmes need to be evaluated for longer periods so that the cumulative effects of awareness programmes can be assessed.

9.2 Recommendations

There is sufficient insight from theory, backed up with supporting evidence from case studies, to recommend a more consistent and systematic application of combinations of instruments and approaches as per Figure 9.1.

The study suggests that raising awareness and capacities to help people to change their behaviour, or comply with regulations, should be executed before incentives (financial or reputational) and/or regulatory standards are applied. Incentives and standards should pull in the same direction towards common policy goals.

The Environment Agency should seek to formalise and standardise the ways in which it adopts combinations of instruments and approaches, and it should engage with other public agencies to encourage them to adopt instruments and approaches that further common objectives.

The evidence base needs to be developed to document exactly how, and to what extent, combinations of instruments and approaches might improve policy outcomes. A few in-depth, multi-method evaluations of carefully controlled pilots with clear counterfactual cases in place are needed to underpin the broader argument that combinations of instruments and approaches can lead to better policy outcomes.

Such experiments can be designed into the policy process – either in advance where pilots can be adopted and evaluated, or *ex post* where initiatives can be in place for a fixed term (i.e. by designing sunset clauses into the selection of initiatives) before being formally evaluated.

10 Guidance

A guidance document has been produced as part of the output from this study. It is based on the findings from this project arising from the literature review and case studies.

The full guidance document can be found in Appendix F to this report. It is recommended that, before the guidance document is fully implemented within the Environment Agency, it is tested with a sample of representatives from the policy wing of the Environment Agency who may be able to offer advice for its refinement if necessary.

The guidance should be reviewed regularly to ensure it is up-to-date with current literature and techniques.

The guidance document covers the following themes:

i. **Introduction**
   Why the guidance has been devised.

ii. **Summary**
   A background to the theory of combining policy instruments effectively.

iii. **Practical advice**
   A checklist of practical steps to use when planning, implementing and monitoring a new initiative.

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Appendix A Phase 1 case study criteria analysis

Table A.1 Summary of case study scores against defined criteria.

Range of Policy Instruments Applied	Range of Policy Approaches Applied	Complementary instruments in the Policy Area	Antagonistic Policy Instruments present (env and non-env)	Range of Sector/ Target audiences	quantitative information	Agency Staff willing to support	External Staff willing to support	Cost effectiveness analysis possible?	Counterfactual analysis possible?	Link to environmental outcomes possible?	Efforts with regulated and illegal community measurable?	Level of importance	Key Organisations and role of Agency	Degree of freedom to make a difference	
Coverage					**Quality of Information**							**Of interest to Agency**			**Case study**
Med	High	High	?	Low	High	Yes	Yes	Yes	Yes	Yes	High	High	Med	Med	**Catchment-sensitive farming**
Med	High	Med	?	Med	Low	Yes	Yes	?	Yes	Yes	?	Low	Med	High	**Food and drink**
Low	Low	Med	?	Med	Low	?	?	?	?	No	Yes	Low	Low	Low	**ELV and small transfer sites** (YR)
Med	High	High	?	High	High	Yes	Yes	?	Yes	No	Yes	High	High	High	**New approach to waste enforcement**
?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	**Waste crime** (BH)
Med	High	Med	?	Low	Med	Yes	Yes	?	No	Yes	No	Low	Med	High	**Cement** (BH)
Med	Med	Med	?	Low	Med	Yes	Yes	?	Yes	Yes	No	Low	Med	High	**Water industry**
Med	Med	Low	?	High	Low	?		?	?	no	No	Med	Low	Med	**Chemical users, not manufacturers**
Low	High	Low	?	Low	?	?	?	?	?	?	Yes	Low	High	High	**Fishing**
Low	Med	High	?	Med	Med	Yes	Yes	?	Yes	Yes	Yes	High	Low	Med	**Packaging**
Low	Med	High	?	Med	Med	Yes	?	?	?	Yes	?	Med	Low	Low	**Landfill Allowance Trading Scheme**
Low	Low	High	?	High	Low	Yes	?	?	no	no	?	Med	Low	Low	**WEEE Directive**
Low	Low	High	?	Low	Med	Yes	Yes	?	yes	Yes	?	High	Low	Low	**Emissions Trading Scheme** (YR)
?	?	?	?	High	?	Yes	?	?	?	?	?	High	Med	Med	**Flood risk management**

Table A.2 Criteria for case study analysis and how they were scored.

Criteria	High	Medium	Low
Of interest to Environment Agency			
Degree of freedom to make a difference	Make policies and determine approaches	Flexible policies give Agency decisions on how to approach	Approaches largely determined elsewhere
Key Organisations and role of Agency	Agency is lead organisation	Other lead organisation but Agency has major role	Agency has a minor role
Level of importance	High political interest and unsolved problem	High politically interest or unsolved problem	Neither high political interest or unsolved problem
Quality of Information			
Efforts with regulated and illegal community measurable?	Yes		No
Link to environmental outcomes possible?	Yes		No
Counterfactual analysis possible?	Yes		No
Cost effectiveness analysis possible?	Yes		No
External staff willing to support	Yes		No
Agency staff willing to support	Yes		No
Availability of quantitative information	All aspects covered and co-ordinated	Good data for some aspects but not co-ordinated	Limited data
Coverage			
Range of sector/ target audiences	3 or more	2	Only 1
Antagonistic policy instruments present (env and non-env)			
Complementary instruments in the policy area	As for medium plus designed in conjunction with another	Part of a policy instrument mix	No clear links
Range of policy approaches applied	5 or more	1 to 4	Only 1
Range of policy instruments applied	Financial, Regulatory and Non-regulatory present	Good range but not all types	Only 1

Table A.3 Pros, cons and recommendations for each case study going forward into phase 2.

Case study	Pros	Cons	Recommendations
Catchment-sensitive farming	Considerable recent and complete readily available data analysing implementation from a variety of perspectives. Deals with farming community which is a big political issue for WFD. Counterfactual analysis possible as approaches vary between the 40 priority catchments and between these catchments and those not included in the initiative, there is the possibility of before and after analysis due to monitoring.	Limited instruments and only one target audience and farmers may be difficult to engage for further studying, although it is assumed that this could be handled through NFU.	Consider as an interesting case study, particularly due to high level of information for analysis.
Food and drink	There are several policy instruments and approaches applied and the target audience covers a wide range.	The information available on policy instruments is rather general. Further investigation might be difficult since the level of information available is unclear.	Possible case study to cover approaches relevant to large and medium-sized enterprises but the information available may be limited.
ELV and small transfer sites		Lack of information.	Not a good case study for phase 2 analysis
New approach to waste enforcement	A variety of policy approaches were used and have been developed. As part of an R&D project, lessons learned could be identified from the experiences of this project. Several approaches have been combined and success could be seen. Also several different stakeholders have been involved. Complete datasets available on costs and impacts of approaches.	Despite existing cost evaluations, the cost effectiveness of the different approaches and combinations of measures would be difficult to assess. The project was part of an R&D programme, which may not equate well to “real life”.	Consider as an interesting case study. Particularly since many novel approaches have been used and there is likely (report not yet available) to be good information on the approaches used from a number of perspectives.

Table A.3 continued overleaf

Table A.3 continued

Case study	Pros	Cons	Recommendations
Cement (BH)	Range of approaches including voluntary sector plan which is more developed than other sector plans. There are many indicators, such as use of fossil fuels, waste recovered off-site; dust-, NO_x-, SO_2-, CO_2-emissions to air per tonne PCe manufactured; would also be able to equate activities to outcomes using figures on emission reductions. Information on delivery costs might be difficult to obtain.	The sector plan was introduced in 2005, setting targets for 2006; therefore the experience just looks back on a rather short period of time. Information on costs is limited and not quantitative. In particular, information on delivery costs would have to be obtained from the industry. The sector addressed is rather small.	Possible case study, analysing approaches for dealing with major industry with a high public profile to show how combination of the voluntary sector plan works with statutory permitting and enforcement. Possibly include in a case study as part of greenhouse gas emission reduction.
Water industry	Good range of policy instruments. Only possibility of studying the unique asset management planning system where improvements and the funding required for them are agreed up front (also a disadvantage). Good historical data sets may allow progress to be demonstrated in terms of environmental benefits. Possibly a good baseline or model for approaches to use with major industry since this is the most mature relationship that the Environment Agency has with industry with a high level of trust.	Existing datasets won't provide all the information needed to look at cost effectiveness, for example it would be quite difficult to assess the costs to the Environment Agency of implementing the approaches adopted. The Environment Agency's relationship with the Water industry might also be considered a specialist case and unsuitable for general guidance.	Possible case study particularly because of the long-term data sets tying activities to environmental quality, but could also be considered unsuitable because of the heavy reliance on the unique AMP system.
Chemical users, not manufacturers		No clear case study initiative to evaluate.	Not a good case study for phase 2 analysis.

Table A.3 continued overleaf

Table A.3 continued

Case study	Pros	Cons	Recommendations
Packaging	Trading scheme an interesting approach and shows time spent dealing with illegal community. Good information available.	Limited range of instruments, approaches and target audiences.	Consider as an interesting case study, particularly because of novel policy instrument used and strong approaches. Possibly as part of a wider case study looking at the basket of policy instruments which seek to reduce waste disposal to landfill and to increase recycling.
Landfill Allowance Trading Scheme	The impact of the approach could be assessed by the amount of waste (waste statistics). Differences between regions could be assessed as well.	The LATS is a single statutory instrument to meet the demands of the European Landfill Directive.	Not a good case study for phase 2 analysis as a single statutory tool but possibly as part of wider case study on landfill.
WEEE Directive		As a single instrument being applied as directed by the EU with little scope for local interpretation of approach and also as it is such a new policy instrument there would be little information on which to base analysis.	Not a good case study for phase 2 analysis as a single statutory tool.

Table A.3 continued overleaf

Table A.3 continued

Case study	Pros	Cons	Recommendations
EU Emissions Trading Scheme (EU ETS)	This is a novel approach receiving much attention in a relevant area.	The information available is restricted. It is a single instrument, single approach case study.	Possible case study but as a single policy instrument applied in a uniform manner across the country, there is little scope for analysing combinations of approaches. Possibly consider as part of the basket of instruments used to reduce greenhouse gases (range of target audiences), or to specifically to compare the impact of the EU ETS with more traditional permitting instruments.
Flood risk management (FRM)	FRM is politically of high interest and covers a wide range of policy instruments, approaches and target audiences.	The scope of FRM may be too wide to handle effectively within this project. Information covering all policy instruments used under FRM would have to be pulled together from limited existing sources.	Not a good case study for phase 2 analysis as such a wide policy area and the information needed for the project has not been bought together and so would be difficult to analyse. CFMPs, as they are implemented, could be usefully analysed as these will vary in the approaches proposed at a catchment level.
Reservoirs Act 1975	Would provide a distinct package of information about the cost effectiveness of the approaches adopted.	As a single statutory tool, little information on combination of policy instruments available.	Possible case study.

Table A.3 continued overleaf

Table A.3 continued

Case study	Pros	Cons	Recommendations
Landfill	Would provide wide coverage of instruments, approaches and target audiences.	Disparate information sources.	Possible case study but the focus on policy instruments rather than policy approaches.
HazRed	Appears to be useful range of approaches and good information sets.	Unsure of information available and scope until further analysis.	Possible case study.

Appendix B Common interview template

Title	
Interviewer	
Interviewee	
Date	
Thoughts on Information Gathering Approaches and Key Sources	
1. What information is available, can it be accessed for analysis and what is the time-series (sufficient to see impacts?)?	
a) success/ effectiveness	
b) costs of delivery	
c) costs of compliance	
d) admin burden	
2. Did the initiative reduce compliance costs and/or admin burden – is there evidence to support this?	
3. What sort of analysis on this policy instrument has already been conducted?	
4. What is the best counter-factual situation that we can analyse for comparison – e.g. before and after / differences between regions, differences between sectors included/excluded from the regime (e.g. PPC vs nonPPC).	
5. Who should be involved in helping us gather information and views:	
a) yourself and other key policy contacts who have helped design/implement these policies	
b) those delivering these instruments (i.e. on the ground agency staff and partners)	
c) those impacted directly by the policies and have to implement the requirements made (e.g. industry sectors, etc)	
d) those benefiting from these policies	

6. How many focus groups/ in-depth interviews are required and with whom. For focus groups who would you group together?	

Question	Answer/Source
Section A: Case study Description – Context, Goals, Objectives, Assumptions and Evaluation	
(a) Completing a LogFrame (see end of document)	
1. What problem was this initiative attempting to tackle (describe the background in political, economic, social, and technological terms)?	
2. What were the overall objectives (include timescales if possible) of this initiative?	
3. What are/were the specific objectives (include media covered and sectors/industries targeted)?	
4. How were/are you measuring success (input, output, outcome and impact measures)?	
• Inputs	
• Outputs	
• Outcomes	
• Impacts	
5. What instruments were applied as part of this case study ? • when and why were they introduced • what was the process of developing them • who was involved in developing them • who is involved in implementing them	Introduction from project about instruments and objectives– response from audience
6. What is the wider range of policy instruments/approaches supposedly generating these outcomes: • in theory and in practice • at national, regional and local levels?	

7. How transparent are outcomes and performance, are all stakeholders aware of these? • The desired outcomes that are being sought ? • Are they explicit? • Is there broad agreement on these? • Are there clear measures of performance?	

Section B: Bottom-up Analysis of an Environmental Change **(Objective is to, without talking about the policy instruments, get a feeling for the changes witnessed, their drivers and the role of the policy instruments within this)**	
Information required	**Approach for gaining views**
8. Description of the 'outcome'	From the literature
9. Thoughts on the outcome and the changes that have been seen over recent years?	Response from stakeholders
10. What are the key drivers for this change ? – can we prioritise ?	Response from stakeholders – do not lead
11. Are there any other unforeseen changes resulting – negative or positive (e.g. fly-tipping has increased as a result of decreasing waste to landfill)	Response from stakeholders – can provide the example but otherwise do not lead
12. What policy instruments have helped to drive this change and how big has their contribution been? • big contribution • small contribution	Response from stakeholders
(a) Introduction to the policy instruments we are focusing on	From the project
13. Which instruments worked well together?	Response from stakeholders
14. Which instruments did not work well together?	(i) Response from stakeholders
15. Which other drivers lead to the change?	(j) Repeat from above but just to catch all

Section C: Policy instrument interactions	
16. Were the different instruments specifically designed to interact with each other from the outset or did they emerge over time? • If it was by design, was there coordination within the Agency or between the Agency and actors responsible for other instruments. • If they emerged over time what were the main drivers for this? • If they have not emerged over time what are the main barriers stopping them from doing so? • Can you see ways of organizing the institutions or designing the instruments so that they can interact better.	
17. Are the different policies/approaches seen to be complementary or contradictory? a) by regulators b) by the targets of regulation c) by stakeholders	
18. Has the need for interaction/coordination between different agencies and policies/approaches influenced a) the costs of delivery? b) the costs of compliance? c) environmental outcomes?	
19. Have any complementary approaches or measures (i.e. aimed at awareness raising or capacity building) been adopted at different levels and have these influenced a) costs of delivery b) costs of compliance c) on environmental outcomes	
20. Has the sequencing of complementary approaches been important (i.e. are outcomes and costs changed if awareness raising and capacity building measures are adopted as a precursor to regulation)	

21. Had some instruments been applied before hand that made it possible for current approaches to work?	
22. Was there any one instrument that was critical in success?	
23. What was the main role of the Agency?	
24. How much leeway did the Agency have in deciding the design and implementation of this initiative?	

Section D: Assessing Costs and Effectiveness	
25. How effective were the approaches in terms of:	
• The level of policy instrument adoption?	
• Changing behaviours (good and bad)?	
• Changing business position (good and bad)?	
• Changing the relationship between the regulated and regulators?	
• Achieving improved regulatory outcomes?	
• Achieving improved environmental outcomes?	
26. In terms of overall effectiveness	
a) Which instruments worked well and why?	
b) Which instruments worked well TOGETHER and why?	
c) Which instruments didn't work well and why?	
d) Which instruments didn't work well TOGETHER and why?	
e) Are there other factors that have been more significant in shaping environmental outcomes?	

f) Have there been any unintended consequences when combinations of instruments and approaches have been applied?	
27. Can you think of any instruments or approaches that could improve outcomes or reduce costs if introduced by: a) government b) the Environment Agency c) any other actors (a) If so, what are the preconditions for their introduction and application?	
28. How are the costs and benefits of the combinations of instruments/approaches distributed a) between or within regulatory agencies b) over time c) from place to place d) across scales (local, regional and national)	
29. Delivery Costs	
a) What was the overall cost of delivery ?	
b) Which instruments were expensive to deliver – was it worth it?	
c) Which instruments were cheap to deliver – were they effective?	
30. Compliance Costs	
a) What was the overall compliance cost?	
b) Which instruments caused greatest problems in terms of compliance costs?	
c) Which instruments provided flexibility to ease the costs of the measure?	
d) Were there changes in externalities which should be accounted for – e.g. costs of waste being exported overseas?	

31. Admin Burden	
a) What was the overall Admin Burden	
b) Which instruments created a high Admin Burden	
c) Which instruments created a low Admin Burden	
32. Acceptability	
a) What was initiative acceptable overall?	
b) Which instruments were most accepted by the target audience and why	
c) Which instruments were least accepted by the target audience and why	
33. Did instruments work as you expected? (a) If not – why not?	
34. What are your views on the timing of introducing instruments?	
35. Were any of the policy instruments made redundant by others in the combination?	

Section E: Specific lessons to take forward	
36. In developing guidance, what would you say are the top 5 lessons to be learnt from this case study?	
37. What are the key elements of interest from this case study that should be taken forward in future Agency Business?	
38. If starting from scratch, what would you have done?	
39. If you had limited budget, which approach/ combination of approaches would you use?	
40. If you had less money – what would you have done differently/ how could you have done it more effectively?	

41. What would be the top 5 things you would do to?	
a) increase effectiveness	
b) reduce costs of delivery	
c) reduce costs of compliance	
d) reduce admin burden	
42. What are your views on the 5 things the Environment Agency needs to do differently to improve the effectiveness of policy instruments	
a) increase effectiveness	
b) reduce costs of delivery	
c) reduce costs of compliance	
d) reduce admin burden	
43. What would have made those impacted by the policy instruments more willing to accept the changes?	
44. Why would those impacted by the policy instruments go beyond the basic requirements?	
45. How relevant is this case study to areas where new policy combinations are being considered?	

Appendix C Good policy criteria analysis

CSF case study

Comparison against good policy criteria

In addition to the criteria of the logic model, catchment-sensitive farming policy instruments can be evaluated using some or all of the criteria in Table C.1.

Comparison with Hampton principles

The publication *Implementing Hampton: from Enforcement to Compliance* details the actions taken to date by a variety of regulators to enact the principles of the Hampton Report. It outlines the powers in the Legislative & Regulatory Reform Act (LRRA) and offers thoughts on the way forward.

The LRRA contains powers that should enable the Hampton principles to be established in UK law through a statutory Regulators' Compliance Code (RCC). Regulators are legally obliged to have regard to the Hampton principles when they:

- decide on their policies and principles;
- set standards;
- give advice.

The RCC obliges all regulators (both national and local) to have regard to the Hampton principles. Table C.2 evaluates the ECSFDI case study in terms of these principles.

Table C.1 Some criteria for evaluating environmental policy instruments related to and catchment-sensitive farming (CSF).

Criteria	Assessment	
	Instruments in the mix scoring highly	**Low scoring instruments in the mix**
Environmental Effectiveness: Will the instrument(s) achieve the environmental objective(s) within the specified time span and what degree of certainty can be expected? If the environmental outcome is somewhat uncertain and different instrument levels (e.g. charge levels) are needed, how acceptable is deviation from the set goal?	CSF measures will contribute to the goal of achieving WFD standards. Extensive research has gone into the development of this approach and it has been demonstrated to lead to improvements in water quality and saves farmers money. Financial assistance will deliver real improvements to farm waste management practices. Awareness raising will ensure that farmers know about diffuse water pollution. The Government are consulting on the introduction of Water Protection Zones. This regulatory action would improve the level of certainty for improving water quality and delivering the WFD targets.	There is a high degree of uncertainty associated with the impact of awareness raising campaigns, although it is an essential first step in getting farmers to co-operate. There is still an uncertainty about whether CSF measures are enough to improve water quality to meet the stringent WFD standards. The ECSFDI is time limited to 2010/11 and if it doesn't continue there is no guarantee CSF practices will continue.
Cost effectiveness: Will the instrument(s) achieve the environmental objective(s) at the minimum possible cost to society? The social cost of a policy instrument(s) comprises three elements: (1) abatement or compliance costs (2) regulatory costs (3) transactions costs.	It is not cost effective to regulate all farming practices that could potentially cause pollution of water. By its nature, diffuse pollution originates from sources that on their own do not lead to significant water quality issues, but collectively they lead to a large problem.	The consequences of an awareness raising campaign is not known which will affect its overall cost effectiveness. If the WFD standards are not met, will the grants paid to farmers and the cost of the initiative have been worthwhile.
Flexibility: Is the instrument(s) flexible enough to adjust to changes in technology, resource scarcity, and market conditions?	Flexibility comes through the possibility of adopting a different mix of instruments and approaches to their delivery. Advice is being tailored to suit the issue. Catchments were selected based on evidence of water quality problems.	Some farmers in the priority catchments are visited and advised even though they are probably not having much impact on water quality thereby wasting resources.

Table C.1 continued overleaf

Table C.1 **continued**

Criteria	Assessment	
	Instruments in the mix scoring highly	**Low scoring instruments in the mix**
Dynamic Efficiency: Does the instrument(s) provide incentives for developing and adopting new environmentally cleaner and economically more efficient technologies? Does it promote development of an environmentally sound infrastructure in general?	CSF promotes the improved management of soil which will help to reduce pollution overall and leads to other environmental benefits. Good soil quality is one of the main 'infrastructures' to consider. Better farm waste practices are also an example of using materials more efficiently.	Farmers may adopt better farming practices thinking this is the right thing to do when in some circumstances their current practices are probably not having very much of an impact.
Equity: Will the costs and benefits of the instruments be equitably distributed? Who gains and who loses?	All farm businesses in priority catchments can potentially gain from any capital grants available and free advice, and can potentially save money.	Better farming practices might produce cost savings for all farm businesses and there would be an impact if advisors were providing one-to-one advice to farmers everywhere – this could be viewed as being an inequality.
Ease of Introduction: Is the instrument(s) consistent with the legislative framework? If new legislation is necessary, how feasible is it? Does the relevant branch of government have the administrative capacity to issue the necessary regulations and administer the instruments? What is the administrative opportunity cost given limited administrative resources?	The WFD is the key driver and it is important for the UK Government to hit the targets. In theory it should be an initiative therefore attracting plenty of administrative support and one that was easy to introduce.	The limited timeframe for the ECSFDI lasting only up to 2010/11 will probably be a barrier to the success of the work. This leads to uncertainty and is perhaps a factor affecting the retention of catchment officers (a particular problem in Phase 1 which was for two years only, with uncertainty of its continuation).

Table C.1 continued overleaf

Table C.1 **continued**

Criteria	**Assessment**	
	Instruments in the mix scoring highly	**Low scoring instruments in the mix**
Ease of Monitoring and Enforcement: How difficult or costly will monitoring and enforcement be?	Modelling has been used to predict the outcome for water quality and provides a good indication of the likely benefits.	Detecting water quality changes will require specialist skills. Trends will not become apparent for some time and will need to be quite sophisticated taking into account weather patterns before and after, for example, and other factors, such as changes in farm practice and other (legislative) measures, e.g. NVZs.
Predictability: Does the instrument(s) combine flexibility and predictability?	The ECSFDI as an approach can be moved from place to place over time (into different catchments or concentrated on sub-catchments as and when better monitoring evidence becomes available).	There is no guarantee that CSF practices will be sufficient to meet the WFD targets.
Acceptability: Is the instrument(s) understandable by the public, acceptable to economic agents and politically sellable? Does the instrument(s) agree with certain moral and ethical precepts?	The programme was developed in liaison with farmers and farming bodies. Farmers appear to be willing to accept the concept of CSF. In particular, farmers prefer to be encouraged to change rather than being told what to do and they valued the two-way approach of the CSFOs of being listened to and understanding their particular situation, whilst providing practical solutions through a common sense approach.	There are people who doubt if CSF will bring the level of improvements required to meet the WFD targets. Water companies probably take the view that tackling diffuse pollution requires more regulation of farmers rather than advice and grants.

Table C.2 Hampton principles and CSF.

Principle	Assessment
1. Regulators, and the regulatory system as a whole, should use comprehensive risk assessment to concentrate resources on the areas that need them most.	The WFD Article 5 report and other evidence were used to select priority catchments based on a risk of not meeting the WFD objectives.
2. Regulators should be accountable for the efficiency and effectiveness of their activities, while remaining independent in the decisions they take.	A monitoring programme has been established in the priority catchments to quantify the improvements achieved in water quality.
3. No inspection should take place without a reason.	Diffuse water pollution from agriculture has been identified by Government as a significant environmental issue that must be tackled to meet statutory targets for water quality.
4. Businesses should not have to give unnecessary information, nor give the same piece of information twice.	Catchment officers will give one-to-one advice to farmers and work as part of a partnership between regulatory bodies avoiding such duplication of effort. The Environment Agency is still independent of Government within this partnership.
5. The few businesses that persistently break regulations should be identified quickly.	Studies are being undertaken to pin-point the pollution hotspots (investigative monitoring programme) which will identify those farm businesses causing most pollution.
6. Regulators should provide authoritative, accessible advice easily and cheaply.	Defra has developed relevant webpages that provide information on CSF and the ECSFDI.
7. Regulators should recognise that a key element of their activity will be to allow, or even encourage, economic progress and only to intervene when there is a clear case for protection.	CSF can save farmers money thereby increasing their profits.

The Hampton principles appear, to a significant extent, to have been adhered to when tackling diffuse agricultural pollution. The Hampton principles together provide all the elements that are required for successful implementation of combinations of instruments or approaches. The Hampton principles advocate a risk-based approach to policy initiatives, along with independence, enforcement and providing advice. The application of these principles at the planning stage helps to ensure that an initiative contains a variety of elements that reinforce each other and help combinations of instruments and/or approaches be as successful as possible.

Landfill case study

Comparison against good policy criteria

In addition to the criteria of the logic model, landfill policy instruments can be evaluated using some or all of the criteria in **Error! Reference source not found.**.

This analysis highlights areas where implementation has been successful, but also areas where adaptations could improve their performance. Some of the criteria used in this analysis link directly with the overall policy objectives. Evaluating environmental effectiveness, for example, is important to measure the broad overall objective to reduce the environmental impact of landfill sites. Other criteria, such as dynamic efficiency, are not explicit aims of the policy instruments, but they are certainly a beneficial secondary consequence.

The analysis shows that the main problem areas in this case study concern:

- the ease by which the instruments were introduced;
- the easy by which monitoring was instigated;
- predictability;
- acceptability.

Although awareness campaigns encourage members of the public to dispose of waste in different ways, it is perceived that in some parts of local councils there is little acknowledgement that disposal of waste to landfill is an environmental issue. This apparent lack of awareness could perhaps be addressed with more targeted awareness campaigns. The analysis also shows that although LATS scores highly in terms of flexibility, this may not always be an advantage because it also limits the predictability of the scheme. This can be a serious issue for local authorities when it comes to setting forecasts for future budgets.

Comparison with Hampton Principles

The publication *Implementing Hampton: from Enforcement to Compliance* details the actions taken to date by a variety of regulators to enact the principles of the Hampton Report. It outlines the powers in the Legislative & Regulatory Reform Act (LRRA) and offers thoughts on the way forward.

The LRRA contains powers that should enable the Hampton principles to be established in UK law through a statutory Regulators' Compliance Code (RCC). Regulators are legally obliged to have regard to the Hampton principles when they:

- decide on their policies and principles;
- set standards;
- give advice.

The RCC obliges all regulators (both national and local) to have regard to the Hampton principles. Table C.4 evaluates the landfill case study in terms of these principles.

Table C.3 Some criteria for evaluating environmental policy instruments related to landfill.

The selection and assessment of policy instruments can be achieved by asking and answering the following questions, all conditioned by the special circumstances of the policy objective concerned.

Criteria	Assessment	
	Instruments in the mix scoring highly	**Low scoring instruments in the mix**
Environmental Effectiveness: Will the instrument(s) achieve the environmental objective(s) within the specified time span and what degree of certainty can be expected? If the environmental outcome is somewhat uncertain and different instrument levels (e.g. charge levels) are needed, how acceptable is deviation from the set goal?	All instruments are working to reduce the amount of waste sent to landfill and are therefore well placed to achieve the environmental objective. Fiscal instruments are the particular focus for local authorities due to financial implications. Awareness campaigns seem to be working well as recycling rates are increasing, although some parts of society still have low recycling rates. There is significant work still to be done if the second and third rounds of targets are to be met.	Little information on measurable environment benefits. Awareness campaigns have an uncertain outcome.
Cost effectiveness: Will the instrument(s) achieve the environmental objective(s) at the minimum possible cost to society? The social cost of a policy instrument(s) comprises three elements: (1) abatement or compliance costs (2) regulatory costs (3) transactions costs.	LATS – trading element should allow authorities to be as cost effective as possible.	LAS is more rigid and so could potentially be less cost effective.
Flexibility: Is the instrument(s) flexible enough to adjust to changes in technology, resource scarcity, and market conditions?	LATS – trading provides flexibility for local authorities to adjust to local issues e.g. delays in implementing new infrastructure Both LATS and LAS are subject to regular reviews.	LAS – allowances are inflexible and guidance from WAG can be prescriptive, which does not allow local authorities to take their own circumstances into account.

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Criteria	Assessment	
	Instruments in the mix scoring highly	**Low scoring instruments in the mix**
Dynamic Efficiency: Does the instrument(s) provide incentives for developing and adopting new environmentally cleaner and economically more efficient technologies? Does it promote development of an environmentally sound infrastructure in general?	LAS – central government expects allowances to be met mainly through recycling. Fiscal instruments are encouraging developments such as treatment of waste and anaerobic digestion. Does not appear that instruments have led to an increase in illegal waste activity.	Continuing debate over role of incineration and associated environmental impacts
Equity: Will the costs and benefits of the instruments be equitably distributed? Who gains and who loses?	Original allocation of allowances was as fair as possible, based on previous waste arisings.	LAS – if allowances are redistributed this could adversely impact authorities which have performed better to date.
Ease of Introduction: Is the instrument(s) consistent with the legislative framework? If new legislation is necessary, how feasible is it? Does the relevant branch of government have the administrative capacity to issue the necessary regulations and administer the instruments? What is the administrative opportunity cost given limited administrative resources?	Legislation introduced to support both allowance schemes and the Landfill Tax.	Some issues over differing definitions of municipal waste and biodegradability.
Ease of Monitoring and Enforcement: How difficult or costly will monitoring and enforcement be?	Monitoring is all through the central WasteDataFlow tool and validated. Results are easily obtained once information has been entered. Tight reporting timescales are difficult for authorities but ensure information is provided quickly.	Authorities have had to be trained and there are tight reporting timescales. They may not be enough resources to have several people trained so difficulties arise if people off sick at crucial times.

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Criteria	Assessment	
	Instruments in the mix scoring highly	**Low scoring instruments in the mix**
Predictability: Does the instrument(s) combine flexibility and predictability?	Landfill Tax provides predictable costs but is not flexible.	LATS and LAS do not provide long-term certainties for local authorities
Acceptability: Is the instrument(s) understandable by the public, acceptable to economic agents and politically sellable? Does the instrument(s) agree with certain moral and ethical precepts.	Allowances scheme possibly not well-known by public but awareness campaigns have ensured the public is educated on the main issues and what they can do. Recycling message widely but not entirely accepted.	Some council members may not connect landfill with the environmental issues, as it is seen as primarily an economic issue.

Table C.4 Hampton principles and landfill.

Principle	Assessment
1. Regulators, and the regulatory system as a whole, should use comprehensive risk assessment to concentrate resources on the areas that need them most.	Allowances were allocated among authorities based on previous reports of municipal waste
2. Regulators should be accountable for the efficiency and effectiveness of their activities, while remaining independent in the decisions they take.	The Environment Agency, in conjunction with Defra, has implemented a number of policy instruments to reduce the amount of MSW sent to landfill. Annual reports are published on LATS, LAS and the amount of total MSW.
3. No inspection should take place without a reason.	Site visits to check the amount of landfilled waste only take place where the difference in reported waste is more than 10 per cent.
4. Businesses should not have to give unnecessary information, nor give the same piece of information twice.	Reporting all takes place in WasteDataFlow so that the same information is not reported more than once for different agencies.
5. The few businesses that persistently break regulations should be identified quickly.	Data is reported on a quarterly basis and sites are investigated where necessary.
6. Regulators should provide authoritative, accessible advice easily and cheaply.	Advice is available from the Environment Agency.
7. Regulators should recognise that a key element of their activity will be to allow, or even encourage, economic progress and only to intervene when there is a clear case for protection.	Comments made in focus groups suggest there are some mixed messages from government. On one hand, the public is asked to minimise waste, yet on the other is asked to go out and spend money in the retail sector to support the economy, which often results in waste (packaging, replacing goods rather than repairing them).

Waste crime case study

Comparison against good policy criteria

In addition to the criteria of the logic model, landfill policy instruments can be evaluated using some or all of the criteria in Table C.5.

The analysis highlights areas where approaches have been implemented well and areas where further thought is required. Approaches that score particularly highly are those where a risk-based approach is being taken to target action; this increases cost effectiveness and environmental effectiveness. In addition, it is clear that the success of awareness raising campaigns depends on identifying and researching the target audience so that the initiative reaches the intended population.

Cost and environmental effectiveness are also improved when targeted action is intelligently planned and coordinated and when knowledge is shared between organisations and within different departments of the same organisations.

We have also found that awareness raising on is effective when it is accompanied not just with enforcement activity, but also with efforts to raise people's awareness of the enforcement activities. When people know that enforcement is taking place they will not assume that they can 'get away' with committing an environmental crime. Press coverage of prosecutions, for example, helps to raise this awareness; when high profile prosecutions are complemented with readily available information on legitimate, legal behaviour, you are likely to observe the greatest impact of a campaign and see waste crime fall.

It is useful to couch this approach in terms of generic instruments and approaches. In the area of waste crime we find a combination of different regulations. They are applied in a risk-based manner, accompanied with relatively effective enforcement (at least of compliant businesses) and disincentives through fines, naming and shaming. All this regulatory and enforcement activity is coupled with general awareness and information campaigns and efforts to build capacity, targeted towards key actors. On the face of it, this is a useful combination of instruments and approaches.

Comparison with Hampton Principles

The publication *Implementing Hampton: from Enforcement to Compliance* details the actions taken to date by a variety of regulators to enact the principles of the Hampton Report. It outlines the powers in the Legislative & Regulatory Reform Act (LRRA) and offers thoughts on the way forward.

The LRRA contains powers that should enable the Hampton principles to be established in UK law through a statutory Regulators' Compliance Code (RCC). Regulators are legally obliged to have regard to the Hampton principles when they:

- decide on their policies and principles;
- set standards;
- give advice.

The RCC obliges all regulators (both national and local) to have regard to the Hampton principles. Table C.6 evaluates this case study in terms of these principles:

Table C.5 Some criteria for evaluating environmental policy instruments related to waste crime.

Criteria	Assessment	
	Instruments in the mix scoring highly	**Low scoring instruments in the mix**
Environmental Effectiveness: Will the instrument(s) achieve the environmental objective(s) within the specified time span and what degree of certainty can be expected? If the environmental outcome is somewhat uncertain and different instrument levels (e.g. charge levels) are needed, how acceptable is deviation from the set goal?	Illegal waste sites relatively high although uncertainty surrounding displacement. Use of risk good though – maximises effectiveness of work. Again use of NIMs for illegal waste export maximises the effectiveness of the work undertaken. Undertaking research before campaigning for awareness ensures target audience is correctly identified and most appropriate campaign material can be used.	There is a high degree of uncertainty associated with the impact of awareness raising campaigns in terms of reducing waste crime.
Cost effectiveness: Will the instrument(s) achieve the environmental objective(s) at the minimum possible cost to society? The social cost of a policy instrument(s) comprises three elements: (1) abatement or compliance costs (2) regulatory costs (3) transactions costs.	Using campaign + enforcement means only go after people who are the 'difficult' 20%. Again, risk based, or NIMs approach maximises the 'win' for the work done. Also, by gathering as much intelligence as possible can ensure that in court for instance POCA can be used to get as much back as possible.	The consequences and long-term impact of campaign and awareness raising activity are unknown, and therefore could be a risk to cost effectiveness.
Flexibility: Is the instrument(s) flexible enough to adjust to changes in technology, resource scarcity, and market conditions?	BREW campaigns able to be tailored to local areas. Illegal waste site risk assessments are based on a number of criteria and therefore overall risk scores should reflect any given aspect of the site being considered 'high' risk.	Comments provided indicate that some instruments are not flexible enough to result in the most efficient result and that this could be addressed. For instance it would be effective to be able to issue 'stop' notices for illegal waste sites.

Table C.5 continued overleaf

Table C.5 continued

Criteria	Assessment	
	Instruments in the mix scoring highly	**Low scoring instruments in the mix**
Dynamic Efficiency: Does the instrument(s) provide incentives for developing and adopting new environmentally cleaner and economically more efficient technologies? Does it promote development of an environmentally sound infrastructure in general?		No guarantee that crime is not merely displaced e.g. waste sites open elsewhere, waste carriers find new vehicles, waste export follows different routes.
Equity: Will the costs and benefits of the instruments be equitably distributed? Who gains and who loses?	Partnerships between local authorities and Environment Agency with co-funded enforcement officers. Policy instruments are designed to be used by all partners. Knowledge sharing using NIMs approach means most appropriate body takes enforcement action – this should keep costs down.	
Ease of Introduction: Is the instrument(s) consistent with the legislative framework? If new legislation is necessary, how feasible is it? Does the relevant branch of government have the administrative capacity to issue the necessary regulations and administer the instruments? What is the administrative opportunity cost given limited administrative resources?	BREW campaigns aimed to employ policy instruments that could be used by all partners so that work and techniques would continue by e.g. local authorities, etc.	Highlighted the need to incorporate principles learnt through Environment Agency 'projects' back into day-to-day working of the Environment Agency but this can be difficult.
Ease of Monitoring and Enforcement: How difficult or costly will monitoring and enforcement be?		No guarantee that crime is not merely displaced e.g. waste sites open elsewhere, waste carriers find new vehicles, waste export follows different routes.

Table C.5 continued overleaf

Table C.5 continued

Criteria	Assessment	
	Instruments in the mix scoring highly	**Low scoring instruments in the mix**
Predictability: Does the instrument(s) combine flexibility and predictability?	Campaign techniques are flexible and can be adapted for the required audience to improve effectiveness. Enforcement techniques – notices, warning letters, injunctions etc. can be used as necessary and in combination up to the point whereby the required result is achieved.	Some instruments could be improved e.g. issuing 'stop' notices
Acceptability: Is the instrument(s) understandable by the public, acceptable to economic agents and politically sellable? Does the instrument(s) agree with certain moral and ethical precepts.	Very acceptable by legitimate business and the general public.	

Table C.6 Hampton principles and waste crime.

Principle	Assessment
1. Regulators, and the regulatory system as a whole, should use comprehensive risk assessment to concentrate resources on the areas that need them most.	This is being implemented to different degrees for different aspects of waste crime. The best example of compliance with this principle is illegal waste sites. A comprehensive risk assessment is undertaken for each site, and then sites with the highest risk are targeted for action. Targets also are linked to the level of risk associated with illegal sites. Using the NIM approach for illegal waste export, and to a lesser extent its use for local enforcement on fly-tipping also allows resources to be focused on the areas that need them most. This approach is being transferred to illegal waste sites also in an attempt to concentrate on situations where multiple sites are owned / run by one individual to increase effectiveness. The BREW campaigns involved research at the outset into who the 'worst' offenders were in terms of repeat offences and/or deliberate ignorance of legislation. This allowed campaigns to be focused on these audiences to get the best possible impact.
2. Regulators should be accountable for the efficiency and effectiveness of their activities, while remaining independent in the decisions they take.	Working with Defra, the Environment Agency has brought in and helped local authorities to implement new policy instruments to help tackle waste crime. The way of working has worked to ensure that as the Environment Agency refocuses its efforts at tackle the 'big, bad and nasty', local authorities have the tools and experience to deal with the low level localised fly-tipping incidents.
3. No inspection should take place without a reason.	This is being put into practice particularly for illegal waste sites, where the inspection results in a completed risk assessment matrix. In addition, the mandatory port inspections are now being targeted to produce useful intelligence to aid major case investigation using the NIM approach.

Table C.6 continued overleaf

Table C.6 **continued**

Principle	Assessment
4. Businesses should not have to give unnecessary information, nor give the same piece of information twice.	This is being put into practice e.g. through the North East text messaging to waste carriers. Businesses are contacted once but have the option of confirming that they do not need to be registered, before they are re-contacted.
5. The few businesses that persistently break regulations should be identified quickly.	Using the NIM approach fits this principle. Intelligence is used to piece together a picture of illegal waste crime activity that can cross local authority borders and the borders of Environment Agency regions to identify the 'big bad and nasty' offenders. Similarly, the Environment Agency takes on the 'big, bad and nasty' fly-tipping incidents, leaving local authorities to deal with minor offences. The illegal waste site policy implementation is slightly behind. It still currently takes an 'end-of-pipe' approach, although this is being addressed.
6. Regulators should provide authoritative, accessible advice easily and cheaply.	The BREW campaigns have focused on engaging with those who are most unlikely to be complying with legislation and informing them of duty of care requirements, waste carrier licensing requirements, etc. Information has been provided in a multitude of formats, for example via 'butty van' events. This approach takes the information to SMEs, as opposed to requiring the SME to put effort into acquiring the information.
7. Regulators should recognise that a key element of their activity will be to allow, or even encourage, economic progress and only to intervene when there is a clear case for protection.	The main aim of work relating to illegal waste sites and illegal waste carriers is to legitimise the business, not necessarily to shut the business down. In some cases the site might be able to apply for exemption for instance, or to apply for the appropriate licence.

We conclude from the evidence that the Hampton principles have been followed, to a significant extent, for tackling waste crime. However, different elements of the principles have been used for different aspects of the problem; no single waste crime initiative meets all of the principles.

The Hampton principles together provide all the elements that are required for the successful implementation of combinations of instruments or approaches: the adoption of a risk-based approach, accompanied by retained independence, enforcement, and advice giving. The use of these principles at the planning stage would help ensure that an initiative contained all the necessary components to combine instruments and approaches in the most successful way possible.

Appendix D Cost-benefit and cost effectiveness analyses

Catchment-sensitive farming

Cost effectiveness analysis is an economic tool that assesses whether or not the costs (inputs) of an activity can be justified by its outcomes and impacts. Cost effectiveness is most commonly expressed as the ratio of costs to outcomes (i.e. cost per unit of "effectiveness"), where outcomes are measured in quantitative, but non-monetary, terms.

The Environment Agency, as an implementing agency for government, has a societal duty to allocate public funds appropriately in order to maximise environmental improvement within its budgetary constraint. Therefore, it is important for the Environment Agency to understand the relative cost effectiveness of the different combinations of operational approaches it adopts. Assuming that effectiveness is measured in a common metric and that sufficient information is available, an ex post evaluation of different combinations of policy instruments and approaches will show which combination offers the highest rate of return on investment. Cost effectiveness analysis estimates inputs in monetary terms and outcomes in non-monetary quantitative terms (such as improvements in performance indicators).

If, however, one can measure outcomes in monetary terms a cost-benefit analysis is possible. A cost-benefit analysis provides even better information for evaluating policies; if such analyses are possible and can be monitored and calculated with no additional cost, the cost-benefit results should certainly be reported. For the ECSFDI case study, we are able to report the net benefits of the programme along with measures of cost effectiveness.

Cost information

Given that our report is trying to identify which combinations of policy instruments and approaches offer the most cost-effective/efficient use of government funds, it is appropriate to focus on the regulatory costs of mixed policy approaches[23].

Table D.1 shows Defra's budget and actual expenditure across the two years of the project. Detailed cost information for each catchment was not available.

[23] **Regulatory costs**: These costs are incurred by government or their implementing agencies and include the monitoring, administrative, enforcement and litigation costs associated with new policies. These costs also include the cost of setting up a new market when economic instruments regulations are used, in particular tradable permit schemes. The costs are typically examined in terms of staffing requirements (expressed as full-time equivalent employees (FTEs)). Ultimately, these costs are borne by taxpayers, unless other regulatory costs are reduced to accommodate any new policy. Regulatory costs can therefore be either (i) the opportunity costs of other activities that are discontinued or reduced because budgets are fixed or (ii) the private costs imposed on taxpayers to support the increased expenditure by government necessary to implement the new policy.

Table D.1 Budget for Phase 1 of ECSFDI.

Year	Original budget (£ million)	Out-turn budget (£ million)
20006/07	8.557	6.592
2007/08	13.287[1]	7.563[1]
Total		14.115

Notes: [1] 2007/08 budget includes £5 million capital grant scheme. Claims worth £4.645 million were paid in capital grants (93 per cent).

Measures of Effectiveness

The ECSFDI had four objectives against which measures of its effectiveness could be assessed. These objectives were to:

- stimulate farmer engagement (take up of) CSF practices;
- raise farmers' awareness of DWPA;
- improve soil and land management practices;
- improve the environment through reduced DWPA.

A comprehensive monitoring and evaluation framework was designed to measure success against each of these objectives. Our analysis focuses on environmental improvement (i.e. reduction in diffuse water pollution) as a measure of effectiveness.

Since improvements in actual water quality are expected to take some time to become apparent, the ECSFDI conducted some high level modelling to provide an initial estimate of the water quality improvements that might arise from the implementation of DWPA mitigation measures. Reductions in DWPA were modelled using information on recommended control measures that had been planned or implemented through the ECSFDI's advisory service (as recorded by CSFOs in the Land Manager Recording Database).

A pollutant baseline was modelled using ADAS NEAP-N (diffuse N) and PSYCHIC models (diffuse P and agricultural sediment) and:

- a simple quantitative assessment based on agricultural census data;
- estimates of the per capita generation rates of intestinal bacteria for humans and livestock;
- the likelihood of connectivity to surface waters (FIOs).

A tool called the Catchment Change Matrix (CCM) looked up reductions in pollutants for relevant control measure and calculated the cumulative reduction of pollutants against the modelled baseline level. The CCM used values from the Diffuse Pollution Inventory (DPI) Manual to quantify the reduction in diffuse pollutants associated with a particular control measure.

A "current" scenario modelled reductions in diffuse water pollutants based on control measures recorded in the Land Manager Recording Database as of the end of October 2007. Data were graded according to the extent to which the control measure had been completed (control measure recommended, planned or implemented) and the way in which the advice had been delivered (i.e. whether action arose from one-to-one contact

with the farmer or via a group event). These factors were used to judge how confidently it could be said that the control measure had actually been implemented.

Subsequently, the data were separated into two datasets, ‘optimistic’ and ‘pessimistic’, based on this confidence level. The ‘optimistic’ and ‘pessimistic’ results are thought to represent the upper and lower limits of what has happened ‘on the ground’ in the catchments. ‘Pessimistic’ results are based on planned or implemented measures delivered one-to-one while the ‘optimistic’ scenario also includes advice given at events and assumes that all recommended measures are undertaken.

Table D.2 shows modelled annual reductions in diffuse phosphorous and diffuse nitrogen in each priority catchment.

Table D.2 Modelled reductions in diffuse water pollutants in "priority catchments".

Catchment	Reduction in diffuse water pollutant (kg/yr)			
	Diffuse P		Diffuse N	
	Pessimistic	Optimistic	Pessimistic	Optimistic
Bassenthwaite Lake	1,003	1,638	9,392	91,340
Bure, Ant and Muckfleet	5	32	3,949	41,620
Deben, Alde and Ore	42	81	3,268	61,573
Dorset Stour	207	594	9,623	70,588
Deast Riding of Yorkshire and North Lincolnshire	7	133	2,553	74,140
East Rother and Walland Marsh	673	933	46,399	166,985
Exe Estuary	916	3,542	61,229	588,051
Gipping and Orwell	30	72	23,286	45,633
Hampshire Avon System	1,901	2,966	16,544	359,551
Lincolnshire Coast Rivers	90	111	7,286	46,977
Little Ouse (Thetford Ouse)	94	304	3,459	193,153
North Norfolk Rivers	983	1,208	42,670	199,958
North Somerset Moors	0	3	152	1,103
Peak District Dales	419	607	38,294	56,373
Pevensey	414	628	30,452	40,805
River Camel Valley and tributaries	32	127	58,659	107,568
River Eden and tributaries	836	1,218	42,511	61,691
River Eye	20	36	14,522	25,616
River Itchen	114	301	66,635	110,882
River Lugg	0	555	4,594	58,258
River Nar	10	13	5,672	10,463
River Teme	0	5,562	-	179,162
River Test	438	736	94,934	468,197
River Waver and Biglands Bog	1,185	1,687	55,683	78,505
River Wensum	116	368	45,422	108,797
River Wye (ex Lugg)	0	3,759	-	201,708
River Wyre	475	617	4,877	15,265
Rivers Axe and Otter	733	1,514	01,800	217,870
Rivers Lanbourn and Kennet	89	202	10,084	18,055
Slapton Ley and Salcombe to Kingbridge	120	398	17,957	42,193
Somerset Levels and Moors	0	597	4,935	145,383

Table D.2 continued overleaf

Table D.2 continued

Catchment	Reduction in diffuse water pollutant (kg/yr)			
	Diffuse P		Diffuse N	
	Pessimistic	Optimistic	Pessimistic	Optimistic
Tamar – Tavy Estuary	251	1,000	95,459	225,760
The Frome, The Fleet and Part of Poole Harbour	227	343	11,455	144,292
The Stour	427	598	03,190	130,022
Tweed English Tivers including Lindisfarne	0	27	-	34,959
Waveney	345	655	20,351	415,415
West Cornwall Catchments	24	84	18,900	59,531
West Midlands Meres	0	252	-	44,466
Yare	1	4	4,932	19,883
Yealm and Erme Estuaries	38	93	4,704	8,344
Yorkshire Derwent	159	310	47,493	81,273
Yorkshire Ouse, Nidd and Swale	105	149	63,568	96,031
Total reduction (kg/yr)	**12,533**	**34,054**	**2,596,895**	**5,147,433**

Cost-benefit analysis

For a cost-benefit analysis, the costs of a project and the benefits that arise over time are both quantified in monetary terms. Costs and benefits that occur in different time periods are discounted to their 'present values', based on the principle that most people prefer goods and services now rather than later ('time preference').

In cost-benefit analysis, the net present value (NPV) is the primary criterion for deciding whether or not the benefits of a project or scheme justify the costs. The NPV of a projected stream of net benefits is estimated as the summation of the difference between the annual discounted benefits and costs over the period of analysis. A scheme is considered as cost-beneficial where its NPV is non-negative.

Monetising the benefit of the ECSFDI

Farming imposes costs on the environment that are not included in prices paid by consumers or producers. These 'hidden' or unpaid costs are known as external costs or damage costs. Diffuse water pollution is an externality that arises, in part, as a result of farming practices.

A study by Blottnitz *et al.* (2006) estimated the external cost of nitrogen from fertilizer as €0.3/kg. In another study, Pretty *et al.* (2000) estimated the annual total external costs of UK agriculture. This estimate included an assessment of the cost of contamination of drinking water from nitrate (£16.4 million) and phosphate and soil (£52.3 million). Based on Blottnitz's damage cost for nitrogen and the ratio of Pretty *et al.*'s estimated damage costs, the external cost of phosphate can be estimated as €0.96/kg.

Using these damage costs, the benefit of reducing diffuse water pollutants can be quantified in monetary terms, as avoided damages. Table D.3 shows the total modelled reductions in diffuse N and diffuse P under both the "pessimistic" and "optimistic" scenarios, and the benefit of these reductions. An exchange rate of €1.4664 /£ was used[24] to convert damage costs into pounds sterling.

Table D.3 Benefit of the ECSFDI.

	Pessimistic		Optimistic	
	Diffuse N	**Diffuse P**	**Diffuse N**	**Diffuse P**
Total reduction (kg/yr)	2,596,895	12,533	5,147,433	34,054
Benefit in 1st year (€)	779,068	12,032	1,544,230	32,691
Benefit in 1st year (£)	531,280	8,205	1,053,076	22,294

Results of cost-benefit analysis

The total benefit (in terms of reduced diffuse water pollutants) of the first phase of the ECSFDI is sensitive to the number of years that pollutant reductions are assumed to last. Without evidence on the longevity of reductions under this scheme, it could be assumed that reductions in DWPA will be maintained for any number of years. Accordingly, NPVs were calculated for a range of scenarios relating to the lifetime of pollutant reductions. Costs and benefits were discounted at the social time preference rate of 3.5 per cent; this is the recommended rate where the analysis aims to capture the preferences of society[25]. The results of these analyses are shown in Table D.4 and Table D.5.

Table D.4 Cost-benefit analysis with 'pessimistic' benefits.

	Assumed time period reductions maintained			
	10 years	**15 years**	**20 years**	**30 years**
Total discounted benefit (£)	£4,643,715	£6,430,938	£7,935,732	£10,269,505
Total discounted cost (£)	£13,899,246	£13,899,246	£13,899,246	£13,899,246
NPV	-£9,255,531	-£7,468,308	-£5,963,514	-£3,629,741

[24] HM Revenue & Custom average annual exchange rate for year ending 31 March 2006. http://www.hmrc.gov.uk/exrate/exchangerates-05-06.rtf

[25] HM Treasury. The Green Book: Appraisal and Evaluation in Central Government. http://www.hm-treasury.gov.uk/d/1(4).pdf

Table D.5 Cost-benefit analysis with 'optimistic' benefits.

	Assumed time period reductions maintained			
	10 years	**15 years**	**20 years**	**30 years**
Total discounted benefit (£)	£9,256,441	£12,818,961	£15,818,507	£20,470,478
Total discounted cost (£)	£13,899,246	£13,899,246	£13,899,246	£13,899,246
NPV	-£4,642,805	-£1,080,268	£1,919,260	£6,571,232

Comments on the cost-benefit analysis

Whilst the cost-benefit analysis using the pessimistic results indicates that the ECSFDI is not cost-beneficial even when the pollutant reductions are maintained for 30 years, the optimistic results suggest that the scheme is worth pursuing if benefits are maintained for at least 20 years. The uncertainty in the pollutant reduction results is reflected in the differing outcomes of the cost-benefit analysis for the "optimistic" and "pessimistic" scenarios.

These results are based on a number of assumptions, both in the pollution/catchment modelling and in the economic modelling.

The methodology used to model these reductions in diffuse water pollutants is still in development, so the results should be treated as indicative of the possible reductions that could be achieved. The people involved in the modelling work suggested that confidence is highest in the predicted reductions for phosphorus; reductions in sediment and nitrate are thought to be over estimated by the models.

The following assumptions were made to fill current knowledge gaps:

i. **A simple method of diminishing returns.**
The DPI Manual contains no information on the cumulative effect of DWPA measures. Since multiple control measures were being reported for many of the targeted areas (some CSFOs were reporting more than 20 measures on individual farms), a simple method of diminishing returns was used (e.g. Measure 1: 100 per cent efficient; Measure 2: 50 per cent efficient; Measure 3: 25 per cent efficient, etc.). There is no scientific evidence for this relationship.

ii. **Some control measures were ignored.**
The DPI Manual does not list all of the control measures which were used in the catchments. Where possible, additional measures were mapped to those in the DPI. However, a number of control measures could not be mapped to those in the DPI and so were excluded from the assessment. Therefore, some benefits may not have been captured.

iii. **100 per cent immediate efficiency.**
The DPI Manual defines the effect of measures as Effect = Reduction x Implementation x Efficiency. For this assessment it was assumed that every measure is 100 per cent efficient immediately.

iv. **Some farms excluded.**
Any measures recorded on farms which did not have a valid CPH number nor any records in the agricultural census data could not be mapped and were excluded from the assessment.

v. **Accounting for mixed land use on farms.**
The DPI Manual defines the percentage reduction for each diffuse pollution control measure according to a model of a farm system that has a defined, single land use. But most farms (and the model baselines) have mixed land use. To account for this discrepancy, we calculated a revised reduction from each measure for each grid square or farm. This calculation was based on the relative strength of relationship between the actual land use of the farm or grid and the various model farm types.

vi. **A representative location of control measures for modelling.**
Differences in the modelled 1 km land use and actual land use reported in the agricultural census data meant that reductions could not always be applied in the exact geographical locations reported by CSFOs. Reductions were therefore applied to grid squares representative of the farms where measures were actually applied. It was assumed that measures would be applied according to the pollutant loading, with the highest pollutant loading being covered first.

Work continues to refine the CCM system and the approaches to modelling the baseline. It is anticipated that, following further refinement, the CCM will be able to estimate the cumulative effects of control measures and model the relative contributions of manure, fertilizer and soil nitrate. It would be useful to conduct further cost-benefit analysis once the uncertainty of the modelled results has been reduced.

It is possible that farmers working in catchments not covered by the scheme will have observed the initial pilot phase of the ECSFDI and consequently changed their behaviour in order to reduce diffuse water pollutants. These benefits, if they exist, will not have been captured by the monitoring and evaluation programme. It may be worth exploring at a later stage whether this 'demonstration effect' has occurred.

Cost effectiveness analysis

A cost effectiveness analysis can also be reported for the same data. In this case the present value costs of the project are divided by the reductions in emissions. Two emissions have thought to be reduced by CSF practices, so a weighted average of the two needs to be taken. In Table D.6 the weights are based on relative values in terms of benefits, i.e. €0.3 for N and €0.96 for P. This implies one unit of P has a weight equal to 3.2 units of N. A 3.5 per cent discount rate was applied to costs and future pollutant reductions. The resulting values of 'cost per tonne of weighted pollutant removed' are given in Table D.6.

Table D.6 Cost effectiveness results.

	Assumed time period reductions maintained		
	10 Years	**20 Years**	**30 Years**
Cost per tonne (£) – 'optimistic' estimates	1,290	755	538
Cost per tonne (£) – 'pessimistic' estimates	2,572	1,505	1,163

An intra-case study analysis of cost effectiveness could inform future initiatives for reducing DWPA. For such an analysis, information on the approaches used in each catchment (e.g. events attended, one-to-one advice given) and the cost of these

approaches would be required. The cost effectiveness of pollutant reductions could be compared across the catchments to identify which approaches worked best in combination.

Since each catchment has different physical characteristics, this spatial factor will not provide an ideal "counterfactual"; results would have to be interpreted in the light of conditions in each catchment. Furthermore, catchment-level cost data is not currently available.

Landfill

Cost effectiveness analysis is an economic tool that assesses whether or not the costs (inputs) of an activity can be justified by its outcomes and impacts. Cost effectiveness is most commonly expressed as the ratio of costs to outcomes (i.e. cost per unit of "effectiveness"), where outcomes are measured in quantitative, but non-monetary, terms.

The Environment Agency, as an implementing agency for government, has a societal duty to allocate public funds appropriately in order to maximise environmental improvement within its budgetary constraint. Therefore, it is important for the Environment Agency to understand the relative cost effectiveness of the different combinations of operational approaches it adopts. Assuming that effectiveness is measured in a common metric and that sufficient information is available, an ex post evaluation of different combinations of policy instruments and approaches will show which combination offers the highest rate of return on investment.

The Landfill Allowance Scheme (LAS) and Landfill Allowances Trading Scheme (LATS) are allowances schemes (in Wales and England, respectively) which cap the annual volume of biodegradable municipal waste (BMW) that each waste disposal authority (WDA) can send to landfill. In Wales, local authorities that exceed their allowances are subject to a fine (currently £200 per tonne of BMW in excess). In England, under LATS, local authorities are permitted to trade allowances in order to meet their quotas. Following trading, if authorities in England still exceed their allowances then they will be fined (currently £150 per excess tonne).

LATS was designed to enable local authorities to meet their obligations (for BMW to landfill) in the most cost-effective way. This analysis will consider the cost effectiveness of introducing trading to an allowance scheme.

Cost information

Several costs are associated with both the LAS and LATS, namely:

- regulatory costs (i.e. the costs of operating the scheme, for example the Environment Agency's start-up costs and staff costs);
- administrative burdens of the scheme (costs to local authorities, waste operators and waste disposal authorities to run the scheme);[26]

[26] Data on the administrative cost of the scheme to participants are only available for England.

- compliance costs (i.e. the cost to local authorities of meeting the targets, for example the cost of infrastructure for waste diversion , or the cost of paying a fine).

Trading, banking and borrowing of allowances are recorded on a web-based allowance register, known as the LATS Register. The trading element of LATS has additional costs, specifically:

- the cost to Defra of managing the trading system (i.e. start-up costs and the hosting overheads);
- the regulators' staff costs associated with managing the LATS register;[27]
- the additional administrative burdens on local authorities associated with trading (i.e. the cost of submitting monitoring information quarterly (rather than annually) and the costs associated with the requirement to register any trading, banking or borrowing on the electronic register. There are also real resource costs associated with recording the weight of each load of MSW accepted at landfill).

The benefits of trading

The purpose of the trading scheme is to enable local authorities to meet their obligations in the most cost-effective way. The cost of diverting waste from landfill will vary across local authorities, but trading aims to reduce the overall cost of meeting a given target.

The gains from trade can be seen in Figure D.1. In this scenario, two authorities face a required cut in waste from A to B, but Authority 1 has a steeper marginal abatement cost curve (MAC) than Authority 2. The total cost of meeting the target without trading is the sum of the areas between A and B in each figure. If, however, trading is allowed, Authority 2 could make an additional reduction at a cost equal to the dark shaded area in the lower part of the figure and sell those credits to Authority 1. In this way Authority 1 could reduce its cutbacks by a similar amount, saving the dark shaded area in the upper part of the figure. Since the saving to Authority 1 is greater than the cost to Authority 1, there is an overall saving. This continues until the marginal costs of abatement are equalised.

[27] A representative from the Environment Agency [Fran Lowe] suggested that the additional resource time for the Environment Agency would be negligible.

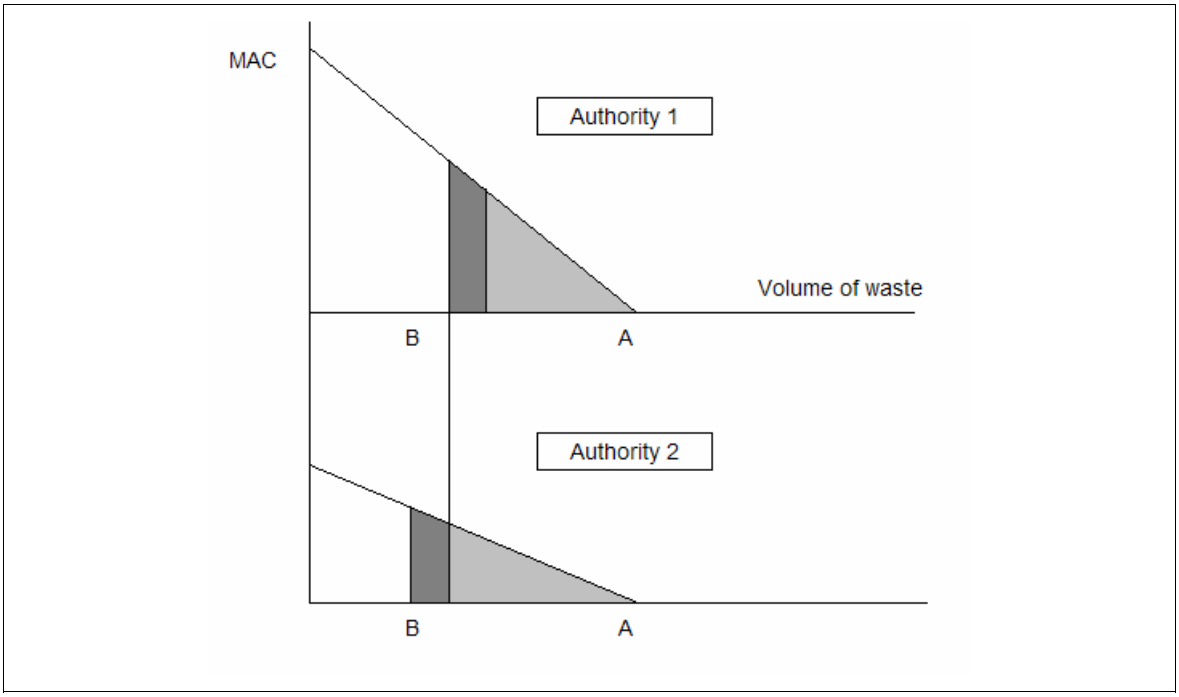


Figure D.1 Gains from trade.

In theory, therefore, authorities will sell allowances where the marginal cost of diverting waste (e.g. through recycling) is less than the price of an allowance; conversely, they will purchase allowances where it is cheaper to do this than to divert waste from landfill. Following an allotted trading period, if authorities do not hold enough allowances to cover the waste they sent to landfill then they will be fined.

Measures of Effectiveness

Table D.7 Reduction in BMW attributable to allowances schemes.

	Total BMW to landfill in year prior to start of scheme (tonnes)	Total allowances in 1st year of scheme[28]	Apparent reduction in BMW to landfill due to scheme
England	13,478,960	12,380,966	8.15%
Wales	1,017,960	550,000	-8.06%

Comments on the cost effectiveness

In Wales, where no trading is allowed, the difference between the amount of BMW allowed and how much was generated before the scheme would be a measure of the reduction attributable to the scheme. This reduction could then be costed, using estimates of the costs of reducing waste in the Welsh local authorities. The data, however, do not indicate that any reduction was in fact required by the local authorities

[28] One allowance is required for each tonne of BMW.

in Wales (see Table D.7[29]). Therefore a cost effectiveness estimate for these authorities is not possible (unless further information can be provided to indicate that the scheme did in fact reduce the quantity of waste generated).

For England a similar analysis is required. Information is needed on the amount of waste reduced as a result of the scheme and some measures of what it cost to make the reductions. In this case, however, the scheme can be credited with the benefits from the trading. Authorities that buy credits save the difference between the price of the credits and the costs of abatement in their systems, while those that sell credits incur a cost equal to the costs of additional abatement in their systems. Since this information is not available, a cost effectiveness analysis cannot be carried out at present.

Waste crime

Cost effectiveness analysis is an economic tool that assesses whether or not the costs (inputs) of an activity can be justified by its outcomes and impacts. Cost effectiveness is most commonly expressed as the ratio of costs to outcomes (i.e. cost per unit of "effectiveness"), where outcomes are measured in quantitative, but non-monetary, terms.

The Environment Agency, as an implementing agency for government, has a societal duty to allocate public funds appropriately in order to maximise environmental improvement within its budgetary constraint. Therefore, it is important for the Environment Agency to understand the relative cost effectiveness of the different combinations of operational approaches it adopts. Assuming that effectiveness is measured in a common metric and that sufficient information is available, an ex post evaluation of different combinations of policy instruments and approaches will show which combination offers the highest rate of return on investment.

As previously discussed, there are a number of activities that fall under the heading 'waste crime' and a number of initiatives have been introduced to try and tackle these problems. However, for the majority of these initiatives, there are insufficient data to carry out cost effectiveness analysis. No cost information is available for activities targeting illegal waste sites. Cost information is available for the project targeting illegal waste export (£4 million over three years), but it is currently too early to measure the success of the project as it had only been operational for nine months at the time the work for this report was carried out. Therefore, our cost effectiveness analysis focuses entirely on the BREW campaigns.

Using the revenue generated from increased landfill tax rates, Defra developed the Business Resource Efficiency and Waste (BREW) programme, a package of work to encourage businesses to send less waste to landfill and to assist them in achieving this objective. In 2005, the Environment Agency received funding from Defra to deliver projects over three years to tackle waste crime under the BREW programme. Nine BREW campaigns ran across England between 2005 and 2008; three of these were one-year pilot studies and the remaining six were two-year projects. A range of approaches were used across the campaigns.

[29] Allowances were only issued for the last 2 quarters of 2004/5. Therefore, the reduction in waste was calculated on the assumption that, had allowances been introduced at the beginning of 2004/5, double this number of allowances would have been issued for the entire year.

Cost information

Given that this study is concerned with identifying which combinations of policy instruments and approaches offer the most cost effective solution to the Environment Agency, it is appropriate to focus on the regulatory costs associated with mixes of policy approaches[30].

Cost information was received from Paul Keay relating to various BREW campaigns as detailed in Table D.8.

Table D.8 Cost of BREW campaigns, by area.

BREW campaign area	Cost
Year 1 (one-year small, pilot campaigns)	
Preston	£57,305
Luton	£27,955
Stoke	£41,808
Years 2&3 (larger campaigns)[1]	
Bristol	£246,076
Chester	£221,665
Derby	£263,284
Liverpool	£294,385
London	£240,816
North East	£300,244

Note: [1] Figures are cumulative over two years

Measures of effectiveness

An ENCAMs evaluation of the BREW campaigns[31] noted that project objectives were broad and, generally, not clearly defined. Furthermore, these objectives varied across the project areas, making it difficult to identify an obvious metric for effectiveness. However, some common aims and objectives included:

- raising awareness of waste crime and responsibility (particularly for businesses);
- working in partnership to tackle waste crime;

[30] **Regulatory costs:** These costs are incurred by government or their implementing agencies and include the monitoring, administrative, enforcement and litigation costs associated with new policies. These costs also include the cost of setting up a new market when economic instruments regulations are used, in particular tradable permit schemes. The costs are typically examined in terms of staffing requirements (expressed as full-time equivalent employees (FTEs)). Ultimately, these costs are borne by taxpayers, unless other regulatory costs are reduced to accommodate any new policy. Regulatory costs can therefore be either (i) the opportunity costs of other activities that are discontinued or reduced because budgets are fixed or (ii) the private costs imposed on taxpayers to support the increased expenditure by government necessary to implement the new policy.

[31] ENCAMs (November 2007): 'Evaluation of the Business Resources Efficiency & Waste (BREW) Programme'.

- enhancing the credibility of Environment Agency as a fair and firm regulator;
- environmental improvement through reduced illegal disposal of waste.

The nature of these objectives meant that on the whole a qualitative assessment of how much they were met most appropriate.

Since the BREW campaigns ultimately aim to reduce waste crime, a reduction in fly-tipping incidents (a component of waste crime) in regions where campaigns took place is a suitable measure of effectiveness. National data on the number of fly-tipping incidents and the associated clear-up costs are collected and entered into *FlyCapture*, a database set up by Defra, the Environment Agency and the Local Government Association in 2004. *FlyCapture* records incidents dealt with by the Environment Agency and local authorities across England.

FlyCapture data for incidents dealt with by local authorities in England were available from 2004/05[32]. The average number of incidents before and during the campaign, and associated clearance costs, in each BREW campaign area were identified (full information on this can be found in Appendix D). Fly-tipping incidents increased in all campaign areas over this period, except for the North East, where there was an 8.8 per cent decrease in incidents. Across all the campaign areas, reported fly-tipping incidents increased by 920 per cent, compared with an average increase of 36 per cent in non-campaign areas. However, it is clear that the Liverpool campaign, where the understanding of a "unit of fly-tipping" was different, has skewed these results. With Liverpool excluded from the analysis, the increase in fly-tipping incidents in campaign areas drops to 34 per cent, indicating that the increase was smaller in campaign areas than in other areas. The increase in clearance costs in campaign areas (with Liverpool excluded) is marginal (0.9 per cent) whilst there is an increase of 29 per cent in non-campaign areas.

Regression analyses were carried out to determine if any of the two-year BREW campaigns had a significant effect on either the number of fly-tipping incidents or the clearance costs. Confounding factors were controlled by including variables to take account of time (year) and the economic activity of an area in the regression.

The results indicate that reductions in fly-tipping incidents in the years of the campaign could not be detected at a statistically significant level. The effect of the campaigns on the costs of clearance was not statistically significant either. This lack of significance may be due to the incomplete nature of the data set (see below). Certainly further analysis is merited.

[32] Incidents dealt with by the Environment Agency were not included in the analysis.

Table D.9 Summary of *FlyCapture* data 2004/05–2006/07.

Area	2004/05 (before campaign)		Average 2005/06–2006/07 (during campaign)		% Increase	
	No. incidents	**Clearance costs**	**No. incidents**	**Clearance costs**	**No. incidents**	**Clearance costs**
Bristol	1,593	£83,072	2,023	£111,185	27.0%	33.8%
Chester	579	£30,845	1,072	£36,340	85.1%	17.8%
Derby	1,607	£85,657	5,641	£258,766	251.0%	202.1%
Liverpool	4,966	£312,331	635,636	£13,182,564	12699.8%	4120.7%
London	4,936	£291,082	7,858	£401,201	59.2%	37.8%
North East	4,464	£367,180	4,071	£224,036	-8.8%	-39.0%
Campaign areas	4,099	£281,235	42,637	£1,047,912	940.2%	272.6%
Campaign areas excl. Liverpool	4,155	£286,814	5,575	£289,497	34.2%	0.9%
Non-campaign areas	2,592	£116,911	3,519	£151,069	35.8%	29.2%

Comments on the cost effectiveness

Had there been evidence that some or all of the BREW campaigns had produced a reduction in fly-tipping, it would be possible to compare the cost effectiveness of these campaigns. The counterfactual analysis would then have compared the approaches across the geographical range.

Since *FlyCapture* data was only available for local authorities, the measure of the number of fly-tipping incidents and associated clearance costs was incomplete. Had it been possible to include data from incidents dealt with by the Environment Agency, a significant effect may have been identified. Whilst local authorities are responsible for smaller scale incidents of fly-tipping, the Environment Agency deals with 'big, bad and nasty' incidents (where there is often an element of organised criminal involvement).

The increase in clearance costs is much lower in campaign areas (0.9 per cent) than non-campaign areas (29 per cent) whilst the increase in fly-tipping incidents is similar (34 per cent and 36 per cent respectively). This suggests that local authorities in campaign areas are dealing with smaller incidents, perhaps as a result of more effective working partnerships between local authorities and the Environment Agency. However, further statistical analysis with an expanded data set (including incidents dealt with by the Environment Agency) would be required to attribute this success to the campaign.

The number of fly-tipping incidents was thought to be the best measure of effectiveness for this analysis. It is reasonable to assume that publicity and awareness raising will have increased the number of incidents reported. Therefore, fly-tipping incidents are not an ideal measure of effectiveness and further work with an expanded data set would be required to measure the success of the campaigns.

Appendix E Case study support to existing theory

Table E.1 CSF case study support to existing theory.

Theory	Evidence from this study
If a single-aspect environmental problem can be targeted directly, an optimum effect can be achieved with the use of a single policy instrument.[1]	Diffuse pollution from agriculture is a complex issue in a politically sensitive area and cannot be tackled by means of a single policy instrument.
If the relevant markets do not function perfectly, combinations of instruments, which mutually underpin each other, would be required in order to address non-environmental 'failures' in the markets in which an environmental policy instrument operates.[1]	The ECSFDI has successfully combined three policy instruments, i.e. awareness raising; capacity building (advice delivery); and financial incentives.
It is advisable to address social concerns primarily with non-environmental policy instruments (e.g. the social security system or the tax system), rather than to modify environmental policy instruments.[1]	Important to build trust between those delivering the instruments (Environment Agency/NE/CFSOs) and farmers by demonstrating understanding of farm business and local knowledge, and listening to their concerns.
When considering appropriate combinations of policy instruments, it is important to remember that instruments commonly need to be applied in a dynamic, responsive way that reflects changing circumstances.[1]	The policy instruments applied and approaches used have successfully combined the different elements of the 'Defra Diamond', i.e. encourage/ensure, enable, exemplify and engage.
A disadvantage of policy instrument mixes is that they can have a number of negative interaction effects, one instrument may hamper the flexibility of businesses, which could have been provided by another instrument when it is used on its own. Also instruments in a mix may be redundant and thereby increasing costs with no compensatory gain in effectiveness.[1]	Not relevant in this case.
Concerning enforcement and policy instruments, the Hampton and Macrory reports, as well as the RES Bill and their implementation documents, provide overall guidance for the application and evaluation of enforcement.[1]	Hampton principles have been followed. Macrory recommendations would be implemented when Water Protection Zones are established.

Table E.1 continued overleaf

Table E.1 continued

Theory	Evidence from this study
Different delivery mechanisms work well in different situations – therefore the specific situation should be understood in terms of the issue, the solution and the target audience (the one whose behaviour needs to change to implement the proposed measure).[2]	This has been applied by focusing primarily on the local level and targeting individual farmers and farming sectors with specific advice
Existing delivery mechanisms, if effective, are likely to provide an easy route for delivering the measure as the costs, difficulties and time-delays associated with establishing new mechanisms should be avoided. They may not however be the most cost-effective approach. The development of a new delivery mechanism may prove to be more cost-effective in the long run. Consideration of new delivery mechanisms will be constrained by the spatial or administrative level at which the analysis is being undertaken[33]. Hence any analysis of delivery mechanisms should be appropriate to the spatial scale of the decision being made.[2]	The initiative has been specifically designed but builds on existing mechanisms, networks and partnerships, e.g. Environment Stewardship. This has been achieved by working in partnership with Natural England.
Delivery mechanisms (DMs) can be combined, co-ordinated, and connected – in most instances a combination of DMs is likely to have greater effect. DMs should be applied in combination to effectively address the challenges of the specific situation. New initiatives should be co-ordinated with existing initiatives to avoid confusion, ensure consistency and efficiency in delivery. New initiatives should be incorporated into the PoMs (and/or other existing planning processes and/or funding mechanisms) as the 'day job' so that they are not lost as one-off action.[2]	A wide range of mechanisms has been applied to suit the particular local challenges and it is clear that no single instrument or approach would have been successful on its own.

Table E.1 continued overleaf

[33] A local appraisal of measures to implement a specific measure cannot readily consider a new national delivery mechanism.

Table E.1 continued

Theory	Evidence from this study
DMs should be introduced and implemented using the principles of modern regulation (Environment Agency, 2005), and good regulation (BRTF, 2005) namely[2]:	Voluntary scheme (more acceptable to farmers than regulation).
- DMs should be *transparent*, so that the rules and processes are clear to those in businesses and communities;	Incorporated into awareness raising, publication of material, Defra dedicated website, seminars, workshops demonstrations, etc.
- DMs should *provide public confidence* (be *accountable*);	See above – monitoring of success is built into the initiative and project evaluation is available to public. The confidence of farmers in the Environment Agency has improved.
- DMs should be *consistent* – apply the same approach within and between sectors over time;	Grant scheme applies across different catchments and different farming sectors, but focuses on target areas within priority catchments. There is a view that the items available in the Capital Grant are biased towards livestock farming; however, this is offset by the options available to arable farmers through ELS.
- DMs should be *risk-based (proportionate)* in that they will be designed and applied in a risk-based manner so that resources are allocated according to the risks involved and the scale of the outcomes which can be satisfied;	Focus on selected priority catchments (those failing or likely to fail WFD water quality objectives). The provision of advice and capital grants are also targeted within catchments based on environmental priority and strength of evidence.
- DMs should be *outcome-focused* – the environmental outcome is central to the planning and assessment of performance;	Focus was on supporting farmers in applying CSF and thereby reducing DWPA. The programme has key performance indicators (KPIs) which are translated to catchment specific indicators of success. Advice delivery strategies and capital grant targeting are tailored to achieve these. KPI 4 – reduction in agricultural phosphate load.

Table E.1 continued overleaf

Table E.1 continued

Theory	Evidence from this study
- DMs should *not impose unnecessary costs*;	The farmer survey showed that there were financial burdens which limited the mitigation measures which could be introduced (grants covered only 60% of capital costs) but it is also clear from case studies that some measures resulted in cost savings to farmers.
- DMs should be as *simple* as possible.	Kept as simple as possible within the constraints of the complexity of the issues, and difficulties addressed through education, provision of information and advice.
- DMs should be *targeted*.	Targeted at priority catchments and individual farmers.
DMs will be designed and introduced to achieve good target audience/stakeholder buy-in – The more stakeholders support the use of a DM the greater its chances of success which is absolutely critical for non-regulatory approaches. If some parties in a sector oppose the requirements, then problems can occur. If operators need to be coerced, then prescriptive legislation may be a better option, provided there is adequate enforcement. Better buy-in will be achieved if the Agent[2] :	Voluntary initiative involving many stakeholders and partnerships.
- develops a good understanding of who the target group is, how they behave and what motivates them;	Training of CSFOs is crucial (training manual has been produced) based on extensive research undertaken over many years with farmers and farming bodies.
- consults at the right time, in the right way and with the right people, to ensure that a wide range of delivery options is considered;	Seminars, workshops, farm demonstrations, champion farmers, one-to-one farm visits and advice, advice 'clinics' at farmers markets and other local events. The implementation of the WFD has been a key driver. Each catchment has a Catchment Steering Group or Local Liaison Group which are used to help shape the delivery strategies.

Table E.1 continued overleaf

Table E.1 continued

Theory	Evidence from this study
- works in partnership with the target group and others to build trust and ownership, develop capacities to understand the problem and its impacts on the environment and business and the ability (technical and financial) of the target group to implement the changes, identify appropriate solutions and how they can best be delivered (this will also result in better drafted instruments and wider awareness of the new measures).	Partnerships with farmer's organisations, and conservation bodies, associate projects and working one-to-one with farmers.
DMs will contain sound objectives against which progress will be reviewed and the approach adapted if needed. DMs objectives should be SMART (Specific, Measurable, Achievable, Realistic and Time-bound). Progress against these objectives should be measured using agreed indicators and approaches adapted if needed.[2]	WFD targets and timescales apply. Programme and catchment KPIs. These will be reported quarterly.
DMs will contain clear, targeted messages which are well communicated. This requires that [2]:	
- information will be tailored to the target audience in content and format. It must be understandable (i.e. at the right technical level), accessible to the target audience, reasonable, practical (readily applied), seen as relevant to their activities, dynamic, up-to-date, complete and backed up by sound and strong evidence;	Long programmes of research and testing of different approaches has gone into the mix to develop CSF and the ECSFDI. Defra's webpages provide easily accessible information.
- DMs will be launched with a good communication plan suited to the target group e.g. national media, workshops, one-to-one advice.	A detailed communications plan was produced for Phase 1 and is being updated for Phase 2.
DMs will be adequately supported in terms of institutional capacity, adequate monitoring, appropriate sanctions and incentives (including financing where appropriate).[2]	There is only limited support from Government for CSF and the ECSFDI – until 2010/11. There are problems with retaining CSFOs due to no secure long-term funding for the initiative.

Table E.1 continued overleaf

Table E.1 continued

Theory	Evidence from this study
Institutional capacity will be needed to initiate, design, implement, monitor and enforce compliance and update DMs. For regulatory and economic DMs the responsibility for providing much of this institutional capacity normally lies with a government agency but for non-regulatory approaches many organisations can play a role and the role of government may be more supportive or as a catalyst. It is important that the roles are adequately resourced.[2]	Part of the initiative reflects this theory. It is a partnership approach involving several bodies.
DMs will be effectively monitored – reliable and transparent monitoring is vital to success as it enables all participants to see that the requirements are being complied with equitably by all parties. Adequate resources should be available to ensure this can happen. Careful monitoring of progress against such objectives will create confidence and trust in the DM being used.[2]	Progress monitoring, including targeted water quality monitoring (mainly long-term assessment) and monitoring of interim progress (e.g. farmer attitudes, mitigation measures applied), is an integral part of the initiative and resources have been allocated for this purpose
Appropriate sanctions will be enforced for non-compliance – In cases where non-compliance may cause harm or even death and full compliance is critical, criminal sanctions may be needed to deter breaches. Such sanctions can only be provided by legislation and this may prevent the use of non-legislative alternatives, except in conjunction with legislative tools. For less serious breaches, expulsion from trade bodies, fines, and negative publicity can act as sanctions, as these do not need legal underpinning.[2]	Threat of legislation (farmer survey showed that they prefer voluntary instruments), although this has not been emphasised in Phase 1 of the ECSFDI, but may be emphasised more in Phase 2.
Appropriate incentives will be used to encourage compliance – A DM will be more successful if stakeholders are encouraged to support it and feel it is worthwhile to comply. The threat of EU legislation can sometimes be enough to prompt stakeholders into action. More positively, businesses can often attract good publicity and generate sales by acting on their own initiative to tackle problems, rather than waiting for EU intervention.[2]	Farmers like to know they comply with environmental legislation, and in some cases they benefit financially from mitigation measures through improved management (e.g. fertilizer or pesticide cost savings, crop yield improvements, labour cost savings)

Sources: [1] WRc, 2008. Choice of policy instruments for modern regulation, draft phase 1 report. Draft final report to the Environment Agency under contract SC070063.
[2] Metroeconomica and WRc, 2006. Deriving the Costs and Effectiveness of Delivery Mechanisms. Final Report to Defra.

Table E.2 Landfill case study support to existing theory.

Theory	Evidence from this study
If a single-aspect environmental problem can be targeted directly, an optimum effect can be achieved with the use of a single policy instrument.[1]	This study considered a variety of policy instruments, which work in combination both to reduce waste and increase recycling and composting rates.
If the relevant markets do not function perfectly, combinations of instruments, which mutually underpin each other, would be required in order to address non-environmental 'failures' in the markets in which an environmental policy instrument operates.[1]	The market for recyclate has dropped recently and this has shown that relying on recycling targets alone may not achieve the objective. Combining with instruments such as allowances schemes and Landfill Tax encourages recycling activity to continue.
It is advisable to address social concerns primarily with non-environmental policy instruments (e.g. the social security system or the tax system), rather than to modify environmental policy instruments.[1]	'Pay-as-you-throw' scheme would incentivise householders directly.
When considering appropriate combinations of policy instruments, it is important to remember that instruments commonly need to be applied in a dynamic, responsive way that reflects changing circumstances.[1]	Landfill Allowances – there is scope for redistribution of allowances, but this also has negative consequences. Trading within LATS allows local authorities to apply the instrument in a dynamic way to suit their own circumstances.
A disadvantage of policy instrument mixes is that they can have a number of negative interaction effects, one instrument may hamper the flexibility of businesses, which could have been provided by another instrument when it is used on its own. Also instruments in a mix may be redundant and thereby increasing costs with no compensatory gain in effectiveness.[1]	The combination of instruments that target all MSW (Landfill Tax, recycling targets) with one that focuses just on BMW can mean activity leading to good performance in one has negative effects elsewhere (such as increasing separate collections of glass for recycling which adversely affects landfill allowances for BMW).
Concerning enforcement and policy instruments, the Hampton and Macrory reports, as well as the RES Bill and their implementation documents, provide overall guidance for the application and evaluation of enforcement.[1]	The policy instruments fit well with the Hampton principles.

Table E.2 continued overleaf

Table E.2 continued

Theory	Evidence from this study
Different delivery mechanisms work well in different situations – therefore the specific situation should be understood in terms of the issue, the solution and the target audience (the one whose behaviour needs to change to implement the proposed measure).[2]	The issue, solution and target audience are well defined. The issue is the environmental impact of landfill. The solution is to send less waste to landfill, especially biodegradable waste. The target audiences are local authorities and the general public.
Existing delivery mechanisms, if effective, are likely to provide an easy route for delivering the measure as the costs, difficulties and time-delays associated with establishing new mechanisms should be avoided. They may not however be the most cost-effective approach. The development of a new delivery mechanism may prove to be more cost-effective in the long run. Consideration of new delivery mechanisms will be constrained by the spatial or administrative level at which the analysis is being undertaken[34]. Hence any analysis of delivery mechanisms should be appropriate to the spatial scale of the decision being made.[2]	This was not fully considered within this case study; however a comment within one focus group suggested that increasing Landfill Tax would have had a significant effect on reducing waste without the introduction of the allowances scheme.
Delivery mechanisms (DMs) can be combined, co-ordinated, and connected – in most instances a combination of DMs is likely to have greater effect. DMs should be applied in combination to effectively address the challenges of the specific situation. New initiatives should be co-ordinated with existing initiatives to avoid confusion, ensure consistency and efficiency in delivery. New initiatives should be incorporated into the PoMs (and/or other existing planning processes and/or funding mechanisms) as the 'day job' so that they are not lost as one-off action.[2]	The evidence from this study suggests that the effect has been enhanced by combining policy instruments. However, direct co-ordination was not a deliberate part of their design and there are some aspects that do not combine well, such as the focus of LATS and LAS on BMW compared to wider materials for recycling.

Table E.2 continued overleaf

[34] A local appraisal of measures to implement a specific measure cannot readily consider a new national delivery mechanism.

Table E.2 continued

Theory	Evidence from this study
DMs should be introduced and implemented using the principles of modern regulation (Environment Agency, 2005), and good regulation (BRTF, 2005) namely[2]:	
- DMs should be *transparent*, so that the rules and processes are clear to those in businesses and communities;	Local authorities are clear on the rules and processes of the policy instruments.
- DMs should *provide public confidence* (be *accountable*);	Accountability and confidence can be gained through the validation of waste data to ensure that reports are accurate.
- DMs should be *consistent* – apply the same approach within and between sectors over time;	The allowance schemes will use the same approach through all EU target years, although the base year and allocations may change.
- DMs should be *risk-based (proportionate)* in that they will be designed and applied in a risk-based manner so that resources are allocated according to the risks involved and the scale of the outcomes which can be satisfied;	Steps have been taken to reduce risks, such as banning of the landfilling of liquid waste and introducing a requirement for the pre-treatment of non-hazardous waste.
- DMs should be *outcome-focused* – the environmental outcome is central to the planning and assessment of performance;	The main focus is reducing waste to landfill and some parts of local authorities (e.g. individual council members) may not fully appreciate the link with the environmental outcome.

Table E.2 continued overleaf

Table E.2 continued

Theory	Evidence from this study
- DMs should *not impose unnecessary costs*;	The trading element within LATS should allow the avoiding of fines and even the opportunity to receive money if sale of surplus allowances can be achieved.
- DMs should be as *simple* as possible.	Some elements are not simple, such as the mass balance calculation. Trading may be complex and it was commented within one focus group that council waste managers may not have the economic backgrounds required to make best use of the scheme.
- DMs should be *targeted*.	Allowance schemes and Landfill Tax are targeted at the authorities disposing of waste to landfill. Awareness campaigns i.e. the work of WRAP and Waste Awareness Wales have been targeted at the public to change individual behaviour.
DMs will be designed and introduced to achieve good target audience/stakeholder buy-in – The more stakeholders support the use of a DM the greater its chances of success which is absolutely critical for non-regulatory approaches. If some parties in a sector oppose the requirements, then problems can occur. If operators need to be coerced, then prescriptive legislation may be a better option, provided there is adequate enforcement. Better buy-in will be achieved if the Agent[2] :	
- develops a good understanding of who the target group is, how they behave and what motivates them;	Local authorities are primarily motivated by economic factors and will do what they need to do to achieve the best economic outcome.
- consults at the right time, in the right way and with the right people, to ensure that a wide range of delivery options is considered;	Authorities and the Local Government Association have been consulted on many aspects, such as the definition of municipal waste within LATS.

Table E.2 continued overleaf

Table E.2 continued

Theory	Evidence from this study
- works in partnership with the target group and others to build trust and ownership, develop capacities to understand the problem and its impacts on the environment and business and the ability (technical and financial) of the target group to implement the changes, identify appropriate solutions and how they can best be delivered (this will also result in better drafted instruments and wider awareness of the new measures).	Authorities are conscious of the Environment Agency as the regulator, but most of the positive messages come from WRAP. Wales – LAS advisors in place and good communications with local authorities. Further evidence not collected in this case study.
DMs will contain sound objectives against which progress will be reviewed and the approach adapted if needed. DMs objectives should be SMART (Specific, Measurable, Achievable, Realistic and Time-bound). Progress against these objectives should be measured using agreed indicators and approaches adapted if needed.[2]	The objectives are: - Specific: number of tonnes landfilled; - Measurable: reported through WasteDataFlow; - Achievable: targets are challenging; - Realistic: possible but will require significant behavioural change of society; - Time-bound: three target years.
DMs will contain clear, targeted messages which are well communicated. This requires that [2]:	
- information will be tailored to the target audience in content and format. It must be understandable (i.e. at the right technical level), accessible to the target audience, reasonable, practical (readily applied), seen as relevant to their activities, dynamic, up-to-date, complete and backed up by sound and strong evidence;	Authorities are clear on what is expected of them. Training has been provided to enable authorities to use WasteDataFlow effectively.
- DMs will be launched with a good communication plan suited to the target group e.g. national media, workshops, one-to-one advice.	This was not fully explored within this case study but there was some feeling within the focus groups that implementation could have been better.
DMs will be adequately supported in terms of institutional capacity, adequate monitoring, appropriate sanctions and incentives (including financing where appropriate).[2]	Fines will be imposed on authorities that exceed their allowances (£150 per tonne in England, £200 in Wales). Monitoring takes place via WasteDataFlow.

Table E.2 continued overleaf

Table E.2 continued

Theory	Evidence from this study
Institutional capacity will be needed to initiate, design, implement, monitor and enforce compliance and update DMs. For regulatory and economic DMs the responsibility for providing much of this institutional capacity normally lies with a government agency but for non-regulatory approaches many organisations can play a role and the role of government may be more supportive or as a catalyst. It is important that the roles are adequately resourced.[2]	Environment Agency has a service delivery team to undertake monitoring, send reminders and notices to authorities, and implement the mass balance calculation. Penalties are imposed by Defra.
DMs will be effectively monitored – reliable and transparent monitoring is vital to success as it enables all participants to see that the requirements are being complied with equitably by all parties. Adequate resources should be available to ensure this can happen. Careful monitoring of progress against such objectives will create confidence and trust in the DM being used.[2]	WasteDataFlow has been set up so that all reporting goes through one tool and is validated (internally in Wales and by Enviros in England).
Appropriate sanctions will be enforced for non-compliance – In cases where non-compliance may cause harm or even death and full compliance is critical, criminal sanctions may be needed to deter breaches. Such sanctions can only be provided by legislation and this may prevent the use of non-legislative alternatives, except in conjunction with legislative tools. For less serious breaches, expulsion from trade bodies, fines, and negative publicity can act as sanctions, as these do not need legal underpinning.[2]	Fines will be imposed on authorities that exceed their allowances. In England, authorities should be able to trade in order to avoid fines.
Appropriate incentives will be used to encourage compliance – A DM will be more successful if stakeholders are encouraged to support it and feel it is worthwhile to comply. The threat of EU legislation can sometimes be enough to prompt stakeholders into action. More positively, businesses can often attract good publicity and generate sales by acting on their own initiative to tackle problems, rather than waiting for EU intervention.[2]	LATS provides an incentive for authorities to reduce the amount of BMW sent to landfill below their limit as surplus allowances can potentially be sold. Some initiatives have emerged from the private sector without the need for legislation, such as the campaign to reduce the number of single-use carrier bags being used in supermarkets.

Sources: [1] WRc, 2008. Choice of policy instruments for modern regulation, draft phase 1 report. Draft final report to the Environment Agency under contract SC070063.
[2] Metroeconomica and WRc, 2006. Deriving the Costs and Effectiveness of Delivery Mechanisms. Final Report to Defra.

Table E.3 Waste crime case study support to existing.

Theory	Evidence from this study
If a single-aspect environmental problem can be targeted directly, an optimum effect can be achieved with the use of a single policy instrument.[1]	This case study has provided no examples of only a single policy instrument being used. This is probably because waste crime is not a single-aspect environmental problem.
If the relevant markets do not function perfectly, combinations of instruments, which mutually underpin each other, would be required in order to address non-environmental 'failures' in the markets in which an environmental policy instrument operates.[1]	A combination of 'carrot' and 'stick' policy instruments has been effectively employed to tackle waste crime. The biggest driver of waste crime is the economic value of waste and/or the cost of legitimate disposal. The combination of awareness raising (to allow the uninformed time to legitimise), along with awareness raising of enforcement action taking place (to 'scare' others into compliance) followed by enforcement action on the hardened criminal enable the most cost effective results to be achieved.
It is advisable to address social concerns primarily with non-environmental policy instruments (e.g. the social security system or the tax system), rather than to modify environmental policy instruments.[1]	Enforcement activity addresses social concerns resulting from fly-tipping and illegal waste sites etc. Enforcement activity targeted through a NIM approach results in the biggest wins with the biggest environmental benefit but these use non-environmental policy instruments.
When considering appropriate combinations of policy instruments, it is important to remember that instruments commonly need to be applied in a dynamic, responsive way that reflects changing circumstances.[1]	The BREW campaigns allowed for individual instruments to be tailored to the campaign area based on local knowledge. Using the NIM approach for illegal waste export allows the response to the crime to be ever-changing based on the intelligence received.
A disadvantage of policy instrument mixes is that they can have a number of negative interaction effects, one instrument may hamper the flexibility of businesses, which could have been provided by another instrument when it is used on its own. Also instruments in a mix may be redundant and thereby increasing costs with no compensatory gain in effectiveness.[1]	No evidence from this case study suggests that combinations of instruments used to tackle waste crime can negatively interact with each other, although it has been highlighted to be most cost effective the instruments must be employed in the most appropriate order e.g. awareness raising, prevention campaign and finally enforcement.
Concerning enforcement and policy instruments, the Hampton and Macrory reports, as well as the RES Bill and their implementation documents, provide overall guidance for the application and evaluation of enforcement.[1]	The Hampton principles have been applied well to the implementation of schemes to tackle waste crime.

Table E.3 continued overleaf

Table E.3 continued

Theory	Evidence from this study
Different delivery mechanisms work well in different situations – therefore the specific situation should be understood in terms of the issue, the solution and the target audience (the one whose behaviour needs to change to implement the proposed measure).[2]	This case study highlights the importance of understanding the target audience, their lifestyles, etc. to get the best possible outcome from campaigns. Carrying out thorough research also means the correct target audience is identified.
Existing delivery mechanisms, if effective, are likely to provide an easy route for delivering the measure as the costs, difficulties and time-delays associated with establishing new mechanisms should be avoided. They may not however be the most cost-effective approach. The development of a new delivery mechanism may prove to be more cost-effective in the long run. Consideration of new delivery mechanisms will be constrained by the spatial or administrative level at which the analysis is being undertaken[35]. Hence any analysis of delivery mechanisms should be appropriate to the spatial scale of the decision being made.[2]	This case study does not provide evidence against this theory.
Delivery mechanisms (DMs) can be combined, co-ordinated, and connected – in most instances a combination of DMs is likely to have greater effect. DMs should be applied in combination to effectively address the challenges of the specific situation. New initiatives should be co-ordinated with existing initiatives to avoid confusion, ensure consistency and efficiency in delivery. New initiatives should be incorporated into the PoMs (and/or other existing planning processes and/or funding mechanisms) as the 'day job' so that they are not lost as one-off action.[2]	This case study has highlighted the importance and effectiveness of building solid partnerships with e.g. police, local authorities, fire service, DVLA, etc. and working closely with them to tackle waste crime. This case study has shown that incorporating work carried out in 'projects' can be one of the most difficult aspects of new approaches and one that is possible not well addressed.

Table E.3 continued overleaf

[35] A local appraisal of measures to implement a specific measure cannot readily consider a new national delivery mechanism.

Table E.3 continued

Theory	Evidence from this study
DMs should be introduced and implemented using the principles of modern regulation (Environment Agency, 2005), and good regulation (BRTF, 2005) namely[2]:	
- DMs should be *transparent*, so that the rules and processes are clear to those in businesses and communities;	The waste crime work has incorporated many awareness raising and educational events to provide clear and consistent messages to business and communities.
- DMs should *provide public confidence* (be *accountable*);	The awareness raising carried out surrounding BREW campaigns, and also highlighting the success of such campaigns to the public. This will all work to raise the Environment Agency's reputation and provide public confidence.
- DMs should be *consistent* – apply the same approach within and between sectors over time;	This case study concludes that a national strategy is required for waste crime which is flexible enough to be tailored to meet the requirements of local areas.
- DMs should be *risk-based (proportionate)* in that they will be designed and applied in a risk-based manner so that resources are allocated according to the risks involved and the scale of the outcomes which can be satisfied;	The illegal waste site approach is an excellent example of using a risk-based approach to allocate resources.
- DMs should be *outcome-focused* – the environmental outcome is central to the planning and assessment of performance;	The logframe derived for this case study indicates that whilst environmental outcomes are desired at all levels, the assessment of physical outputs is difficult and hence it is difficult to assess the overall environmental benefit.

Table E.3 continued overleaf

Table E.3 continued

Theory	Evidence from this study
- DMs should *not impose unnecessary costs*;	The most cost effective method is sought for the implementation of policy instruments for all of the three aspects of waste crime considered. Funding in kind has been sought where appropriate for campaign work. Using a NIM and risk-based approach allows resources to be allocated to those locations where the biggest wins are likely.
- DMs should be as *simple* as possible.	The approaches taken are relatively simple. This case study did not suggest that anyone has been confused by the instruments available.
- DMs should be *targeted*.	All actions undertaken under BREW campaigns were targeted. The illegal waste export work provides an excellent example of using NIM to target action in an effective way to take out the 'big, bad and nasty'.
DMs will be designed and introduced to achieve good target audience/stakeholder buy-in – The more stakeholders support the use of a DM the greater its chances of success which is absolutely critical for non-regulatory approaches. If some parties in a sector oppose the requirements, then problems can occur. If operators need to be coerced, then prescriptive legislation may be a better option, provided there is adequate enforcement. Better buy-in will be achieved if the Agent[2] :	This case study has demonstrated that building partnerships requires a significant investment in time, but that once those partnerships are built then implementing policy instruments can be more cost effective and successful.
- develops a good understanding of who the target group is, how they behave and what motivates them;	Research was undertaken for the BREW campaigns at the outset to identify the target group and enable action to be targeted specifically at those identified.
- consults at the right time, in the right way and with the right people, to ensure that a wide range of delivery options is considered;	Time was spent investing in partnerships. In some instances joint steering groups were set up to ensure complete buy-in from the partners.

Table E.3 continued overleaf

Table E.3 continued

Theory	Evidence from this study
- works in partnership with the target group and others to build trust and ownership, develop capacities to understand the problem and its impacts on the environment and business and the ability (technical and financial) of the target group to implement the changes, identify appropriate solutions and how they can best be delivered (this will also result in better drafted instruments and wider awareness of the new measures).	When partnerships were built, the most effective route to tackling the waste crime was identified. It might not be the Environment Agency that is most appropriate for dealing with the problem – it could be e.g. customs officers or VOSA.
DMs will contain sound objectives against which progress will be reviewed and the approach adapted if needed. DMs objectives should be SMART (Specific, Measurable, Achievable, Realistic and Time-bound). Progress against these objectives should be measured using agreed indicators and approaches adapted if needed.[2]	Certain aspects of the case study had clear objectives, other areas are lacking in this area. Measuring progress is one of the most difficult aspects for this particular policy area as estimating the scale of the problem is still a fairly unexplored area.
DMs will contain clear, targeted messages which are well communicated. This requires that [2]:	
- information will be tailored to the target audience in content and format. It must be understandable (i.e. at the right technical level), accessible to the target audience, reasonable, practical (readily applied), seen as relevant to their activities, dynamic, up-to-date, complete and backed up by sound and strong evidence;	This case study highlights the importance of understanding the target audience, their lifestyles, etc. to get the best possible outcome from campaigns. In addition carrying out thorough research means the correct target audience is identified.
- DMs will be launched with a good communication plan suited to the target group e.g. national media, workshops, one-to-one advice.	The BREW campaigns and the illegal waste export work both have clear communications plans and the people involved have highlighted communication as one of the most importance aspects of the work, especially with regard to timing.
DMs will be adequately supported in terms of institutional capacity, adequate monitoring, appropriate sanctions and incentives (including financing where appropriate).[2]	The National Enforcement Team (NET) coordinates work to tackle waste crime at a national level. There are also regional roles of responsibility, working with NET to ensure work is effective. Individual projects have considered their resource requirements and employed the appropriate people (but this is an area of risk for future work).

Table E.3 continued overleaf

Table E.3 continued

Theory	Evidence from this study
Institutional capacity will be needed to initiate, design, implement, monitor and enforce compliance and update DMs. For regulatory and economic DMs the responsibility for providing much of this institutional capacity normally lies with a government agency but for non-regulatory approaches many organisations can play a role and the role of government may be more supportive or as a catalyst. It is important that the roles are adequately resourced.[2]	Individual policy leads take responsibility for particular aspects of waste crime.
DMs will be effectively monitored – reliable and transparent monitoring is vital to success as it enables all participants to see that the requirements are being complied with equitably by all parties. Adequate resources should be available to ensure this can happen. Careful monitoring of progress against such objectives will create confidence and trust in the DM being used.[2]	Monitoring is a weak point within this case study. For fly-tipping a monitoring framework is in place, although there a significant number of factors which influence the reported figures and they therefore do not necessarily indicate success/failure of policy instruments. Illegal waste sites have the most detailed and useful monitoring in place, although this relies upon repeat visits to sites and it is unknown how many sites are merely displaced following closure.
Appropriate sanctions will be enforced for non-compliance – In cases where non-compliance may cause harm or even death and full compliance is critical, criminal sanctions may be needed to deter breaches. Such sanctions can only be provided by legislation and this may prevent the use of non-legislative alternatives, except in conjunction with legislative tools. For less serious breaches, expulsion from trade bodies, fines, and negative publicity can act as sanctions, as these do not need legal underpinning.[2]	Promoting enforcement action and undertaking enforcement action were key aspects of the work to tackle waste crime.
Appropriate incentives will be used to encourage compliance – A DM will be more successful if stakeholders are encouraged to support it and feel it is worthwhile to comply. The threat of EU legislation can sometimes be enough to prompt stakeholders into action. More positively, businesses can often attract good publicity and generate sales by acting on their own initiative to tackle problems, rather than waiting for EU intervention.[2]	The risk of non-compliance i.e. fines etc. were highlighted in campaign and awareness building work on waste crime. This should have acted as an incentive to legitimise business, etc.

Sources: [1] WRc, 2008. Choice of policy instruments for modern regulation, draft phase 1 report. Draft final report to the Environment Agency under contract SC070063.
[2] Metroeconomica and WRc, 2006. Deriving the Costs and Effectiveness of Delivery Mechanisms. Final Report to Defra.

Appendix F Proposal for using conjoint analysis to inform choices of policy instruments

It has been proposed that discrete choice modelling could be used to determine both the most preferred combination of policy instruments and the preferred values of each instrument of the regulated group. This information could allow regulators to target policy instruments in a way that achieves optimal behavioural change.

Focus groups of regulators would be used to:

- discover the policy instruments (e.g. taxes) they want to employ;
- value the policy instruments;
- rank the combinations based on their expertise.

This process would be used to set the attributes and the levels of the attributes.

We propose an experiment which will use conjoint analysis in this way. It is envisaged that the combination of policy instruments will be the "product", the policy instruments will be the "attributes" and the "values" will be the instrument values.

A study sample of regulators will be selected. The size of the sample could be reduced by using a *fractional factorial design*. Each participant could be asked to score or choose between alternative combinations of policy options. For example, the participant may be presented with the following combinations; they could be asked either to score each combination or choose their preferred combination.

Combination 1:
Instrument A: tax type 1 value: 2%
Instrument B: tax type 2 value: 0.1%
Instrument C: Permit value: condition X (difficult to fulfil)

Combination 2:
Instrument A: tax type 1 value: 3%
Instrument B: tax type 2 value: 0.1%
Instrument C: Permit value: condition X (medium)

Combination N:
Instrument A: tax type 1 value: 8%
Instrument B: tax type 2 value: 0.1%
Instrument C: Permit value: condition X (easy to fulfil)

Following analysis, the results of this experiment will be fed back to the regulators so that they are aware of the preferences of their target audience and combine policy instruments to encourage optimal behavioural change.

This experiment does have a number of limitations:

i. **No 'price value**
Without a price it is possible to derive quantitative results but not a value-based trade-off between 'attributes', such as revenue collected versus indicator scores achieved. It is therefore possible to collect some information on preferences using conjoint choice analysis. There is no obvious 'price' variable for a package of instruments, only a ranking.

ii. **Difficulty of the task**
This approach has a heavy cognitive burden – it may be easy to say which option is best and which is worst, but to rank even 3 options may be too demanding.

iii. **Need to describe the consequences of combinations**
Policy instruments are complex and to treat combinations of them is possible, but only if the consequences of these combinations are described.

iv. **Non-transferability of results**
The results from one application could not easily be transferred to another situation.

The use of conjoint choice analysis to determine the preferences of policy-makers between different combinations of instruments is possible, but it is time consuming and would need careful specification. It would be necessary to define the policy objective clearly (e.g. reduce green house gasses, or in the case of water, to meet certain water quality objectives in a given river basin). This specification would have to be exact because in defining each set of instruments, the policy-maker must be provided with a measure of how the 'package' performs with respect to these objectives. The information set would also have to include data on changes in government spending (positive or negative), the 'acceptability' of the package to different stakeholders and so on.

Although collecting this information is possible, we think that it would be difficult and not practical within the time and budget constraints of the present project.

Appendix G Guidance document

Guidance on combining policy instruments

Practical implementation for use by policy and operational staff to deliver environmental outcomes

This guidance sets out how combinations of policy instruments and approaches can be used for delivering environmental outcomes in the most effective way. It is for use by the Environment Agency and provides practical information on how to:

- implement the policy instruments selected by the EU or UK governments;
- how to adopt complementary approaches at a more operational level.

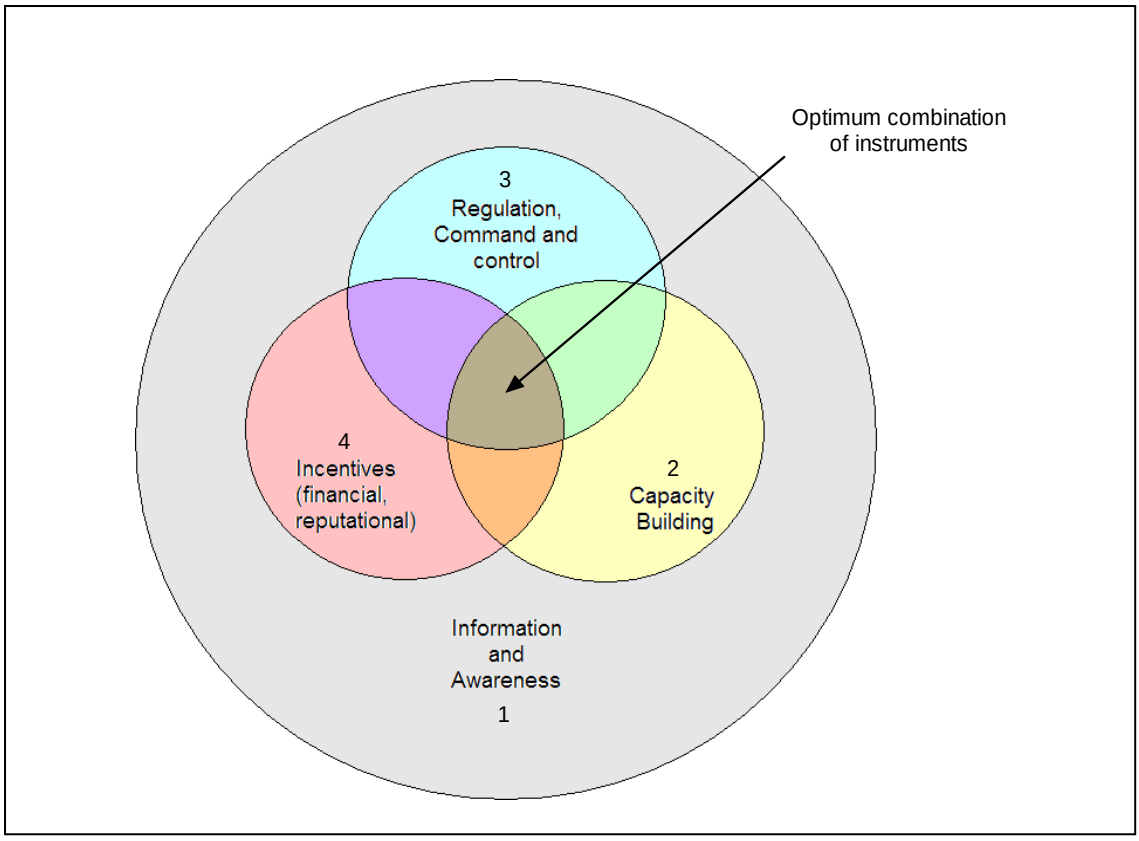
It is for use by both policy and operational staff. The guidance within this document has been developed from in-depth analyses of case studies (detailed in Science Report 070063/SR).

Background

Better regulation focuses on securing improved environmental outcomes in improved ways. Theory from existing literature suggests that better outcomes – as measured against key criteria such as efficacy and efficiency – can be secured by applying a combination of policy instruments rather than delivering individual policy instruments on their own.

To illustrate, the imposition of a tough regulatory standard, but without any effort to raise awareness among those affected and ensure they have the capacity to comply with the regulations, is likely to reduce both the efficacy and the efficiency of the tough regulatory regime.

The diagram below illustrates this multi-level approach. It suggests that change is most achievable where there is a level of awareness, where there are capacities for change and where there are mutually reinforcing imperatives and incentives for change. This mix of policy signals can come from one or more instruments and approaches – and the sequencing of these signals (as depicted in the numbers assigned to each) can be an important element of successful implementation.



Definitions

Whilst implementing agencies such as the Environment Agency do not select policy instruments, they do choose how to apply them, and they can adopt complementary approaches to improve policy outcomes at a more local level. We therefore distinguish between *instruments* and *approaches* throughout this document.

i. **Policy instruments**
Policy instruments are the policy tools that the Environment Agency is asked by government to apply. They can involve:

- direct regulation (including permits, registrations or the direct application of legislation, for example setting certain areas of farmland as Nitrate Vulnerable Zones);
- alternative approaches (including market based approaches e.g. taxes or trading schemes, education or advisory campaigns and voluntary or negotiated agreements).

ii. **Policy approaches**
Policy approaches include the range of measures, such as awareness raising or capacity building measures, that the Environment Agency can choose to apply as a complement to the instruments they are required to apply. Policy approaches can have a significant effect on policy outcomes, including the costs of implementation and the costs of compliance.

Combinations of instruments and approaches

Policy instruments and approaches can work in a number of ways as illustrated by the Defra Diamond[36]:

- They can **engage** – new initiatives that allow people to take better decisions and to work together more effectively.
- They can **enable** – by educating and raising awareness, or by building the capacity of people to participate and to contribute to the delivery of environmental goals. This has tended to be done via education or by providing facilities and infrastructure to enable behavioural change, for example by providing recycling facilities or water meters.
- They can **encourage** – by adopting or offering incentives for more desirable forms of behaviour and disincentives for the less desirable forms of behaviour. Typically, this has been done through economic or tax-based instruments, but it is also possible to recognise and reward good behaviour with positive publicity.
- Or they can **exemplify** – by those seeking the change setting a good example in the way they conduct their business.

Evidence from the case studies indicates that a combination of measures (legislative and/or non-legislative mechanisms) often works best. Non-legislative mechanisms can be used either instead of, or as well as, regulations or economic instruments. The case studies show that measures tend to work best when they are applied as part of a 'complementary mix' of instruments and approaches – with each reinforcing the influence of another.

For example, when an instrument is introduced to encourage changes in behaviour, perhaps using a tax-based economic incentive, it will have little effect unless target groups are able to respond to these incentives. Similarly, information-based approaches usually work best when they are combined with measures that increase the ability of the target group to apply the information. Many programmes or initiatives therefore adopt a range of mechanisms.

Combining approaches at a regional/field level

This section provides a check list of key points to consider so that policy instruments and approaches can be combined effectively to improve the way they tackle environmental problems.

Following these guidelines will allow policy instruments and approaches to be combined in a coordinated manner, using a formal process for their design, implementation, monitoring and analysis. Environmental policy should take into account the dynamic nature of the issues so it is important that the choice of policy instruments and approaches is continually reviewed.

[36] HMSO, 2005. UK Sustainable Development Strategy model of behaviour change.

Raise awareness amongst the target group

In most cases the first approaches that should be applied are those which will raise awareness of the environmental issue. This work should highlight to the target group their legal obligations and any other action they should follow to address the environmental issue of concern.

This step might involve carrying out bespoke research first to identify the target group, then to understand the best ways of targeting information at that audience. The benefits of investing time and money into this research were shown in the case study on waste crime, where research helped to determine the most appropriate geographical areas for an information campaign, preventing wasted advertising costs elsewhere. This research also enabled the policy leads to gain a better understanding of the motives for current behaviour amongst the target group.

Build capacities to change and to comply

The target audience needs to have all the information and resources it requires so that it can comply with a piece of legislation. The approaches taken to implement a policy must ensure that there are no barriers that prevent the target audience from complying with new requirements.

The catchment-sensitive farming initiative offers a good example of a capacity building programme directed at the target audience: dedicated catchment officers worked one-to-one with farmers to help them change their farming practices.

Ensure all instruments and approaches in a mix support the same environmental objective

The same environmental outcome must be the goal for all of the instruments and/or approaches being considered. If the outcome is not consistent, then different instruments or approaches in a mix may adversely affect one another. By keeping consistent terminology and objectives, the target audience will be clearer on the ultimate goal and the measures will appear simple.

In the landfill case study it was clear that different environmental objectives were causing negative interactions between policy instruments. Whilst the majority of instruments work towards the reduction of all types of municipal waste being sent to landfill, the landfill allowances schemes focus on the reduction of biodegradeable waste. This creates conflict when, for instance, a local authority implements a separate glass recycling collection. By taking the glass fraction out of the municipal waste stream, the recycling collection reduces the total volume of municipal waste going to landfill, but it also results in a higher proportion of biodegradeable waste going to landfill which impinges on the local authority's landfill allowance.

Work with other actors to ensure regulations support rather than contradict

It is important to invest time to build partnerships with key stakeholders so that the partnerships are as effective as possible. Close working partnerships can affect the cost effectiveness of any initiative. Involving partners in all stages of an initiative, from planning through to monitoring and analysis, can help ensure that regulations support rather than contradict one another. Partnerships also open opportunities for the application of a wider suite of policy instruments or approaches.

The use of the 'national intelligence model' approach to combating the illegal export of waste highlights the benefit of working with partner agencies to effect the most beneficial results. Time has been invested in building partnerships with the Vehicle and Operator Services Agency (VOSA), the Driver and Vehicle Licensing Agency (DVLA), immigration, the police, the Scottish Environment Protection Agency (SEPA), the

Northern Ireland Environment Agency (NIEA) and the Dutch Ministry of Housing, Spatial Planning and the Environment (VROM). These agencies also work closely with major shipping lines to gain information.

It has been found that in some cases it is more effective (in terms of cost or time) to ask another organisation to solve a particular problem. For instance, it may be better for immigration officers to deal with a key player, rather than the Environment Agency trying to tackle a problem using only the policy instruments it has at its disposal.

The waste crime case study highlighted that it is important to define clearly the roles of different partners. For example, the Environment Agency and local authorities have agreed that the Environment Agency has responsibility for 'big, bad and nasty' cases of fly-tipping whilst local authorities have responsibility for smaller incidents.

Consider using incentives (financial or reputational) to reward change and compliance

Financial incentives or good publicity can reward those who comply with legislation. Alternatively, the threat of enforcement action may be a sufficient incentive for compliance.

Therefore it is important that any enforcement action is representative of the scale of the environmental problem. Being caught for non-compliance must not be perceived as a simple 'inconvenience'.

Campaigns to raise awareness of waste crime included examples of enforcement activity. They showed incidents where vehicles had been seized for non-compliance and then crushed. This publicity acted as an incentive for other non-registered waste carriers to complete the necessary paperwork.

An alternative approach is taken by the catchment-sensitive farming initative where grants are available to assist with the costs of complying. These grants can cover up to 60 per cent of the capital costs required. Farmers are also made aware of the possible cost savings that capital investments can bring, for example by avoiding or reducing the use of fertilizer or pesticides and improvements in crop yields.

Sequencing of policy approaches and instruments

The careful sequencing of different policy instruments and relevant approaches can result in a more cost effective implementation. As the earlier diagram indicates, it is common for information and awareness campaigns to be completed first, followed by capacity building, then the introduction of incentives and finally hard regulation and control comes into force.

This sequencing fits well with a risk-based approach to implementation whereby the initial softer steps result in wins from some of the target audience, the second step induces more behaviour change, the introduction of incentives reaches most of the target audience and leaves only high risk offenders to be tackled with hard regulation and enforcement action. This order is recommended as a starting point when planning combinations of policy instruments and approaches, but it is not always the most appropriate, so every initiative needs to be considered on an individual basis.

Examples from the waste crime case study show that whilst the suggested approach works for dealing with illegal waste carriers, it was not the best method for tackling

illegal waste export. In this case the information and awareness raising activity needs to occur at a later stage because too much awareness among the target audience may hinder the collation of evidence and stop the national intelligence model approach working effectively.

Plan and undertake careful monitoring and formal evaluation

If a policy instrument is to be effectively evaluated information is needed on both the costs of the policy as well as on its actual environmental achievements. This means that data must be collected prior to the implementation of the policy instruments and approaches, during their implementation and (if relevant) after the policy instruments and approaches have been concluded. The evaluation of the instruments and approaches can be compromised if data are inadequate due to a lack of sufficient and timely monitoring.

The first task is to establish as clearly as possible a baseline. The baseline reflects the environmental situation in the region where the policy is to be introduced and in other comparable regions prior to the introduction of the policy. This baseline should cover all major indicators of the environmental burden, as well as economic data on costs of any mitigation measures that are currently in place. Such a baseline is critical to the evaluation of any policy action.

The second task is to collect data on the same variables during the implementation of the policy. In some cases a programme is introduced gradually, in which case the degree of enforcement over time should be recorded. If the programme has a regional aspect, it is very helpful to continue collecting data in similar areas where the instrument is not being invoked. This make it possible to use econometric techniques based on spatial matching; these are becoming increasingly effective for comparing ‘policy’ areas with areas where the policy is absent.

The collation of baseline data and the ongoing monitoring activity need to be planned well in advance of the implementation of the instrument. Monitoring needs to continue for the entire duration of the implementation as well as well after the programme has ceased operating.

The third task is to collect a comprehensive data set on the instrument itself. Parameters will include the costs of compliance for the affected parties, as well as the costs associated with administration and monitoring. Such costs may include capital and variable costs (in which case an estimate of annualised costs will need to be constructed from the primary data).

It may be appropriate to undertake a formal evaluation between comparative case studies after an interval of, for example, three to five years after implementation of any initiative. This evaluation should help to determine whether or not the implementation is cost effective. It is part of the essential process of review that is necessary to ensure that the instruments and approaches being implemented are the most appropriate solution to a given environmental problem.

Sources of further information

More information on the evidence behind this guidance, sources of literature relating to combining policy instruments and details of the three case studies referred to here can be found in the Environment Agency science report 070063/SR.

A useful tool to consider using during the design stage of a policy implementation is the 'logframe matrix'.

The logical framework can help to clarify the objectives of any project, programme, or policy. It helps to identify expected causal links (programme logic), outcomes, and impacts. It can help to identify performance indicators for each stage in this chain, as well as risks which might prevent the objectives from being attained.[37]

During implementation the logframe provides a useful tool to review progress and take corrective action.

More information on using a logframe can be found in *The Logframe Handbook* (World Bank, 2000) available at http://www-wds.worldbank.org/.

It may be possible to employ a quantitative technique, such as conjoint analysis, to help policy-makers select the optimum combination of policy approaches. Conjoint analysis, or discrete choice modelling, could be used to determine both the most preferred combination of policy instruments and the preferred values of each instrument of the regulated group. This information could allow the regulators to target policy instruments in such a way to achieve optimal behavioural change.

The use of conjoint choice analysis to determine the preferences of policy-makers between different combinations of instruments is possible, but it is time consuming and would need careful specification. It would be necessary to define the policy objective clearly (e.g. reduce green house gasses, or in the case of water, to meet certain water quality objectives in a given river basin). This specification would have to be exact because in defining each set of instruments, the policy-maker must be provided with a measure of how the 'package' performs with respect to these objectives. The information set would also have to include data on changes in government spending (positive or negative), the 'acceptability' of the package to different stakeholders and so on.

It is important to note that the results of this type of analysis cannot be easily transferred to another application, so specific combinations have to be assess for each individual policy implementation.

More detailed discussion about the use of conjoint analysis can be found at http://www.sawtoothsoftware.com and http://www.marketvisionresearch.com.

A useful overview of impact evaluation can be found at http://www.worldbank.org/ieg/ie/.

An overview of general principles and methodologies that are applicable across sectors for economic analysis, including quantitative risk analysis can be found in *Economic Analysis of Investment Operations* (World Bank, 2001; available at http://www-wds.worldbank.org/)

[37] World Bank, 2002. Monitoring and Evaluation: Some Tools, Methods and Approaches. Operations Evaluation Department, World Bank, Washington, DC:

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