THE DEVELOPMENT OF ENVIRONMENTAL ASSESSMENT PROCESSES FOR PROJECTS WITHIN THE WATER ENVIRONMENT

by

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A Doctoral Thesis

Vol I

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Abstract

One of the major tools for assisting in the implementation of sustainable development is environmental assessment (EA). This thesis has sought to develop a model and associated techniques required to provide an effective and efficient EA of projects in the water environment. The challenge has been to integrate a number of disparate elements into a cohesive model that provides workable procedures and outputs. The conceptual elements of the EA process have included the needs of environmental ethics and values; the political decision-making processes; current legislation and policy; the communication of information for a range internal and external stakeholders and decision-makers; the links with technical and economic issues; and The Environmental Agency's project management systems.

Qualitative and quantitative research techniques have been used to develop the model through a number of iterative stages. Two case studies have been used to review and discuss the application of the EA model, resulting in the development of a final model and recommendations for future research work.

A number of innovative concepts have been developed; firstly the 'communication paradigm', whereby the principle feature of the EA process is considered to be the communication of information into and out of the process. This leads to the establishment of an effective framework for the EA process, resulting in the more effective influencing of project decision-making and implementation of projects on the ground. Secondly the thesis has developed the concept of 'environmental action plans', which provide a focus and management tool for the effective delivery of environmental objective and constraints.

It is considered that the basic principles of the EA model developed through this thesis can be used for any type of project and have also been successfully applied to the environmental assessment of strategic projects.

Acknowledgements

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Acronyms used in the Text

ANOB	Area of Outstanding Natural Beauty (UK)
BATNEEC	Best Available Technology Not Exceeding Excessive Cost (UK)
BTO	British Trust for Ornithology (UK)
BTCV	British Trust for Conservation Volunteers
CBA	Cost-Benefit Analysis
CCW	Countryside Council for Wales (UK)
CEQ	Council for Environmental Quality (USA)
EA	Environmental Assessment (= EIA in USA)
EAO	Environmental Assessment Officer
EAP	Environmental Action Plan
EC	European Commission
ECW	Environmental Clerk of Works
EEC	European Economic Community (now EU)
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement (USA)
EN	English Nature (UK Government Agency responsible for nature conservation)
ES	Environmental Statement
ESA	Environmentally Sensitive Area (UK)
EU	European Union
FAS	Flood Alleviation Scheme
FONSI	Finding of No Significant Interest (USA)
FRCN	Fisheries, Recreation, Conservation and Navigation
HMIP	Her Majesty's Inspectorate of Pollution (UK)
IUCN	International Union for the Conservation of Nature
MAFF	Ministry of Agriculture, Food and Fisheries (UK)
MCA	Multi-Criteria Analysis
NEPA	National Environmental Policy Act 1969 - USA
NOI	Notice of Intent (USA)
NRA	National Rivers Authority -UK (predecessor of the Environment Agency)

PPA	Post-project analysis/appraisal
RSNC	Royal Society for Nature Conservation (UK)
SAC	Special Area of Conservation (a Site of European Importance as designated by EC Directive)
SEA	Strategic Environmental Assessment
SEPA	State Environmental Policy Act (e.g., Washington State)
SEPA	Scottish Environment Protection Agency (UK)
SI	Statutory Instrument (UK)
SPA	Special Protection Area (a European Site as designated by EC Directive
SSSI	Site of Special Scientific Interest (UK - protected site of nature conservation or geological/geomorphological importance.
UK	United Kingdom
UN	United Nations
UNEP	United Nations Environment Programme
USA	United States of America
WCED	World Commission on Environmental and Development - UN
WHO	World Health Organisation
WTW	Water Treatment Works

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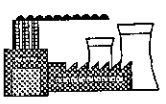
Chapter One - Introduction and Research Plan

'The function of research is not necessarily to map and conquer the world but to sophisticate the beholding of it'

(Robert Stake, 1995, p.43)



Chapter One
Introduction and Research Plan

1.1 Introduction

This research project sought to develop an Environmental Assessment (EA) good practice model to improve the effectiveness and efficiency of the EA process for projects in the water environment. It was developed in an iterative manner from first principles; in terms of ethics (Chapter Two), policy and legislation (Chapter Three); current practice and research worldwide (Chapter Four); and the practical needs of the EA process (Chapter Five) in order to develop the first iteration of the model (model 'A'). Model 'A' provided the criteria for reviewing 14 current ESs (Chapter Six). A revised model (model 'B') was then developed (Chapter Seven) which was then tested on two case study projects (Chapters Eight and Nine). The good practice model development process and issues were then discussed and summarised (Chapter

Ten) and a vision for the future EA process provided. The key concept of the 'communications paradigm' was developed (Chapter Five) from the recognition of the importance of EA as an information management process for stakeholders and decision-makers within the wider project management process.

Good EA is itself always an iterative process which should be integrated within the overall project management procedures. This research project followed an iterative path to develop the guidelines and tools that will help improve the effectiveness and efficiency of the EA process within the water environment.

1.2 Background to the Research Project

In the 1990s, development in a socially, economically and environmentally sustainable manner is the order of the day. From the international level, with the Rio Declaration in 1992 (United Nations, 1993) to the local community level with the development of Agenda 21 and Biodiversity Action Plan initiatives in the UK. The concept of sustainable development is being discussed and debated at many levels and environmental issues are now starting to be incorporated into the decision-making process for policies, programmes and projects. Environmental assessment (EA) is a mechanism, which if used effectively, can aid this decision-making process and help ensure the efficient use of natural and human-based resources in an environmentally sustainable manner (Clark, 1994).

One of the key elements of the environment is water and all projects can have a potential effect on the water environment when viewed in the widest sense. Some actively exploit the water regime, for example, water supply reservoirs, hydropower schemes, navigation waterways and ground water boreholes; whilst others attempt to manage the water regime for the protection of people, for example, flood and coastal defence schemes. A great many others can also directly and indirectly effect the water environment. For example, a new residential development may well alter the water runoff, groundwater recharge, and flooding characteristics of the water catchment.

Projects such as reservoirs, weirs, hydropower and navigation projects will not only have direct effects on the water environment, but will also have other direct and indirect effects on the wider environment including the socio-economic effects.

This thesis has formed the basis of a programme for development of EA processes for operational projects and associated guidelines undertaken by Midlands Region of the Environment Agency. As flood defence and coastal works form the largest component of the Agency's capital programme, this study has concentrated on the application of EA procedures for such projects, however, the EA principles that have been developed will be applicable to any type of project. As Europe's strongest environment protection agency and being tasked by the Environment Act 1995 to contribute to the attaining of sustainable development (UK Government, 1995), there is a need to ensure that all the Environment Agency's projects take into account their potential environmental effects in any decision-making process. The lessons to be learned from development of such EA processes may be transferred, in whole or part, to other projects both within the water environment and those in a wider environmental setting.

On the 16th of July 1988, a new piece of environmental legislation called Statutory Instrument No. 1217 'Land Drainage Improvement Works (Assessment of Environmental Effects) Regulations' 1988, (UK Government, 1988a) known as SI No. 1217, came into force in the United Kingdom. This legislation radically changed the environmental accountability of Land Drainage Authorities in all their operations throughout the water environment.

In the period prior to 1988, section 48 of the Wildlife and Countryside Act 1981 (UK Government, 1981) was the major piece of environmental legislation which required the water industry to take into account environmental issues in all their operations and activities. It required all Water Authorities and internal drainage authorities to 'so exercise their functions ... as to further the conservation and enhancement of natural beauty and the conservation of flora, fauna, and geological and physiographical features of special interest' (UK Government, 1981). Most projects undertaken by Water Authorities had permitted development rights, i.e., planning permission was not required and so projects were implemented taking into account the duties conferred on them

by the Wildlife and Countryside Act 1981 (UK Government, 1981), but with no real accountability to the public or to any other bodies for the environmental consequences of such projects.

The environmental effects of many schemes undertaken by Water Authorities in the period 1973 to 1988, such as those undertaken on the River Idle in Nottinghamshire, were of international significance. The River Idle scheme was undertaken by Severn Trent Water Authority and completed in 1980-1. The drainage patterns of the Idle washlands were altered by the land drainage scheme adversely affecting 174 over-wintering Bewick swans recorded in 1971. Only 17 over-wintering swans were counted in 1981-2 and none the following year (Purseglove, 1988). Despite the environmental implications of such schemes no form of proper environmental assessment was deemed necessary.

The SI No. 1217 Land Drainage EA regulations, together with the new wider duties in the Water Act 1989 to 'promote, conserve and enhance' the environment (UK, Government, 1989), provided new strong protection duties and public accountability for the National Rivers Authority (NRA) projects in the water environment. The NRA had been formed by the Water Act of 1989 from the water management sections of the old Water Authorities. The remaining water supply and sewerage sections were formed into new Water Companies, such as Severn Trent Water plc.

The duties conferred upon the NRA by the Water Act of 1989 created potentially one of the strongest environmental protection agencies in Europe. The remit of the NRA covered three major areas: regulatory activities (abstractions and discharges of water, consenting any works that could impede flood flows, and, the movement of fish stocks into waters); operational works (managing and implementing works to improve water quantity and quality, and flood defence works); and providing advice regarding the water environment, including consultation on relevant planning applications.

In 1995, the Environment Act (UK Government, 1995a) provided the legislation to amalgamate the NRA, Her Majesty's Pollution Inspectorate (HMIP) and the waste regulation authorities (which were part of the local authorities) to form the Environment Agency on the 1st April 1996, operating throughout England and Wales. In Scotland the new Scottish Environment

Protection Agency (SEPA) was created with similar duties and powers. The operational works of the new Environment Agency include a wide range of projects associated with the management of the water environment, from inter-basin water transfer schemes to major new flood defence works; and, at a smaller scale, from small gauging stations providing hydrometric information to the replacement of flap valves and pumping stations. All can have potentially large effects on the surrounding environment, no matter what the scale of the project. If a pumping station is refurbished and has larger capacity pumps installed, this can have large scale secondary effects on, perhaps, thousands of hectares of land that are controlled by the pumping regime. An example of such a scheme is the water pumping stations on the Hatfield Chase and Isle of Axholme. A potential change in the pumping regime could substantially alter the wetland environment of large parts of such an area.

Current environmental legislation and policy (discussed further in Chapter Two) require adequate assessment of proposed schemes, in order to comply with the requirement for environmental accountability of the Environment Agency's operational work as an environmental protection agency. The Environment Agency, therefore, has to provide an effective and efficient EA system in order to ensure that all operational projects are environmentally sound, comply with the needs of environmental legislation and the tenets of good practice.

The Environment Agency, however, is not the only statutory agency responsible for flood defence works. It maintains all water courses that are officially designated as 'main river' under the Land Drainage Act of 1991 (UK Government, 1991b). The 'main river' watercourses, which can range in size from the River Thames to a small ditch no more that half a metre wide, are designated because of their importance for flood defence purposes. All other watercourses which are not designated as 'main river' are the responsibility of local authorities with the exception of watercourses within low lying areas which have been designated as Internal Drainage Districts. These are administered by local Internal Drainage Boards (Institution of Civil Engineers, 1996). These local Boards, which in some cases can trace their history back to medieval times, manage the local land drainage within their district, and are able to seek funding for capital schemes from the Ministry of Agriculture,

Fisheries and Food (MAFF) in a similar manner to the Environment Agency. All flood defence works proposed by all three agencies are subject to SI No. 1217 Land Drainage EA regulations.

1.3 The Problem

At the start of this research project there was limited guidance as to what was good EA practice for projects in the water environment. Such guidance was required in order that EA staff (both in-house and consultants) could consistently achieve acceptable delivery of the EA process for operational projects with respect to three key needs. Firstly, to ensure legislative and policy requirements were met (in an open and accountable manner). Secondly, to ensure the credibility of the EA process undertaken by the Environment Agency in the eyes of third parties, such as English Nature and the general public; and finally, to ensure the effective project management of schemes (EA on time and on budget). Existing procedures had been developed on an *ad hoc* basis, with little or no analysis of the successes or failures of the existing EA processes. The procedures had been developed from existing government guidelines (Department of the Environment, 1989a) and on a purely reactive basis in response to problems faced by EA and project staff. There had been no evaluation to see whether the procedures used were the most appropriate to achieve the satisfactory EA of projects in an effective and efficient manner.

In addition to the need to provide guidance for existing staff working on EA, the steady expansion of the EA programme over the previous six years had led to additional in-house staff and consultants working on Environment Agency projects. These additional staff also needed EA training and guidance. Therefore, there was a need for the review and development of a good practice EA model based on the needs identified above.

1.4 EA Background

The art and science of EA in the UK has a short life in terms of applicability

to of water-based projects. During the period 1973 to 1988, in the Severn Trent Water Authority (which became the NRA Severn-Trent Region and latterly the Midlands Region of the Environment Agency) only one flood defence project had any real environmental input. This scheme was the Soar Valley Improvement Scheme, a large-scale flood defence scheme in Leicestershire. The scheme was promoted through an Act of Parliament in 1983 and because of opposition to the scheme, environmental issues were reviewed at the Parliamentary Committee stage. A rudimentary EA was undertaken and followed through for this project.

Prompted by the new legislation and greater public awareness of environmental issues, during the period from 1988 to 1994, over seventy flood defence projects were assessed using formal EA methodologies in the NRA Severn-Trent Region, and twelve were published as environmental statements (ESs) for full public consultation.

In the UK, large-scale projects such as power-stations, motorways, airports and new town developments have a history of EA stretching back to the early 1960s as part of the town and county planning approval process, especially for public inquiries. This expertise had tended to be restricted to a number of large landscape and planning consultancies because of the need to have large multi-disciplinary assessment teams for such large tasks. Many smaller consultancies have had little experience of EA, but their numbers have expanded since 1988 with the introduction of the EA regulations for many types of development (Coles *et al.*,1992).

New EA legislation introduced in 1988 (discussed further in Chapter Three) requires that for all projects on the Schedule 1 list or those Schedule 2 list projects where there may be significant environmental impacts, there must be a formal EA as part of the decision-making process. Most projects will require planning permission, but some, as is the case with flood defence projects, often have permitted development rights and are assessed using the SI No. 1217 Land Drainage EA regulations. This relatively new requirement has created an increase in environmental input to the Environment Agency project design and decision-making process and has had beneficial effects on the resulting projects; ensuring that the projects were developed in an environmentally sensitive manner.

The amount of EA work mushroomed in a short period of time following the introduction of the EA legislation. In the Midlands Region alone, the annual expenditure on EA associated with flood defence capital projects rose from £30,000 in 1988 to over £400,000 in 1990, and today stands at over £450,000 which is approximately 5% of the annual Flood Defence Capital programme budget. A nominal figure of 5% of the annual capital and maintenance budget to be spent on EA and environmental works was originally approved by the Severn-Trent Regional Flood Defence Committee in 1986. Until the advent of the NRA in 1989, this 5% budget was never fully utilised because the full need for EA for large flood defence programme was not understood. Until the formation of the Conservation and Recreation team within the NRA Severn-Trent Region, with a remit to address such issues, the assessment was dealt with on an *ad hoc* basis by the Severn Trent Water Authority's Regional Landscape Architects Department. The engineering project managers liaised on environmental matters only when they saw fit. The Regional Landscape Architects assessed the environmental implications in a manner which would be considered nowadays to be limited, and designed the associated conservation plans to protect the environment, a concept developed by Jeremy Purseglove in the Severn Trent Region (Newbold *et al.*, 1983).

EA is not only an end in itself, but can assist in the decision-making process, both in project development and the final decision stages. It can also assist in ensuring that projects can then be successfully implemented on the ground in an environmentally sensitive manner and provide the subsequent basis for post project appraisal. There has been a misconception amongst many that environmental concerns are independent from good design practice and that EA is only a reactive process (Holling, 1978). EA should be seen as a pro-active element of the project management and design process, emanating from an integrated environmental management system throughout the whole of an organisation. Such an ethos has been promoted by systems such as BS:7750 for Environmental Quality Assurance, which specifies the 'requirements for the development, implementation and maintenance of environmental management systems aimed at ensuring compliance with the stated environmental policy and objectives' (British Standards Institution, 1992, p.18). Most engineering consultancies will operate a company and project

quality assurance system based on BS:5750 (British Standards Institution, 1987) and so there is the potential to link in with such systems as part of any new EA quality assurance system developed.

Failure to adequately take into account environmental issues can lead to costly delays. An example of which is the NRA's Hill Pill Outfall project on the Severn Estuary, where in 1988, the proposed site had to be moved and re-designed due to lack of consultations with the Nature Conservancy Council (now known as English Nature). The cost penalty was approximately £30,000 in design fees alone. Such problems encouraged engineering managers to start to include EA as part of the design process and not just a process to be undertaken at the end of the scheme design.

Early evaluation of the standard of NRA ESs undertaken on the NRA's behalf by the University of Wales, Aberystwyth, indicated that there were certain problems in the existing EA systems used. The study reviewed NRA ESs for flood defence and coastal protection schemes, culminating in the production of NRA R&D Note 52: Environmental Assessment of NRA Projects (King and Wathern, 1992) which is discussed in Chapter Six.

The conclusions of the King and Wathern report (1992) and similar studies of ESs for developments requiring planning permission, (Wood and Jones, 1991; Coles *et al.*, 1992) indicated consistent areas of weakness in the production of ESs. The results of this early work led to some improvements, but still in 1995 only 40% of ESs achieved an adequate standard (Nelson, 1995).

1.5 Aim of the Research Study

The aim of this thesis was to seek to explore and improve the EA processes associated with projects which alter or regulate the water environment. It sought to provide guidelines for a better understanding of the potential consequences of our actions on the environment, whilst seeking to implement the EA process in the most effective and efficient manner for the benefit of the environment and the successful completion of the project.

Objectives of the Research:

These aims were:

1) To develop an initial model for good practice EA procedures;

2) To identify the limitations of current practice in relation to the good practice model;

3) To refine the good practice model;

4) To review implementation of the refined good practice model;

5) To develop final recommendations for the good practice model.

1.6 The Research Plan

In order to develop a logical conceptual framework for the proposed research programme, a systematic research plan was planned. The proposed research plan was to be iterative (as with many similar research plans evaluating programmes of work (Hedrick *et al.*, 1993)), refining the model as the research programme progressed to provide the final model of good practice.

Table 1.1 Research Plan Stages and Year of Implementation

Stage I	Development of initial good practice model [1994]
Stage II	Current Practice Review [1995]
Stage III	Case Study Reviews [1996] Summary and production of final model [1997]

Table 1.2 Iterative Research Steps for Stages II and III

A	Research Definition - Understand the Problem - Identify the Questions - Refine/revise the Questions
B	Research Design - Choose Design / Data Collection Approach - Inventory of Resources - Assess Feasibility - Determine Tradeoffs
C	Research Execution - Execution
D	Research Analysis - Analysis - Conclusions

The initial phases of exploratory research sought to achieve objectives 1, 2 and 3 in providing a model for good practice. The developed model was then tested in the form of a hypothesis that:

'good practice guidelines using the communications paradigm provide for the implementation of the EA process in the most effective and efficient manner, for the benefit of the environment and the successful completion of the project'.

The secondary phase sought to achieve objectives 4 and 5 and to provide final recommendations for the good practice model.

The overall research plan could be divided into three iterative stages (Table 1.1) each of which went through a cycle of sub-stages A to B (Table 1.2).

The Research Plan was designed to be implemented in an iterative manner in the steps 1 to 12 (Table 1.3) starting with the theoretical model A, which was then to be developed to model B and finally to model C.

Table 1.3 Research Plan

Research Stage	I Project Definition, Design and Literature Review	II Current Practice Review ('95)	III Case Study Review ('96)
(A) Research Definition	1. Research Definition	5. Review Research Objectives	9. Review Research Objectives
(B) Research Design	2. Research Design	6. Review Design	10. Review Design
(C) Research Execution	3. Review Literature	7. Review 14 NRA ESs	11. Review Case Studies
(D) Research Analysis	4. Model A	8. Model B	12. Model C

Research Definition

From a review of the research problem discussed earlier in this chapter, five research objectives were defined:

Objective 1: To identify the initial model for 'good practice' EA procedures

In order to understand the requirements and limitations of such EA processes, it was important to analyse not only the process itself, but also the environment and the social, historic and economic context, in which that process would take place.

This phase of the research involved the review of ethics, policy, legislation, and general literature; distilled to provide the initial 'good practice' model (Chapters Two, Three and Four). Chapter Five developed the concept of the communications paradigm and the initial good practice model.

Objective 2: To identify the limitations of current practice in relation to the 'good practice' model

In developing the thesis, the quality of previously prepared ESs were reviewed in relation to the proposed 'good practice' model EA process (Chapter Six).

This phase involved the exploratory review of the existing standards of NRA ESs. A review questionnaire was developed in the form of normative questions, to evaluate the difference between the initial 'good practice' model and the existing ESs. All 10 ESs produced by the Midlands Region of the Environment Agency during the period from 1990 to 1994 were evaluated.

Objective 3: To refine the 'good practice' model

This phase collated the analysis derived from the exploratory phase and refined the 'good practice' model to provide a new model for evaluation as part of the next stage of research (Chapter Seven). This phase also involved the development of the Environmental Action Plan as a tool for the implementation of EA practice within the wider project management process.

Objective 4: To review implementation of 'good practice' model

The new model EA process was tested on two case study projects to assess the effectiveness and efficiency of the new model process in relation to environmental legislation, policy, guidelines and ethics; and satisfactory project management (Chapters Eight and Nine). The case study projects were flood defence projects, which had a wide range of environmental issues and were in an appropriate stage of project development with respect to the

research project.

Objective 5 To develop final recommendations for 'good practice' model
This final phase sought to analyse the research process and provide final recommendations for the 'good practice' requirements (Chapter Ten). It also sought to identify avenues for further study and development of the EA process.

1.7 Research Plan Conclusions

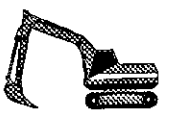
Research Plan Summary
The thesis sought to develop a model of the current 'good practice' EA procedures derived from the concepts of environmental ethics, current environmental policy and legislation, tried and tested EA guidelines and review systems.

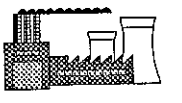
The development of a good practice model for the EA of projects in the water environment was designed to be undertaken in an iterative manner (Figure 1.1). Firstly, a review of current literature and research to provide the building blocks for an initial good practice model; secondly, to evaluate existing NRA EA practice in respect to this initial model; thirdly, a review of a number of case studies using the 'good practice' model; and finally, a summary evaluation of all the issues, culminating in the recommendation of a final good practice model.

Figure 1.1 Research Map

Thesis Chapters	Research Stages	Development of EA Process Models
One	Research plan	↓
Two	Review of environmental ethics, values and decision-making	↓
Three	Review of policy and legislation	↓
Four	Review of EA guidelines and research	↓
Five	**Development of 'model A'**	
Six	Review of current ESs	↓
Seven	**Development of 'model B'**	
Eight	Case study 1: review of 'model B'	↓
Nine	Case study 2: review of 'model B'	↓
Ten	**Discussion and development of 'model C'**	

Chapter Two - Environmental Ethics, Values and Decision-making





Chapter Two
Environmental Ethics, Values and Decision-making

2.1 Introduction

In order to develop the initial EA good practice model, it is important to understand the justification and methodologies for the inclusion of environmental values in the decision-making process. As Dixon *et. al.* (1988) point out, 'it is rarely a simple choice between development and the environment; rather it is generally a question of incorporating sensible measures for environmental protection into the earliest stages of development projects' (1988, pp.6-7). Some form of value system is essential to help provide a systematic evaluation of the alternative approaches to a project (Bisset, 1988; Glasson, *et al.*, 1994).

2.2 The Ethical Basis for Environmental Decision-making and EA

In considering the ethical basis of public decision-making seven major ethical paradigms can be discerned (Finsterbusch, 1995) and whichever ethical decision-making ethic is chosen, EA has a positive role play.

The first paradigm is that of 'utilitarianism' which judges that the best solution is that which provides the greatest good for the greatest number of people. EA is an excellent tool for determining the full set of adverse and beneficial effects upon which a utilitarian decision may be made.

The second is the 'libertarian' view which considers that the rights of the individual are paramount. According to Nozick (1974), this view means that the only decisions that should be made by the state are those in the areas of defence and law enforcement, and that most other decisions will infringe the rights of the individual, especially their property rights. EA provides the mechanism to evaluate how the actions of the proposed project may affect the individuals and their rights.

Rawls' (1971) 'theory of justice' provides the third paradigm. This requires that the decision-making process treats all members of the contractual society equally. When a decision involves inequality, which it will often do in the real world, the decision is considered to be just if everyone potentially benefits from it. If some have to bear some costs, these may be considered acceptable if the more advantaged bear the costs rather than the less advantaged. The EA process enables the justice paradigm to be evaluated.

The fourth decision-making paradigm, the Marxian 'condemnation of exploitation', calls for the removal of all forms of exploitation and bias. For the implementation of such a paradigm, EA can provide an evaluation of unequal distribution of power and benefits.

'Functionalism', which seeks to evaluate policies on the basis of how well they improve the functioning communities, states or societies rather than the individual, is the fifth paradigm. EA can provide the information for functional decision-making.

The sixth ethical paradigm is the 'democratic decision-making process'. Habermas (1977) suggests that a truly democratic decision-making system requires that the information for the decision-making process should be equally

accessible to all people affected by that decision. An EA is required to provide a full evaluation of all the effects and their receptors. Habermas, also points out that not only should the information be available to all, but that it should be accessible to all, i.e. written in plain English with little or no technical language. The EA can provide a mechanism whereby democratic decision-making can occur. This can only occur if the EA is written in an unbiased style with no technical jargon, which then allows all persons affected to participate in the democratic political process. Whether intentional or not, technical jargon is a subtle form of disenfranchisement of the less-educated groups in society (Habermas, 1977).

The EA process which involves the participation of the public in the decision-making process enhances the democratic process (Finsterbusch, 1995). If such a process allows for informed public participation of all, it is much better than the public hearing style of participation. In the latter process the dominant personalities will have their say, but there will be little opportunity for the more introvert members of the public to comfortably participate. The confrontational style of such a process does not allow the effective communication between the public and the developing or decision-making agencies (Hornback, 1981).

The final ethical paradigm is the 'ethical pluralism' view where rather than excepting that there is one overriding criterion as with the other six paradigms, the criteria may vary from case to case. The only way that the significant effects can be assessed effectively and weighted against each other is by using some form of EA process.

Finsterbusch (1995) does note that when the costs of the evaluation process exceed the benefits of such an assessment, there is no ethical basis for undertaking an EA.

The severn paradigms cover a wide range of different ethical bases for environmental decision-making. All seven can best be implemented by the use of EA to provide the requisite information required by the decision makers. In western society the democratic decision-making process is seen as the ideal ethical basis for our decision-making process but in making a political decision it has to be combined with one of the other ethical paradigms. The most common combination is utilitarism (the greatest good for the greatest number)

and the democratic decision-making process. The reality of the political process in the UK is that it superficially seeks to provide for a democratic decision-making process, but in reality it does not guarantee the accessibility of all the information to all the participants in the process. The less educated groups, who are very often the main potential receptors of the effects, in many cases are not invited to participate in the process, and if they are, they find that the format of the document and the technical jargon prevents them from understanding the issues and justifications, and from being able to comment on the potential effects.

In summary, a discussion of the main ethical bases for decision-making provide the following criteria for a good EA process and associated documents:

a) in any project there will generally be some beneficial effects and some adverse effects. A decision has to be made, which very often is a compromise providing the greatest good for the greatest number of people or receptors;
b) any decision should ensure that all those who are disadvantaged are adequately compensated in form or other;
c) include a range of alternatives to provide a choice for decision-making;
d) information should be equally accessible to all people affected by that decision;
e) public participation in the EA enhances the democratic process;
f) inclusion of public comments and concerns derived from the participation process should be included in the EA outputs;
g) the lack of technical jargon in all public documents and the ESs;
h) the need for real values to define the potential effects of a project;
i) the inclusion of indirect effects on people, future generations and the environment; and,
j) EA costs should not be excessive in relation to the benefits provided by the assessment process (efficiency of the EA process).

2.3 Environmental Value

Whichever ethical paradigm is chosen as the basis of the decision-making process, there is a need to evaluate the values and significance of the effects upon the environment.

The values of environmental elements such as rivers, wetlands and coastal areas within the overall ecosystem create a very complex issue. Amongst many functions these elements provide and regulate water flows, perform vital cycling and filtering tasks, provide valuable ecological linkages and islands, as well as potentially containing a diverse range of habitats and species. They also provide for a wide range of human functions including transport, fisheries, recreation, irrigation, water supply and treatment.

Whilst it is often very simple to predict that there will be a number of environmental effects from a proposed new project in the water environment, to actually assess the value and significance of such effects is a much harder task. For example, a flood defence scheme could possibly cause the loss of naturally eroding cliffs along a riverbank, which could be very important in providing nesting sites for birds such as kingfishers and sand martins. Should another alternative route for the new channel be chosen? Some form of environmental value is necessary in order to assist with the decision-making process. How should we value the environment, what value system should we use and what are our responsibilities to others and the environment? The use of value systems is further discussed later in this chapter.

Environmental Philosophy

If we look to the work of environmental philosophy, a number of theories have been developed to try and answer some of these questions which superficially appear to be quite simple, but when studied in some detail, the potential complexities of these issues soon becomes apparent. The concept of environmental value is central to the arguments of environmental philosophy. One major tenet of environmental ethics is that 'future generations, non-human animals and non-sentient nature are all morally considerable' (Goodin, 1983, p.x). An ethic 'indicates among other things, appropriate and inappropriate behaviour and treatment and to whom it is applicable' (Sylvan and Bennett,

1994 , p.7). These concepts and their links with economic thinking will be discussed in some detail, because environmental value and its use in environmental policy-making and decision-making are important features of any EA process.

Traditional economic models have ignored the economy-environment inter-relationships altogether (Turner *et al.*, 1994), treating nature only as a resource to be exploited and, therefore, valued only as a monetary capital asset. They simplify the model used and fail to accept a wider picture where 'the industrial economy is only part of the "Great Economy" - the economy that sustains the total web of life and everything that depends on the land' (Daly and Cobb, 1990, p.18). How then should the environment be effectively taken into account in the decision-making process?

In an attempt to answer this problem environmental economics was born. One of the first stepping stones in developing the moral arguments for the need to include the value of the environment and its systems as well as the wants of the individual, was the Leopold's 'Land Ethic' (Leopold, 1949). The early concepts of environmental economics then blossomed in the 1960s with the first modern green thinking and policy perceptions within developed countries known as 'environmentalism' (O'Riordan, 1983).

The ideas of environmental economics since this period have polarised into two camps. The neo-classical environmental economists seek to simplify the process by creating an economic model whereby all the relevant factors can have a monetary value. The alternate viewpoint held by those who support the concepts of ecological economics suggests that some forms of the environment can have intrinsic value in their own right. The ecological economists consider that these forms should not have a monetary value put on them, but another type of value should be used. These two environmental economic philosophies have been developed from the two environmental philosophies known as shallow and deep ecology respectively; or with reference to sustainable development, weak and strong sustainability (Cooper and Palmer, 1992).

Some of the fundamental reasons put forward by environmental economists in the weak sustainability camp (Pearce and Markandya, 1989; Winpenny, 1991) for being able to put a value on the environment are :

a) many current evaluation systems do not include environmental issues, therefore, it would help to redress the balance between quantifiable and non-quantifiable effects if environmental issues could be valued in cost-benefit analysis;

b) it is a reminder to decision-makers that the environment is not free;

c) if you can put a value (in common economic terms) on as many of the effects as possible it reduces the remaining factors open to subjective judgement;

d) in order to implement the 'polluter pays' principle, you need to know how much the polluter should pay.

The counter argument to putting economic values on environmental effects which are inherently non-quantifiable, is that it merely devalues the debate. Many have criticised the concept of putting any monetary value on the environment, and have suggested that such value systems should be political or cultural, not solely economic (Sagoff, 1988; Keat, 1994).

2.4 Environmental Economics

The concepts of environmental economics will be discussed in some detail because of the recent trend in the UK for policy makers to look to monetary valuation as a key element of any decision-making process (Department of the Environment, 1991; HM Treasury, 1991). The arguments for and against such valuation systems will be examined and discussed.

Environmental economists take as their starting point the concept of sustainability and the lessons to be drawn from the 'laws of thermodynamics' first put forward by Georgescu-Roegen (1971), although the concepts can be recognised in earlier writings such as Marshall (1961):

1. *The first law of thermodynamics - the law of conservation of matter.* All resource extraction, production and consumption will eventually result in waste products (residues) equal in matter/energy terms to the resources flowing into these sectors;

2. *The second law of thermodynamics - entropy (transformations).* Environmental resources will be exploited and consumed by economic processes, and there is no possibility that such processes can ever achieve 100% recycling of materials, as some will always be returned to the environment as residues (or pollution). The importance of this concept is that there will be a long-term resource depletion, even with the most conscientious of recycling policies.

There is 'a one-way, linear entropic flow (throughput) from the environment (depletion) through the economy (production and depreciation) back to the environment (pollution)' (Daly, 1992, pp.39-40). Within a society where there are seemingly boundless reserves of natural material to be exploited, such as England in the Medieval times (with the exception of resources such as timber), this does not present a major problem to such a society. Where societies, such as the current western developed countries, are faced with near total depletion of some natural resources, such concepts start to become important factors in the decision-making process.

In trying to include environmental features in the economic model, environmental economists define capital in three broad types:

a) *man-made capital*, such as roads, houses and factories, which can be increased and decreased at our discretion without any effect on the overall natural capital (assuming the fact that the demands and sacrifices on the natural environment are ignored);

b) *critical natural capital*, such as biodiversity, wilderness, global climate and ozone layer, which are essential for life and cannot be substituted by man-made capital; and,

c) *other natural capital*, including natural resources which are renewable or that can be replenished or substituted by man-made capital, such as sustainable timber forests (Winpenny, 1991).

All environmental economists agree with the basic concept of sustainability, requiring the conservation of the critical natural capital. But there is a divergence of opinion regarding other natural capital. The proponents of the weak sustainability philosophy suggest that natural capital can be exploited as long as it is replenished either by renewed natural capital or substituted man-made capital (Pearce *et al.*,1989; Winpenny, 1991). The strong sustainability proponents suggest that natural capital and man-made capital are complementary and cannot be substituted for each other (Daly, 1995). The concept of sustainability will be discussed in more detail later in this chapter.

The development of the environmental economic model, requires the determination of the Total Economic Value (TEV), which is made up of the sum of the user benefits (Winpenny, 1991). These can be divided into three areas:

1. *actual use value* — the value to those who make actual use of the environment, for example, farmers, fishermen, canoeists, boaters, polluters;

2. *option value* — the potential present or unborn users, defined as 'a willingness to pay for the preservation of the environment against some probability that the individual will make use of it at a later date' (Pearce *et al.*, 1989, p.60);

3. *existence value* — described as 'the value of an object in the natural world apart from any use of it by humans' (Aldred, 1994, p.381).

Aldred (1994) suggests there is confusion in the literature discussing existence value, which can have a range of meanings including:

a) *Indirect Use Value* - derived, for example, from watching television or scientific value from the advancement of knowledge made possible by the existence of some environmental good;

b) *Vicarious Use Value* (or altruism) - derived from the pleasure of knowing someone else uses the environmental good;

c) *Aesthetic Value* - analogous to the value derived from works of art. Some anthropocentric environmental philosophers, such as Morito (1995) and Norton (1984), maintain that such an approach can provide an ecologically informed valuation of the environmental resource;

d) *Intrinsic Value* - derived from the knowledge that an environmental feature is preserved and undisturbed.

Rolston (1992) suggests that there is one other value in addition to instrumental and intrinsic value, which is systemic value. The ecosystem itself has a value; such a value being neither instrumental nor intrinsic which are values associated with the individual components of that system and not the whole interrelated system.

The subjective or anthropocentric view of intrinsic value is that an environmental feature can only have value if it is the subject of interest in it. 'Values, it is typically said, form no part of nature, but only come with the human response to the world' (Rolston, 1983, p.136). Others supporting this anthropocentric view, such as Randall, suggest that 'caring is extended [to non-humans] because it gives human satisfaction to do so' (1988, p.84). This is also known as the 'stewardship ethic'. 'If humans are stewards of nature, it is in their interest to protect and maintain nature because of the instrumental value it represents' (Turner *et al.*, 1994, p.33)

An objective viewpoint would suggest that intrinsic value 'recognizes value inherent in some natural occasions, without contributory human reference' (Rolston, 1983, p.158). 'Certain things do have an absolute value which makes them essentially non-quantifiable - life itself, beauty, the diversity of species' (Winpenny, 1991, p.7).

The arguments put forward by environmental philosophers such as O'Neill (1993) and Jacobs (1995) to support the environmental ethic of intrinsic value are persuasive. O'Neill cites the Aristotelian ethic that we should 'value items in the natural world for their own sake, not simply as an external means of our own satisfaction' (1993, p.24). Aristotle compares the relationship of man and nature, to the relationship of friendship to our fellow men. 'It is constitutive of friendship of the best kind that we care for friends for their own sake and not merely for the pleasures or profits that they might bring' (1993, p.24). The concept of friendship is raised to a higher level than merely objective goods. Friendship is a human need, not as basic as food and water upon which a nominal cost/price can be put, but friendship is also a very important component of flourishing life. 'To do good for friends purely because one thought that they might later return the compliment not for their own sake is to have and ill-formed friendship. ...Given the beings we are, to lack friendships is to lack what makes for flourishing human existence' (1993, p.24).

The case for the environmental ethic can proceed on similar lines. For a large number, although not all, of living things we can recognise and promote their flourishing as an end in itself. 'Such care for the natural world is constitutive of a flourishing human life' (O'Neill, 1993, p.24). The Aristotelian ethic also supports the argument that if the intrinsic value of environment, (or friendship), is valued using monetary criteria, then the intrinsic value of environment disappears to become a form of instrumental value (and so likewise friendship is devalued to become pecuniary companionship). By this definition of intrinsic value it can never have a monetary value ascribed to it (Turner *et al.*, 1994).

O'Neill comments that Routley's 'last man' argument is often cited in defence of the environmental ethic. The argument is as follows:

> 'If non-humans have only instrumental value, then the last man whose last act was to destroy a forest or magnificent oak would have done no wrong; the last man does do wrong; hence it is false that non-humans only have instrumental value' (O'Neill, 1993, p.12).

However, there is a counter argument that if you take a subjectivist account of

value, the last man does no wrong, since a world without humans is without value.

A fine view of a mountainous landscape or wilderness may be seen to have a value, as when John Muir opposed the construction of the dam in the Hetch Hetchy valley in the USA on the grounds that wild mountain parks should lack 'all...marks of mans work' (Dubos, 1980). This infers that wilderness can have such a value in virtue of our absence. Such arguments again support the philosophy that an environmental feature, therefore, can have value in virtue of its relation with human beings without being only of instrumental value for humans.

Although I consider that the concept of intrinsic value is valid, and that it would be wrong to ascribe a monetary value to it, I accept that there will also very often be an instrumental existence value, as well as an actual use value and option value, that could be usefully valued in monetary terms, which may aid the decision making process. It is possible to ascribe some other forms of non-monetary value to environmental features of intrinsic value and these are discussed later in this chapter.

2.5 Sustainable Development

The concept of sustainable development has arisen from the 'increasingly conclusive evidence of environmental unsustainability' (Ekins, 1994, p. 29). In 1966, Boulding wrote an essay about 'spaceship earth', arguing the case against unlimited development of resources and for a concept of a circular system, where conservation, recycling and waste reduction policies are required to survive (Boulding, 1966).

In the early 1970s, the Gaia hypothesis was proposed. This sought to explain the survival of life on Earth by treating life and the global environment as two parts of a single system (Lovelock 1988; Watson, 1991). 'If Gaia (the system) is knocked dangerously off balance (by human activity and waste disposal), it can repair itself. But the process of repair only guarantees the system's survival and not the survival of any one (including humans) individual species ... The system (Gaia) has developed so that it can regulate

and repair itself' (Turner *et al.*, 1994, p.33). The need for a steady state economy to ensure that the system never reached such a perilous state, has been recognised by many.

The concept of a need for a steady state economy was not new, thinkers such as Malthus [1766-1834] (1909), Ricardo [1771-1823] (1926) and Marx [1818-1883] (1970) suggested that there would be limits to economic growth. Malthus believed that the population would outgrow the means of subsistence (agriculture) and a state of misery or the stationary state would follow. Ricardo suggested that there would be relative limits for a growing economy, i.e. once the best resources had been used, lower grade resources would be used, but at a greater cost; and Marx believed that economic growth might be limited by social and political unrest.

The stationary state idea re-emerged during the 1970s when it was popularised again by Daly (1977), where a limit to human presence, or scale, in the overall system was envisaged. Many environmental economists, such as Turner *et al.*, (1994) and Winpenny (1991) do not accept the 'steady state' philosophy; diverging from the ideas of philosophers and economists believing in ecological economics such as Daly and Cobb (1990) and Costanza (1991). 'Ecological economics is an alternative that recognises the dependence of the economic system on the natural world and the ethical content of economic decisions' (Gowdy and Olsen, 1994, p.162). Development (the qualitative improvement in circumstances) is not necessarily synonymous with growth (the quantitative increase in the physical scale of the economy). Daly suggests that 'an economy can develop without growing, just as the planet Earth has developed (evolved) without growing' (Daly, 1992, p.36).

Economists have sought to identify a level of environmental use that preserves the natural capital in some sustainable way. The satisfactory definition of 'sustainable development' has taxed the minds of many economists, e.g., the Pearce Report lists 30 suggested definitions (Pearce *et al.*, 1989) and another paper lists almost 60 (Pezzy, 1989). The origins of the phrase 'sustainable development' can be traced back to such texts as Max Nicholson's The Environmental Revolution (1970) and the World Conservation Strategy: Living Resource Conservation for Sustainable Development (IUCN, 1980). Recent discussions have centred around the Brundtland Commission's

definition of sustainable development:

> 'to ensure that (development) meets the needs of the present without compromising the ability of future generations to meet their own needs' (World Commission on Environment and Development, 1987, p.8).

The concept is that we should bequeath to future generations the same natural capital, that we currently enjoy. Whilst it is an admirable concept, there are many problems involved in trying to implement such policy. Future unborn generations with an unknown lifestyle cannot be consulted about the world they may wish to live in (Daly, 1995). The number of people to be satisfied by such natural capital assets will increase in the future and so the nature and value of these assets to be bequeathed to future generations is therefore problematic. Others have questioned the concept further:

> '... there is nothing sacrosanct about the stock levels we have inherited from the past. Whether or not policy should be directed at expending environmental resource bases is something we should try and deduce from considerations of population change, intergenerational well being, technological possibilities, environmental regeneration rates and the existing resource base' (Dasgupta and Maler, 1990, p.10).

Some traditional economists such as Beckerman (1994), suggest that a strong sustainability philosophy which overrides all other considerations is morally unacceptable, as well as impracticable. He argues that weak sustainability in which compensation is made for resources consumed, is traditional economic welfare maximisation and concludes that the concept of sustainability is therefore redundant. Many refute such arguments, noting that strong sustainability is not an overriding ethic, but one of a number of ethics that should be included in the decision-making process (Sagoff, 1994; Jacobs, 1995).

A policy of sustainable development will have a number of wide ranging implications and should:

'i) avoid damage to critical natural capital, such as biodiversity, etc., and be wary of starting processes that are irreversible;

ii) where possible put economic values on environmental costs and benefits as a reminder to decision-makers that the resources are not free, ...

iii) in certain cases, 'internalise' the costs of the project to the environment, either by requiring compensation to be made ... or by building a 'compensatory project' into the scheme being appraised (e.g., planting to replace trees destroyed during road building);

iv) for man-made and non-critical natural capital, aim to recover at least the initial capital by the end of the project ...;

v) on project design, and as part of project negotiations, aim to incorporate as many of the environmental costs (and benefits) as possible through the adjustment of actual prices, taxes and subsidies' (Winpenny, 1991, pp.4-5).

Most environmentalists do not accept the concept of weak sustainability and Jacobs (1995) suggests that those environmental economists who do are in the minority. He notes that the 1994 conference of the International Society for Ecological Economics hardly mentioned the concept of weak sustainability and that some of the most distinguished theorists and practitioners are supporters of the concept of strong sustainability including: Daly, Norgaard, Costanza, Martinez-Allier, Leff and Ekins (Jacobs, 1995). However, this argument is weakened somewhat, by the fact that by definition ecological economists support the philosophy of the strong sustainability. But it is noted that there is no equivalent international organisation supporting the weak sustainability position, and therefore, the argument by Daly (1995) and Jacobs (1995) that internationally mainstream environmental economists now support the concept of strong sustainability does have some validity. These arguments refute the

ideas put forward by the supporters of weak sustainability, as over-simplistic, and economically and ethically suspect.

2.6 Methods of Evaluating Projects

There are many different approaches to aid the decision-making process of a project in the water environment that have been used over the years. Some form of evaluation technique or combination of techniques, such as cost benefit analysis (CBA), cost-effectiveness analysis (CEA), EA or multi-criteria analysis (MCA - a combination of CBA and EA), is required for the decision makers to come a rational decision (Hanley and Spash, 1993).

Many evaluation techniques aim to synthesise the different dimensions of an environmental effect into common units. These are generally monetary, but may occasionally be solar energy for some particular ecological system evaluations (Folke,1991).

The most common forms of appraisal for current projects are cost-benefit analysis (CBA) and cost effectiveness analysis (CEA). 'The former is used where benefits can be valued, and the latter where the exercise is one of selecting the best (i.e. lowest-cost) method of satisfying a given objective' (Winpenny, 1991, p.42). EA techniques analyse environmental effects in a consistent multi-dimensional framework and will be discussed in more detail later in this chapter. The multi-criteria analysis (MCA) approach involves adopting a number of criteria for project selection, which may include efficiency (CBA may be used to perform this role), equity, and environmental quality (EA).

2.7 Cost Benefit Analysis

The standard method for environmental economic evaluation using common monetary units is the CBA, which is a system of decision-making for projects and policies, based on a method which estimates the net effects on the economy from the activity being appraised (Winpenny, 1991). In CBA 'both

costs and benefits are translated, as far as is feasible, into monetary terms and discounted over a given time horizon. Only projects with benefits greater than the costs are acceptable' (Turner *et al.*, 1994, p.8).

The first ideas of CBA were introduced as early as 1808, by Albert Gallatin, US Secretary of the Treasury, when recommending the comparison of costs and benefits in water related projects. In the USA, CBA was developed from the requirements of early legislation such as the 1902 Federal Reclamation Act and the 1936 Flood Control Act. The US Presidential Executive Order 12291 of 1981 now explicitly requires all new regulations to apply CBA to all US federal policies, programmes and projects in the USA (Hanley and Spash, 1993).

In the UK, all Flood Defence schemes which are part-funded by MAFF are required to have a CBA together with an associated EA (MAFF, 1985). The CBA will require an input of data from an EA to identify effects and initiate cost/benefit analysis.

The basic principle of CBA is that 'an activity should proceed if it generates benefits for the gainers which are more than enough to compensate those who will lose' (Mishan, 1971, p.316). Traditionally this requires a monetary value to be calculated for all costs and benefits associated with the project. A benefit-cost ratio is often used, as it can be meaningful to a decision-maker with a choice of different sized projects, and a range of capital costings, and is a major component of the decision-making procedure used in the MAFF funding of flood defence and coastal projects undertaken by the Environment Agency.

The ability to value the environment in a decision-making process cannot be denied, but such a value does need to be equitable and morally acceptable. Some such as Knetsch suggest that we should 'back off from valuations that are, with current methods (CBA), not capable of acceptable monetary assessment'. His suggestion is that we should have 'some form of interim damage schedule' or standard schedules of rates for environmental compensation (Knetsch, 1994, p. 364). Such an approach does provide an oversimplified approach to the problem leading to potential criticisms from many different quarters of the schedule of rates. The environment is made up of a complex set of interactions, and therefore the unique contextual

associations of the environmental features are very important. A schedule of rates could not easily provide for such complex interactions.

It has been suggested by some (Swartzman *et al.*, 1982) that because of the inherent problem of environmental evaluation in CBA, it should be left out of the CBA and the environmental costs can be listed, and benefit and cost flows presented undiscounted. 'What will then emerge is not a full-blown CBA result, but may be a useful way of presenting information about the effects of a project' (Hanley and Spash, 1993, p.272). The 1977 Advisory Committee on Trunk Road Assessment came to a similar conclusion, suggesting that monetary evaluation should be explicitly rejected but the environmental effects should be carefully listed and measured, because 'monetary evaluation was infeasible but that environmental effects clearly mattered' (Barde and Pearce, 1991, pp. 207-208).

The UK government's Economic Appraisal in Central Government (HM Treasury, 1991) in examining non-market outputs (such as environmental features) suggests that two other methods other than CBA can be used to provide such values. Firstly, they suggest a matrix or effect statement approach, where each effect is listed and quantified as far as possible, with no attempt being made to aggregate the effects. Secondly, a weighting system may be used to combine the scores or ranking associated with effects, into a single index or indicator, which is then used to rank the options. A range of different methodologies has been discussed and the use of simple matrices and checklists is recommended.

2.8 Evaluation Systems Using Non-monetary Values

A wide variety of evaluation methodologies have been developed since the introduction of EA legislation in 1970 in the USA. Canter (1979) has summarised over 100 different methods and techniques. These can be grouped into five main categories:

1. checklists (Dee *et al.*, 1973; Sondheim, 1978; Solomon *et al.*, 1977);

2. matrices (Leopold *et al.*, 1971);

3. networks (Sorenson, 1971; Odum, 1972; Longley, 1979);

4. computer simulation models (Holling, 1978; Gallopin *et al.*, 1980);

5. overlays (McHarg, 1969).

Some methodologies are quite simple and others are very complex. Lee (1989) suggests that surveys of EA practice have indicated that although the more complex methodologies have been widely discussed and taught on the majority of EA training courses, they are not as widely used as was originally supposed and they have a number of practical drawbacks in practice (VROM, 1981a; 1981b).

Checklists

These methodologies, as their name implies, provide lists for the assessor to work through as part of the impact assessment process. The list may be based on project characteristics (features of the development type which are likely to lead to significant environmental effects) or on environmental characteristics (environmental elements which are potentially sensitive to development), or a combination of both project and environmental characteristics (Lee, 1989).

The prime value of checklists is in promoting a measure of standardisation and comprehensiveness in the implementation of EAs (Lee, 1989). They can be extremely useful for inexperienced staff who may not be particularly familiar with a development type or the environment being assessed. However, this advantage can become a disadvantage if inexperienced staff are undertaking the assessment in a mechanical manner, without any real understanding or regard to the EA process of impact and effect identification. Lee (1989) suggests, therefore, that the explanatory notes accompanying checklists, needs to be very carefully prepared.

More complex checklists can have highly structured approaches involving the application of scaling techniques and weighting factors for a range of alternatives. Two such methodologies that have been developed for water

resource projects are the Battelle environmental evaluation system (EES) (Dee *et al.*, 1973) and the water resources assessment methodology (WRAM) developed by the US Army Corps of Engineers (Solomon *et al.*, 1977).

Matrices

Interaction Matrices combine the use of two checklists (normally environmental characteristics and project actions) on two axes. They may be used in two different modes. Firstly, to identify which project impacts will cause effects on a range of environmental topics, and secondly, to record the project-environment links and their significance. Matrices are straight-forward to use in the first mode, but in the second mode the matrices only record the significance, they do not necessarily explain how the analysis concluded that the effect was significant. One of the drawbacks of matrices is that it is very difficult to adequately convey to the reader the cumulative, synergistic or neutralising effects of the impacts on the environment. This can be overcome by using matrices in combination with other methodologies.

The matrices in themselves, provide little guidance as to how they should be used, and can, as with checklists, be used in an 'over-mechanical' way by the inexperienced assessor (Lee, 1989). Adequate accompanying guidelines are essential.

The information provided in matrices can be either numerical, text, graphical symbol or any combination of these. Unless carefully designed matrices can often leave the reader more confused, rather than having a clearer understanding of the assessment outputs. Readers will be scanning the information to detect patterns of information and key significant effects. Figure 2.1 shows an example of two matrices showing the same information, one using text in the form of the letters L (low),M (medium) and H (high); and the other using the graphical symbols [*],[**] and [***] to represent the same output information.

One of the first matrix methodologies to be developed for EA was the 'Leopold matrix' (Leopold *et al.*, 1971). This matrix lists about 100 specified action and 90 environmental elements. The first step involves the identification of effects for each intersection of action and environmental element. If there is likely to be an effect, a diagonal line is marked in the appropriate box in the

matrix. The second step involves the assessment of the effect in terms of magnitude and significance. Magnitude being assessed on a scale of 1 to 10; 1 representing a low magnitude and 10 a large magnitude. Magnitude should be based on an objective evaluation of the 'facts' related to the potential effect. The significance is also assessed on a scale of 1 to 10; with 1 again representing a low significance and 10 a very high significance value. The subjective assessment of the significance can be undertaken by either an individual, a small group or a larger interdisciplinary team working on the EA of the project (Canter, 1996).

Figure 2.1 Example of using letters and symbols in a matrix

	Option A	Option B	Option C	Option E
Soils	L	H	M	L
Air	L	L	L	L
Water	H	M	L	L
Ecology	L	H	M	M

	Option A	*Option B*	*Option C*	*Option E*
Soils	*	***	**	*
Air	*	*	*	*
Water	***	**	*	*
Ecology	*	***	**	**

Key:					
	Low	=	L	=	*
	Medium	=	M	=	**
	High	=	H	=	***

One of the advantages of the Leopold matrix is that it can be expanded or contracted to fulfil the requirements of a specific project. The summation of the number of columns and rows having an interaction can provide an insight to the likely consequences of a project or alternative (Canter, 1996), but this

should be undertaken with caution. As the summation does not include any weighting factors with respect to different effects this may lead to some misleading conclusions, especially as the indirect linkages with other secondary effects are not easy to identify in the matrix.

The matrix can be used to identify beneficial as well as adverse effects, and the probability of occurrence can be added in more complex matrices.

A variant on the simple matrix is the stepped matrix which can address the secondary and tertiary effects, an example of which is shown in Figure 2.2. The environmental elements can be displayed against project impacts. The matrix can be followed through to another matrix which displays the consequences of the initial effects.

Canter (1996) suggests that it is best to develop a specific matrix for a project, rather than using a generic development type matrix. He suggests the following steps to prepare a simple interaction matrix (1996, p.78):

1. EA team to list all the likely project actions/impacts and group them in temporal phases, such as site investigation, construction, operation, maintenance and decommissioning;

2. List all the relevant environmental factors from the environmental setting and again group them (a) according to physical-chemical, biological, cultural and socio-economic categories and (b) based on spatial considerations such as local or regional; or upstream, site and downstream.

3. Discus the preliminary matrix with the EA team and/or advisors.

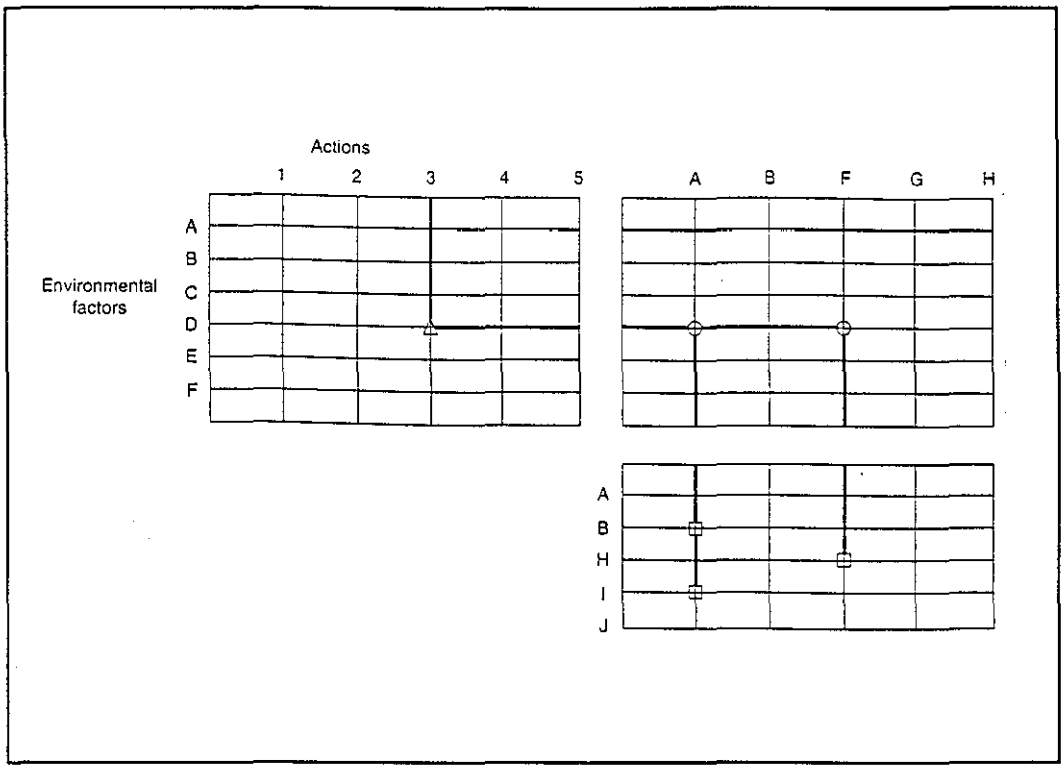
4. Decide on effect-rating scheme to be used, e.g., numbers, letters, graphical symbols or colours.

5. As a team talk through the matrix, agreeing ratings and making notes in order to summarise the effects of the project.

Matrices can also be used for other stages of the EA process including

summarising baseline environmental conditions (Canter, 1996).

Figure 2.2 Example of a stepped matrix (Canter, 1996, p.69)



Networks

These methodologies have been developed to provide the identification and recording mechanisms for the transmission of effects through an environmental system. They can show the secondary and tertiary inter-relationships and can aid discussion by the EA team as to such relationships.

The potential drawbacks of networks are that they provide minimal information on the technical aspects of the prediction of the effects (Canter, 1996). They can get very complex in nature if they are to truly cover the majority of effect linkages that could occur and, therefore, the complex nature of the required network that needs to be developed can be daunting to the inexperienced assessor and the complex diagrams can often insufficiently intelligible that readers do not understand or use them (Lee, 1989).

To offset the problems associated with complex network diagrams, simpler diagrams which analyse the cause and effect links for each impact of the project can provide both the reader and the inexperienced assessor with a useful analysis and communication tool.

The cause-effect diagrams do have there limitations. They still require the assessor to have a good understanding of the assessment processes involved, but not necessarily in great detail (Lee, 1989), and the diagrams, as with matrices, do not provide the reader with an indication the cumulative, synergistic or neutralising effects of the impacts on the environment. However, if they are used in combination with other methodologies such as checklists, they can provide a good impact/effect identification tool for the assessor and reader.

Computer Simulation Models

A number of methodologies have been developed using the cause and effect networks with computer software (Holling, 1978; Gallopin *et al.*, 1980). Theoretically, the user need not have an expert knowledge of the cause and effect linkages within the network as long as the model has been adequately calibrated (Lee, 1989). They do have their drawbacks which can include: the computer package not being calibrated for a particular development type or environment characteristics; not necessarily comprehensive enough for a particular project; they may require specific baseline data that is not easy to obtain; the algorithms for significance may need to be re-calibrated for a new project; and they may not always be user friendly (Lee, 1989).

Overlays

This technique is based on McHarg's proposition 'that any place is the sum of historical, physical and biological processes, that are dynamic, that they constitute social values, that each area has an intrinsic suitability for certain land uses and finally, that certain areas lend themselves to multiple co-existing land uses' (McHarg, 1969, p.104). Maps identifying factors such as: existing land use; historical landmarks; physiographic features; tidal inundation; geology; slope; existing vegetation; soil limitation for foundations; can be combined using overlay techniques to provide suitability maps for various land uses, such as urbanisation, recreation and forestry (McHarg, 1969). The suitability maps are prepared using information provided by matrices. The matrices provide information on the incompatibility of land uses, natural determinants and consequences of activity or land use, which indicates which

overlay maps should be combined to provide the required suitability map. This technique is especially suited to being used with a computerised geographical information system (GIS).

The overlay technique is particularly useful in determining alternative sites, especially when used in a land use planning context. It can be used successfully to identify and communicate to the reader spatially where effects or conflicts are likely to occur, however, it cannot be used for quantifying effects or identifying indirect effects (Canter, 1996).

Choice of Assessment Method

Glasson *et al.*, (1994) suggests that in choosing an assessment method, the following should be considered by the assessor, 'some of which conflict:

1. to ensure compliance with the regulations;

2. to provide a comprehensive coverage of a full range of impacts, including social, economic and physical;

3. to distinguish between positive and negative, large and small, long-term and short-tem, reversible and irreversible impacts;

4. to identify secondary, indirect and cumulative impacts as well as direct impacts;

5. to distinguish between significant and insignificant impacts;

6. to allow comparison of alternative development proposals;

7. to consider impacts within the constraints of the area's carrying capacity;

8. to incorporate qualitative as well as quantitative information;

9. to be easy and economical to use;

10. to be unbiased and to give consistent results; and

11. to be of use in summarising and presenting impacts in the EIS' (Glasson *et al.*, 1994, p.93)

The Economics and Social Commission for Asia and the Pacific (1985;1990) suggest that these methods can be categorised into five main types which they have evaluated in terms of sixteen criteria. They included cost benefit analysis technique for comparison in their analysis (see Table 2.1).

Table 2.1 Summary of EA Methodology Evaluation

(based on Economic and Social Commission for Asia and the Pacific (1985))

Criteria	**Check -lists**	**Overlay**	**Network**	**Matrix**	**Env. index**	**Sim. model.**	**CBA**
1. Comprehensiveness	o	.	O	o	o	O	o
2. Communicability	O	O	o	O	o	O	O
3. Flexibility	O	o	O	O	o	O	o
4. Objectivity	.	o	o	O	O	o	O
5. Aggregation	.	o	.	.	o	.	o
6. Replicability	o	O	o	o	o	o	o
7. Multi-function	.	o	o	o	o	O	o
8. Uncertainty	.	.	.	.	.	o	.
9. Space-dimension	.	O	.	.	o	o	.
10. Time-dimension	o	.	.	.	o	O	o
11. Data requirements	O	.	o	o	o	.	.
12. Summary format	O	o	o	O	o	O	O
13. Alternative comparison	o	O	O	O	O	O	O
14. Time requirement	O	.	o	o	o	.	o
15. Manpower requirement	O	o	o	o	o	.	o
16. Economy	O	O	O	O	O	.	O

Legend:

O = Completely fulfilled, or low resource needed.

o = Partially fulfilled, or moderate resource needed.

. = Negligibly fulfilled, or high resource needed.

Thompson (1990) evaluated 24 different methodologies which he separated by differing treatment of magnitude and significance. The summary of his

evaluation is shown in Table 2.2.

Table 2.2 Examples of EA Methodologies

(developed from Thompson (1990, p.236-239))

Group 1

The Water Resources Assessment Methodology (WRAM) (Solomon *et al.*, 1977) makes explicit use of scaling and weighting methods. Environmental, social and economic components are weighted by an interdisciplinary team using a ranked pairwise comparison technique. Scaling is achieved by three alternative approaches; the use of the scaling part of the weighted rank technique; the use of function curves (see also Dee *et al.*, 1973); and the proportioning of the resulting scaled impacts. Full details are included on how this scaling may be carried out. Values obtained for the effects of each alternative on specific environmental components are expressed in terms of 'alterative choice co-efficients'. Weighting and scaling values are multiplied in a matrix to produce a final aggregate score for each alternative. At no stage is there an input of public opinion.

Group 2

The Crawford Methodology (Crawford, 1973) has less explicit guidelines than those exhibited in group 1. It was devised for use in highway route planning and makes extensive use of public involvement by employing a Delphi technique on three reference publics to gather information for the following:

1. The assigning of relative weights.
2. The prediction of consequences for the alternative to be evaluated.
3. Estimations of the probability of the predicted consequences.
4. Numbers to represent the magnitude of the impact of each consequence on each evaluation criterion.

An interdisciplinary panel of experts is responsible for predicting consequences and estimating probabilities for each highway corridor alternative. Estimates of impact magnitude are developed on a seven point scale, from +3 to -3. The impact of an alternative on each set of evaluation criteria is then calculated by multiplying impact size by probability. Results are then presented showing each highway alternative as a percentage of the maximum possible positive or negative impact.

Table 2.2 continued Examples of EA Methodologies

(developed from Thompson (1990, p.236-239))

Group 3

The PADC methodology (Clark et al., 1983) favours a disaggregated presentation of impacts (i.e. there is no attempt to group impacts under generic headings) and there is no specific mechanism for public involvement. Significance, for each impact, is determined by a choice on each of the following polarities:

1. Adverse/Beneficial
2. Short-term/Long-term
3. reversible/Irreversible
4. Direct/Indirect
5. Local/Strategic

Qualitative statements of significance such as this could clearly be aggregated by summing the numbers within each polarity. To do so would, however, implicitly weigh all impacts equally. No indication is given as to how alternatives may be made ... Ranking and weighting of impacts is also mentioned, but with a warning to guard against creating an illusion of objectivity.

Group 4

The Leopold matrix (Leopold *et al.*, 1971) contains no guidelines on how significance should be determined. There is no attempt at aggregation of impacts, nor any input of public opinion. ... employing matrix cells to relate project activities to environmental parameters. The matrix cells are bisected by a diagonal line, above which is entered a value for impact magnitude whilst below is placed a value for importance. Definitions of magnitude and importance are presented ... A rating system from 1 to 10 is suggested as a means of discouraging purely subjective opinion and the method asks that impact statements should contain the reasoning behind the assignment of values for magnitude and importance.

Group 5

The Fischer and Davis methodology (Fischer and Davis, 1973) does not explicitly differentiate between impact magnitude and significance. A complex three-phase process is handled by an interdisciplinary team to develop an implicit indicator of significance. Impacts are assigned a "+" (benefit) or "-" (cost), for which some guidance is given and the degree of impact from 1 (low) to 5 (high) is assigned subjectively by the team. Additionally an "s" or "l" suffix is used to indicate short-term of long-term impacts. Those achieving plus or minus 4 or 5 scores are transferred from an "environmental compatibility matrix" to a "decision matrix". The exclusion of "low strength" impacts from the decision matrix can be seen as risking the loss of valuable information, or as focusing the study upon "key issues", depending upon one's viewpoint.

Table 2.2 continued Examples of EA Methodologies

(developed from Thompson (1990, p.236-239))

Group 6

The Loran methodology (Loran, 1975) does not consider significance explicitly and makes no specific provision for input of public opinion. It does use a matrix of 234 project activities and 27 environmental features. each element is scaled according to forecast severity of impact from 0 (none) to 5 (severe) by the interdisciplinary team. The result is recorded using a computer algorithm and a primitive aggregation of impacts is achieved via a "clustering" of highly rated impacts.

It is suggested that the technique serves to identify critical environmental areas. No further evaluation is made and it is not clear how project variant discrimination should proceed.

In addition to these main types of methodology there is the *ad hoc* method which is sometimes used. This consists of the information on the effects of the project being presented without any cause and effect relationships or relative weighting of the effects. Such lack of any real assessment of the potential effects of a project mean that such a methodology produces outputs which are of little real value to a decision-maker. It is not recommended that such a methodology should be used for EA in normal circumstances.

Each methodology has its advantages and disadvantages. Nichols and Hyman (1980) concluded that of the fifteen methodologies that they reviewed and evaluated, none satisfied all the evaluation criteria that they had established for good EA. These criteria were: treatment of the probabilistic nature of environmental quality; incorporation of indirect and feedback effects, dynamic characteristics; multiple-objective approach to social welfare; clear separation of values and facts; facilitation of participation by the public and decision makers; and efficiency in resource and time requirements. They also concluded that many did not satisfy the criteria even substantially.

Canter (1996) suggests that it can be useful to use portions of several methodologies for particular activities within the overall EA. This will ensure that the best characteristics of each are utilised in an appropriate manner. Matrices and networks are useful for impact/effect identification, whilst checklists can find greatest application in the evaluation of alternatives.

Multi-criteria Analysis

One other method for the evaluation of alternatives is multi-criteria analysis (MCA). An example of MCA approach is the method developed by Chechile and Carlisle for multiattribute utility measurement, based on the work of Hill (1978) and Edwards (1971) for their work on environmental decision analysis. They cite the example of the analysis for a new fish ladder, where they consider four attributes, or value dimensions, associated with each alternative:

'1. the value of saving time in building the ladder
2. the value of building the ladder for less monetary cost
3. the value of the ladder effectiveness
4. the value of the attractive appearance for the ladder'
(Chechile and Carlisle, 1991, p.73)

The steps in the analysis process for are:

1. Establish the alternatives
2. Establish dimensions of the values
3. Rate outcomes on each dimension
4. Determine minimum thresholds which are acceptable for each dimension
5. Determine relative weights of the dimensions
6. Determine the multi-attribute utility score for each alternative

Different viewpoints will result in different recommended actions. A power company putting in a fish ladder in a hydroelectric scheme may have a different viewpoint to that of environmentalists, with respect to the weighting of the dimensions of the value and the thresholds of acceptability of these dimensions. Chechile and Carlisle suggest that decision tree analysis is an under used tool in environmental decision-making and can assist in focusing on the key issues in a structured way. It can assist decision-makers by providing a visual representation of the possible alternatives. One limitation of such a process is the perceived infinite number of options, but alternatives can be grouped into a finite number of categories, or other mathematical procedures,

such as linear programming can be utilised in such cases. However, a mathematical process will rarely assist any process which involve political conflicts or highly political issues.

Magnitude

It is important to distinguish between magnitude and significance when predicting environmental effects. A magnitude should be an objective measurement or ranking, whereas the significance is a normally a subjective judgement by the assessor or advisors. For example, a large numerical loss of trees in a forest may not be significant. Whereas the same numerical loss of trees in a open hedgerow landscape could be very significant.

In providing a value of magnitude several types of scale may be used:

1. Ordinal Scales - provide a ranking of effects or options on the basis of the characteristic being assessed. Using this system the water quality at location 1 is class A and that of location 2 is class B using the Environment Agency's General Quality Assessment (GQA) classification system, but by how much, cannot be determined;

2. Interval Scales - provide a scale where the difference between measurements is meaningful. Water temperature figures for two locations could be 2° C and 3° C, but in no useful sense is one 50% hotter or 33% cooler than the other;

3. Ratio scales - provide measurements that have an origin, and so ratios between scores may be calculated. For example, a water flow of 50 cubic metres per minute is 100% bigger than a flow of 25 cubic metres per minute, or an effect which scores twice as highly as another may said to perform twice as well on that characteristic (HM Treasury, 1991).

It can be helpful to allow negative scores and zero implying no change, but Chechile and Carlisle (1991) suggest that in environmental decision-making it is much better to select dimensions which are positive with respect to value. For example, construction speed, which is proportional to increase in dimension value, rather than construction time which is inversely proportional to value. They suggest that 'a meaningless mixture of positive and negative attributes' (Chechile and Carlisle, 1991, p.76), makes the decision analysis process much harder, than a straight forward set of positively weighted scores for various alternatives.

Significance in Decision-making

A key question in the decision-making process is how significant is an effect? What is the significance of the loss of a 100 m^2 of wetland habitat as compared to the loss of 100 m^2 of woodland or 5 parking spaces? In non-monetary evaluation the question is how important is this issue/feature, how can we value how much it matters that it either changes or is lost? In environmental evaluation this process requires two stages: firstly, what is the value of a particular effect and how significant is it; and secondly, how significant is it in relation to all the other effects, both beneficial and adverse. The answers to these questions provides the decision-maker with the information to make a rational decision, based on the information and evaluation results available to them.

The Importance of Natural Trends

Natural trends and influences are fundamental features of the water environment which should be taken into account in the evaluation process. For example, in the United Kingdom, many of the designated wetland Sites of Special Scientific Interest (SSSIs) are being slowly degraded by reduced groundwater tables (Department of the Environment, 1992). An adverse impact which reduces the value of an environmental feature which either has no natural trend of change in value or is actually increasing in environmental value over time, will be considered to be more significant than an impact on an environmental feature which is in decline. Contrast, for example, the loss of a fine mature ash with the loss of a dying mature ash tree. The impacts will

be similar, i.e., the loss of the trees, but the significance of the effects will be different. In reality nothing is usually as clear cut as this. For example, the dying tree may be a better habitat for a more diverse range of invertebrates living on the dead wood. Natural background trends are an important feature of the context of an impact and they have not been considered properly in many EAs in the past (Wathern, 1988). These natural trends can be due to a number of factors: ecological cycles, for example, natural succession; irreversible natural trends, for example, disease or climatic changes altering the range of certain plant species. Human activity interacts with and influences these natural trends, for example, overgrazing, salinization of soils and improvement of grasslands by use of fertilizers, leading to a combination of natural and human related factors (Munn, 1979; Wathern, 1988).

Types of Effects

The interaction of factors needs to be considered both in relation to current trends and potential effects which can create cumulative or synergistic effects. Some effects are direct on environmental factors, others are indirect, for example, the extraction of stone for filling stone gabions for a flood defence scheme may involve the quarrying of a site which has a high nature conservation value.

Some effects are going to have permanent or long-term effects, for example, the felling of a group of mature oak trees, others such as noise during the construction stage will be short-term. Medium-term effects could be the effects such as the disturbance of aquatic vegetation on a flood defence project, which could take a number of years to re-establish to the same density and diversity.

Effects may often be adverse, but they can be beneficial; for example, the clearing out of some watercourses in a sensitive manner can be beneficial for a large number of flora and flora. The siltation of ditches can lead to the reduction in diversity of flora and fauna because of limitation in the range of types of habitats. The reduction in ditch management could be said to be an adverse effect in some circumstances.

The significance of the effects may range from a local to a strategic scale. Such variations in scale will be weighted differently by decision-makers,

normally in some form of subjective manner. For example, effects on a National Nature Reserve will be considered to be weighted differently to similar ones on a Local Nature Reserve.

It is important to understand whether the effects of project effects are reversible or irreversible. For example, the effect of a project which reduces the water table near an archaeological site can cause irreversible damage to any archaeological artefacts in the ground if they are allowed to dry out. Such issues do need to be highlighted in the EA process.

2.9 Conclusions

We need to know the possible consequences of our actions: for ourselves, future generations and the non-human world, before we make a decision that we or future generations might live to regret.

> 'What does it profit a man who gains a fortune and yet loses the world?' (O'Neill,1993, p59).

To enable such a man to evaluate the consequences of such an outcome before he makes an irreversible decision, and to help him to chose the best practicable environmental option is the essence of what EA should be about.

Needs of the EA Process

Discussion of environmental philosophy, economics and decision-making theory leads us to a number of conclusions of key relevance for EAs:

1. The environmental effects evaluated should include:
   a) Effects on current generation of humans;
   b) Effects on future generations of humans;
   c) Effects on non-human environment.

2. A range of alternatives should be evaluated to provide a choice for the decision-making process.

3. Irreversible choices should be not be selected without careful consideration.

4. Public participation is an important part of the democratic process of environmental decision-making.

5. The decision-making process should include the following steps:
   a) Baseline data of current situation;
   b) Baseline trends of environmental change;
   c) Predicted effect magnitude value;
   d) Use standards, prediction, or professional judgement, to determine the significance threshold value;
   e) Predicted effect significance in relation to this threshold value;
   f) Predicted cumulative effects of all inter-related effects; and

6. A valuation system of some kind is required to enable a decision-maker to make a choice. The valuation should include the identification of the significance of the effect and the effects criteria should include:

   a) Adverse/Beneficial;

   b) Short-/Medium-/Long-term;

   c) Reversible/Irreversible;

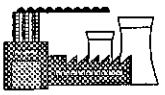
   d) Strategic/Local;

   e) Direct/Indirect; and

   f) Cumulative.

7. The EA process should cover all stages of a project, including: site investigation, design, decision-making, implementation, operation, and decommissioning. It is important that not only should all stages of the project life be considered, but that the agreed constraints and mitigation measures should be considered and implemented at all these stages. Failure to do so will lead to the decision-making process, and hence the EA process, being only a paper exercise.

Chapter Three -
EA Policy and Legislation



Chapter Three
EA Policy and Legislation

3.1 In the Beginning

Historically, EA is not a new phenomena. Lord Ashby in his opening address to a conference on EA at the University of East Anglia in 1976, suggested that 'the idea of assessing environmental impact and making plans to deal with it may be said to have begun with Noah's Ark and to have a long tradition in the history of prophesy. The recent inovation is that prophets now try to base assessment on scientific evidence rather than on superstition' (O'Riordan and Hey, 1976, p.3). This may be somewhat of an exaggeration, but it does highlight the need for and some of the problems associated with EA.

From more recent times, Fortlage cites the example of a Commission set up in 1548 to examine the environmental effects of the Wealdon iron mills and

furnaces in Kent and Sussex on the local economies (Fortlage, 1990). It reviewed the resources, numbers of jobs and other social consequences of the options in a similar fashion to a present day EA.

In the environmental decrees of Napoleon in 1810, other examples can be found of early rudimentary EA in environmental legislation. Noxious operations and occupations were divided into various categories: 'those which must be far removed from habitation, those which may be permitted on the outskirts of towns, and those which can be tolerated even close to habitations having regard to the importance of the work, to the nature and configuration of the soil, and to the importance of the surrounding dwellings' (O'Riordan and Hey, 1976, p.3).

In the following centuries, what little environmental legislation there was, tended to be enacted to protect the economic value of the environment for the benefit of only the ruling classes and the king. For example, the protection of oak timber for use in shipbuilding. However, a change in attitude to the environment evolved during the nineteenth century which can be described as a gradual move from 'the politics of interest towards the politics of value' (O'Riordan and Hey, 1976). The values of human life, e.g., slaves, children, and then wildlife, became socially acceptable political goals for new legislation, earlier legislation having been enacted only to protect the interests of the establishment.

3.2 The Evolution of Environmental Legislation

Phases of Environmental Legislation

Winter (1989) suggests that there are four distinct phases in the evolution of environmental legislation in all western societies. The first phase he calls the 'circular economy' (1989, p.38), where people use renewable resources such as water power, wind and wood, produce organic waste, and consume little in relative terms. The population remains fairly constant and has a low standard of living. There are no specific environmental laws, because as Winter points out, 'the legal norms regarding the cooperative life of human beings also ... provides for the preservation of natural resources' (1989, p.38). The laws of

common land provided for the exploitation of land on a community basis, which tended to limit the growth of individual wealth and restricted the incentives for individual investment in the land.

Winter's second phase is the 'exploitation of nature by man', where there is an enormous waste of non-renewable energy resources and a conversion of natural resources into man-made products, such as fertilisers and pesticides. Nature is used for the deposition of by products and pollutants, without any regard to their possible harmful effects. Laws are developed to allow freedom of exploitation of natural resources and common land is expropriated and unrestricted transfer of land rights is brought in. This phase seeks to 'prevent environmental damage by means of police power' (1989, p.40), but only once thresholds have been triggered and 'spatial separation' is used to allow for relatively unrestricted development.

The third phase is characterized by the 'planned management of nature' using environmental protection laws. In the UK this started in the 1960s and 1970s. In 1972 in Europe, the EU abandoned its previous single-minded strategy for free economic development and introduced new active environmental policies (Haigh, 1989). Some of these will be discussed later in this chapter.

Winter suggests that such protective laws are not enough to halt the current rate of environmental degradation and that there is a need for the fourth stage: 'thinking about new solutions'. He suggests changes in thinking, from laws providing thresholds for sickness or death, to thresholds which for 'organisms would mean impairment of well-being, and for ecosystems disruptions of a given equilibrium' (Winter, 1989, p.43). The problems of pollution containment could be addressed by a change of technology and not necessarily a development of better technology in order to improve the risks associated with the potential pollution of the environment due to human failures. Accidents will always occur whatever safety measures are taken. Human failures have been an essential component of many accidents causing severe environmental damage, such as the Exxon Valdiz oil tanker spillage in Alaska and the Chernobyl radiation incident in the former USSR. He concludes that laws must be developed which are 'inoculated with ecological considerations' (Winter, 1989, p.45) in order to provide for a viable future for mankind.

Early Legislation in the UK

In the UK environmental legislation really began in the nineteenth century. The assertion by Stamp (1969) that 'modern conservation really begins with the famous Game Act of 1831' is questioned by Evans (1992), who whilst accepting that it did highlight the problems of species protection and the interaction of animal and plants, suggests that this was conservation for instrumental, not altruistic reasons. The first legislation derived from the politics of value of wildlife, emerged in 1869 as the Sea Birds Preservation Act (UK Government, 1869), which introduced a closed season on 33 species (Evans, 1992). Thereafter, a series of Bird Protection Acts were enacted over a long period of time, the bird being one of the main beneficiaries of Victorian environmental legislation.

Table 3.1 Chronology of Some Key Environmental Legislation and Events in UK (1831-1946)

1831 -	Game Act, legal recognition of gamekeepers.
1869 -	Sea Birds Preservation Act, introduced closed season on 33 species.
1876 -	Wild Birds Protection Act, extended closed season and species covered.
1880 -	Wild Birds Protection Act, all species protected from 1st March to 1st August.
1891 -	Society for the Protection of Birds formed.
1894 -	Wild Birds Protection Act, entitled County Councils to protect certain species.
1895 -	National Trust for England and Wales was registered.
1896 -	Wild Birds Protection Act
1902 -	Wild Birds Protection Act
1904 -	Wild Birds Protection Act
1907 -	National Trust Act
1912 -	Society for the Promotion of Nature Reserves formed (now RSNC)
1913 -	British Ecological Society formed.
1914 -	Grey Seals (Protection) Act, seals facing extinction.
1919 -	Forestry Commission formed.
1925 -	Wild Birds Protection Act
1926 -	Council for the Preservation of Rural England formed (changed Preservation to Protection in 1970)
1926 -	Institute of Landscape Architects formed.
1932 -	Grey Seals (Protection) Act, extended protection season.
1933 -	British Trust for Ornithology formed.
1933 -	Protection of Birds Act, illegal to take, sell off, possess, any one of 66 British species.
1939 -	Wild Birds (Ducks and Geese) Protection Act
1943 -	Field Studies Council set up.
1946 -	Severn Wildfowl Trust set up.

Environmental Quality Legislation

The other major beneficiary from an environmental perspective was water and air quality. In the large cities such as London, Birmingham and Manchester, the quality of the urban environment in the nineteenth century was extremely hazardous to health through the uncontrolled development of industry and the insanitary condition of the sewerage and water supply systems.

The reporting of the Select Committee on the Health of Towns in 1840 and the Royal Commission on the State of Towns in 1845 resulted in the Public Health Act of 1848 (UK Government, 1848). The air quality was also recognised as a public health hazard, particularly the corrosive hydrogen chloride gases emitted from alkali works, and so in 1863, the first of a series of Alkali Acts was enacted to improve air quality.

The chronology of selected key environmental legislation and events in the UK from 1831, through to the present day is shown in Tables 3.1 and 3.2.

Development of Wider Environmental Legislation

The early environmental protection legislation tended to be species specific, e.g., the many Wild Birds Protection Acts from 1876 to 1925, derived from the lobbying of specific interest groups or societies, which resulted in legislation primarily for birds and landscape. It is only after the first half of this century, with the many writing of ecologists, such as Tansley (1946) in the UK and Leopold (1949) in the USA, that the wider acceptance and understanding of the inter-relationships of the environment started to influence scientific and political thinking towards the need for more general environmental legislation.

Development of Land-Use Legislation

Early land-use legislation derived from a need to plan the development of towns in a controlled fashion. The land-use needed to be planned in parallel with the provision of municipal facilities, such as water supply and sewerage, housing, parks, gas and electricity. The 1909 Town Planning Act (UK Government, 1909) provided local authorities with some control over housing development and the 1919 Planning Act (UK Government, 1919) required local authorities with towns with greater than 20,000 populations to start

Table 3.2 Chronology of Some Key Environmental Legislation and Events in UK and around the World (1947 - date) (International Events in Italics)

1947	-	Town and Country Planning Act.
	-	British Herpetological Society formed (reptiles and amphibians).
1948	-	International Union for the Protection of Nature (IUPN) formed.
1949	-	National Parks and Access to the Countryside Act establishes National parks, National Nature Reserves, Sites of Special Scientific Interest and the Nature Conservancy Council.
1951	-	River (Prevention of Pollution) Act sets up River Purification Boards.
	-	First UK National Nature Reserve declared at Beinn Eighe in Scotland.
1952	-	London smog kills 4000 in December.
	-	First Local Nature Reserve designated.
1954	-	Protection of Birds Act, protects all wild birds, their eggs and nests.
	-	Mammal Society formed.
1955	-	Royal Commission on Common Land set up.
1956	-	Clean Air Act.
1957	-	Electricity Act provides for duty to consider effects upon landscape and wildlife.
	-	Civic Trust formed.
1958	-	Council for Nature formed.
1959	-	Deer (Scotland) Act establishes closed season in Scotland.
	-	Conservation Corps formed (now BTCV).
1961	-	World Wildlife Fund set up to fund IUCN activities .
1962	-	*'Silent Spring', Rachel Carsen's influential book published.*
1963	-	Deer Act establishes closed season in England and Wales.
	-	Water Resources Act establishes River Authorities with a duty to consider the preservation of natural beauty and conservation of flora and fauna.
1967	-	Torrey Canyon oil tanker disaster.
	-	Cow Green Reservoir development.
1968	-	Countryside Act, Section 11 requires all government departments and public bodies to 'have regard to the desirability of conserving the natural beauty and amenity of the countryside'.
	-	Countryside Act establishes Countryside Commission.
	-	*'Design with Nature', Ian McHarg's book first published.*
1969	-	Frank Fraser Darling presents the Reith Lecture.
	-	*Friends of the Earth formed in USA.*
	-	*Don't make a wave formed (which became Greenpeace).*
1970	-	Conservation of Seals Act provides protection of Grey and Common seals during closed season.
1971	-	The Ramsar Convention on Wetlands of International Importance especially as Wildfowl Habitat .
1973	-	Badgers Act provides protection of badgers from killing or ill treatment.
	-	Protection of Wrecks Act restricting works around shipwrecks of historical, archaeological and artistic importance.
	-	*The Washington Convention on International Trade in Endangered Species of Flora and Fauna.*
1974	-	*Biosphere Reserves are first promoted by UNESCO.*
1975	-	*Convention concerning the protection of World Cultural and Natural Heritage which designates World Heritage Sites.*
1979	-	Ancient Monuments and Archaeological Areas Act restricting works around scheduled ancient monuments.
	-	*The Berne Convention on the Conservation of Wildlife of Europe's Natural Environment.*
	-	*The Bonn Convention on the Conservation of Migratory Species of Wild Animals.*

Table 3.2 (continued) Chronology of Some Key Environmental Legislation and Events in UK and around the World (1947 - date) (International Events in Italics)

1980	-	*IUCN becomes World Conservation Union.*
1981	-	Wildlife and Countryside Act gives protection to certain species .
1983	-	National Heritage Act establishes English Heritage (and Cadw in Wales).
1984	-	*Bhopal chemical industry disaster in India.*
1985	-	Wildlife and Countryside Act amendment provides for Marine Nature Reserves and Areas of Special Protection (for birds), and planning authorities can designate Areas of Archaeological Importance.
1986	-	Agriculture Act establishes Environmentally Sensitive Areas.
1989	-	Severn Wildfowl Trust becomes the Wildfowl and Wetlands Trust.
	-	Water Act provides Drainage Authorities and privatised Water Companies with duties to conserve and enhance the environment, duty to promote, liaise with English Nature and National Park authorities.
	-	*Exxon Valdiz oil tanker disaster in Alaska.*
1990	-	Town and Country Planning Act revises Tree Preservation Orders.
	-	Environmental Protection Act establishes English Nature and Countryside Council for Wales.
	-	Planning (Listed Buildings and Conservation Areas) Act regulates works on/near Listed buildings and in conservation areas.
1991	-	Water Resources Act re-establishes the environmental duties of Water Act 1989, specifically for NRA
	-	Badgers Act requires that badger setts must not be disturbed without a MAFF licence.
	-	*The Espoo convention on transboundary EA in Europe.*
1992	-	Oakhampton Bypass.
1993	-	Twyford Down highway development.
	-	Braer oil tanker spillage in Shetland Islands.
1995	-	Environment Act re-establishes the environmental duties of Water Resources Act 1991 for Environment Agency, plus sustainable development duties, and new protection for hedgerows.
1996	-	Sea Empress oil tanker spillage disaster.
1996	-	Newbury Bypass.

preparing plans for new development. The following Planning Acts further developed the requirement to plan land-use. These culminated in the 1947 Town and Country Planning Act (UK Government, 1947), which set up detailed development control procedures for the majority of developments in England and Wales. A few permitted development classes were excluded from the planning controls; agricultural developments being the major loophole in the system (Rydin, 1993).

The Town and Country Planning Act 1990 (UK Government, 1990a) provides the latest edition of legislation controlling land-use. The majority of EAs carried out in the UK are undertaken in association with submissions for planning applications, and this will be discussed later.

Conservation Legislation

From the early 1960s a wide range of other environmental legislation has been implemented both to regulate pollution and development, and to protect specific wildlife species or environmental features (Tables 3.2).

3.3 The Politics of Environment

In the mid-sixties there was a marked change in political awareness of environmental issues, 'at least on the periphery of politics, in the media, the universities and among administrators, there was something of an "environmental" fashion' (Allison, 1975, p.13). Environmental writings such as Rachel Carson's Silent Spring (1963), brought to the attention of many, the horrific effects of the misuse of insecticides, particularly their wider effects on humans and other species. 'They should not be called "insecticides" but "biocides"' (Carson, 1963, p.7). She provided the medical evidence which highlighted the effect of such biocides on humans and the whole of the food chain; titling one of her chapters, 'Beyond the Dreams of the Borgias' (Carson, 1963, p.143).

Graham (1970) in reviewing the affects of Silent Spring suggests that the book made 'large areas of government and the public aware for the first time of the inter-relationship of all living things and the dependence of each on a healthy environment for survival' (Graham, 1970, p.268).

Brooks (1973) claims that it is 'one of those rare books that change the course of history - not through incitement to war or violent revolution, but by altering the direction of man's thinking' (1973, p.227). By the spring of 1963 the book made an impact at the highest levels, e.g., Prince Philip's endorsement that he would 'strongly recommend Rachel Carson's Silent Spring if you want to see what is going on' (Brooks, 1973, p.311). The book highlights the potential for man-made disasters and highly adverse effects on the environment, not taking into account the wider implications of such actions.

Ian McHarg's Design with Nature (1969) also highlighted the inter-relationships between man and his environment, and suggested ways of

developing more systematic techniques for environmental planning in harmony with environmental processes and needs. This involved the development of land suitability analysis based on a series of overlay maps and ranking systems for each environmental characteristic.

In other areas of thought, economists such as Mishan (1967) and Daly (1968), put forward the new argument that economic and demographic growth should be suspect. They emphasised the positive value of stability and the quality of the environment. The elements of such ideas can be discovered in Sir Frank Fraser Darling's 1969 Reith Lecture (Fraser Darling, 1971), and in Tony Aldous's Battle for the Environment, published in 1972.

The planning process provides the decision-making forum for many land-use and environmental planning problems. Allison suggests that 'planning problems are mis-understood if they are thought of as technical problems to be solved by planners, architects, biologists, chemists and ecologists' (Allison, 1975, p.14). He argues that 'environmental planning, the processes and patterns of action through which the use of land is controlled in a nation-state, is political' (1975, p.17). Political theory had been absent from much of the early environmental debate. In the 1960s the 'Doomwatch Syndrome' was much talked about, where scientists were seen as the guardians of the environment. The implication of the syndrome was that environmental catastrophe was a technical issue which could only be dealt with by the scientists. The viewpoint of many was that the management of the environment was nothing to do with politics or politicians, who were only interested in social and economic issues. The slow realisation that environmental issues were not separate led to the development of international political consensus that they should be on the political agenda.

The key issue of survival of the planet is fundamentally important in the environmental debate, but as Allison suggests this can become clouded in the discussion of the many complex environmental issues. He expresses his concern that if environmental problems become equated with the 'Doomwatch Syndrome', then politicians will not face up to the hard political decisions that have to be made, leaving the complex issues unresolved, or lost without a fight.

It is hard to assess the individual importance of landmarks in the slow

emergence of environmental issues into the arena of political issues; the emergence of the politics of value over the politics of interest evolved with ever gathering pace in the 1960s and 1970s. Allison writes, 'the diffusion of ideas is rarely as simple as a direct influence one man to another, ... it is easy to point to landmarks, very difficult to assess their importance' (1975, p.14). Table 3.2 summarises a number of landmarks which influenced the need for EA of man's actions before developments proceeded.

The concept of EA must operate within a political framework and philosophy. A constant theme in planning controversies is an attempt to make a rational choice between a development, whose direct financial value can be calculated, and a wide set of social features (Gregory, 1971) whose benefit value is thought to be beyond financial calculation. The political nature of such planning decisions is self evident. Allison suggests that 'planning controversies are won by arguments within a limited range of (want regarding) political principles and theories' (Allison, 1975, p.28).

Gregory comments that there is an obvious fundamental truth common to all amenity disputes, 'what we are not prepared to pay for, we cannot have'. He goes on to question 'who are "we"? And how do "we" decide what is to be spent on preserving or enhancing amenity and the natural environment' (Gregory, 1971, p.296). The answers must lie in a political solution of some kind; relying on environmental and economic science to assist with assessing the options, predicting the effects and costing the potential financial and environmental consequences. Willingness to accept or to object to a proposed development, and the willingness to enforce a decision, are all political acts.

3.4 International Dimension

Stockholm Conference to Rio

The United Nations' Stockholm Conference on the Human Environment in 1972, 'which summed up the awakened global conscience and marked the beginning of a truly ecological era' (Kiss and Shelton, 1993, p.11), was an influential watershed event in international environmental policy and law. The declaration contained 24 principles, which provided the first general text of

international environmental law, and overcame the inertia for the slowly evolving political action.

Following the successful Stockholm Conference, the United Nations created the United Nations Environmental Programme (UNEP) in 1974. UNEP mainly acts in a coordinating and catalysing role, promoting environmental initiatives globally. One of these initiatives created the World Commission on Environment and Development (WCED), under the chairmanship of Gro Brundtland (the then prime-minister of Norway) to examine the global issues and conflicts of environment and development. The resulting report, Our Common Future (World Commission on Environment and Development, 1987), and the open and participatory way in which the Commission operated, have had a significant influence on many nations and organisations (Rydin, 1993).

In analysing the political climate of the early 1990s, Rowlands (1992) suggests that there were three factors underpinning the growth of international environmental awareness:

a) increasing domestic environmental concerns which have influenced the international agenda;

b) increases in perceived and actual pollution, and the level of global environmental degradation and losses; and

c) greater scientific knowledge (and admitted lack of knowledge) about environmental effects.

With the advent of increased access to media, especially television, many more people are aware of the various global environmental issues, such as the destruction of the rainforests and global warming, which provide such highly attractive and attention grabbing television programmes.

Rio Conference - 1992

On the twentieth anniversary of the Stockholm Conference, the United Nations convened another global conference in Rio de Janiero, from 3 to 14 June

1992, to focus on the issue of environmentally sustainable development.

The concept of sustainable development had been one of the major tenets of the Brundtland Report - Our Common Future (World Commission on Environment and Development, 1987), but can be traced back to earlier environmental writings, such as Max Nicholson's The Environmental Revolution (1970) and in policies such as World Conservation Strategy: Living Resource Conservation for Sustainable Development (IUCN, 1980).

The Rio Conference, also known as the 'Earth Summit', brought together 178 nations and many other international organisations. Five major environmental texts were issued at the end of the conference (United Nations, 1993a; 1993b):

a) Rio Declaration on Environment and Development - 27 principles;

b) Agenda 21 - a 500 page plan, linking development and environmental action;

c) Framework Convention on Climatic Change;

d) Convention on Biological Diversity; and

e) Non-binding Statement of Principle on Forests.

These international agreements bind countries, such as the UK, to implement an environmental action programme on a wide range of environmental issues. The key principle relevant to EA is:

> 'Principle 17
> *Environmental impact assessment*, as a national instrument, shall be undertaken for proposed activities that are *likely to have a significant adverse impact* on the environment and are subject to a *decision of a competent national authority'* (United Nations, 1993a: author's italics).

In Chapter Eight of Agenda 21, 'Integrating Environment and Development in Decision-making' (United Nations, 1993b), the many objectives for improving the decision-making process are outlined in order to promote the concept that the consideration of socio-economic and environmental issues is fully integrated and that a broad range of public participation is assured.

The suggestions for improved planning and management systems include: 'improving the use of data and information ... making systematic and simultaneous use ... of data; analysis should stress interactions and synergisms; a broad range of analytical methods should be encouraged so as to provide various points of view' (United Nations, 1993b, p.97).

Agenda 21 calls for the adoption of 'comprehensive analytical procedures for prior and simultaneous assessment of the effects of decisions, including the impacts within and among the economic, social and environmental spheres; these procedures should extend beyond the project level to policies and programmes; analysis should also include assessment of costs, benefits and risks' (1993b, p.97). The improvement of laws and regulations is addressed, including improved procedures, legal reference and support services (1993b, p.101).

States will be required to establish at the earliest date, a system of 'integrated environmental and economic accounting' (1993b, p.107), to complement traditional national accounting practices. As sustainable development does not just include economic goods, but also includes social and environmental dimensions, 'a common framework needs to be developed whereby the contributions made by all sectors and activities of society, that are not included in the conventional accounts, are included' (1993b, p.107).

Agenda 21 makes reference to the 'polluter pays' and 'natural-resource-user-pays' concepts of market oriented approaches of economic analysis (1993b, p.104), but suggests that such approaches can only be used to enhance the capacity to deal with environmental and development issues, if used within a wider integrated context.

The Rio Conference received great publicity in the media, highlighting many global issues, but many people will fail to see the relevance to them at a local level in the UK. Foreseeing this potential problem, Agenda 21 sought to provide local authorities with the target of undertaking a local consultation

process to achieve 'a local Agenda 21' (1993, p.393) for the community, identifying local sustainable development issues and targets, by 1996. Whilst The Environmental Agency has liaised with local authorities with regard to their local Agenda 21 programmes, to date, it has not specifically used the Agenda 21 avenue to promote environmental issues. It has used the concept of Local Environment Agency Plans, based on water sub-catchments, as the basic for its strategic environmental planning.

The Rio Declaration and Agenda 21 clearly highlight international concern for the need for EA; firstly at a strategic level, and then at the project level; taking into account all the environmental issues, including the needs of future generations and the need to involve the community in the decision-making process.

International Environmental Conventions

A number of international conventions have been signed since the 1970s, seeking to protect the environment on a global scale. The Ramsar Convention on Wetlands of International Importance especially as Wildfowl Habitat was signed by over 50 countries in 1971 (in the town of Ramsar in Iran) and came into force in 1975, being the first international treaty solely to protect habitat rather than an individual species (Ball and Bell, 1994). Other environmental conventions include the Washington (trade in endangered species), Bonn (conservation of migratory species of wild animals) and Berne (conservation of European wildlife) conventions (Table 3.2). With respect to EA, the Espoo (a town in Finland) convention was signed in 1991 covering European transboundary EA issues.

3.5 Environmental Policy and EA in North America

Although the wider environmental and social effects had been taken into account in major projects, such as the Grand Coulee Dam on the Columbia River in the 1930s (Clarke, 1993), it was not until 1969, with the passage of the National Environmental Policy Act (NEPA) by the US Congress, that the term environmental impact assessment started to be used (now often shortened

to EA). Before this time, the appraisal of federal projects had been mainly undertaken using cost benefit analysis as the major decision-making tool to ensure that public funding was not being squandered. Environmental issues were rarely given any serious consideration. NEPA, the 'national charter for the protection of the environment' (Council on Environmental Quality, 1986, p.3), applies to all Federal agencies and permits; requiring environmental issues to be an integral part of the decision-making process.

The advent of NEPA was a turning point in the development of environmental legislation worldwide. It influenced the passage of many other similar pieces of legislation; Canada being the next country to initiate an environmental protection system. The Canadian system was initially a policy based one (i.e. non-mandatory) rather than a legislative one as in the case of NEPA. However, the Canadian Government has now introduced a legislative system, making EA mandatory for certain projects, in the light of their unsatisfactory experience of a policy led system (Clark, 1993).

The environmental legislation in the USA also has its problems. Steiner (1991) highlights a major criticism of environmental impact assessment at federal level, in that 'essentially the process is procedural rather than substantive' (1991, p.292). The Natural Resources Defense Council (1977) observed:

> 'Environmentalists today are turning more attention toward the substantive quality of the NEPA statements which are prepared. Unfortunately, far too frequently the quality of these impact statements leaves much to be desired. For example, NEPA statements are sometimes silent on the most severe environmental effects caused by a proposed project' (1977, p.28).

Many US States have developed their own environmental protection legislation in a much more substantive form (Steiner, 1991), an example of which is the Washington State Environmental Policy Act (SEPA). SEPA was first adopted in 1971, 'to ensure that environmental values are considered (in addition to technical and economic considerations) by state and local government officials when making decisions ... which apply to actions at all levels of government

within the state, except the judiciary and the state legislature' (Department of Ecology, 1993, p.A-1).

The comprehensive Washington SEPA policy and legislation seeks to 'encourage productive and enjoyable harmony between man and his environment; ... promote efforts which prevent or eliminate damage to the environment and biosphere; ... stimulate the health and welfare of man; and ... enrich the understanding of the ecological systems and natural resources important to the state and the nation' (Department of Ecology, 1993, Appendix B, p.1).

3.6 Environmental Policy and EA in Europe

Entry into the European Economic Community (EEC) in 1973 meant that the UK had to be a party to the new evolving environmental policies of Europe. Following the Treaty on European Union (Maastricht Treaty) the EEC is now referred to as the European Community (EC), which is one of the three communities which make up the European Union (EU). The three communities and their legal framework derive from a series of treaties: the 1951 Paris Treaty, instituting the European Coal and Steel Community; the 1957 European Atomic Energy Community (EURATOM) agreement; and the 1957 Treaty of Rome, creating the EEC or Common Market (Kiss and Shelton, 1993). All these treaties and agreements were for the economic benefit of the participating countries, and made no reference to the environment (Rydin,1993). To avoid confusion EU will be used in this thesis to mean both the EC, its predecessor the EEC and the EU; except for titles of legislation and publications.

At the 1972 Paris Conference of EU Heads of State, held in conjunction with the Stockholm Conference on the Human Environment, the meeting adopted a declaration stating that environmental protection was now to be part of EU policy:

> 'Economic expansion is not an end in itself. Its firm aim should be to enable disparities in living conditions to be reduced. It must take place

> with the participation of all social partners. It should result in an improvement in the quality of life as well as in standards of living. As befits the genius of Europe, particular attention will be given to intangible values and to protecting the environment, so that the progress may really be put at the service of mankind' (Kiss and Shelton, 1993, p.19).

This change in policy was consolidated in the 1986 Single European Act, which added Title VII to the Treaty, to define EU principles of action on the environment. The 1986 Act also requires environmental protection measures to be written into all EU policy and states a commitment to the 'polluter pays' principle (Rydin,1993). Article 25 of the Act states that environmental policy could be better determined at Community level, rather than at national level; giving a Community led strategic level environmental policy, rather than leaving it to Member States to decide on environmental policy. The Treaty of European Union (EU) signed at Maastricht on 7th February 1992 has strengthened the EU's commitment to environmental protection. One of the EU's basic tasks now is the promotion of 'sustainable and non-inflationary growth respecting the environment' (Wilkinson, 1992). The principles as amended by the Treaty of Maastricht, and contained in Article 130R include:

- preserving, protecting, and improving the quality of the environment;
- protecting human health;
- prudent and rational utilization of natural resources; and
- measures at the international level to deal with regional and world-wide environmental problems.

The EU has introduced a number of Environmental Action Programmes; the first in 1973 and the current fifth Environmental Action Programme is entitled 'Towards Sustainability - a Community Programme of Policy and Action in Relation to the Environment and Sustainable Development' (Ball and Bell, 1994). In 1983, as part of the third Environmental Action Programme, the EU established a directorate general (DG XI) and commissioner responsible for developing environmental policy, followed by the fourth Environmental Action

Programme making protection of the environment a basic principle which is to be respected all EU policies (Springer, 1994).

The four Institutions responsible for achieving the aims of the EU are: the Council of Ministers - decisions on Commission proposals; the European Commission - policy formulation and implementation; the European Parliament - debates and has limited powers; and the Court of Justice - judicial system, (Borchardt, 1994).

For implementing environmental policy and legislation the EU has five tools available to it: 'regulations', which apply equally in all member states and are directly binding; 'directives', which bind member states to the objectives of the policy, but allow each state to find its own way of implementing these objectives; 'decisions' which bind only the parties which the Commission has been asked to adjudicate; and, 'recommendations' and opinions, which have no binding force (Kunzlik, 1994).

In recent years there has been a shift of the implementation of EU policy away from the use of advisory policy documents and selective subsidies and grants to steer domestic national policies towards a greater use of formal legislative tools. The main form of legislative tool that is currently used by the EU to prompt member state legislation is the directive (Rydin, 1993). A series of environmental directives have been made by the EU; the key directive for EA being the Council Directive on the assessment of the effects of certain public and private projects on the environment (85/337EEC) (Commission of the European Community, 1985), and will be discussed in further detail in the next section.

Another directive, Council Directive on the conservation of natural habitats and of wild fauna and flora (92/43/EEC) (Commission of the European Community, 1992), aims to promote and maintain biodiversity by setting up Natura 2000. This programme is a network of European Special Areas of Conservation (SACs), including the Special Protection Areas (SPAs) set up to protect birds and their habitats by Council Directive on the conservation of wild birds (79/409/EEC) (Commission of the European Community, 1979).

In order to be able to make sound environmental decisions, Council Directive on the freedom of access to environmental information (90/313/EEC) (Commission of the European Community, 1990) provides for citizens in their

capacity as either voters or consumers, to have access to environmental information, subject to certain exceptions, within a minimum period of two months of requesting the information from a public body, which may be subject to a reasonable charge being made for copying the information.

The EA Directive

This directive can be thought of as 'the embodiment of the preventative approach to environmental assessment' for new projects (Haigh, 1989, p.349). The EU approach differs from the US NEPA approach in that it is directed at all projects of a certain type which could cause potential environmental damage, rather than the NEPA approach of only applying to projects promoted by a Federal Agency. However SEPA legislation, implemented by many U.S. States, is similar in scope to the EU legislation, requiring all projects which are environmentally significant to have a environmental impact statement (EIS) produced for them (Steiner, 1991).

The EA Directive (Commission of the European Community, 1990) contains 14 Articles and is the basis of EA legislation in the UK. Some problems have arisen in the interpretation of the requirements of the directive. The preamble and the Articles do not specifically state whether it is the developer or the competent authority who should carry out the assessment, and are particularly vague on issues such as scoping and public participation, which are seen to be key elements of good practice. In addition there are no requirements for the developer to consult anyone prior to submission for consent, which does not accord with the good practice of consulting throughout the EA process.

Haigh (1989) notes the Commissions early proposals in 1980 required a two stage process, firstly, the developer providing the information for the assessment, and secondly, an assessment made by the competent authority. Such procedures did not meet with the full agreement of all member states. The finally agreed directive requires the developer to provide and publish information; to collect information and comments from other authorities and the public; and finally the competent authority to make a decision to grant or withhold consent for the development. There is no requirement to publish the assessment, only the decision.

Planned Changes to the EU Legislation

The amendment to the EU EA Directive (85/337/EEC), the 'Council Directive 97/11/EC of amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment' (Commission of the European Union, 1997) of 3 March 1997, introduces non-mandatory scoping. The request for scoping information from the regulating agency (competent authority) will be entirely voluntary on behalf of the developer. Ideally, a mandatory scoping system is required to ensure that agency and community issues are properly addressed in the EA process, so that they can be effectively taken into account at the decision-making stage. In addition to scoping, the new EU amendment includes a requirement for the developer to address the project alternatives in the Environmental Statement and the competent authority to provide information on their final decision. This will include reasons and considerations on which the decision was based, and a description of the main measures to mitigate adverse effects. A number of changes have also been made to the thresholds and types of project included in Annex I and II (Commission for the European Union, 1997). Member States have until 14 March 1999 to bring into force the required laws and regulations necessary to comply with these amendments.

3.7 Environmental Policy and EA in the United Kingdom

During the early 1980s, when the EU was trying to introduce EA regulations, there was much opposition from the UK government and many planning professionals. The planning system in the UK was seen by many as perfectly adequate for the protection of the environment in any development application. The UK Government's long standing position was 'that the European requirements for environmental impacts assessment might duplicate or complicate the current planning procedures' (Wood, 1988, p.96) and many planners such as Baldwin (1979) were arguing against the need for any change in the planning system. It was said that the planning system already allowed environmental issues to be taken into account, as 'any consideration which relate[d] to the use and development [was] capable of being a material

consideration' (Carnwath, 1991, p.59) and, therefore, the existing system could take such issues into account in the decision-making process.

A number of EAs were undertaken during the 1960s and 1970s and Herington (1979) suggests that major resource developers were keen to use EA for practical rather than altruistic reasons, e.g., the adoption of EA by the British Gas Corporation for it's development projects which required planning consent.

In 1974, the Department of the Environment commissioned consultants to prepare a study of the implications of introducing a formal EA system. The consultants outlined the basic procedure required and recommended that 'a system ... could be introduced experimentally.' (Catlow and Thirlwall, 1977, p.68). They suggested that could be done without amending the Planning Acts. The approaches recommended in their report were adopted by both public and private sectors for the implementation of EA of major schemes (Clark and Herington, 1988).

During the period 1970 to 1980, thirteen major EAs were undertaken of oil related projects in Scotland alone. The new large-scale projects associated with the oil industry during this period called for planning on a macro-scale, involving the assessment of a very wide range of effects and options. The existing planning processes were not sufficient for such major projects and a reassessment was required of the local and central government planning systems to accommodate such a large task. The Manual for the Assessment of Major Development Proposals (Clark, *et al.*, 1981) was produced by central government for the task.

In 1981, a House of Lords Committee on the EU, 'welcomed the proposal for an (EU) Directive, which would require environmental impact assessments to be carried out before planning consent was granted for special classes of development projects' (Clark and Herington, 1988, p.22). A preliminary draft EU Directive was issued in 1978 for consultation, followed by twenty more drafts, before a final draft was put forward to the Council of Ministers in June 1980. This was followed by much negotiation and concessions, and Wood (1988, p.96) suggests that 'the House of Lords Committee report, as well as the concessions obtained, facilitated the eventual change in the UK Government's attitude to EA. The antagonism of British industry to

environmental impact assessment (together with the enthusiasm of environmental groups for it) appears largely to have evaporated'. However, the UK planning system has evolved to provide a regulatory limiting factor on development, where the planning authority has to justify why the development should not be approved. One strand of EA philosophy is that EAs provide the decision-makers with the information which justifies why the preferred option should be approved. This apparent conflict has not been resolved in the UK implementation of EA of the development process and will be discussed later

The influence of membership of the EU is now far reaching for the UK; 'as far as Britain is concerned, the EU has firmly established itself as a major policy actor for both economic and environmental problems' (Rydin, 1993, p.76).

UK Environmental Policy

Following the Earth Summit and associated Rio Declaration in 1992, which the UK signed up to, the government committed itself to publish a national plan for the implementation of the Rio Declaration and Agenda 21. The plan was published as a White Paper in the form of the 2nd edition of This Common Inheritance (UK Government, 1992a). One of the priority areas identified for action was the injection of environmental concerns into decision-making at all levels. It promotes the use of EA to ensure that environmental considerations are properly considered in planning decisions. It highlights the programme of works required and commits the government to further research on the evaluation of environmental information. As part of the national strategy, the national environmental plan has promoted a number of initiatives including Biodiversity Action Plans and the promotion of environmental guidelines for the majority of central and local government functions. This has included the requirement to include environmental issues in policy appraisal. The combined impetus of policy and EU legislation has led to a range of EA legislation being implemented from 1988 onwards.

Environmental Assessment - UK Statutory Instruments

The EU EA Directive (85/337/EEC) was enacted in UK law as a series of Statutory Instruments (SI), made under the European Communities Act 1972

(UK Government, 1972), which came into force in July 1988. The current series of EA regulations which relate to projects in the water environment are given in Table 3.4.

The introduction of these statutory instruments has created a complex set of regulations which need to be complied with. For example, in working on flood defence improvement works along the Severn Estuary (SSSI and Special Protection Area), the Midlands Region of the Environment Agency has to comply with: SI No. 1217 Land Drainage EA regulations (UK Government, 1988b); SI No. 2617 - works near or in a SPA (UK Government, 1994d); SI No. 418 - EA and permitted development rights (UK Government, 1995c); as well as obtaining approval as required by section 28 of the Wildlife and Countryside Act 1981 (UK Government, 1981) for works in a SSSI.

In addition to these statutory instruments, all projects approved by Private Act of Parliament will require an EA, but this is over and above the requirements of the EU Directive which specifically excludes such projects.

Of the eight individual statutory instruments relating to EA, one is for general development (SI No. 1199). This covers all those projects which require planning permission. The other SIs cover development types which have permitted development rights and are therefore exempt from normal planning permission requirements. Four of them are for projects in the water environment (SI No. 1217 for land drainage, SI No. 1336 and 424 for harbours and SI No. 1218 for salmon farms), the remainder being for other land-based project types (SI No. 1241 for highways, SI No. 442 for electricity, gas and oil pipelines, and SI No.1207 for forestry).

The impacts of projects on the water environment can result in significant environmental effects. The presence of water is essential for the majority forms of life on earth and, therefore, if the goal of sustainable development is ever to be achieved, it is essential that all those projects which impact on water environment do take account of such effects and are implemented in an environmentally sensitive manner.

Table 3.4 Environmental Assessment - Statutory Instruments and amendments relating to projects in the water environment

SI No. 1199	- Town and Country Planning (Assessment of Environmental Effects) Regulations 1988 [contains the regulations for EA of EU Directive Annex 1 and 2 projects, for submission in association with a planning application]
SI No. 367	- Town and Country Planning (Assessment of Environmental Effects)(Amendment) Regulations 1990 [contains amendments to SI 1199]
SI No. 1494	- Town and Country Planning (Assessment of Environmental Effects)(Amendment) Regulations 1992 [contains amendments to SI 1199 - change in publicity requirements and new regulations regarding applications by planning authorities]
SI No. 677	- Town and Country Planning (Assessment of Environmental Effects) (Amendment) Regulations 1994 [contains amendments to SI 1199 - adding new classes to Schedule 2 list projects: a wind generator; a motorway service area; and coast protection works. Additional copies of ES to be submitted]
SI No. 2716	- The Conservation (Natural Habitats, &c.) Regulations 1994. [contains regulations concerning the limitation of permitted development rights in or near a European site, ie. SPA or SAC, regulations 60, 61 and 62; and the regulation 105 - Powers of drainage authorities, ie. if they have approval of English Nature for works in or near a European site, they may then proceed with the works]
SI No. 417	- Town and Country Planning (Environmental Assessment and Permitted Development) Regulations 1995 [contains the regulations regarding the consideration as to whether an EA is required if the project has permitted development rights]
SI No. 418	- Town and Country Planning (General Permitted Development) Order 1995 [details which developments have permitted development rights and those which do not]
SI No. 1217	- The Land Drainage Improvement Works (Assessment of Environmental Effects) Regulations 1988 [contains the regulations for EA of land drainage works]
SI No. 2195	- The Land Drainage Improvement Works (Assessment of Environmental Effects)(Amendment) Regulations 1988 [contains amendments to SI No. 1217, regarding consultation for additional information]
SI No. 1336	- The Harbour Works (Assessment of Environmental Effects) Regulations 1988 [contains the regulations for EA of harbour works]
SI No. 424	- The Harbour Works (Assessment of Environmental Effects) (No. 2) Regulations 1989 [contains the regulations for EA of harbour works]
SI No. 1218	- The Environmental Assessment (Salmon Farming in Marine Waters) Regulations 1988 [contains the regulations for EA of salmon farming projects in marine waters]

Table 3.5 Comparison of SI No. 1199 (Planning) and SI No. 1217 (Land Drainage)

	SI No. 1199 (Planning)	SI No. 1217 (Land Drainage)
Project Type	Any Schedule 1, or Schedule 2 which is environmentally significant.	Land Drainage Improvement Works (ie. Schedule 2)
Project Promoter	Any Developer including public authority.	Drainage Authority only ie. Environment Agency, Internal Drainage Board or Local Authority.
Lead EA Authority	Local Planning Authority	Drainage Authority
Authority who make initial decision on 'environmental significance'	Local Planning Authority	Drainage Authority (Decision published for 28 day consultation period)
Competent Authority (Final Legal Arbiter)	Secretary of State for the Environment	Minister of Agriculture, Fisheries and Food (in Wales - Secretary of State for Wales)
Content of ES	Similar	Similar
Statutory Consultees	Any principal council, if not the local planning authority, Countryside Commission, English Nature, for specific projects - HMIP, HSE, British Railways, British Coal, and the Environment Agency (Department of the Environment, 1989a, pp.43-47)	English Nature Countryside Commission any other public, statutory body or organisation, which appears to have an interest in the matter.
Public Consultation Period for ES.	21 days	28 days

Land Drainage Environmental Assessment

The Land Drainage Improvement Works (Assessment of Environmental Effects) Regulations 1988 - SI No. 1217 differ from the SI No. 1199 (EA for planning projects) regulations in a number of key factors, but the ES will be prepared and published in a similar format. A comparison of differences between SI No. 1199 and SI No. 1217 are shown in Table 3.5, which highlights that although some of the players and detailed procedures differ, the

EA process and content of an ES will be very similar.

SI No. 1217 applies to any land drainage improvement works undertaken by a drainage body. Under the regulations a 'drainage body' means: '(a) a water authority; (b) an internal drainage board (IDB); and (c) the council of a county, district or London borough or the Common Council of the City of London;' (UK Government, 1988b, p.1).

As discussed in Chapter One, in the UK, the Water Authorities' roles spilt, when the Water Act of 1989 created the National Rivers Authority (NRA) and the privatised Water Companies, such as Severn Trent Water plc. The new Water Companies took on the water supply and treatment duties of the former authorities, and the NRA took over the remainder of the duties, including the duties of the 'drainage body'. The term 'water authority' as used in the regulations, therefore, passed to the NRA. On 1st of April 1996, the Environment Agency (created by the 1995 Environment Act (UK Government, 1995a)) superseded the NRA and inherited the land drainage powers in its role managing in the water environment.

The SI No. 1217 regulations require that no 'improvement works' are carried out by a drainage body unless the EA procedures are followed. The definition of 'improvement works' is given as 'works which deepen, widen, straighten or otherwise improve any existing watercourse or remove or alter mill dams, weirs or other obstructions to watercourses, or raise, widen or otherwise improve any existing drainage work' (UK Government, 1988b, p.2).

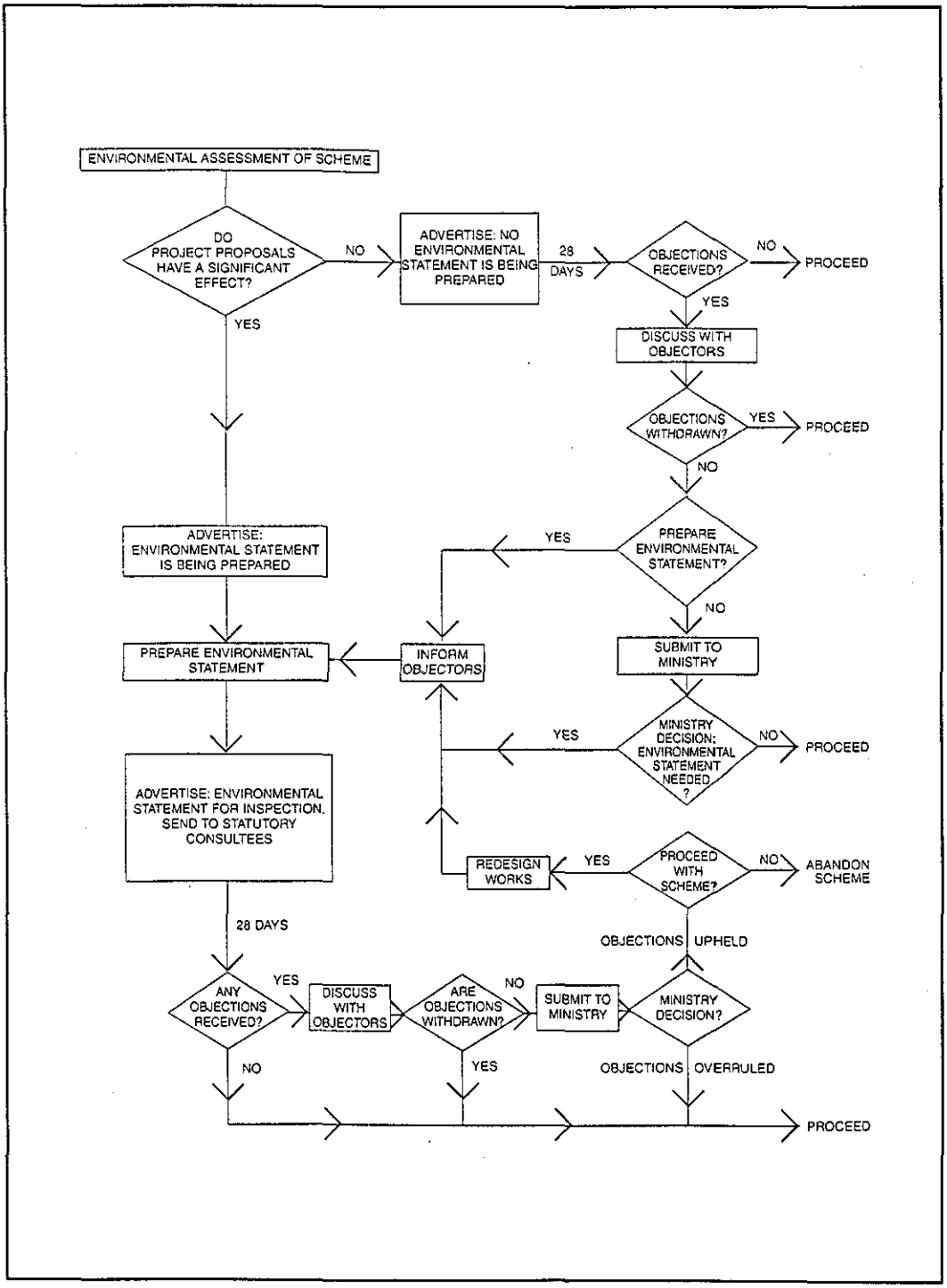
In the Midlands Region of the Environment Agency, this has been interpreted to potentially cover any works undertaken by the Agency which are proposed in a watercourse channel; not only flood defence works, but also other water management operations. These have included, e.g., new flow gauging weirs such as the Whatstandwell gauging station on the River Derwent, south of Matlock, in Derbyshire; and a new fish pass constructed on a weir on the River Teme in Worcestershire. The Midlands Region of the Environment Agency has adopted a flexible approach to the inclusion of most Agency water management capital works. Most of such works have permitted development rights, i.e. they do not require planning consent by a local planning authority, nevertheless, they can potentially have a significant effect on environment and are therefore all assessed (Hickie, 1993). Such a

philosophy appears to be in keeping with the spirit of the EU EA Directive.

A more literal approach has been taken by the Thames Region of the Environment Agency which has prepared lists of specific works that require EA under the SI No. 1217 EA regulations. All other works do not require any formal EA, unless required by planning legislation. Other Environment Agency Regions, such as South West Region, use the SI No. 1199 Planning EA regulations rather than the SI No. 1217 Land Drainage EA regulations. They seek planning permission for all capital flood defence works, putting the onus on the local planning authority to approve their proposals, instead of using their permitted development rights as a drainage authority.

All the Environment Agency Regions have to use the SI No. 1199 Planning EA regulations where there are no existing flood defences, and therefore, no permitted development rights. In such circumstances the Environment Agency has to submit the proposals, as would any other developer, through the planning application process and guidelines are provided for this process, including how to seek a decision as to whether an ES will be required to accompany the planning application (Department of the Environment, 1989). An example of such a project is the Shrewsbury Flood Alleviation Scheme, on the River Severn through the centre of the Shrewsbury (Gould Consultants, 1993). However, one problem that has arisen from such a procedure is that in following the SI No. 1199 procedures, the comments on the ES are forwarded to the local panning authority and not the developer. The advantages of the SI No. 1217 procedures are that the developer (the drainage authority) can try to sort out any problems and arrive at a compromise with objectors and can comment on any outstanding objections when they are forwarded to MAFF for formal arbitration. Since 1993 the Midlands Region of the Environment Agency has used these advantageous principles of the SI No. 1217 regulations in the planning ES situation. An independent ES is now normally published for public comment with responses sent to the Environment Agency, which can then submit the planning application with the ES, together with any comments and the Environment Agency's response to such comments or ideally to get the objectors to withdraw their objections before the planning application is submitted.

Figure 3.1 SI No. 1217 Land Drainage EA Flowchart (MAFF, 1992)



The SI No. 1217 regulations state that the drainage authority should initially publish either a proposal to prepare an ES in respect of the works; or a written justification as to why an ES will not be required (Figure 3.1). If an ES is required, it will be prepared after a full EA has been undertaken, and published for public consultation for a period of 28 days. If there are any objections received, the drainage authority will seek to agree a compromise with the objectors so that they with draw their objections; or decide to abandon the works.

If the drainage authority cannot agree a compromise with the objector, they have to refer the matter to the Minister for MAFF (or Secretary of State for Wales) for a final decision. If additional information is provided to the Minister to assist in making a decision, the SI No. 2195 (UK Government, 1994d) requires such information to be published for a further 28 day consultation period to allow any others to comment on this additional information or proposed changes to the original ES.

English Nature - EA Agreement in Principle

In a letter of agreement between MAFF and English Nature dated June 1993 (MAFF, 1993d), it was agreed nationally that English Nature would 'approve in principle' projects at the feasibility stage of design, rather than the much later stage of after final design as had been the previous practice. The object of this change in procedures was to ensure that the final design work, which was to be funded by MAFF, was approved by English Nature at least in principle. As part of this agreement it was agreed that it should be good practice for projects to have an ES published after the feasibility stage, and re-published if there were any significant changes in environmental effect. Figure 3.2 summarises this change in procedure.

Figure 3.2 Changes in EA Procedures

Old Procedure	**New Procedure**
Scoping	Scoping
Feasibility	Feasibility
Detailed Design	***PUBLISH ES***
PUBLISH ES	Detailed Design
Construction	Construction
Post-project Appraisal	Post-project Appraisal

European Union and UK EA Practice

The EU in a formal note to the UK government in October 1991, cited a number of areas where it thought the UK was in breach of the Directive (Alder, 1991):

1) The UK legislation only includes those projects which have been submitted for consent after the EA Directive came into force, and not those which had applied for consent before this date and consent had not yet been given. The EU is of the opinion that such projects should have been assessed in accordance with the EA Directive;

2) The UK's widespread use of exemptions from planning permission through the use of a permitted development system for many types of project, excludes there being an independent competent authority to assess and consent the development. The EU thinks that formal consent should be required in these cases;

3) In UK legislation the definition of significance is a subjective judgement, most often taken by fairly junior officials. The EU feels that it should be an objective test;

4) The most fundamental objection of the EU is that the implementation of UK legislation does not count as EA. It is the EU's view that the assessment should be undertaken by a competent authority, and not by a developer as required in the UK.

Alder suggests that the implementation of EA in UK law falls short of the spirit of the EA Directive. The UK courts are not able to require that all the information provided is sufficient and that all parties have an equal opportunity to air their views, as is the case in the US courts. Also environmental interests are not considered by English courts to be rights, analogous to property and financial rights, and this tends to lead to judgements in favour of financial rights. Alder suggests that the 'literalistic' way in which UK courts tend to interpret the EA Directive run contrary to the continental style of 'open textured' drafting and interpretation of the EA Directive, (Alder, 1991, p.217). He concludes that 'the deferential character of English legal culture is now being challenged by European values which give greater emphasis to environmental rights than can apparently be accommodated within English law' (1991, p.220).

3.8 EA Policy and Legislation Conclusions

From the discussion of policy and legislation there are a number of conclusions of particular relevance for the EAs:

1. EAs have to comply with the procedures detailed in the relevant UK Statutory Instruments, which are based on EU EA Directive (85/337/EEC);

2. The basic format, content and procedures are prescribed by legislation in the appropriate Statutory Instruments;

3. Public involvement in the procedures is important;

4. EA is part of the decision-making tools in a political process.

A number of key problem issues regarding EA in the UK are:

1. European legislation can be interpreted to imply that the competent authority should undertake the assessment process. In UK policy and legislation this is not seen as necessary.

2. Within the UK planning system there is perceived to be a political presumption in favour of development and the local planning authority has to justify why the development should not proceed. This approach is the antithesis of the ethos of good EA, where the developer is expected to justify the development. However, new planning guidance issued by the Department of the Environment now requires the land-use designation in the Local Plans to be a deciding factor in approving new developments.

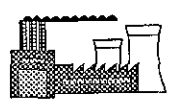
3. There is no UK legislation which requires a check on the sufficiency of the information provided in the ES.

4. The legislation does not adequately allow for the control of the changes which occur in real projects when they are being implemented. Good practice requires such changes to be assessed and if they are significant, the ES will need to be re-published before such changes are implemented.

The former problem of lack of public consultation on additional information requested after the ESs have been published has now been ironed out by the new regulations that require the publication of any additional information relating to the ES before it is considered by the relevant competent authority. For the planning EA regulations this was SI No. 677 (1994) and for land drainage EA regulations this was SI No. 2195 (1995) (Table 3.4).

In terms of information management it is important not to be constrained by the minimalistic approach of many UK EA regulations and the planning system's approach of the ES only providing supporting information to the formal decision-making process. Good EA needs to aspire to implement the higher ideals of international policy such as the Rio Declaration and legislation such as the EU EA Directive.

Chapter Four - EA Guidelines and Research Review



Chapter Four
EA Guidelines and Research Review

4.1 Introduction

Following on from a review of environmental ethics, values, policy and legislation discussed in the preceding chapters, the objective of this chapter is to review and select the best elements of good practice worldwide in order to construct a good practice model which will be developed in Chapter Five of this thesis.

Since the introduction of the NEPA in the United States in 1970 and the 1985 EU EA Directive 85/337/EEC on EA (Commission of the European Community, 1985), there have been a wide range of guidelines and books published on the subject of EA and associated topics. For example, A Directory of Impact Assessment Guidelines (Roe *et al.*, 1995) lists over 450 different guidelines produced by various agencies throughout the world. A standard framework for EA good practice has emerged from early research work and will be discussed in this chapter in the context of its application worldwide and in relevant sectors of EA.

There have been a range of EA definitions used, many of which are based on Munn (1979):

> 'An environmental impact assessment is an activity designed to identify and predict the impact of an action on the biogeophysical environment and on man's health and well being, and to interpret and communicate information about the impacts' (Munn, 1979, p.1).

It is interesting to note that EA definitions can be broadly divided into two camps: those which follow Munn (1979) and view EA as providing information for the decision-making; and those which view the EA process as related to the whole of the project cycle. These two views of the EA process will be discussed.

In the field of EA research, a wide range of papers have been published on the many facets of EA and its closely linked subject areas of social impact assessment (Burdge and Vanclay, 1995); technology assessment (Porter, 1995) and health impact assessment (Birley and Peralta, 1995). A number of key research papers and publications and their links to the guidelines will be discussed in this chapter.

EA has been developed to be used as a tool to help assess policies, plans, programmes and projects. This thesis will concentrate on project EA, but it is worth spending some time to discuss the strategic EAs (SEAs) which cover the policies, programmes and plans, rather than individual projects.

4.2 Strategic EA

Thérivel *et al.* (1992) defined SEA as:

> 'the formalised, systematic and comprehensive process of evaluating the environmental effects of a policy, plan or programme and its alternatives, including the preparation of a written report on the findings of the evaluation, and using the findings in publicly accountable decision-making'.

One of the main objectives for using SEA is that it promotes sustainable development (Thérivel and Partidário, 1996). The importance of sustainable development and its importance in strategic environmental policies has been discussed in Chapter Three of this thesis.

The link between policies and projects can be considered to be a tiered linkage (Figure 4.1).

Figure 4.1 Linkage from Policies to Projects

<table>
<tr><td colspan="8">Policy</td></tr>
<tr><td colspan="4">Plan 1</td><td colspan="4">Plan 2</td></tr>
<tr><td colspan="2">Programme 1.1</td><td colspan="2">Programme 1.2</td><td colspan="2">Programme 2.1</td><td colspan="2">Programme 2.2</td></tr>
<tr><td>Project 1.1.1</td><td>Project 1.1.2</td><td>Project 1.2..1</td><td>Project 1.2.2</td><td>Project 2.1.1</td><td>Project 2.1.2</td><td>Project 2.2.1</td><td>Project 2.2.2</td></tr>
</table>

Examples of SEAs include the use of SEA in catchment management plans (Gardiner, 1996); the SEA of the Dutch ten-year programme on waste management 1992-2002 (Verheem, 1996); and the European high speed train network (Commission of the European Union, 1994).

The actual process of SEA is very similar in nature to project EA (Commission of the European Union, 1994) and will not be discussed in detail as this thesis is about developing EA at project level. The details of SEA methodologies with examples are discussed by the Commission of the European Union (1994), Gilpin (1995) and Thérivel and Partidário (1996).

Whilst some SEAs have been developed for use in the water environment (Gardiner, 1992), the advent of the Environment Agency's 'Local Environment Agency Plans' (LEAPs) which have replaced the catchment management plans of the NRA, will increasingly look to SEA as a tool to assist in promoting sustainable development in the Environment Agency's policies, plans and programmes.

The Ministry of Agriculture, Fisheries and Food is requiring SEAs to secure 'approval in principle' from all the Environment Agency's strategic flood defence elements of Regional programmes. Examples of such SEA would be those required for the Lower Severn (Mott MacDonald, 1994a) and Lower Trent (Mott MacDonald, 1994b) areas of the Midlands Region of the Environment Agency.

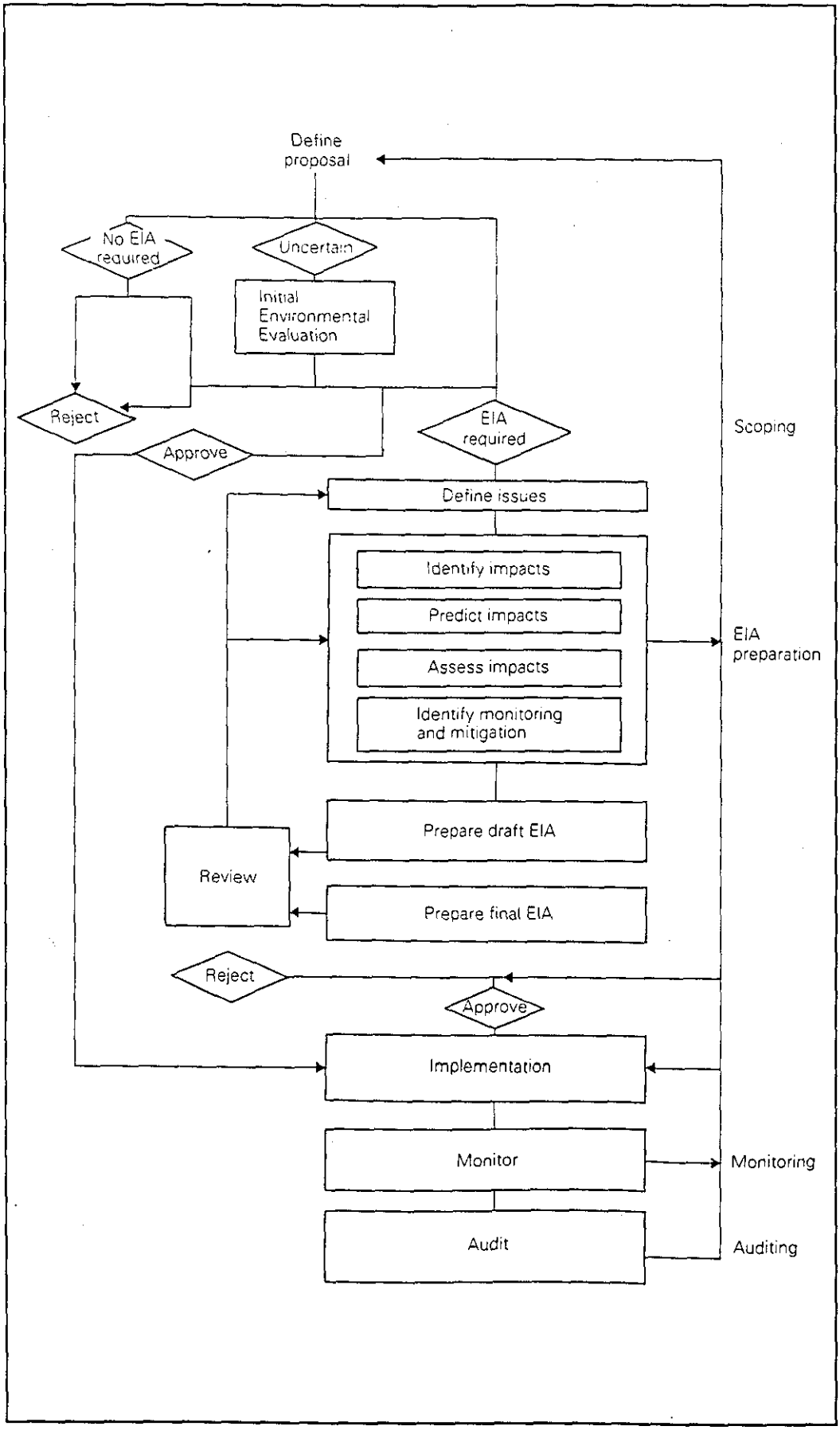
In an ideal world the projects will evolve from these SEAs at policy, plan and programme level, the projects in turn requiring EA. The principles of open and accountable EA, techniques for assessment and EA management procedures developed for projects in this thesis can be used in a strategic context for SEAs. An example of such a SEA would be the Severn-Vyrnwy Area Strategic Environmental Statement (Nicol *et al.*, 1997) prepared for the Midlands Region of the Environment Agency. This SEA provides the assessment of the strategic alternatives and defines the preferred alternative and strategic environmental objectives which will need to be taken into account in the EA of individual projects within the study area.

4.3 Project EA Procedural Methods

The EA Process

The main steps in the EA process (Figure 4.2) are similar whichever particular procedure is used (Wathern, 1988). The elements of the process have evolved from the typical steps in scientific research, i.e. definition of need, survey, analysis and conclusion; which are also analogous to the typical design steps of 'survey, analysis and design'. The specific procedural requirements of individual legislatures will vary, but the elements remain similar.

Figure 4.2 EA Flow Diagram (Wathern, 1988)



The general EA process can be thought of as a 'data management process' (Wathern, 1988, p.17) which ideally has three elements. Firstly, the appropriate information required for decision-making must be identified and collected (scoping and baseline survey). Secondly, the baseline environmental parameters should be compared with the predicted changes to these parameters following project implementation and the significance of these changes predicted (assessment and reporting). Finally, the actual changes should be recorded and analyzed (monitoring and post project appraisal). Few formal procedures require the monitoring or post-project appraisal of the proposed project, although this can be a requirement of the consent; and very often this stage is not implemented effectively (Wood and Jones, 1991). This is probably due to the fact that the EA process is viewed by many writers of such procedures as a tool for providing information for the decision-making process. When viewed in a wider context of the need to plan, approve and implement developments in an environmentally sensitive and sustainable fashion, such thinking can appear to be blinkered.

The 'ultimate purpose of an EA is to safeguard ecological functions, ensure responsible natural resource use and protect community values' (World Bank, 1995, p.3). The EA can be designed to be 'a flexible process making environmental considerations an integral part of the project preparation (and) allows environmental issues to be addressed in a timely and cost-effective way during project preparation and implementation. It also helps avoid costs and delays due to unanticipated environmental problems' (1995, p.1). This broader view of the EA process will help to promote a better understanding and communication of the consequences of the development and to deliver projects in an environmentally sensitive manner. This ethos should be the major objective of the EA process.

Guidelines prepared by the Department of Environment Affairs (1992a) in South Africa have followed through this concept by calling the whole process 'integrated environmental management' (1992a, p.5) and suggest that the basic principles underpinning good EA are:

- informed decision-making;

- accountability for information on which decisions are taken;
- a broad meaning given to the term environment (i.e. one that includes physical, biological, social, economic, cultural, historical and political components);
- an open, participatory approach in the planning of proposals;
- consultation with interested and affected parties;
- due consideration of alternative options;
- an attempt to mitigate negative impacts and enhance positive aspects of proposals;
- an attempt to ensure that the 'social costs' of development proposals (those bourne by society, rather than the developers) be outweighed by the 'social benefits' (benefits to society as a result of the actions of the developers);
- democratic regard for individuals rights and obligations;
- compliance with these principles during the planning, implementation and decommissioning of proposals (i.e. 'cradle to grave'); and
- the opportunity for public and specialist input in the decision-making process

(Department of Environment Affairs, 1992a, p.5)

Such an integrated approach, considering EA from inception to decommissioning would appear to lie at the heart of EA good practice.

EA Objectivity

In considering the objectivity of the EA process, Wathern (1988) takes a pragmatic view. He suggests it is important that the responsibility for EA should lie with the developer not the regulating agency and that if responsibility were transferred to an authorising authority, this would divorce the EA process from project formulation and development, which would be a retrograde step. However, the problem with the EA responsibility being with the developer is that they may possibly try to influence the preparation and production of the EA outputs in such a manner as to optimise EA minimum costs with the likelihood of obtaining consent. In their Guidelines for Assessing Industrial Environmental Impact and Environmental Criteria for

Industry, the United Nations Environment Programme (1980) has recognised this problem and recommended that 'the group charged with assessing environmental impacts ... should be independent and established in such a way that it can undertake its tasks objectively. Equally important, is that the group needs the necessary resources to carry out a professional task of high quality' (United Nations Environment Programme, 1980, p.19). The potential problem of developers not covering all the appropriate issues can be solved by having a formal scoping process, where either the regulating agency or an independent EA agency produce an initial scoping document. The scoping document highlights the aspects to be addressed by the developer in their published ES document, which is then submitted with the application for project approval. This scoping document is often required to be published for public comment. Such procedures have been developed in the Netherlands, Spain (Carnwath, 1991), United States, Canada and New Zealand (Wood, 1995).

The EU EA Directive (85/337/EEC) can be interpreted, as in the case of the Netherlands and Spain, to provide for such a system. The UK, however, has opted not to develop the required new legislation, procedures and agencies to implement such a system, but to use the traditional UK planning system to act as the framework for all EA procedures (Alder, 1991). This has inherent problems as identified by Alder (1991), including bias in favour of the development, lack of independence of assessment, lack of experienced professional ES reviewers in local authorities and other competent authorities.

In their discussion of the advantages of an independent review body, Scholten and Bonte (1994) note that 'the process cannot fulfil its promise if the competent authority and the proponent of the scheme share a common interest in realizing the proposed activity according to a preconceived arrangement. This risk arises particularly when the competent authority also acts as the initiator for the activity. Thus, safeguards in the EA procedure and its substance of the EIS are necessary to minimise the risk of sweetheart statements which only present a token interest in the environment' (1994, p.2). They achieve this objective in the Netherlands by the use of the Commission on EIA, which acts as an independent review panel for each project which requires an ES. The Commission has over 200 specialists on whom it may call

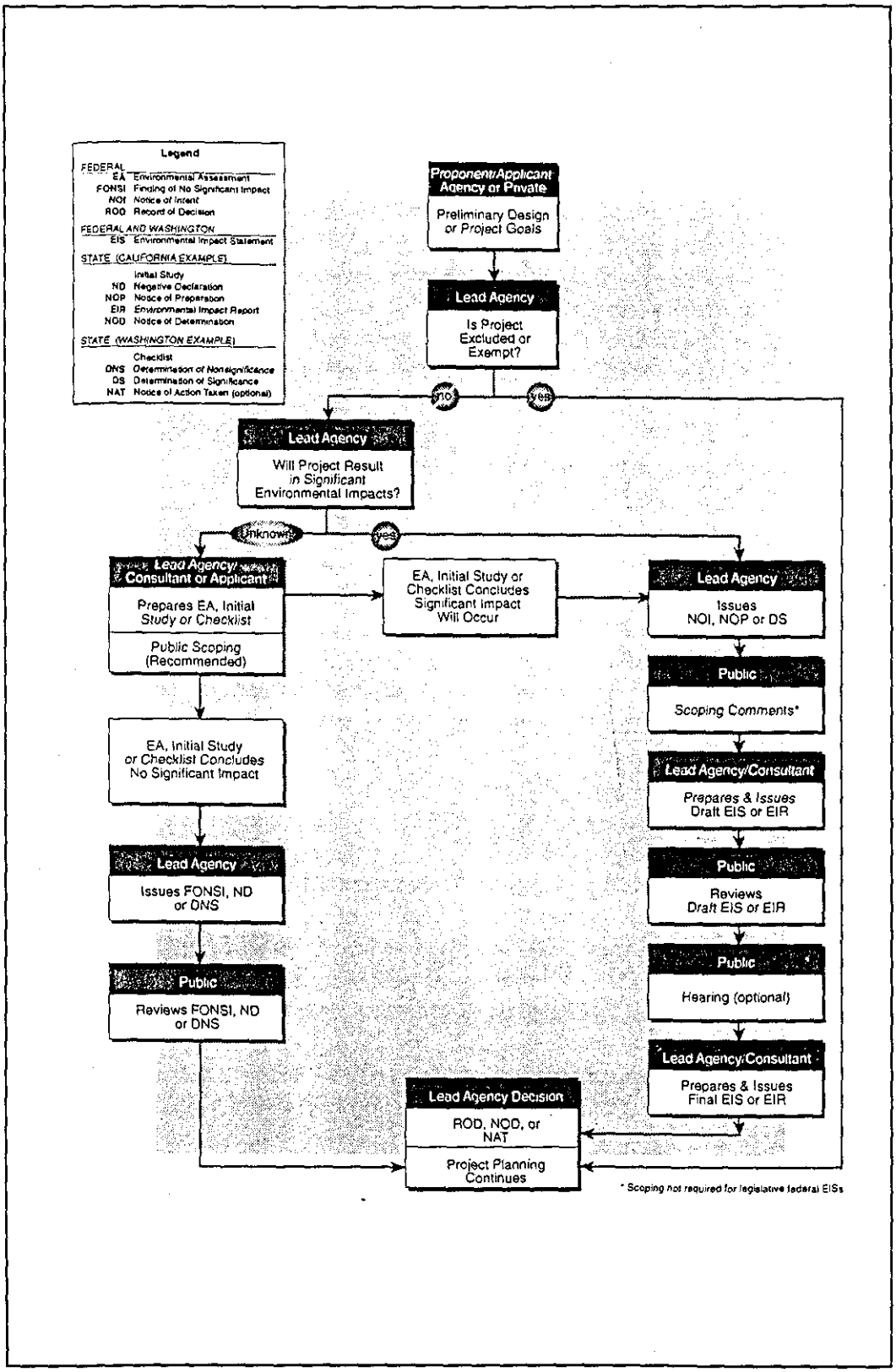
on to serve on project panels to specify the scope of the EA and then review the final ES produced.

United States - EA Procedures

In the USA, the federal legislation for EA is provided by National Environmental Policy Act (NEPA), however, the individual States have their own legislation and guidelines for project approval within their own planning systems. The basic procedures are summarised in Figure 4.3. The process begins when a developer proposes an action or a project. At this early stage the lead agency decides whether the proposed action or project is exempted from the requirement to prepare environmental review documentation. If the project is exempt, the normal planning process applies.

However, if the project is not exempt, the lead agency must then decide whether the proposal will result in likely significant impacts. If the lead agency is not sure, it will request an environmental assessment (for federal projects) to be prepared to determine whether significant impacts are likely (which is called an initial study in California and an environmental checklist in the State of Washington). These documents may be prepared by the lead agency, a consultant or the applicant. If the report indicates that there are not likely to be any significant impacts, a finding of no significant impact (FONSI), which is known by other names in the different States, is issued for public consultation and if there is no objection, the applicant continues with the normal planning process. If it is determined that a significant impact is likely to occur the lead agency issues a Notice of Intent to prepare an environmental impact statement (NOI), which is known by other names in the different States, and commences the public scoping of the issues. A draft environmental impact statement (EIS) is prepared and issued for public review. The lead agency or consultant then prepare the final EIS with responses to public comments, after which the lead agency makes its decision.

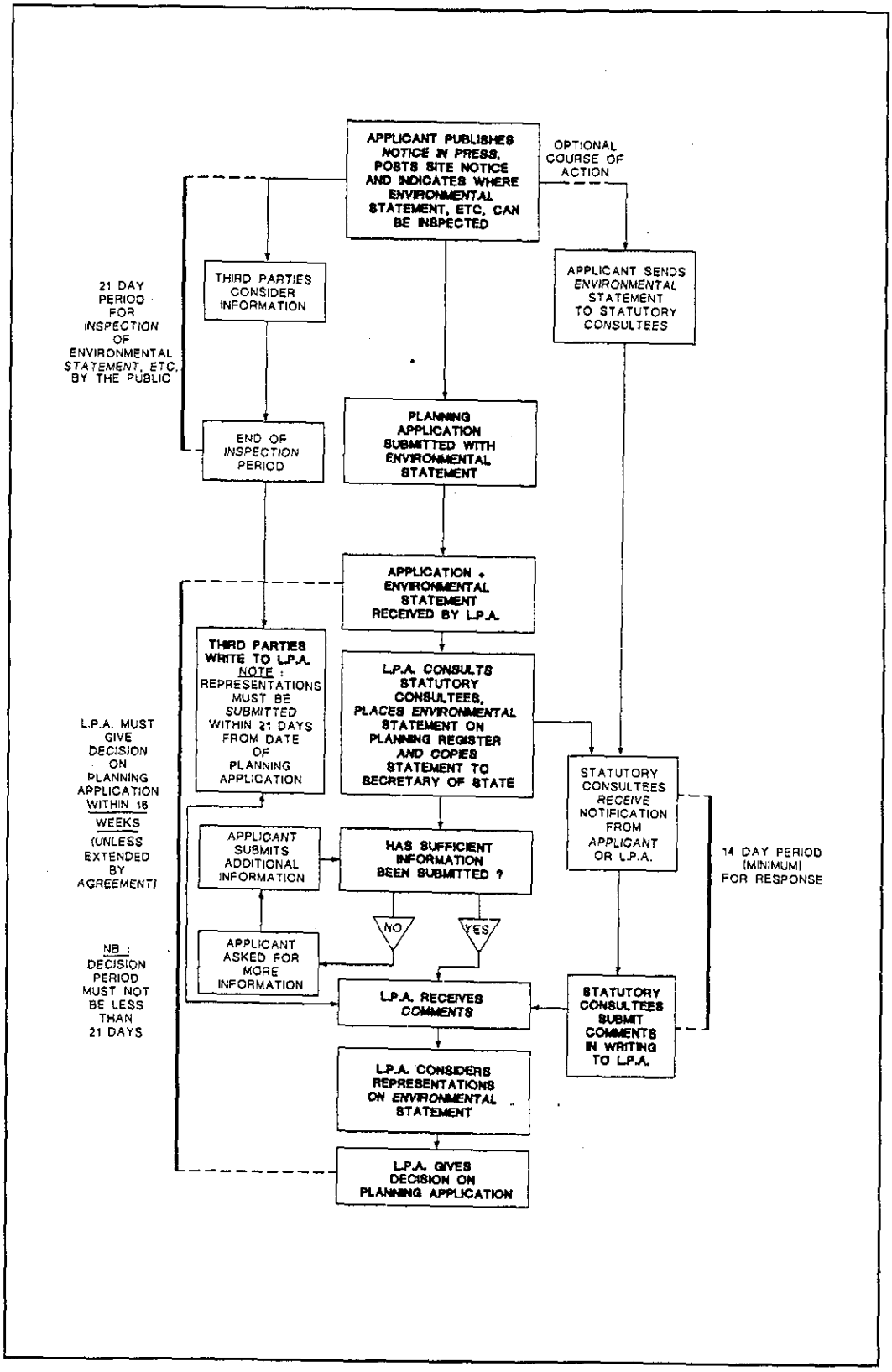
Figure 4.3 US Environmental Review Process (Kreske, 1996, p.19)



European and UK - EA Procedures

Recapping on Chapter Three of this thesis, the EU EA legislation has been transposed into UK law. This provides an initial screening process which allows for the identification of those projects that require an ES, the criteria for which, have been discussed earlier. For projects subject to planning law, the developer then produces an ES which is submitted with the planning application. In UK law the ES submitted with a planning application is treated as additional environmental information, with the planning application and any consent condition required, having the legal primacy. The ES document has no real legal status other than supporting information. No commitments in the ES will be legally binding unless they are referred to in the planning approval. Figure 4.4 shows the UK Department of the Environment's guidelines for this procedure. The guidelines will be discussed in greater detail later in this chapter.

Figure 4.4 UK EA Procedural Flowchart for Project Subject to Planning Law (Department of the Environment, 1989a, p.50)



Definitions of EA

As discussed earlier in this chapter, the definitions of EA fall into two distinct groups. Those which define EA (EIA) as the collecting, analysis and provision of information (normally presented in a report or statement) to aid the decision-making process; and those which consider the EA process to have a wider remit covering not just the decision-making stage, but the implementation stage onwards, as well.

An example of the former would be Munn (1979) quoted earlier in this chapter and a similar definition provided in Clark *et al.*:

> 'Environmental impact assessment or analysis (EIA) is the systematic examination of the environmental consequences of projects, policies, and programmes. Its main objective is to provide decision-makers with an account of the implication of alternative courses of action before a decision is made' (Clark *et al.*, 1980, p.1).

Canter, whilst quoting the above definition provides another definition which is more goal orientated:

> '... to encourage the consideration of the environment in planning and decision-making and to ultimately arrive at actions which are more environmentally compatible' (Canter, 1996, p.2)

An example in the latter group would be the definition provided by Lee:

> 'EIA may be defined as a process designed to ensure that potentially significant environmental impacts are satisfactorily assessed and taken into account in the planning, design, authorisation and implementation of all relevant types of action' (Lee, 1989, p.3)

Figure 4.5 Definitions of EA

Information for Decision-maker	Planning/Approval/Implementation Stages
Jain *et al.* (1977, p.18)	Lee (1989, p.3)
Munn (1979, p.1)	Bingham (1993a, p.1)
Canter (1996, p.2)	World Bank (1995, p.1)
Clark *et al.* (1980, p.1)	
United Nations Economic Commission for Europe (1987, p.v)	
Kennedy (1988, p.257)	
Wathern (1988, p.6)	
Caldwell (1989, p.9)	
Department of the Environment (1989a, p.3)	
United Nations Economic Commission for Europe (1990, p.6)	
World Bank (1991, p.1)	
Department of Environment Affairs (1992)	
Jörissen and Coenen (1992, p.1)	
Masera and Colombo (1992, p.55)	
Ministry for the Environment (1992, p.7)	
Bass and Herson (1993, p.1)	
Gardener (1993, p.1)	
Jenkins and Brooke (1993, p.3)	
Commission for EIA (1994, p.2)	
Engineering Council (1994, p.12)	
English Nature (1994, p.4)	
Glasson *et al.* (1994, p.3)	
Roots (1994, p.2)	
Sadar and McEwen (1994, p.21)	
Dougherty and Hall (1995, p.1)	
Royal Society for the Protection of Birds (1995, p.1)	
Sowman *et al.* (1995, p.45)	
Wood (1995, p.1)	

Although the majority of EA definitions suggest that EA is about providing relevant information for the decision-maker (Figure 4.5), a number are now suggesting that the EA process should be extended to the implementation stage and beyond. Bingham (1993a) in discussing the role of EA, suggests that the EA process should be considered to extend beyond the decision because the 'immediate objective may often be production of an environmental document, but it is important to bear in mind that the goal is not the document ... The goal is to achieve management of the environment through the environmental assessment process' (Bingham, 1993a, p.1). In the concluding section of Chapter Two of this thesis, it was identified that not only should all stages of the project life be considered, but that it was just as important to ensure the implementation of the agreed outcomes of the EA process throughout the life of the project. Hence, it is the latter type of definition which will be taken to be the one to be used for the good practice EA model.

EA Terminology

In the United States, whilst EIA is generally used to refer to the wider process; the term EA has a specific meaning when used in the context of NEPA (which only applies to the assessment of federal projects). Along with other terms these terms are defined by law to have specific meanings (Council on Environmental Quality, 1986; Department of Ecology, 1992):

> *'Environmental Assessment (EA).* A concise public document that analyses the environmental impacts of a proposed federal action and provides sufficient evidence to determine the level of the significance of the impacts.
>
> *Findings of No Significant Impact (FONSI).* A public document that briefly presents the reason why an action will not have a significant impact on the quality of the human environment and therefore will not require the preparation of an environmental impact statement.
>
> *Environmental Impact Statement (EIS).* The detailed statement required by Section 102(2)(C) of NEPA which an Agency prepares when its proposed

action significantly affects the quality of the human environment' (Kreske, 1996, p.31).

The term human environment as used by NEPA is defined to include 'the natural and physical environment and the relationship of people with that environment' (Council on Environmental Quality, 1986) and can include social and economic effects.

In the EU EA Directive (85/337/EEC) (Commission of the European Community, 1985) there are no specific terms defined, but the process is referred to as 'environmental impact assessment' (1985, Article 3) and the content of the information report required to be provided is defined (Article 5 (2) and Annex III) but not named.

In the UK, the term EA is normally used in preference to EIA, to mean the wider process, not just a process to asses if an ES is required. The terms are defined in the Department of the Environment's Circular 15/88 - Environmental Assessment (1988b). In this Circular, EA is defined as 'the whole process required to reach the decision, i.e. the collection of information on the environmental effects of the project, the consideration of that information ... and the final judgement resulting in development consent or refusal' (1988b, p.3). The environmental information submitted in association with the planning application is defined as the ES (Department of the Environment, 1988b). As discussed earlier in this chapter, this is a somewhat limited definition of EA and shall not be taken to be the good practice definition of EA.

The term EA will continue to be used throughout this thesis to mean the whole process of assessment throughout the project lifecycle. A number of other words are defined in legislation and guidelines. The most important being the word 'significant'. When does an effect become significant? The Washington SEPA handbook defines significant as:

(1) a reasonable likelihood of more than a moderate adverse impact on environmental quality;

(2) Significance involves context and intensity and does not lend

itself to a formula or quantifiable test. The context may vary with the physical setting. Intensity depends on the magnitude and duration of an impact.

The severity of an impact should be weighed along with the likelihood of its occurrence. An impact may be significant if its chance of occurrence is not great, but the resulting environmental impact would be severe if it occurred' (Department of Ecology, 1993, Section WAC 197-11-794).

The key words in this definition are: context, intensity and likelihood. All of which need to be taken into account in the EA assessment stage.

In the Department of the Environment's EA Guidelines (1989a) they suggest that there can be no general definition of what constitutes significance, but suggest that 'there are three main criteria of significance:

i whether the project is of more than local importance, principally in terms of physical scale;

ii whether the project is intended for a particularly sensitive location, for example, a National Park or a Site of Special Scientific Interest (SSSI), and for that reason may have significant effects on the area's environment even though the project is not on a major scale;

iii whether the project is thought likely to give rise to particularly complex or adverse effects, for example, in terms of discharge of pollutants' (Department of the Environment, 1989a, p.5).

In addition to the guidelines booklet on EA (1989a), the Department of the Environment has issued a circular 15/88 (Department of the Environment, 1988b) on EA to provide more detailed guidance to planning authorities. This guidance includes indicative criteria and thresholds for such projects. Some planning authorities have issued additional guidelines for developers such as Cheshire County Council (Cheshire Environmental Planning, 1989) and Essex

Planning Officers' Association (1994).

The word 'mitigation' is not always clearly understood when used in the context of EA. The US Council on Environmental Quality has defined the word for use in the context of federal actions (Council on Environmental Quality, 1986). The Washington SEPA legislation has extended the Council on Environmental Quality definition of five elements to include a sixth element covering monitoring works as listed below:

'1. Avoiding the impact altogether by not taking a certain action or parts of an action;
2. Minimising impacts by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts;
3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;
5. Compensating for the impact by replacing, enhancing, or providing substitute resources or environments; and/or
6. Monitoring the impact and taking appropriate corrective measures' (Department of Ecology, 1993, Section WAC 197-11-768).

The elements one to five in the above list are requirements of the traditional approach to EA, i.e. information for the decision-making process. The sixth element has been developed from an understanding of the need to view the EA process from a wider standpoint throughout the whole of the project life-cycle and is an essential element of good EA practice.

Scoping of Environmental Assessment

A number of countries require a formal scoping stage with public consultation. Wood (1995) notes that formal scoping occurs in the United States, the Netherlands, Canada and Australia. Whilst not being obligatory in New Zealand, it is very strongly encouraged by the EA legislation. In the UK there

is no statutory requirement. It often occurs but practice varies with local authorities and developers. The scoping guidelines produced by the New Zealand Ministry for Environment (1992) appear to be the most comprehensive in providing clear objectives and including public consultation in the form of a 'communications plan' and this shall be used as the basis for the model of good practice EA.

'Objectives for Scoping:

(a) To identify the possible effects of the proposal on the environment;
(b) To identify the possible effects on people of potential environmental changes;
(c) To inform potentially affected people of the proposal.
(d) To understand the values held by individuals and groups about the quality of the environment that might be affected by the proposal;
(e) To evaluate concerns expressed and possible environmental effects for the purpose of determining how and whether to pursue them further;
(f) To define the boundaries of any required further assessment in terms of time, space and subject matter;
(g) To determine the nature of any required further assessment in terms of analytical methods and consultation procedures;
(h) To organise, focus and communicate the potential impacts and concerns to assist further analysis and decision-making'

(Ministry for Environment, 1992, p.9).

The Ministry for Environment also suggests the basic steps in scoping process should be:

'1. Develop a communications plan (decide who to talk to and when);
2. Assemble information that will be the starting point of discussions;
3. Make the information available to those whose views are to be obtained;
4. Find out what issues people are concerned about (make a long list);

5. Look at the issues from a technical or scientific perspective in preparation for further study;
6. Organise information according to issues, including grouping, combining and setting priorities (make the longer list into a shorter list);
7. Develop a strategy for addressing and resolving each key issue, including information requirements and terms of reference for further studies (1992, pp.9-10).

The Canadian EA system uses the concept of Valued Environmental Components (VECs) in the scoping process, which can assist in focusing the attention of the decision-makers and the public on the key issues (Conawapa Environmental Review Panel, 1992).

Choice of Alternatives

The choice and clear analysis of alternatives lies at the heart of good EA. Van Eck (1994) suggests that there are two main objectives for comparing alternatives. Firstly, 'to give the competent authority a clear view of the impact of the proposed activity compared to the impact of the considered alternatives. Secondly, to compare the impacts of the proposed activity and its alternatives in relation to standards and objectives of environmental policy. The impacts should be comparable, to make a sound decision. The information should be factual without valued judgement. If valued judgements are unavoidable, they should be explained and justified. ...' (Van Eck, 1994, p.55).

The choice of alternatives in the project management process can also be advantageous to the developer. It can provide cost-cutting solutions; the development of more secure ways of obtaining a favourable decision; and it can also favour the development of an alternative that is environmentally acceptable, because issues are identified and focused alternatives can be developed (Van Eck *et al.*, 1994).

The choice of alternatives can be thought of at three different levels. Firstly, strategic alternatives, e.g., the solution to a heavy congested town

centre could be to review the vehicle circulation patterns in the town; build a bypass around the town; promote the use of public transport within the town; and consider out of town shopping areas as a possible option. Secondly, there is the location of the alternative, e.g., alternative bypass routes could be considered. And finally, the implementation of alternatives could be considered. For example, an existing road could be upgraded or a completely new route chosen. The implementation methods and processes used, together with their operating and maintenance alternatives, should be considered.

In the Netherlands, a minimum of three alternatives are required to be considered: the preferred alternative (PA); the alternative most favourable to the environment (MFA); and the do nothing option (Van Eck *et al.*, 1994)

The other alternatives that have to be considered are those suggested by outside bodies, such an environmental protection agencies or members of the public. In their guidelines for energy projects, the US Department of Energy suggests that 'if certain alternatives appear obvious or have been identified by the public, but are not reasonable, explain why they are not reasonable' (Department of Energy, 1995, p.9). It is important to ensure that such alternatives are discussed openly and not dismissed without any comment in the EA report. Failure to do so could lead to the formal decision-makers and the public thinking that such alternatives have been overlooked, leading to unnecessary objections or even rejection of the project.

Environmental Topics to be covered by the EA

The 'examination of the full social and ecological impacts of the proposed action require a "holistic" approach, in the sense of that examination of the effects on natural and social systems separately will not reveal the full scope of the interactive effects' (Westman, 1985, p.6). However, this does not necessarily mean that the EA has to be exhaustive, 'depending on the type and scale of the ... project and where it is sited, the assessment should be focused on the factors that would have the most pronounced impact' (United Nations Environment Programme, 1980, p.20).

A wide range of guidance exists as to the range of topics that should be considered. Some are sectorially based, e.g., water resources (World Bank,

1991; Mock and Bolton, 1993) and others are designed to be applicable to all types of projects (Department of the Environment, 1989a; Department of Ecology, 1992; Department of Environment Affairs, 1992e). Figure 4.6 shows the list of environmental elements which have been prepared by the Washington State, Department of Ecology. The list splits into two distinct groups; the natural environment and the built environment. This list provides a useful starting point for all EA work. It commences with the natural environment; starting with the underlying geology and soils, through to the elements of air and water, plants and animals, and energy and natural resources. In the second group it lists the human-related elements of the built environment; starting with human health, then land-use, transportation and public services. The list provides a logical progression through the physical, biological, social, economic, cultural and historical components of the EA process. As a good example of clear, logical layout, this list was chosen as a basis for developing the EA good practice model.

Lee (1989) suggests that only those impacts which are 'potentially significant to the decision to authorise the project' (1989, p.52) should be assessed. Sadar (1996) also suggests that the boundaries of the EA process should be limited to the significant impacts. However, this reasoning is flawed, because in limiting the information to a 'reasonable' amount for the decision-maker to read, i.e. only significant effects, it fails to take account of the decision-makers need to be reassured that certain effects will not occur. For example, the potential loss of public access to a site may be important to local residents. If the ES fails to cover this issue because it has been identified that there will be no significant effect on public access, then the ES will have failed to communicate with the decision-makers in an effective manner on one of the key concerns of the local community. Not only is it important to cover both adverse and beneficial effects, but it is also important to communicate those elements where there will be no effect at all. This will require the decision-maker and public to read additional information, but this can be dealt with by careful use of summaries, tables and matrices to help communicate such information in a concise readable manner.

Figure 4.6 Washington State SEPA Handbook - Elements of the Environment (Department of Ecology, 1993)

1.Natural Environment

a. Earth

1) Geology
2) Soils
3) Topography
4) Unique physical features
5) Erosion/enlargement of land area (accretion)

b. Air

1) Air quality
2) Odour
3) Climate

c. Water

1) Surface water movement/quantity/quality
2) Runoff/absorption
3) Floods
4) Groundwater
5) Public water supplies

d. Plants and Animals

1) Habitat for and numbers or diversity of species of plants, fish, or other wildlife
2) Unique species
3) Fish or wildlife migration routes

e. Energy and natural resources

1) Amount required/rate of use/efficiency
2) Source/availability
3) Nonrenewable resources
4) Conservation and renewable resources
5) Scenic resources

Figure 4.6 (*continued*) Washington State SEPA Handbook - Elements of the Environment (Department of Ecology, 1993)

2. Built environment

a. Environmental health

1) Noise

2) Risk of explosion

3) Releases or potential release to the environment affecting public health, such as toxic or hazardous materials

b. Land and shoreline use

1) Relationship to existing land-use plans and to estimated population

2) Housing

3) Light and glare

4) Aesthetics

5) Recreation

6) Historic and cultural preservation

7) Agricultural crops

c. Transportation

1) Transportation systems

2) Vehicular traffic

3) Waterborne, rail and air traffic

4) Parking

5) Movement and circulation of people or goods

6) Traffic hazards

d. Public services and utilities

1) Fire

2) Police

3) Schools

4) Parks or other recreational facilities

5) Maintenance

6) Communications

7) Water/stormwater

8) Sewer/solid waste

9) Other government services or utilities

4.4 Guidelines for the Preparation of the Environmental Statement

US Guidelines

The US NEPA legislation requires that for any federal actions which may significantly affect the quality of the human environment, a detailed statement is required which covers:

'(i) the environmental impact of the proposed action;

(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented;

(iii) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and

(iv) any irreversible and irretrievable commitments of resources would be involved in the proposed action should it be implemented' (US Government, 1969, Section 102 (C)).

In 1986, the US Council on Environmental Quality produced regulations for implementing the provision of NEPA (Council on Environmental Quality, 1986). These reinforced the need for EA, but also provided guidelines as to how the EA process could be improved. They confirmed that the 'procedures must insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken (Council on Environmental Quality, 1986, Section 1500.1 (b)), but highlighted that 'documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail' (1986, Section 1500.1 (b)).

The Council on Environmental Quality in 1986 reviewed the use of EA and suggested how excessive paperwork could be reduced. They include:

'(a) reducing the length ... by means such as setting appropriate page limits;

(b) preparing analytical rather then encyclopedic environmental impact statements;

(c) discussing only briefly issues other than significant ones;

(d) writing ... in plain language;

(e) following a clear format ...;

(f) emphasizing portions ... that are useful to decision-makers and the public;

(g) using the scoping process not only to identify significant issues, but also to de-emphasise insignificant issues, narrowing the scope of the ... process accordingly;

(h) summarizing the environmental impact statement and circulating the summary instead of the entire ... statement if the latter is unusually long;

(i) using program, policy, or plan environmental impact statements and tiering from statements of broad scope, to eliminate repetitive discussions of the same issues;

(j) incorporating by reference;

(k) integrating NEPA requirements with other environmental review and consultation requirements;

(l) requiring comments to be as specific as possible;

(m) attaching and circulating only changes to the draft environmental impact statement, rather than rewriting and circulating the entire statement when changes are minor;

(n) eliminating duplication with State and local procedures, by providing for joint preparation ...;

(o) combining environmental documents with other documents;

(p) using categorical exclusions of actions which do not individually or cumulatively have a significant effects on the human environment and which are therefore exempt from requirements to prepare an environmental impact statement;

(q) using finding of no significance when an action not otherwise excluded will not have a significant effect on the human environment ...'

(Council on Environmental Quality, 1986, Section 1500.4)

The key recommendations in these guidelines are the need for scoping and the clear, concise format and readability of the information presented in the report.

Guidelines for EA Team Membership

The use of interdisciplinary teams is critical to the successful implementation of an EA (Canter, 1991). The US Council on Environmental Quality require the use of an 'inter-disciplinary approach which will insure the integrated use of natural and social sciences and the environmental design arts ... The disciplines of the preparers shall be appropriate to the scope and issues identified in the scoping process' (Council on Environmental Quality, 1986, Section 1502.6). The phrase 'interdisciplinary' rather than 'multidisciplinary' should be used, because 'multidisciplinary' implies a group of disparate professionals with minimal attempts to coordinate their work (Canter, 1991). An effectively managed team of professionals working to a clear set of objectives and work programme, greatly increases the chances of a successful EA. Kreske (1996) discusses the role and responsibilities of the EA project manager and team. However, no specific guidelines for project management of the EA process appear to have been produced as yet (Roe *et al.*, 1995) though there is limited discussion in a few recent textbooks and papers (Canter, 1991; Kreske, 1996; Weaver *et al.*, 1996) and a few lines in some guidelines (World Bank, 1995; Department of the Environment, 1995b).

Guidelines for the Writing Style of EA Documents

The need for the reports to be written in plain language is highlighted in many guidelines. The Washington SEPA handbook requires that they 'shall be concise and written in plain language ... shall not be excessively detailed or overly technical ... shall explain plainly the meaning of technical terms not generally understood by the public ... in a glossary or footnotes ...' (Department of Ecology, 1993, Section WAC 197-11-425 (2)). The handbook goes on to require that such reports shall 'allow the reader to understand the most significant and vital information concerning the proposed action, alternatives, and impacts, without turning to other documents ...' (Department of Ecology, 1993, Section WAC 197-11-425 (1)). The US Council on

Environmental Quality even suggests that 'agencies should employ writers of clear prose or editors to write, review, or edit statements, which will be based upon the analysis and supporting data from the natural and social sciences and the environmental design arts' (Council on Environmental Quality, 1986, Section 1502.8).

The Saskatchewan guidelines echo this ethos, noting that the document should be 'written in non-technical language and be suitable for widespread public distribution. The report, especially the Summary, should be printed so that black and white reproductions can easily be made' (Saskatchewan Environment and Resource Management, 1993, p.20).

Guidelines for the Length of EA Documents

The recommendations for length of ES vary, with guidance for US NEPA projects requiring that the 'statement shall normally be less than 150 pages and for proposals of unusual scope or complexity shall normally be less than 300 pages' (Council on Environmental Quality, 1986, Section 1502.7). However, Washington State SEPA guidelines recommend shorter documents which shall range 'from thirty to fifty pages and may be shorter. The EIS text shall not exceed seventy-five pages; except for proposals of unusual scope or complexity, where the EIS shall not exceed one hundred and fifty pages. Appendices and background material shall be bound separately if they exceed twenty-five pages, except if the entire document does not exceed one hundred pages ...' (Department of Ecology, 1993, Section WAC 197-11-425 (4)).

Guidelines for Format of Documents

Many guidelines suggest broadly similar formats for the ES documents. It is preferable that the format should encourage good analysis and clear presentation of the alternatives including the proposed action. The required format of the US Council on Environmental Quality is shown below:

(a) cover sheet;
(b) summary;
(c) table of contents;

(d) purpose of and need for action;
(e) alternatives including proposed action;
(f) affected environment;
(g) environmental consequences
(h) list of preparers;
(i) list of agencies;
(j) index;
(k) appendices
(Council on Environmental Quality, 1986, Section 1502.10).

This format provides the sequence of need; alternatives; baseline environment; and assessment, which is followed in others such as the checklist of matters to be considered for inclusion in an ES provided by the UK Department of the Environment (1989a). Their checklist is less prescriptive than the one provided by the US Council on Environmental Quality, but the similarities in structure and sequence are there:

Section 1 - Information describing the project

1.1 Purpose and physical characteristics of the project.
1.2 Land use requirements.
1.3 Production processes and operation features of the project.
1.4 Main alternative sites and processes considered.

Section 2 - Information describing the site and its environment

Physical features

2.1 Population
2.2 Flora and fauna
2.3 Soil
2.4 Water
2.5 Air
2.6 Architectural and historic heritage
2.7 Landscape and topography
2.8 Recreational uses

2.9 Any other environmental features

2.10 The policy framework -statutory designations and structure/unitary/local plans

Section 3 - Assessment of Effects

Effect on human beings, buildings and man-made features

Effects of flora and fauna

Effects on land

Effects on water

Effects on air and climate

Other indirect and secondary effects associated with the project

Section 4 - Mitigating Measures

Section 5 - Risk of Accidents and Hazardous Development

(Department of the Environment, 1989a, pp. 37-42)

Chapter Three of this thesis discussed the minimum requirements for ESs prepared under the EU EA Directive (85/337/EEC) which specifies the information to be included as mandatory information and non-mandatory further information. Whilst there is no specific requirement to provide any of the information in a specific order as in the US regulations, there is an implied format, as contained in the Department of the Environment EA guidelines (1989a) listed above.

The Washington State SEPA handbook recommends that 'most of the text ... shall discuss and compare the environmental impacts and their significance, rather than describe the proposal and the environmental setting. Detailed descriptions may be included in the appendices ...'(Department of Ecology, 1993, Section WAC 197-11-425 (3)). This highlights the essence of what EA is about; the key information for the decision-makers and the public is the assessment of the likely effects of the project, rather than a detailed explanation of the project and local environment with little real analysis of the effect of the project.

Guidelines for Public Consultation

The public can play a key role in helping to identify possible effects (World Bank, 1995) and to provide an indication of the value they perceive various elements of the environment to be worth (in a qualitative sense). The World Bank (1995) suggests that the 'quality of the EA work improves when information and views provided by affected groups ... are taken into account' (1995, p.6). The other role of consultation will be to keep the public informed and to help reduce the tendency of the public to automatically object to any changes in their local environment. As the Washington State, Department of Ecology suggests: 'whatever the form (of public consultation), an open and fluid public involvement process is a key to avoiding polarized positions which can lead to needless and unpleasant conflict' (Department of Ecology, 1993, p. A2).

A number of guidelines and texts (Praxis, 1988; Canter, 1996; Sadar, 1996) suggest that the use of more informal communication and targeted techniques is preferable. The use of public meetings is recognised as not a good forum for gaining an effective response from a wide audience. Such meetings very often get hijacked by people with specific objections, and peer pressure can lead to the majority of the audience being unhappy to air their personal views in public.

4.5 UK Government Guidelines

Following the publication of Our Common Future (World Commission on Environment and Development Report, 1987), the UK Government published a short report entitled Our Common Future: A Perspective by the United Kingdom on the Report of the World Commission on Environment and Development (Department of the Environment, 1988), which outlined the Government's general agreement to the principles of sustainable development and the need to introduce programmes to implement such a policy. The report suggests that there is no need to change the 'machinery of UK government' (1988, p.55), but there is scope for more progress to be made, integrating

environmental issues in policy making and the implementation of those policies, towards the goal of sustainable development. This was followed by the UK's environmental strategy, entitled This Common Inheritance, as an annual report commencing in 1991. This summarised a wide range of environmental policies under three headings: Government White Paper commitments; action to date; and commitments to further action (UK Government, 1992a).

At a strategic level the UK Government has produced Policy Appraisal and the Environment (Department of Environment, 1991) as a guide for government departments to promote the inclusion of environmental costs and benefits in government decision-making. Its goal is to 'promote a form of cultural change, a different and broader way of thinking for civil servants' (Braun, 1992) cited in Thérivel *et al.*, (1992). The main Government advisory guidelines for economic appraisal, Economic Appraisal in Central Government (HM Treasury, 1991) also include examples of how non-marketed outputs, e.g., environmental features, should be taken into account in the decision-making process.

The concept of EA implies a change in the UK Government's policy. Traditionally there has been a presumption in favour of development, and it is the responsibility of the relevant authority (normally the planning authority) to show why the development should not go ahead. However, the EA process requires the developer to describe and justify the proposed development, which is 'an implicit shift of the onus (of justification)' (Carnwath, 1991, p.63)

Ministry of Agriculture, Fisheries and Food - EA Policy Guidelines

The Ministry of Agriculture, Fisheries and Food (MAFF) produced the Conservation Guidelines for Drainage Authorities (Ministry of Agriculture, Fisheries and Food, 1988) covering the general requirements of drainage authority operations with respect to the conservation and enhancement obligations under Section 22 of the Water Act 1973, as amended by Section 48 of the Wildlife and Countryside Act 1981. When considering new or improvements to flood defence works, the guidelines identified the need for drainage authorities to consult with a wide range of appropriate bodies 'so that

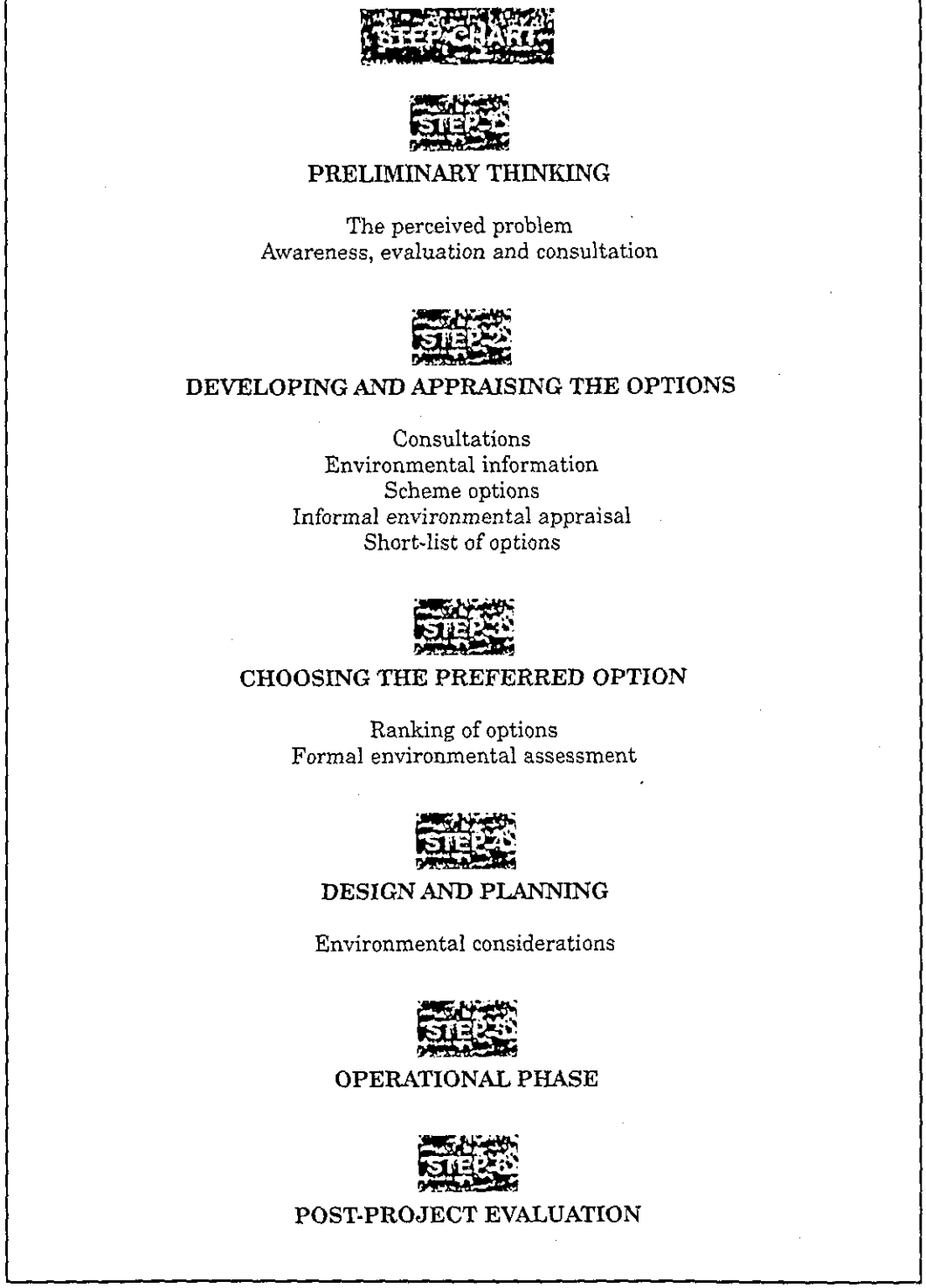
environmental and conservation considerations can be taken into account and positive measures planned' (Ministry of Agriculture, Fisheries and Food, 1988, p.8). The 'consultation should cover the need for the works; design, execution, timing and environmental impact; on request, the aggregate of the cost-benefit data provided for in the MAFF guidelines on investment appraisal' (1988, p.8).

In 1992 the MAFF produced the Environmental Procedures for Inland Flood Defence Works: A Guide for Managers and Decision Makers in the National Rivers Authority, Internal Drainage Boards and Local Authorities (Ministry of Agriculture, Fisheries and Food, 1992). The guidelines recommended a 6 step procedure:

'Step 1: Preliminary Thinking
Step 2: Developing and Appraising the Options
Step 3: Choosing the Preferred Option
Step 4: Design
Step 5: Operational Phase
Step 6: Post-Project Appraisal'
(Ministry of Agriculture, Fisheries and Food, 1992, p.3)

These steps follow Wathern's standard EA process (Figure 4.2), implying the need for scoping (but not actually using the word 'scoping') and the importance of the selection of appropriate alternatives. A minimum of four options are required to be assessed: do nothing; reduce the standard of protection of the flood defence; sustain the present level of flood defence; or improve it.

Figure 4.7 MAFF Step Chart for EA Procedures using SI No. 1217
(Ministry of Agriculture, Fisheries and Food, 1996, p.8)



The Coastal Defence and the Environment: A Strategic Guide (Ministry of Agriculture, Fisheries and Food, 1993a) guidelines are similar in content to the Inland Flood Defence Works (Ministry of Agriculture, Fisheries and Food, 1992) guidelines, and options should include consideration of risk

management, sustainability and change of alignment of the defence. It provides more detail on recommended consultees and procedures for environmental impact. Step 5: the Operational Phase, includes reference to the timing and area of the works, comprehensive and unambiguous contracts, and effective communication to ensure good environmental practice is implemented. However, it again fails to specifically mention the scoping phase, although it could be inferred from the discussion of the needs of the 'preliminary thinking stage'. These guidelines identify the need for 'an appropriate level of environmental monitoring ... before ... during and after the operational stage' (Ministry of Agriculture, Fisheries and Food, 1993a, p.9). The Coastal Defence and the Environment: A Guide to Good Practice booklet (Ministry of Agriculture, Fisheries and Food, 1993b) provides guidance as to good practice techniques that can be used to implement schemes in an environmentally sensitive manner.

The key elements in these MAFF guidelines are a need to consider a number of alternatives, including do nothing; risk management; need for the management of change; and the need for post project appraisal, none of which are included in the minimum requirements of either the EC Directive or the SI No. 1217 regulations. Figure 4.7 shows the MAFF recommended EA steps.

4.6 NRA and the Environment Agency Policy and Guidelines

NRA National Environmental 'Mission Statement'

In 1992 the NRA Board approved an internal environmental policy to promote sustainable development:

> 'The NRA is committed to the environmental principles of stewardship and sustainability. In addition to vigorously pursuing its statutory responsibilities as Guardians of the Water Environment, the Authority will aim to establish and demonstrate wise environmental practice throughout all its functions'
>
> (National Rivers Authority, 1992)

This policy statement highlighted the need to ensure that the NRA's own projects were implemented in accordance with good EA practice.

National NRA EA Guidelines

In September 1993 draft national guidelines (Brookes, 1993) were produced to cover both comments on external developers ESs and the production of internal ES for NRA operations, such as flood defence and water resources projects. This provided a useful general guidance for those new to EA and included EA legislation and the Department of the Environment's guidelines (Department of the Environment, 1989a), but the recommendations for the internal ESs were based on the procedures adopted by Thames and Anglian Regions, which were not the same as those used in the Severn-Trent Region. However, specific regional guidelines are required to ensure EA can be effectively implemented at Region and Area level. In 1994, Thames Region produced their own regional guidelines for EA (Brookes, 1994). Following the development of the national guidelines for EA (Brookes, 1993), a series of scoping guidance notes were produced for internal staff to provide scoping guidance for external developers on over 60 development types (Brookes, 1995a; 1995b). In July 1995 an national internal EA directory was produced which listed key legislation and guidelines (Brookes, 1995c).

NRA Severn-Trent Regional Levels of Environmental Appraisal

The duty imposed on the NRA to 'conserve and enhance' the environment (UK Government, 1989; 1991a) in all operations and activities, means that they should be appraised at some level or other for their effects on the environment. The Severn-Trent Region of the NRA developed a three tier system of appraisal:

'i) Environmental Appraisal

All NRA activities must be initially appraised to identify whether they have an impact on the environment.

ii) Environmental Assessment

If the predicted impact is significant, then a formal EA procedure will

be undertaken.

iii) Environmental Statements

ESs will be required to be published for public consultation, for those operations undertaken by the Agency, or external developers, which are considered to have a potential significant environmental impact, as defined by legislation. The ES will be a published version of the EA for a project.'

(Hickie, 1994, p. 2)

This tiered system of appraisal was formally introduced in the Severn-Trent's Regional Guidelines for Environmental Assessment of NRA Operations (Hickie, 1993). For the formal EA process, these guidelines simply reiterated the general guidance on EA contained in the Department of the Environment's EA guidance booklet (1989a), but with the SI No. 1217 land drainage EA regulations included. These general guidelines were identified as limited, in that they were not providing sufficient explanation of good EA practice to staff. Neither were all EA staff using the same procedures or techniques, nor did the guidelines provide a feedback of individual good practice which was being developed across the Region. This recognition of the need for better guidelines to assist staff in implementing their EA tasks in an effective and efficient manner, was the part of the basis for this research project.

The Environment Agency - Policy and Guidelines

With the creation of the Environment Agency on 1st April 1996 superseding the NRA, the need for implementing good practice was again highlighted. The Environmental Agency's principle aim, as defined in Section 4 of the Environment Act (UK Government, 1995a) in the somewhat strangely worded legislation below:

'In discharging its functions so as to protect or enhance the environment, taken as a whole, as to make a contribution towards attaining the objective of achieving sustainable development that Ministers consider appropriate'

The Environment Agency corporate plan objectives identify the need to 'organise its activities in ways which reflect good environment and management practice ... operate on high professional standards, based on sound science, information and analysis of the environment and the processes which affect it' and 'provide clear ... information on its work' (Environment Agency, 1996, p.5). An effective and integrated EA process is required to ensure delivery of such objectives.

4.7 Guidelines for other UK Environmental Statements

Highways Environmental Assessments

The SI No. 1241 - The Highways (Assessment of Environmental Effects) Regulations 1988, covers environmental requirements of Road Schemes. The Department of Transport has published the Design Manual for Roads and Bridges, Vol. 11 - Environmental Assessment (1993), which provides a voluminous set of EA guidelines. It is a useful source of various assessment techniques and possible mitigation measures.

Pipeline Environmental Assessments

The SI No. 442 - The Electricity and Pipe-line Works (Assessment of Environmental Effects) Regulations 1990, covers electricity and pipeline works (excluding water pipelines). The Department of Trade and Industry has commissioned consultants to produce guidelines for such works, and has published the Guidelines for the Environmental Assessment of Cross-Country Pipelines (Department of Trade and Industry, 1992). These guidelines thoroughly cover the subject and introduce the need for an environmental management programme to manage the restoration phase. The guidelines also cover thoroughly the measures required in the construction phase, providing protection to water courses and environmentally sensitive areas.

4.8 General EA Research

There is a plethora of papers published on a whole range of EA issues. Many papers have been referred to in the previous discussions. Historically, the majority of papers have originated from the United States, where EA research started in earnest in the early 1970s. The evolution of EA is summarised in Figure 4.8, which shows the development of research from a range of predictive methodologies; to the need to take account of social impacts in the late 1970s; through to the need to consider sustainable development using SEA for policies, plans and programmes during the 1990s.

Many of the general conclusions of researchers appear in papers and texts repeatedly over the years. In the early 1980s Lee (1983) concluded that there should be more widespread use of scoping and better guidance as to how to select EA methodologies. Ten years later similar conclusions were published by other researchers (Department of the Environment, 1994c). Some reviews of the EA process have questioned the science involved in the process (Fairweather, 1989). It has been suggested that EA results which purport to be scientific, are in fact very subjective and can lead decision-makers and the public into thinking the predictions are precise scientific evaluations of the consequences of the proposed project. The decision-makers and public have sought simple 'black and white' answers to the question of: what are the effects on the community and wider environment going to be? The study of EA methodologies over the past two decades has not led to the successful development of objective evaluation systems. Many of the systems developed provide an 'answer', but as to how the answer was arrived at and its limitations are often not clearly understood by decision-makers or the public. The traditional 'technocratic paradigm' of EA is incomplete if not considered in the political context within which it has to operate (Formby, 1990). This political dimension which has been discussed in earlier chapters, is also highlighted by a number of others (Allison, 1975; Nichols and Hyman, 1982; Sippe, 1996) as specifically not a scientific or technological process, but in reality a tool in the political process. If, therefore, the EA process and outputs are regarded as a tool for the political decision-making process, they can be

Figure 4.8 The Evolution of Environment Assessment
(based on Sadler, 1994)

Date and Phase	Trend and Innovations
1. Prior to 1970 Pre - EA	Project review based on purely engineering and economic studies, e.g., cost-benefit analysis, limited consideration of environmental issues.
2. 1970-1975 Methodological development	EA introduced in some developed countries; initially focusing on identifying, predicting and mitigating bio-physical effects; opportunity for public involvement in major studies.
3. 1975-1980 Social dimensions included	Multi-dimensional EA, incorporating social impact assessment and risk analysis; public consultation becomes part of development planning and assessment process; alternatives become important.
4. 1980-1985 Process and procedural redirection	Efforts to integrate EA with policy planning and follow-up phases; research and development focusing on effects of monitoring, on EA audit and process evaluation; adoption of EA by international aid lending agencies and by some developing countries.
5. 1985-1990 Sustainability paradigm	Scientific and institutional frameworks for EA begin to be rethought in response to sustainability ideas and imperatives; search begins for ways to address regional and global changes and cumulative impacts; growing international cooperation on EA research and training.
6. 1990-present Strategic EA	Strategic EA of policies, programmes and plans introduced in some developed countries; international convention on transboundary EA.

developed to assist in achieving this goal. If this goal is not considered the EA process will tend to be a technological procedure divorced from reality and will not provide any outputs which can effectively influence the decision-making process (Wood and Jones, 1991) or its implementation and operation on site.

EA Methodologies

The main EA methodologies have been discussed in Chapter Two of this thesis. It is often preferable to use the simpler technique such as a checklist approach rather than a complex analysis system such as Water Resources Assessment Methodology (Solomon *et al.*, 1977), to convey information to the decision-maker and the public (Canter, 1996). Others have also noted the that simplicity will be required when there are staff and resource constraints on the EA team, and that the methodology needs to be flexible to change with the final iterations of the project alternatives (Economic and Social Commission for Asia and the Pacific, 1990). However, another practical constraint is 'information overload'. The more effectively and comprehensively all the effects are specified, the harder it is for a decision-maker to choose amongst the effect trade-offs in the final decision-making process (Elliot, 1981). A few effects with no other secondary effects listed, leads to a simple exercise for the decision-maker to come to a decision. A range of different methodologies has been developed to help evaluate the component impacts, effects and alternatives.

Evaluation of Comparative Methodologies

Nichols and Hyman (1980; 1982) concluded that none of the methodologies they evaluated fulfilled all their evaluation criteria. Some use quantitative expressions of environmental values, often displayed in numerical tables (e.g., Water Resources Assessment Methodology (Solomon *et al.*, 1977), Environmental Evaluation System (Dee *et al.*, 1973) and decision analysis techniques). Others make greater use of qualitative techniques and graphic displays (e.g. network analysis and overlay techniques). They conclude that most of the techniques rely on experts to provide the value. None of the 12

techniques that they evaluated could take account of local community values to any real degree. In looking at the range of methodologies available, Canter (1993) agrees that no single methodology provides for the whole of the EA process, but that the EA team can use a combination of methods to achieve the required tasks. He suggests that matrices and descriptive checklists are admirably suited to impact identification and assessment summary, with more complex techniques used for impact and alternative evaluations.

As discussed in Chapter Two, Thompson (1990) in reviewing 24 methodologies using 15 evaluative criteria came to similar conclusions as Nichols and Hyman (1982). Again no one single methodology achieved the full criteria. He notes that the PADC (Clark *et al.*, 1983) system scores highly, but fails to provide for public participation. It is suggested that methodologies that provide a 'final score' should not be used, as these remove the decision from the hands of the decision-maker and place it in the hands of the EA team (Thompson, 1990). Such a conclusion is refuted by supporters of multi-criteria analysis and other similar techniques, who argue that decision-makers still have to make a decision to accept the weighting factors and the final conclusion of the analysis (Chechile and Carlisle, 1991).

A number of researchers have promoted the use of multi-criteria analysis to assist the decision-making process (Chechile and Carlisle, 1991; Patera and Říha, 1996), an example of which, has been discussed in Chapter Two of this thesis. Such techniques do show some promise for a rational and open choice of alternatives, but many EA staff remain to be convinced that the results are any more valid than an entirely subjective value system. As with any methodology, if the decision-makers and public cannot readily follow the evaluation process, it will not help assist in the democratic decision-making process. If the ES is not clear, a decision will very often be made on purely political grounds without any rational EA input.

In commenting on the qualitative and quantitative methodologies, Lawrence (1993) observes that it is important that the methods used by the EA team will help decision-makers and the public to make 'effective, efficient and environmentally sound decisions' (1993, p. 10), and that they should not have to read increasingly 'esoteric mathematical' assessment techniques or 'rambling

descriptions ... with unsubstantiated conclusions' (1993, p.10).

4.9 Development of ES Review Methodologies

The early work on reviewing ESs was pioneered in Canada by the Federal Environmental Assessment Review Office (FEARO - which was superseded by the Canadian Environmental Assessment Agency in 1992). The Canadian system requires the review of ESs by panel members under the Environmental Review Process (EARP). Ross (1987) in reviewing this process, suggests that there are three distinct aspects to evaluate: (1) the focus of ES on key questions that need to be answered in order to make a decision; (2) the scientific and technical soundness of the ES; and (3) the clarity of the ES so that the information presented can be understood.

Ortolano *et al.* (1987) suggest that the key criteria for a successful ES should be: (1) the ES should comply with legal and procedural requirements; (2) the documentation should be adequate; (3) it should use appropriate methods in assessing the impacts; (4) the environmental information should influence technical decisions, including alternatives and mitigation; and (5) the environmental issues should have appropriate status and weighting, relative to economic and technical factors. They concluded there was the need for additional research to develop control mechanisms for EA.

In the development of a review system for reviewing ESs in Canada's National Parks, Elkin and Smith (1988) proposed the list of criteria below:

1. Administration
2. Effective communication
3. Identifying key concerns
4. Looking at alternatives
5. Collecting information
6. Describing baseline conditions
7. Predicting impacts
8. Managing and mitigating impacts

9. Following up: surveillance and monitoring
(Elkin and Smith, 1988, pp.80-81)

Each key criterion has a number of evaluation questions, such as the first question associated with effective communication: 'Statement of Purpose: Is there a clear, concise statement of the purpose of the project at the beginning of the report?' (Elkin and Smith, 1988, p.80). This list of criteria with associated questions is the forerunner of the format used by many current review systems.

For use in the UK, Tomlinson's often quoted review system (1989) is a slightly modified version of Elkin and Smith's review system, with exactly the same key criteria, but with slightly differently worded questions.

Lee and Colley ES Review Methodology

Lee and Colley (1992) note that the review of ES can be undertaken by a number of participants with slightly differing objectives:

a) Developers and their EA consultants to ensure quality control of the EA outputs;

b) Competent or regulatory authorities to review whether the ES is adequate and if additional information should be requested;

c) Official EA review panels such as those in Canada and the Netherlands to provide an independent review of the ES;

d) Statutory and other consultees to check the adequacy of the ES.

The Lee and Colley (1990; 1992) review methodology uses a similar approach to Elkin and Smith (1988). It has four areas for review (1) description of the development, the local environment and the baseline conditions; (2) identification and evaluation of key impacts; (3) alternatives and mitigation; and (4) communication of the results. The four key areas are subdivided into

sub-headings and associated statements. In this system the criteria are statements rather than questions, e.g., 'the purpose(s) and the objectives of the development should be explained' (Lee and Colley, 1992, p.41). Each statement is reviewed using the grading system below:

'A Generally well performed, no tasks left uncompleted.
B Generally satisfactory and complete, only minor omissions and inadequacies.
C Can be considered just satisfactory despite omissions and/or inadequacies.
D Parts well attempted but must, as a whole, be considered just unsatisfactory because of omissions and/or inadequacies.
E Not satisfactory, significant omissions or inadequacies.
F Very unsatisfactory, important task(s) poorly done or not attempted.
NA Not applicable. The Review Topic is not applicable or irrelevant in the context of this Statement'
(Lee and Colley, 1992, p.51).

A summary sheet is completed for each criteria and then an overall quality grading is provided for the review. The objectives of the review process are to provide the reviewer with a methodology to alert them to areas of 'weakness, omission or even concealment' in the ES (Lee and Colley, 1992, p.32). It is not designed to help the reviewer refute any of the findings presented in the ES. This is the main weaknesses in these review methodologies in that they tend to provide a grading system based on a presence or absence checklist, rather than a framework for the evaluation of the actual quality of the content of the ES. Put simplistically, it is the quantity of criteria being met in terms of presence or absence, not the actual quality which is being measured. All the appropriate tasks may be completed, but what about the quality of these tasks? How do they compare to expected good practice? At present no review system has been developed to adequately evaluate the objective quality of ESs.

European Commission's ES Review Methodology

The Directorate General for Environment, Nuclear Safety and Civil Protection (DGXI) of the Commission of European Communities has published a review methodology (Colley and Raymond, 1994) for reviewing ESs submitted, to the competent authorities, as part of the EA legislation. The objectives of this review system are to evaluate the completeness and suitability of the information from both a technical and decision-making point of view. This review methodology uses eight review areas:

1. Description of the project
2. Outline of the alternatives
3. Description of the environment
4. Description of the mitigation measures
5. Description of the effects
6. Non-technical summary
7. Difficulties compiling information
8. General approach

For each review question there are three stages. Firstly, the review has to decide that the question is relevant to the ES being reviewed. If it is relevant a 'Y' is put in the first column (see Figure 4.9) to be completed (if not relevant, a 'N' is put in the column and the reviewer moves on to the next question). If the reviewer has decided that the question is relevant, the decision is required as to whether the information is complete (C); acceptable (A); or, incomplete (I). The review guidelines provide definitions for these terms. If the information is acceptable or incomplete the reviewer is to note the information missing and to recommend a way of obtaining this information, if feasible. The methodology provides for an overall appraisal of the information by subjective grading of the information in the eight review areas. A single overall subjective grading may be derived using the grading of poor to excellent, which are again defined in the methodology.

As with all the methodologies developed to date, the overall grade is obtained by subjective professional judgement. There is no provision for

weighting the completeness or incompleteness of individual questions or review areas. Such a weighting system could be constructed, but it would inevitably be open to widespread disagreement as to the appropriate application of the weighting factors.

Figure 4.9 European Commission - EA Review Checklist
(from Colley and Raymond, 1994, p.11)

1. DESCRIPTION OF THE PROJECT			
No. Criterion	Relevant? (Y/N)	Judgement (C/A/I)	Comment
1.1 Are the purpose(s) and objectives of the project explained?			
1.2 Are the nature and status of the decision(s) for which the environmental information has been prepared clearly indicated?			
1.3 Is the estimated duration of the construction phase, operation phase and, where appropriate, decommissioning phase given, together with the programme within these phases			

Institute of Environmental Assessment EA Review System

Coles, Fuller and Slater (1992) of the Institute of Environmental Assessment (IEA) produced a modified version of the Lee and Colley (1990) review criteria, and following the review of a wide range of ESs, suggested problem areas requiring improvement in EA procedures include:

- Lack of independent project specification
- Lack of ES quality reviews
- Lack of adequate guidance

The IEA review criteria were:

1 Description of the development, the local environment and the baseline conditions.
   1.1 Description of the Development
   1.2 Site Description
   1.3 Residuals
   1.4 Baseline Conditions

2 Identification and evaluation of the key impacts
   2.1 Identification of the impacts
   2.2 Prediction of impact magnitude
   2.3 Assessment of impact magnitude
   2.4 Assessment of impact significance

3 Alternatives and Mitigation
   3.1 Alternatives
   3.2 Mitigation
   3.3 Commitment to Mitigation

4 Communication of the Results
   4.1 Presentation
   4.2 Balance
   4.3 Non-technical Summary

The review was required to be undertaken by two reviewers and graded on a final, A-F (excellent to very poor), with accompanying notes to be provided on areas which are considered below adequate standard.

NRA Review System - 1993

In September 1993, the NRA produced a draft internal technical guide for Assessing Environmental Impact in the NRA (Brooks, 1993), which included in the appendices a review criteria for ESs. This considered 'the ES with respect to 8 attributes:

1. Information on the EA process (Method Statement)
2. The description of the proposed project
3. Alternatives
4. Site and the local environment
5. Predicted environmental impacts
6. Mitigation and enhancements
7. Monitoring and Maintenance
8. Presentation and non-technical summary.'

Each attribute was then divided into a number of questions indicating tasks which should have been performed within that section. These should be circled 'Yes' or 'No' as appropriate. The reviewer then graded each section from A-F, indicating how well the tasks have been performed, from excellent to very poor, in accordance with the ranking defined by Lee and Colley (1990).

4.10 EA and Public Participation

Whilst there is no universally accepted definition for 'public participation', Clark (1995) suggests that there are five basic functions of public participation:

1. Identification - of groups or individuals who may be interested in, or affected by a development action;

2. Outreach - the provision of information which is accurate, understandable, pertinent and timely. Where possible, social, economic and environmental consequences of the proposed action should be clearly stated;

3. Dialogue - between those responsible for the policy, plans and projects, and those directly affected through meetings, workshops, hearings or personal contact;

4. Assimilation - of information received and taking account of what the public say.

5. Feedback - statement of actions taken and how the public influenced the decision.

Clark observes that 'all the evidence suggests that public participation in planning, decision-making and environmental impact assessment has a critical role to play in helping to integrate economic, social and environmental objectives' (1994, p.296). Such a conclusion is also reached when EA is viewed as a political process. Public participation always helps to influence political decision-makers, especially where the decision is likely to be controversial, and politicians can say every one had their chance to put forward their view.

The Testwood Lakes EA (O'Rourke, 1991) is often quoted in the UK as a good case study of public consultation (Hendry,1992; Clarke, 1994). This project involved the proposed construction of a new 58 hectare reservoir for Southern Water Services Ltd in southern Hampshire. Planning permission was sought to extract sand and gravel to provide the new reservoir alongside the existing water supply works. EA consultants undertook a consultation exercise which provided the effective scoping of the issues. The final ES took account of the issues raised in the consultation exercise and there were very few objections to the project.

As discussed earlier in this thesis, public participation is an important feature of the democratic decision-making process. It also makes good EA project management sense to identify and take account of values and concerns held by the public at as early a stage as possible in the EA process.

4.11 EA and Monitoring

The importance of monitoring especially in relation to the environmental management of the project over its whole life cycle is recognised by Canter and Fairchild (1986). Marcus (1979) identified four objectives for an integrated monitoring system: (1) coordination of the inter-agency monitoring effort; (2) documenting the major impacts of a project, thereby improving the accuracy of predictions for future projects; (3) warnings for agencies when critical impact levels are reached and providing feedback on the success of mitigation measures; and (4) limiting the environmental monitoring to the data required to achieve the task of the regulating agencies. Both studies comment on the importance of adequate planning for the monitoring programme (Marcus, 1979; Canter and Fairchild, 1986). One important factor in planning a monitoring programme is to ensure that the monitoring targets relevant indicators and not just those that are easy to monitor. Berkes (1988) cites the example of the ecological monitoring plan conducted for the James Bay Hydro Project in Canada, which was limited to the physicochemical indicators and the sampling of fish. In terms of monitoring the parameters of concern to the local native people, the programme was irrelevant, except for the monitoring of mercury in the fish. Although there had been local consultation, there had been no participatory development of an appropriate monitoring plan to address the main concerns of the local population.

There appears to be a lack of guidance on EA monitoring with only a few examples being published as discussion papers (Lincoln-Smith, 1991; Bingham, 1993b).

4.12 ES Quality Reviews

Review of NRA ESs

In 1991, the NRA commissioned the University of Wales, Aberystwyth, to undertake a review of NRA ESs for flood defence and coastal protection schemes, culminating in the production of R&D Note 52 (King and Wathern,

1992). This report highlighted a number of deficiencies in the sampled 22 NRA projects. The selected projects included: 3 projects requiring planning permission (SI No. 1199); 14 river projects (SI No. 1217); and 5 coastal projects (SI No. 1217); all undertaken from 1989 to 1991 (Table 3.4 provides details of the SIs). The study review methodology was developed from that used by Lee and Colley (1990). The review system used the criteria listed in Table 4.1.

Table 4.1 King and Wathern's Review Criteria

A - very satisfactory B - satisfactory C - just satisfactory	Pass
D - just unsatisfactory E - unsatisfactory F - very unsatisfactory	Fail

Table 4.2 Results of NRA ES Review R&D Note 52 (King and Wathern, 1992)

	Rivers ESs Total:14 (%)	**Coastal ESs Total:5 (%)**
Description of the development, the local environment and baseline	Pass 5 (35) Fail 9 (65)	Pass 5 (100) Fail 0 (0)
Identification and evaluation of impacts	Pass 5 (35) Fail 9 (65)	Pass 3 (60) Fail 2 (40)
Consideration of alternatives, mitigations and enhancements	Pass 5 (35) Fail 9 (65)	Pass 4 (80) Fail 1 (20)
Communication of results	Pass 8 (57) Fail 6 (43)	Pass 3 (60) Fail 2 (40)

The results of this review are shown in Table 4.2. The standards achieved by the coastal ESs were better than the river ESs, with only 40% failing to

achieve a pass in the identification and evaluation of impacts, and the communication of results. However, of the 14 river ESs, only 35% could achieve a pass in most of the sections, with the results on the communications section being similar to the coastal ESs. The results of this review were similar to other studies of the same period (Wood and Jones, 1991; Coles *et al.*, 1992) and overall indicated that there were a number of problems that had to be addressed. The summary of the King and Wathern's (1992) recommendations for improvement were as follows:

a) Description of the development, the local environment and baseline
   - Projects should be clearly justified.
   - There should be a distinct section describing the proposed works in non-technical terms.
   - The broader environmental context should be indicated.

b) Identification and evaluation of impacts
   - The EA methodology should be stated explicitly.
   - The public should be involved at an early stage in the project.
   - The majority of the ES should be constrained to a consideration of the key issues with marginal aspects considered only briefly.
   - Impacts should be quantified wherever possible.

c) Consideration of alternatives, mitigations and enhancements
   - All reasonable alternatives should be covered and the 'do nothing' assessed thoroughly.
   - Mitigation impacts should be stated explicitly. Residual impacts which cannot be mitigated should be given full consideration.
   - Uncertainty should be acknowledged and associated monitoring planned.
   - Enhancements should be included, but undue emphasis should not be given to them.

d) Communication of results
   - The ES should be self contained.
   - A non-technical summary, glossary, references and a list of contents should be provided.

- A notional limit of perhaps 50 pages should be imposed on ESs.

The study also recommended the appointment of an EA Co-ordinator in each NRA Region, together with staff training and a programmed audit of the system. Since the publication of this study (King and Wathern, 1992), the number of Regions with full-time EA Co-ordinators is now three (Thames, Midlands and Anglian); in 1994 there was a large-scale EA training programme for internal staff, where over 1500 staff were provided with some form of EA training. However, there has been no formal nationally programmed audit of the system, as yet.

Department of the Environment - Review of Planning ESs

In 1991 the Department of the Environment published the results of the research work that they had commissioned to review standards of planning ESs (Wood and Jones, 1991). The standards of the ESs were variable and of the 24 ESs reviewed over two-thirds were judged to be unsatisfactory. The key recommendations were:

1. That the developer should be encouraged to initiate pre-submission consultations (they do not refer to these as scoping);
2. Need for better guidance for local authorities as to the definition of 'significant environmental effects';
3. Need for planning authorities to screen all applications to ensure that no EA guideline thresholds are exceeded;
4. Need for planning authorities to involve public and voluntary groups in the EA process;
5. Need for guidance on commissioning and preparation of ESs;
6. Need for common use of evaluation criteria by all planning authorities.

Following these recommendations none of these has been formally implemented by the Department of the Environment.

4.13 Conclusions

From the many guidelines and research papers reviewed there are a number of re-current themes for good EA practice:

1. The importance of widening the EA process to include 'cradle to grave' issues;

2. The need to manage and deliver the EA process after the decision-making stage of the project;

3. Need for scoping process involving public participation;

4. Need for consideration and assessment of reasonable alternatives;

5. Agreed good practice format of EA, i.e. need - alternatives - baseline environment - assessment - mitigation;

6. Appropriate evaluation techniques should be used, the simple techniques are often best;

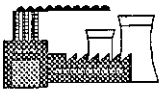
7. Documents need to be readable, clear and concise, and limited in length;

8. Public participation at all stages is essential to fulfil criteria for a proper democratic decision-making process;

9. Need for review and quality assurance system for EA process, which assesses not just presence or absence, but the quality of the information provided;

10. Adequate monitoring of appropriate environmental indicators should be planned and implemented, including remedial follow-up.

Chapter Five - Development of the Initial EA Good Practice 'Model A'



Chapter Five - Development of the Initial EA Good Practice 'Model A'

Chapter Five
Development of the Initial EA Good Practice 'Model A'

5.1 Introduction

The preceding chapters have discussed the elements required for the implementation of good practice in the EA of a project, with a specific reference to projects in the water environment. In this chapter these elements are now used to create a good practice EA process model ('model A'), which will be compared with current practice (in Chapter Six), then refined ('model B') (Chapter Seven), and then tested in the field and the outputs evaluated (Chapters Eight and Nine).

The model has been developed as a practical working model for the implementation of NRA Severn-Trent Region (and since 1st April 1996, Midlands Region of the Environment Agency) projects.

5.2 EA as an Information Management Process

Communication within the EA Process

Through the review of the needs of the EA process a consistent theme was identified throughout. This was the importance of the communication of information within the EA project management system. The recognition of the need for the effective communication of information was broadened to include: the communication of information into and out of the EA process; the search for information through surveys, interviews and meetings; the manipulation of information in terms of evaluation, analysis, conclusions and summaries; and, the dissemination of information in terms of EA stakeholder consultation, briefing notes, reports and ESs.

The first question in the management of the communication of information is 'why' do we need information, then 'who' needs the information, which leads onto to 'what' do they need to know and then in 'what' format, as well as 'when' and 'where'; this is defined as the communications paradigm (Figure 5.1).

Figure 5.1 EA Communication Paradigm

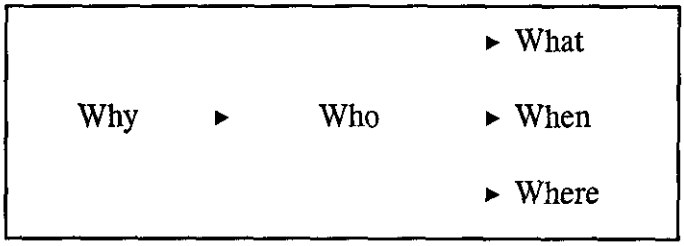
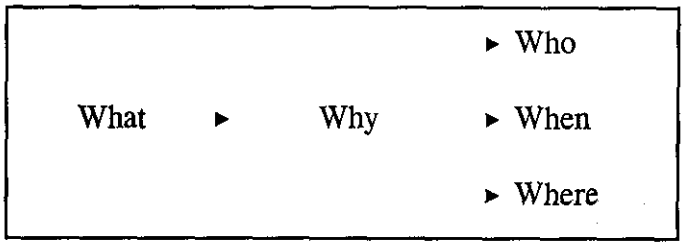


Figure 5.2 EA Technocratic Paradigm



The 'technocratic approach' (Formby, 1990) and more traditional project management approaches can lead to the conclusion that the 'what' is the most

important question. This approach tends to be output orientated providing a definition of the 'what' which then leads to 'why, and then 'who', 'when' and 'where' (Figure 5.2).

Most texts and guidelines concentrate on discussing the stages of the EA process and the techniques available to undertake the assessment of a range of environmental effects (Wathern, 1988; Lee, 1989; Department of the Environment, 1989a; Gilpin, 1995; Morris and Thérivel, 1995).

Whilst this view of EA is important, it is suggested that if we start from the 'why' and the 'who', then the 'what' will naturally follow on. The recognition that EA is a tool for decision-making in a political context, as discussed in Chapters Three and Four, leads to the conclusion that the 'why' and 'who' are the key questions for the EA process. The failure of many project assessments and outputs can attributed to a problem of communication of information; a failure to clearly identify the 'why' and the 'who'. Many technically adequate ESs fail to communicate the information to the decision-makers in an accessible fashion (Hickie, 1996a). Studies of the UK planning system have indicated that a large number of ESs were not even considered in the planning authorities' decision-making process (Wood and Jones, 1995).

Taking an example such as the regular flooding of houses and farmland beside a river, the problem can be considered firstly from perspective of "why is it a problem?". The analysis of the problem can then be expanded to 'who' then 'what, where and when'. In the village of Upton-on-Severn there is a consistent flooding problem caused by the River Severn overtopping its banks and flooding, however, the villagers have decided that they would prefer to be flooded occasionally, rather than live with the necessary permanent defences which would obscure their views of the river and the countryside beyond. This example illustrates the paramount importance of 'who' the project relates to.

As discussed in earlier chapters, the project management process does have to consider the 'what' (the ES format and procedures), but the more important factor is 'who' needs to make decisions as part of the project management process, including design and approval decisions. The communications paradigm, therefore, can be considered to be stakeholder centred rather than output centred. An example of this lack of focus on the 'who' occurred on the Priding Flood Defence Scheme on the Severn estuary, Gloucestershire in 1993

(Ross, 1994). The first phase of this project was assessed by an inexperienced EA consultant, who decided that there were likely to be no 'significant' effects and so an ES was not published for the first phase of this project. The first phase involved rebuilding existing flood defences to a higher level, and therefore, did not require planning permission. There was a subsequent major public outcry over the floodwall which was alongside the riverside road and built too high for motorists to retain their views across the river (and in the 'wrong' colour brick). The consultant had provided, on the face of it, an acceptable EA report in the standard ES format with all the appropriate sections (the 'what') but had relied on the project engineer to do all the consultation with the local residents and public bodies. At the implementation stage the project Resident Engineer was making decisions on site without recourse to EA staff and many of the agreed mitigation measures, particularly protection measures, were not carried out. In retrospect the EA process in the first phase of this project had failed to identify the relevant stakeholders; had not adequately discussed the issues with them; had not taken the issues into account in the planning and design of the works; and then on site, the Resident Engineer and contractor had no real idea of what the environmental issues were.

The subsequent second phase of this project encountered vociferous objections from two particular residents which was countered by vociferous support from the other residents of the village and the parish council. However, this stage of the project was a model of open and public consultation (implemented by a new EA consultant), involving many meetings to try to resolve the conflicting views and the production of an ES (graded 'good' by the Regional EA review process) to support the required planning application (Ross, 1994). The project was completed taking all the stakeholders views into account in a transparent manner, with only one objector battling the project throughout, even after planning permission was obtained to build the preferred option.

In retrospect, the origins of the communications paradigm can be seen in earlier EA development work undertaken by the Midlands Region of the Environment Agency. In early 1993, a review of problems of the River Soar ES had first suggested the importance of information within the EA process.

The external environmental bodies (English Nature, Leicestershire County Ecologist, Leicestershire Wildlife Trust and Charnwood Wildlife Project) and the local residents had not been adequately consulted prior to the publication of the ES. The ES did not paint a particularly accurate picture of the predictable effects of the scheme. Following objections to the ES from all the main external environmental bodies, discussions showed that the project could be altered to accommodate their concerns and allay most of their fears. This project highlighted the need to investigate and improve the EA process.

It is proposed that the model for the EA process should be one of information management following the communications paradigm. This management of information into and out of the EA system involves: selecting, gathering, processing, analysing and evaluating data; and then outputting the information to stake-holders in an accessible format which enables them to make informed decisions in the full knowledge of the environmental consequences of those decisions. It is proposed that the 'who' should include all the stakeholders associated with a project.

Why is EA undertaken?

In developing the EA model and guidelines for improved ESs, it is important to clearly identify their purpose. The EA process should ideally provide decision-makers with the information explaining the predicted consequences of a proposed project, to enable them to make an informed decision. This is a legal requirement for many projects, but as many developers and project managers are finding, EA also makes good project management sense regardless of legal requirements. The improved effectiveness of project planning and resourcing, with all the environmental factors taken into consideration along with engineering and economic factors, leads in the long term to more sustainable projects being developed. EA has a role to play in delivering projects, on time, on budget and in an environmentally sensitive manner. Projects which do have adverse environmental impacts should be halted at the early stages, with the minimum of abortive design work. In the past many projects without such early EA input have resulted in the waste of time and money (Hickie,1996c).

The EA process has five key purposes, which may be summarised as:

1. *Assisting the Decision-making Process*

   The EA provides the decision-makers with appropriate information regarding the various consequences of the proposed alternatives to enable them to come to a decision. This information may be supported by other information such as comments from interested bodies and individuals, and in the case of planning ESs, reports from planning officers regarding the planning application. It is not the role of the EA process to provide the decision-makers with the decision. The decision-makers have to make the political choice of whether to approve the preferred alternative or not, in the full understanding of the consequences of such actions.

   In the Planning EA regulations (SI No. 1199), this is quite straight forward: the local planning authority in the form of elected councillors, make the political choice. The political choice dimension is somewhat different for projects dealt with under the SI No. 1217 land drainage EA regulations. In the case of such projects, unless there are objections, there will be an automatic approval of the development, which already has permitted development rights (i.e. planning permission) under schedule 2, part 15 of SI No. 418: The Town and Country Planning (General Permitted Development) Order (UK Government, 1995c). If there are any objections to the ES these will be referred to the Minister for Agriculture, Fisheries and Food, who will then make a political decision. It must be noted the actual decision-making process does not stop in practice once the approval for the project has been received. Real-world projects will require decisions to be made by the engineering design and supervision team and the EA teams to complete the project on site. Additional information, such as unexpected ground conditions, or change of site access due to the deterioration of the strength of a small bridge which will not now take the load of contactors traffic, may lead to a whole series of proposed changes in a project. Such changes need to be assessed in relation to previous predicted and approved effects on the environment. When does the change of an effect become significant? Is the ES still

legally valid? Should it be republished? Does the loss of a major tree that it was predicted could be retained constitute a significant change? What mitigation measures would be acceptable and to whom? The decision-making process continues on throughout the implementation phase of the project through, theoretically, to the project being finally decommissioned.

2. *Providing Accessibility to the Political Decision-making Process*

   The EA should enable any interested bodies or individuals to understand the predicted consequences of the various project alternatives and then be able to make comments on any facet of the project to the decision-making authority.

3. *Information for Project Staff*

   The EA should provide the internal project staff, especially those who are to be involved in the design and supervision of the implementation of the project if approved, with a clear indication of the environmental constraints and requirements of the EA process. The EA process, working in parallel with the main project management systems, can ensure that the project has a greater chance of being delivered not only in an environmentally sensitive manner, but also on time and on budget. This is because all the potential environmental constraints and resource implications can be identified at an early stage of project planning, and thus this enables them to be taken into account.

4. *Legal Requirements*

   European and UK legislation requires the EA of certain projects. An ES is a legal requirement for all schedule 1 projects, and those schedule 2 projects which are likely to have significant effects on the environment (Department of the Environment, 1989a). Failure for any developer to follow the requirements in the relevant environmental assessment statutory instruments may lead to enforcement action requiring all works to be removed and the site reinstated.

5. *Policy Requirements*

EA is seen as tool for assisting in the implementation of environmental policies. These range from international policy agreements, such as the Rio Declaration (United Nations, 1993), where the need for EA is specifically mentioned, to the UK Environmental Strategy, This Common Inheritance, which has identified the need to use and improve EA (UK Government, 1992a, p.72). Various sectoral guidelines have been produced to promote such a policy (Department of the Environment, 1995; Ministry of Agriculture, Fisheries and Food, 1992).

Who are the Stakeholders?

Environmental ethics, as discussed in Chapter Two of this thesis, requires that we should consider the consequences of any development on three groups of stakeholders, that is all those who will potentially have to bear any direct/indirect effects of a proposed project:

a) Present-day humans;
b) Future generations;
c) Environment.

The environment is included as a stakeholder in the potential consequences of the project because of its intrinsic value which can be affected by a project proposal. Such effects can be far reaching or very localised as shown in Figure 5.3.

The effects on stakeholders can be permanent or temporary, which depends to a large extent on whether the stakeholders are residual or transient. Residual stakeholders are those who will have to live with consequences of the predicted environmental effects. They can include the environment, future generations, landowners, local residents and local public services. Transient stakeholders are those who will be affected by the short-term effects of the project; such as residents in a nearby village who will experience traffic increases during the construction period; and those who will move on to other projects or posts, leaving behind the consequences of the original project. For example, public officials, politicians, consultants and contractors.

Figure 5.3 Range of Environmental Effects

Range of effects:	**Examples:**
Global	- effects on greenhouse gases
Trans-national boundary	- water management across national borders
National	- adoption of a national road building programme
Regional	- materials sourced from quarry 50 km away from site
Local	- localised water quality deterioration

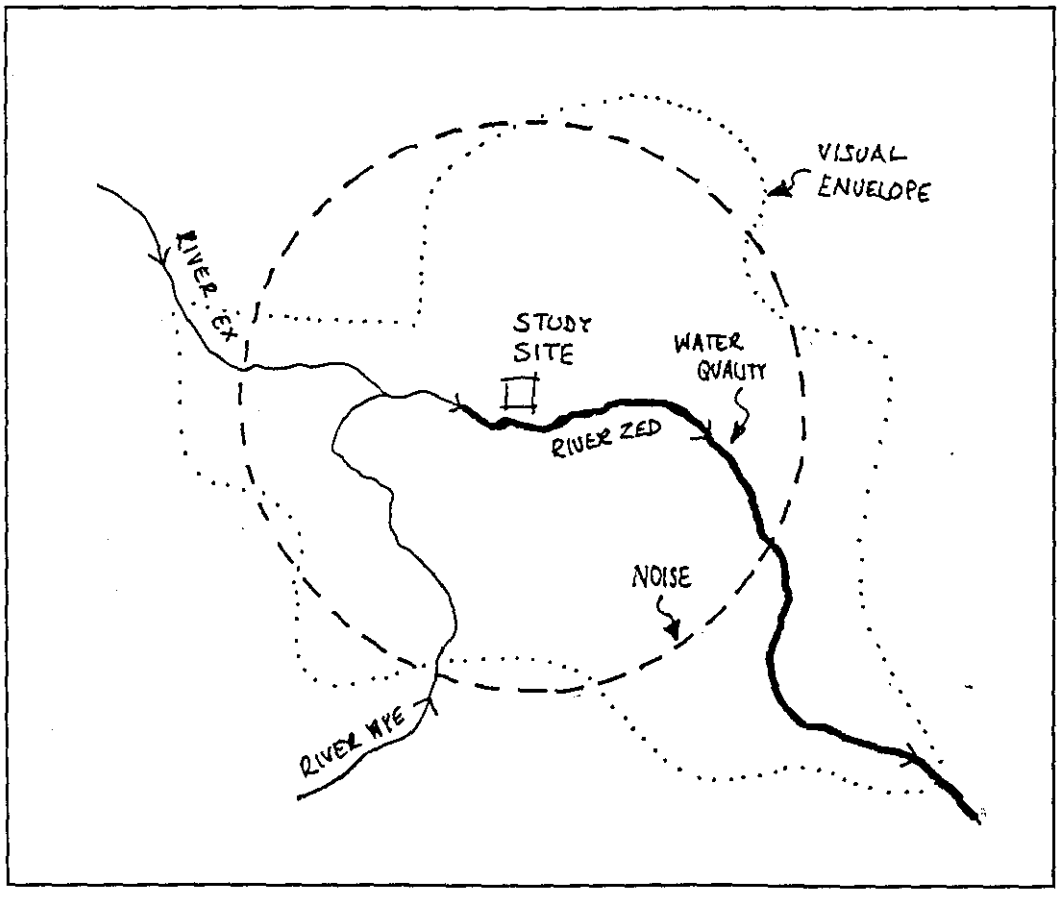
The level of stakeholding can vary, from indirect high level strategic political decisions (which may affect a politicians career), to the direct ownership of land affected by a project. Some stakeholders can also be decision-makers; but stakeholders such as children, future generations and the environment, will have to rely on other stakeholders and decision-makers to represent them. In many EA and consenting processes, the majority of stakeholders can be disenfranchised from contributing to the process because of poor communication of information (Finsterbusch, 1995). This is one problem that the good practice EA model should seek to overcome.

In practice under the SI No. 1217 land drainage EA regulations, the key decision-makers, i.e. those responsible for making some of the primary decisions such as the project manager, will often be only transient stakeholders, responsible for making the decisions concerning the project, and then moving to another job a few months later. For SI No. 1199 planning regulations, the councillors approving the project are not necessarily from the local area in which the project will be built; and they may retire or not get re-elected again. The planning officers who advise the councillors and have a professional stake in the project again may soon move to another local authority after the decision is made.

Stakeholders may or may not be adversely effected by the project. As

discussed in Chapter Four, a stakeholder (e.g., a resident living close to a proposed development) may not directly or indirectly be adversely effected by the consequences of the impacts of the project. This prediction is just as important, both to the stakeholder and the competent authority, as any other predictions of adverse effects that are taken into account in the decision-making process. There is, therefore, the need for a clear analysis and explanation of all the potential effects, adverse, beneficial and neutral, encountered by all the stakeholders (Hickie, 1996c). This does lead to the problem of identifying the scope or boundaries of the study area. The boundary of each individual environmental parameter, such as noise, visual or water quality, with be defined by its propagation characteristics (Figure 5.4). For example, noise would likely be a series of concentric circles, visual boundaries would be within the line of sight, and for water quality, would be linear in nature (downstream rather than upstream of the site).

Figure 5.4 Boundaries of Different Effects



Who are the decision-makers?

Traditionally the decision-maker has been considered to be the agency which is

responsible for consenting the project. Such agencies are termed differently worldwide: in the European legislation they are defined as the 'competent authority' (CEC, 1985); and, in Washington State, USA, it is the 'agency with jurisdiction' (Department of Ecology, 1993). For consistency, the term 'competent authority' shall be used in this thesis to define such a decision-maker. However, there are many other decision-makers associated with the project and the EA process.

In many texts the EA process is perceived to end once the relevant competent authority has made the decision to approve the project (Department of the Environment, 1989; Wathern, 1988; Glasson *et al.*, 1994). All the mitigation measures will have been defined and the project will move on to the implementation stage in an environmentally sensitive manner. Only the monitoring has to be put in place to ensure the satisfactory completion of the project. In reality this ideal scenario is a rare event. The experience of EA project management of flood defence projects implemented by the Environment Agency (and its predecessor the National Rivers Authority), has shown that many more decisions have to be made both before and after the project approval has been given.

Key Decision-makers

The two key decision-makers in any EA process are the developer and the competent authority. The developer has, at regular intervals, to re-evaluate and decide whether or not to continue the projects based on parameters such as cost, timescale, location, opposition to the project, which vary through the project development stages. The competent authority has to make decisions, such as the acceptable scope of the EA; what mitigation measures will be required if consent is to be given? and is there a requirement for additional information over and above that supplied in the ES submitted?

The primary decisions can be summarised as: project viability (for the developer); and, approval and conditions (for the competent authority). Project viability can be considered to be a combination of economic, technical and environmental issues. From the developer's perspective, the viability of the project takes precedence over consent; for without both, the project cannot progress; but without viability, sound business sense dictates that the project

should not be implemented. However, it is possible to have consent, but not to have a viable project. In the UK, there are many parcels of land with planning permission for development which remain undeveloped because of their current lack of financial viability. The competent authority will consider that the consent takes precedence over viability in their deliberations, but it is also normally in their interest to ensure that the project is viable, to ensure the delivery of all the agreed conditions.

As well as these two primary decisions there are a multitude of secondary decisions to be made, which can influence the outcome of the primary decisions. These are not only made by the two key decision-makers, but by their staff, consultants, consultees and by other third parties. The whole process of project management consists of a series of decision-making events, which will affect the final outcome of the consenting process. The EA, as an active element of the project management process, can provide feedback as to the possible consequences of these secondary decisions, ensuring that environmental considerations and their possible affects on the consenting process, can be taken into account.

The decision-making process can be considered to be a network in nature, each decision, however small, can have a knock-on effect on other decisions later in the process. The influence of third party decisions should not be underestimated and can provide key issues which need to be taken into account in the EA process. For example, the decision by archaeologists that an area of ground could be of great importance, may affect the conditions of approval. Another example would be where an EA team has consulted with residents, explaining that the predicted adverse noise levels for a nearby development should only be temporary in nature, which may then influence the residents to decide not to object to the project. The residents lack of objections may in turn influence the decision of the competent authority.

Decisions in the Post-consent Stages

In the post-consent stage decisions still have to be made. The advent of performance specification contracts for the construction of engineering projects (including water management schemes) in the UK, has increased the number of decisions to be made and the need for the developer to effectively manage

the situation. With such a form of contract specification, the method of construction is not provided. The product performance requirements, as opposed to the details of what should be built and how, are included in the project detailed design documents. The contractor has to decide which are the most cost effective methods and materials to use to ensure satisfactory completion of the project within the performance specifications. Before the contract specification is finalised, this process requires the design engineer to make a number of decisions regarding the selection of performance specifications required to deliver the project within the environmental constraints and mitigation measures identified by the EA process. At the construction stage, the contract supervising engineer then has to decide whether or not the methods and materials proposed by the contractor, comply with the contract specifications and ultimately with the environmental commitments made in the EA process. For projects managed by the Midlands Region of the Environmental Agency, the EA team manages this assessment and liaison process.

Figure 5.5 Internal and External Decision-makers

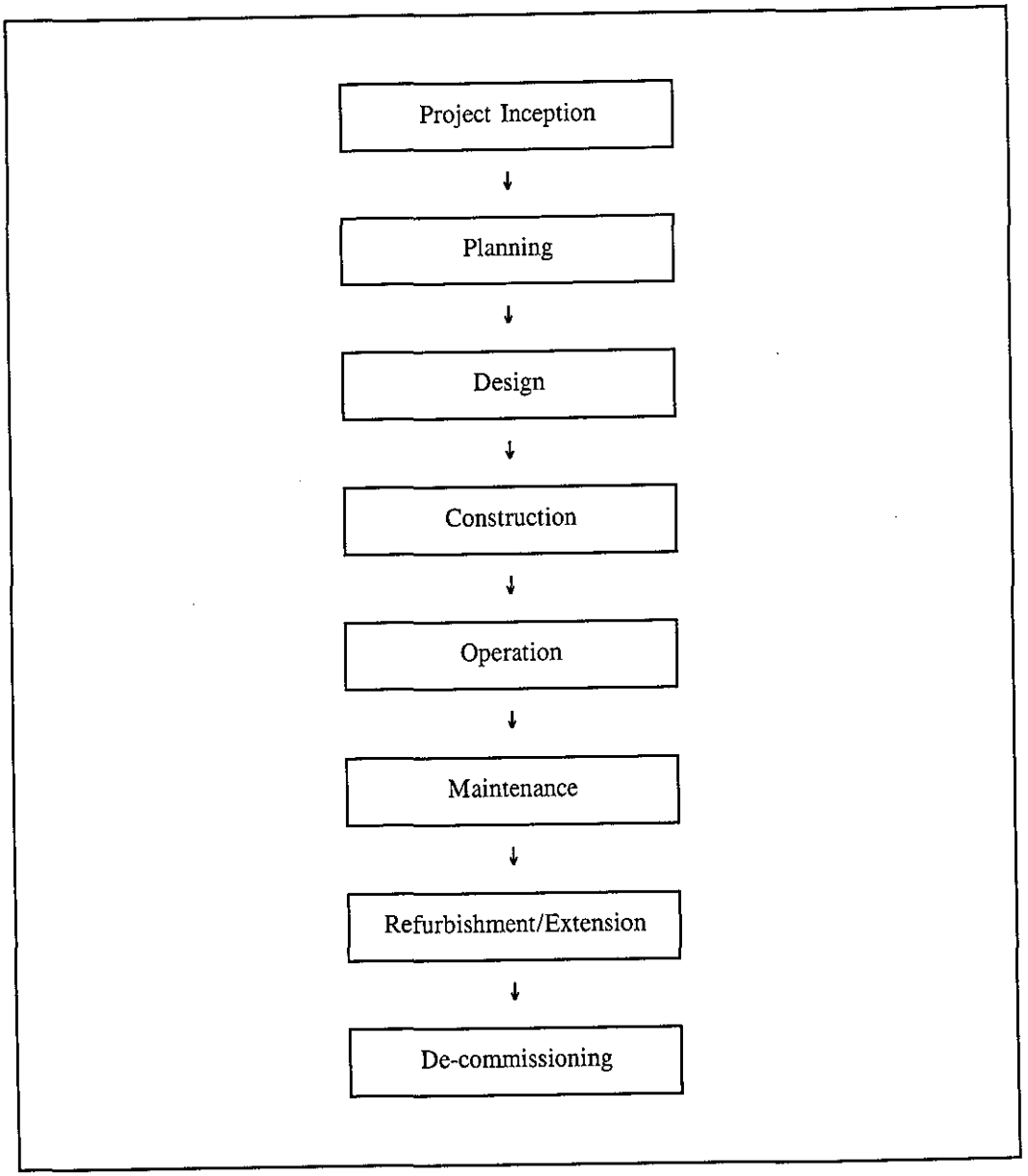
Internal Decision-makers
Developer (Primary)
EA Staff
Project Engineering Staff
Project Contractor
Project Operating Staff
Project Maintenance Staff
Project Decommissioning Team
External Decision-makers
Competent Authority (Primary)
Other Environmental Consenting Agencies (Primary)
Funding Agency
Statutory Consultees
Locally Elected Bodies
NGOs
Other interested Groups
Local Community
Local Individuals

Internal and External Decision-makers

For clarification of the 'who' in the EA process it is useful to split the decision-makers into two main groups, internal and external decision-makers, as shown in Figure 5.5.

Each of these decision-makers will make a range of decisions throughout the lifecycle of the project (Figure 5.6). The very first decision in any project is the decision whether or not to initiate the project. For a public agency acting as a developer, such as the Environment Agency in the UK, this may be in response to the need to investigate options to relieve a particular flooding problem.

Figure 5.6 Life-cycle of a Project



For a commercial developer, the decision may be to expand business into a new region of the country. Decisions continue to be taken by a wide range of people, especially in the project planning and design stages. The links between the internal and external decision-makers are important for the effective implementation of the EA process. The whole process of planning and design involves the taking of many decisions, ranging from small-scale decisions such as the size of the bricks to use, to large-scale decisions, such as which alternative sites should be considered, which may or may not require liaison with or decisions to be taken by the external decision-makers.

The internal decisions taken by the developer, their staff and consultants can have potentially significant effects on the environment, as well as influencing the decision whether or not to permit the project, taken by the competent authority at the later stages in the project. One set of choices may be much less contentious than another. The EA process can help predict the likely decisions related to certain alternatives. In 1994, the EA of a potential scheme to reduce the flooding problem around the Royal Shakespeare Theatre, in Stratford upon Avon, Warwickshire, indicated that the predicted acceptable alternative would be extremely costly. To achieve a reasonable chance of approval it would have required a costly high quality structure and associated mitigation measures; carry the very high risk of the loss of an avenue of mature trees; and require a lengthy consultation process; the total costs of which would have far outweighed the benefits of the scheme. The political context of the decision-making process is an important feature of the EA process, and will be discussed in more detail later.

The external decisions can be made by a wide range of bodies and individuals. The EA process can inform all such potential decision-makers of the likely consequences of the project and ensure that they make an informed choice, on of which may be to object or not. In the early stages of the EA decision-makers will be inputting information to the process as to their issues, preferences and values, all of which can assist with the effective EA project management process.

The Political Context of the Project Decision-making Procedure

It is essential that the EA practitioner managing the EA process fully assesses the political arena within which they are initially discussing, and then formally submitting a project for consent. If they have no personal experience of a particular political context, they are advised to obtain such background information from those who are aware of such contexts. An ES which fails to influence or even be read by decision-makers (or their advisors), must be considered to have failed to achieve one of the prime objectives of EA, that of providing information to formal decision-makers upon which they can make an informed decision.

In a fully democratic decision-making system, public consultation is a key feature. If the EA process outputs, in terms of general information and ESs do not allow the general public to access such information and comment in an informed manner, then the true democratic objectives of the decision-making system will not be served. The inability to access and understand the information presented can lead to ill-informed objections from the public and other bodies. The process ideally should be able to clearly inform all internal and external stakeholders and decision-makers of what the potential effects of the project will be. In many cases potentially adverse perceptions of the project can be allayed by good communication with the relevant parties.

An example of such a problem occurred on the final phase of the River Soar Flood Alleviation Scheme, in Leicestershire, UK. The public were being urged by the local papers to have 'one last walk beside the River Soar before the riverside was destroyed for ever' (Loughborough Echo, 1994). The EA process had failed to discover that there was a strong local perception that the project would destroy the pleasant riverside landscape. The objectors, as stakeholders, had decided to voice their disapproval of the scheme. The published ES, although potentially available to all the objectors, had been read by only a few who even then did not fully understand the proposals. A quickly arranged meeting and riverside-walk with the local objectors soon allayed most of their fears. The objectors accepted the explanation that although the river bed would be dredged, all the new floodbanks would be set back from the river, retaining all riverside, trees, hedges and the footpath completely undisturbed. The EA process should strive to identify all stakeholders and

decision-makers; to discover what are the issues that concern them and what values they hold for their surrounding environment.

What is the EA Process?

It can be concluded that the primary role of the EA process is to provide information to assist the decision-makers (whoever they may be and at whatever stage of the project) in making their decisions in the full knowledge of the consequences of the options under consideration. As discussed earlier, the EA process can be considered to be the management and processing of information. Some elements of the process will follow on from legal requirements, such as public consultation at specific stages of the process, and predetermined contents of the ES (Department of the Environment, 1989; Department of Environment Affairs, 1992; Department of Ecology, 1993). Other elements of the process will be good EA project management practice, such as wide consultation at all relevant stages, provision of information outputs which are accessible to the whole community, enabling them to respond and take part in the democratic decision-making process (Hickie, 1996c).

The communication of information around the EA framework over the whole lifecycle of the project needs to be balanced by the quality of the information. The quality and accessibility of that information are equally important. In the past many EA texts have majored on the importance of EA technical quality. The accessibility of that information is just as important a criteria as the quality of the information for EA effectiveness. The final criteria for EA effectiveness must be the inherent environmental acceptability of the project (Sippe, 1996). Not withstanding the quality of the technical information and clarity of the communication of that information, if it does not result in decision-makers choosing environmentally acceptable options, then EA could be said to have failed to provide an effective tool for project evaluation.

What Stages of the Project Fall Within the EA Process?

Experience has shown that there are five main stages of a project over its lifecycle. These are:

1. Planning/Design (including Site Investigation)
2. Construction
3. Operation
4. Maintenance
5. Decommissioning

Within each of these five stages there will be a worst case scenario, which should be addressed as part of the assessment process. Risk analysis will highlight the potential impacts and effects, together with all mitigation measures required to reduce such risks to acceptable levels.

In reality, decisions have to be made throughout the lifecycle of the project. Unforeseen circumstances at the construction stage should be assessed and managed; operational staff may wish to change the planned operational procedure which in turn will need to be assessed. Maintenance works, especially those which require access to the site across environmentally sensitive areas will have to be assessed. Finally, the decommissioning stage of the project will have to be planned and assessed, but will have to be reviewed in the light of the prevailing environmental issues when decommissioning actually occurs which will not necessarily be the same as today.

The process has been developed to provide the outputs: an ES (or written justification for not publishing an ES as required by SI No. 1217 land drainage EA regulations); and, an environmentally sensitive project implemented on the ground. The EA process and outputs, such as ESs, have tended to become synonymous. The ES describes the EA process to enable the reader to follow the logic of the conclusions of the statement.

Where is the EA Done?

The boundaries of the EA process should be defined by the scoping process which should clearly define the spatial limits and the detail required to cover the assessment of a variety of environmental considerations. The decision as to what these boundaries are will be initially taken by the EA team, but may evolve following the need for approval or consultation with the competent EA decision-maker, the local community and other interested bodies.

When is EA Done?

Types of project requiring formal EA differ from country to country. Such projects may be defined as having potentially significant environmental effects, due to the nature of the project/process, location, or scale of the project. Many suggest that EA should only be undertaken when significant effects are apparent. However, both the competent authority (for example, land-use consenting authority) and the individual living in the locality of the proposed project (who is considering whether to object or not), wish to know that there are no significant environmental effects. In fact, they would probably consider that the information detailing what environmental effects will not occur just as important in their decision-making as those which will occur. An example would be a new industry developing the site adjacent to your house. The most important information that you wish to know is that the assessment of the project indicates that it will not have any effects on you or your property, in terms of, for example, noise; chemical emissions; additional traffic. If the EA only focused on the potentially significant effects (such as the visual appearance of the development) without confirming that the other factors (such as noise and air quality) were not going to effect you, then you would probably consider objecting to the project because of the unknowns. In science, a negative result is just as important (if not sometimes more important) than a positive result. The same can be said of EA.

Decision-makers have to weigh up the values of the advantages and disadvantages of a project. The values very often are personal values, unique to each decision-maker and will vary from decision-maker to decision-maker. An elected representative will be making a decision to approve with or without certain conditions, or to reject the application. A local resident may be considering whether to object or not. A non-governmental organisation (NGO) may be considering whether they can commit the resources to justify and sustain an objection to a certain development.

As the role of the EA process is to provide information to enable decision-makers to make an informed decision; and given that decisions will be being made throughout the project life, then EA must start at the very being of a project lifecycle through to its decommissioning, perhaps many years in the future. It is not acceptable that EA starts once a design has been conceived in

the mind or on the drawing board of a project design engineer. EA must start to be considered at the very 'twinkle in the eye' of the possibility of project development. Environmental issues ideally should be considered at the very beginning of a project, along with the engineering and economic considerations. Once a project need has been identified, whether it is to seek to solve a flood defence problem or for a business to expand by the construction of a new factory environmental issues need to be identified and taken into account. Engineering, economics and environment have to be considered during the project gestation period. Failure to take into account environmental issues can lead to a variety of problems. Projects which need to be re-designed will incur additional costs in terms of extended timescales and financial expenditure, which can affect their viability. There are also potential environmental risks associated with projects which have not taken such issues into account in the planning and design stage.

The Shell Oil Company's Brent Spar problem is a good example of public perception being successfully manipulated by objectors. The problem was not one of technical assessment of the best option. As most scientists agree the best practical environmental option was probably the disposal of the platform at sea, but the EA process failed to convince both the public and more especially the Friends of the Earth, that the best option was disposal at sea and that their decision should be not to object to such a decision. The indirect costs to Shell of a fall in sales due to the bad publicity was considerable.

In submitting an ES and application for a development for consent, the timing can be important (van Eck and Scholten, 1996). It is important not to submit the application too soon, when not all the information is known, or not all the consultees have confirmed that they informally have no objections to the scheme, or if so, what these objections are.

Application of the Information Model for EA

The conceptual model of the EA process is one of information management (the communications paradigm), and can be applied to all types of EA - policies, programmes and projects. The decision-makers and stakeholders may differ, but the need for the EA process to provide accessible information for decision-makers and to gain access to information from stakeholders at all

levels and stages in the EA remains true.

Management of the EA Process

Ideally the EA should be managed by an experienced EA practitioner, acting very much like the conductor of an orchestra, bringing in the various experts as required, on cue, and ensuring that their contribution adds rather than detracts from the whole EA event.

5.3 Types of Readers of ES

As has been discussed earlier, the EA process can be considered to be an information management process. In considering the development of improved EA processes, therefore, the needs and ability of the readers of the process outputs is of paramount importance. Not only is it important for all the relevant information to be in the report, but it is also important for it to be accessible to readers who will have differing requirements of the same report. Some readers will be reading the document to ensure that their individual environmental interests are fully covered in the report, others will be looking to see that a more holistic approach has been taken, taking into account all environmental issues, and others, such as the project design engineers and the contractor constructing the project, will be looking for the key constraints and procedures for protection and mitigation required by the EA.

The types of potential readers can be divided into technical and non-technical groups, which can then be sub-divided into specific and general areas of interest, as in Figure 5.7.

The final criteria for such a document is: does the ES communicate the information or provide the information in such a way as to make the decision-making process simple and all the consequences of each alternative clearly understood? The ES is normally required to assist in the decision-making process, such as planning application to a local planning authority (SI No. 1199 Town and Country Planning (Assessment of Environmental Effects) Regulations 1988 (UK Government, 1988a)). It is important that the format provides a simple clear explanation to busy councillors to ensure that they can

understand all the issues, implications and alternatives related to a given project.

Figure 5.7 Summary of ES Reader Types

Reader Type:		Example of Readers
Technical	a) Specialist	Archaeologist, Ecologist
	b) General	Planning Officers, Engineers
Non-Technical	a) Specialist	Ramblers Association, Individual householders.
	b) General	Councillors, Members of the Public

5.4 Historical Context for the Development of the EA Process in the Environment Agency

The preceding sections have discussed the general context of EA development and usage. The context within which the model is to be developed and used is important and shall now be discussed in some detail.

Evolution of Management Structures

The Midlands Region of the Environment Agency is one of eight Regions, covering England and Wales and it is split into a total of 26 Areas (Figure 5.8). Each Region has a slightly different operating environment and management structure. The management structures evolved from River Boards in the 1960s, through to River Authorities and Water Authorities from 1973 onwards. The National Rivers Authority was formed in 1989, and became part of the Environment Agency in 1996. In management terms the current philosophy is that operational works are managed by the Area offices and policy is managed and developed by the regional offices, with the national headquarters managing national policy and strategies.

Evolution of EA Processes for the Flood Defence Projects

The process of EA in the Midlands Region has developed from the informal

environmental appraisal undertaken for all major flood defence projects since 1973, when the Severn Trent Water Authority was formed.

Figure 5.8 Map Showing Extent of the Midlands Region of the Environment Agency

The process of appraising the environmental effects and developing mitigation

measures was developed by Jeremy Purseglove (Purseglove, 1988), in his role as Senior Landscape Architect in the Regional Landscape Architects Department of Severn Trent Water Authority (STWA).

In 1981 the Wildlife and Countryside Act created a new environmental duty, requiring that Water Authorities 'shall so exercise their functions ... as to further the conservation and enhancement of the natural beauty and the conservation of flora, fauna, and geological and physiographical features of special interest' (UK Government, 1981, section 48). This additional legal requirement to conserve and enhance the environment led to the development of 'sympathetic river engineering' (Purseglove, 1988, p.240).

The phrase 'creative compromise' (Newbold, Purseglove and Holmes, 1983, p.15) was used to describe the balancing of flood defence and nature conservation issues for such schemes. 'A procedure should be followed to ensure balanced (engineering versus environment) flood alleviation schemes' (Newbold, Purseglove and Holmes, 1983, p.16). The suggested procedure for evaluating such schemes had three stages. Firstly, an ecological and visual survey, followed by an ecological and landscape feasibility study which should indicate whether a scheme should be abandoned or modified to conserve certain valuable habitats, followed by an outline landscape design for the enhancement works, which would include tree planting, creation of bays, berms and new pools, and landowner compensation for land lost by creation of enhancement features. A final landscape drawing should then be produced which 'should modify the engineering proposals to protect and enhance natural habitat as far as is compatible with any limitations set by the engineer' (Newbold, Purseglove and Holmes, 1983, p.17-18).

A number of problems with this informal approach were: i) only nature conservation and visual landscape issues tended to be included in the appraisal; ii) no search was made as a standard check of any archaeological records ; iii) no other environmental issues were considered, other than recreation; and iv) the procedure relied entirely on the good will of the project engineer agreeing to the funding of environmental proposals within the required budget.

In 1986 the Regional Flood Defence Committee of the Severn Trent Region approved the expenditure of up to 5% of the project budget on 'conservation enhancement' works. This allowed the Regional Landscape Architect's team

more freedom to plan and implement enhancement works within this budgetary figure of 5%, without having to rely solely on the project engineers goodwill.

However, the EA input to projects prior to the UK EA regulations coming into force in 1988 was by 'invitation only' from the project engineers. The coming of the EA regulations meant that most flood defence projects were now subject to mandatory EA appraisal, which could lead to the need for them to be published as ESs. EA was now a requirement of the engineering project management process.

EA and Regional Engineering Staff

In 1989, with the advent of water privatisation, the functions of STWA devolved to two new organisations. The pollution control and water management functions (including flood defence) were taken on by the newly formed Severn-Trent Region of the National Rivers Authority (NRA). The remainder of the functions of the former water authority, namely, water supply and treatment, formed the basis of the newly privatised water company, Severn Trent Water plc. The historical input from conservation staff (mainly landscape architects with a good grasp of nature conservation issues) was continued into the new NRA organisation in a new Regional Conservation and Recreation team with a increased staff of 21. This team included four landscape architects whose prime responsibility was EA implementation for all regional NRA operational projects (mainly flood defence schemes).

The change of organisation also brought about a centralisation in the engineering design staff in the Severn-Trent Region. Previously there had been four engineering design offices spread throughout the Region, responsible for a range of flood defence, water supply and treatment projects. The newly formed Regional Engineering Services Department became responsible for the implementation of all capital construction projects within the Region. Initially, the department was under the management of Tharma Tharmananthar, who had been the engineering driving force behind the major flood defence schemes on the River Soar between 1983 and 1991. In 1991 he took early retirement and was replaced by Norman Edginton as Principal Regional Engineer. The change in personalities managing the department influenced greatly the ability for the Region to develop and implement new and more effective EA

processes.

In project management terms, environmental issues and approvals from external bodies, such as English Nature, are very often on the 'critical path', and can hold a project up until such issues are dealt with satisfactorily. Norman Edginton's pragmatic approach was to consider that environmental issues can be as important as the engineering and economic constraints for the satisfactory completion of such projects.

From 1989 to 1993, the EA staff were also part of a centralised Regional Conservation and Recreation team, managed by the Principal Conservation and Recreation Officer, who was responsible for the EA process. The team numbered 22 in 1993, all but four being professional conservation and recreation staff. The EA process for capital projects was managed by the senior landscape architect, with a team of three in-house landscape architects, managing a team of external environmental consultants inputting to the £10 million annual programme of capital works spread over about 160 projects at various stages of project development.

The fact that the senior Engineer and Conservation managers were on equal levels within the management structure enabled a strong EA input to the management of capital works projects. This also led to the development of the regional ethos of the importance of an independent EA team, separate from, but working in close cooperation with, the two engineering management teams. The advent of the new EU EA Directive (85/337/EEC) (Commission of the European Community, 1985) for the EA of development projects, also provided the impetus for the development of an EA project management system to work in parallel with the engineering project management system.

In April 1993, the regional decentralisation of many operational tasks to the Area Offices occurred. This reorganisation included the relocation of the four landscape architects to the Area offices with the prime task to manage the EA input to capital projects. A new role was created of Regional Environmental Assessment Co-ordinator, whose responsibilities included the EA of all regulatory, operational and promotional activities. In the re-organisation, the functional management responsibility for Conservation and Recreation was now devolved to the Area Fisheries Managers, who became Area Fisheries, Recreation, Conservation and Navigation (FRCN) Managers.

The posting of fairly inexperienced staff to manage EA in the Area offices, whose direct line managers, the Area FRCN Managers had no knowledge of EA, and little knowledge of conservation issues, led to the development of what is known as 'dotted line' management responsibility of the Regional Environmental Assessment Co-ordinator for all EA and landscape matters. Of the 18 staff employed regionally on Conservation and Recreation work, 13 undertake EA and environmental appraisal tasks on behalf of other functions, such as Flood Defence and Water Resources. To help implement the EA workload, over £200,000 of environmental consultancy work is commissioned annually, all of which is managed by the internal EA staff. This is in contrast to some other Regions, such as Anglian and North-West, where all EA consultants work either for the Regional Engineering Services staff or their engineering consultants.

In order to provide internal staff and the external consultants with guidance as to the complex project management requirements and in order to ensure Regional consistency in approach, it was identified that guidance documents were required. The first Regional Guidelines for Environmental Assessment were produced in August 1992 (Hickie,1992). These provided an outline of the procedures, summary flowcharts, suggested timescales and costings, and responsibilities for the engineering project officer. These guidelines were updated 10 months later (Hickie, 1993). These EA procedures required the ES not to be published until after all the detailed design work had been completed. The problems associated with such late publication of the ES are discussed later in this chapter.

For the management of projects the Regional Engineering Services are split into two engineering teams, both based at the Regional Headquarters in Solihull. The Feasibility Team deals with projects from initial inception through to the final choice of the preferred option, including the publication of the ES, if required. The technical, economic and environmental constraints are then itemised for inclusion in the engineering brief which is handed over to the Design Team, who manage the project through from detailed design to completion of the project. The use of external consultants to design and supervise projects has increased with the transfer of the majority of the design team to Sir William Halcrow and Partners (engineering consultants) in 1995.

In the Midlands Region all the feasibility work is undertaken by inhouse staff, which ensures that all such staff are very familiar with the Regional EA procedures and the lines of communication are very short. However, the majority of design and supervision works is put out to engineering consultants. This can lead to very convoluted lines of communication which the in-house engineers insist are complied with in order to ensure that liability for design and supervision is clear. It is important that such liability is not compromised by the Environment Agency EA staff. This could occur if additional expenditure was requested without obtaining the approval of the inhouse project manager. Such lines of communication can be very cumbersome, but are accepted as a necessary fact of life. There is, therefore, a need for the EA project management system and the outputs, the majority of which are ESs, to be as clear and concise as possible. All environmental issues and constraints have to be clearly explained in such documents, because up to three separate teams of engineers can be working on the project in succession and they need to quickly understand the environmental issues involved and not start to considering design methods which would be inappropriate.

Area EA Staff

The Area EA Team operates on two levels. Firstly, as client EA manager ensuring compliance with EA legislation and the Environment Agency environmental policy. Secondly, as EA consultant, providing the management of the EA process in parallel with engineering project management. The Regional Environmental Assessment Co-ordinator's role is to provide the client policy management for the Regional EA process, ensuring consistency by auditing EA performance and providing the trouble-shooting skills to assist Area staff, as necessary.

The good working relationships between internal EA and engineering staff have led to the successful development of procedures and guidelines to assist in the respective parallel tasks of project management.

5.5 Model Format for the Environmental Statement

As has been discussed in section 5.2 of this chapter, to be most effective the EA can be considered to be an information management process which will result in a number of outputs. The key output and one which will be read by a wide range of external decision-makers is the ES. The format of the ES has been developed to ensure that the appropriate level of information is provided in a logical and concise manner, which can result in the decision-makers taking account of the information provided in the ES in their deliberations.

In section 4.4 of the previous chapter a range of guidelines for ES format were discussed. It was noted that most followed a similar logical format, which has been followed for 'model A'. The ES needs to clearly explain a number of key elements which are discussed below:

The Need for the Project

The EA process needs to clearly define what the need is, and to put this need in a wider context, linked to other projects and programmes. It is important that the title of the project should directly relate to the need (e.g., Shrewsbury Flood Alleviation Scheme) not to the solution (e.g., Shrewsbury Sheet Piling Scheme).

The Choice of Alternatives

All the reasonable alternative options should be considered and following the Ministry of Agriculture, Fisheries and Food (1992) guidelines for flood defence projects, these should include: do nothing; reduce flood defence standards; retain the status quo; and increase standards.

Environmental Topics to be Assessed

It is essential that the EA objectively addresses all the environmental issues associated with the project. These issues should include the effects of the project not only on present-day humans, but also on future generations, and the wider environment. The list below, of relevant issues has been developed from the Washington State guidelines for environmental impact assessment (Department of Ecology, 1993).

1 Natural Environment

1.2	Earth
1.3	Air
1.4	Water
1.5	Plants and Animals

2 Built environment

2.1	Environmental health
2.2	Land and River use
2.3	Transportation
2.4	Existing Public services and utilities

3 Any other relevant environmental features.

These issues include both the traditional environmental (bio-geophysical) features and the socio-economic features related to humans and their use of the environment.

In determining the effects, mitigation measures and risks to be studied, the outline provided in the Department of Environment's EA: A Guide to the Procedures (1989), has been selected as the starting point for the development of the new model.

'Model A' Key Objectives

In developing the good practice model a number of key objectives have be deduced from reviewing the needs of the process from first principles in terms of ethics, policy and legislation; current practice worldwide; and the practical need to continue the process past the decision-making point through to project completion.

EA Technical Objectives:

1. Project Information

To provide sufficient data to enable a non-specialist to visualise the project. The introduction should clearly define the objectives, justifications of the project. A visual impression of the project should be provided giving an indication of the preferred option and alternatives in terms of design, size and

scale, the construction method and duration, operational and maintenance features, and after use. A satisfactory explanation should be provided as to why alternatives were rejected in favour of the preferred option. The links with other projects should be clearly stated.

2. Site and Local Environment

To provide sufficient data to enable a non-specialist to visualise the site and local environment. Maps should be used to indicate the regional context, location of the proposed alternatives and the area affected by the project. Photographs should provide an indication of the general landscape and specific features. All adjacent land-uses and statutory and other site designations should be shown. All legal rights should be shown. The local authority planning context should be indicated.

The baseline surveys should be adequate to enable the significance of the potential environmental impacts to be assessed. The indication of the uncertainty of the data and any additional data required should be provided.

Evidence of adequate consultation with the statutory consultees, the public and all interested parties should be provided.

3. Assessment of Effects

To provide an assessment of the full range of potential impacts and their effects. All assessment should be quantified where possible in terms of magnitude and significance, showing the change from the base-levels and the range of uncertainty. Methodologies should be explained and subjective statements minimised. Matrices and other methods should be used to provide a clear summary of the key assessments. The impacts should be assessed in terms of direct and indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative (Department of Environment, 1989).

4. Mitigating Measures

To ensure all adverse effects are adequately mitigated. To provide details mitigation measures to: protect, conserve environmental features; reduce; or compensate for the effects of the project. Such mitigation measures should also

be assessed for potential impacts.

5. Accidents and Hazards

To provide details of all potentially harmful or hazardous materials or operations that may be involved in the project. Details of risk assessment and potential preventative measures should be provided.

6. Environmental Action Plan

To provide a detailed plan for the management of the implementation of the ES on the ground and the monitoring programme required.

Communication of Objectives

In terms of communication of information, the objectives should be to provide a document which is written in plain concise English, in a logical sequence with appropriate maps, illustrations and graphical representations, to clearly enable the reader to understand the points being made. The document should appear to be open and un-biased.

5.6 Conclusions

From the preceding chapters and the discussion in this chapter an initial good practice 'model A' has been prepared. This has been developed by integrating a range of disparate needs which have included: environmental ethics; legislation and policy; politics; the duties of the Environment Agency; and, needs of internal and external stakeholders.

An important factor has recognition of the communications paradigm for EA. The information management aspects of the EA process should seek to provide an ES that will effectively communicate the relevant information to the decision-makers. This should include why the project is needed; an appropriate range of alternatives and justification as to why one option is preferred; a description of the baseline environment and the predicted consequences of project implementation, together with justifiable mitigation measures and an explanation of how the commitments to implement an environmentally

sensitive project are going to be implemented. By reviewing good practice worldwide, elements have been selected to provide the most appropriate format and content for the 'model A' ES.

The model was produced in September 1994 and issued as Regional Guidelines for the preparation of ESs, for use on all capital flood defence and water resources projects (Hickie, 1994).

Chapter Six - Comparative Review of Current NRA Environmental Statements

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Comparative Review of Current NRA Environmental Statements

6.1 Introduction

The development of the initial good practice 'model A' (in Chapter Five) was the first step in iterative development of a robust EA process model for use in the Midlands Region of the Environment Agency. This chapter will seek to increase our understanding of the use of the EA process by discussing a comparative review of current ESs in relation to the good practice 'model A' (Figure 1.1). The comparative reviews were undertaken of the EA/ES reports as produced for the NRA (before the formation of the Environment Agency).

6.2 Development of a Review System for EA/ES Evaluation of Standards

Development of survey methodology

In developing a review survey it was useful to divide the methodology into a number of stages which were required in order to devise a clear concise technique which will provide useable results (Dixon and Leach,1978):

1. Define objectives and boundaries of field of survey
2. Preliminary investigation of literature and secondary material to check if information already exists in a usable form.
3. Collect primary data, devise initial survey, pilot test, revise and test.

There are two main forms of survey which could be appropriate for this type of evaluation work. Interviews with selected personnel which could be informal but with a defined agenda or structured. The other technique is the questionnaire which is filled in by selected respondents. A wide range of types of questionnaire ranging from those with open ended questions to those eliciting structured graded responses can be used for such purposes.

The informal interviewing of a small number of respondents prior to a formal survey with a standardised interview or questionnaire can help ensure that the questionnaire covers the majority of the area required. An unstructured interview after the formal survey has been analysed, may be useful to sort out any loose ends, contradictions and problems.

Aims and Objectives of the Review Survey

The aim of reviewing the existing standards of the EA/ES reports was to establish how successfully they had complied with the criteria developed for the initial good practice 'model A', and to identify how the process and standard of reporting could be improved. The results of this survey work could then be used to establish future directions for the iterative development of the good practice model. A number of key objectives for the survey were identified to:

1. Evaluate the standard of existing ESs in relation to all the criteria currently identified as required by good practice;

2. Identify consistent features which do not achieve the required 'good practice' standard;

3. Provide recommendations for the development of 'model B'.

Definition of the Survey Boundaries

The EAs were selected from the set of water management projects managed by the NRA, which required ESs to be published for them. The time period boundaries were those ESs published between 1990 and 1994 inclusive. The earliest date for publication was selected as 1990, because the planning and design for many projects had started before the introduction of the UK EA legislation in 1988. The latest date of publication was selected to be 1994, the year of the review survey.

Preliminary investigation of literature

A preliminary investigation of literature which may be relevant to this review has already been undertaken in Chapter Four of this thesis and revealed that the only similar work was by King and Wathern (1992). Research investigations into the standards of ESs produced under the Planning EA regulations (SI No. 1199) revealed similar conclusions to the King and Wathern work, that is, generally low standards, with a need to improve in certain key areas, with many ESs not following the guidelines provided (Wood and Jones, 1991).

Collect primary data, devise initial survey, pilot test, revise and test

The primary data set required for this survey was some form of comparative data obtained using a review criteria to compare the good practice 'model A' with a set of water management project ESs. In developing the review process, the use of questions to lead a reviewer through the process was considered the

most useful technique. This would provide the more inexperienced reviewer with a checklist of criteria for a good ES. The 'yes/no' marking system devised in the NRA Technical Guides (Brookes, 1993) was considered inadequate for use in this context as it gave little indication of the natural gradation of standards in any EA report. It was, therefore, expanded to the 'excellent' to 'very poor' grading in order to provide a better indication of the ranked standard of each individual component. Initially, the grading scale was devised to have five levels in response to the questions, from 'insufficient' to 'sufficient'. This was revised to be compatible with the nationally used six levels of 'very poor' to 'excellent', Lee and Colley (1992). Table 6.1 shows the weakness score index system used.

In designing the questionnaire, the layout of the questions and the answer boxes was carefully chosen. In selecting the questions for the questionnaire the respondent is be most likely to choose one from the beginning or the end, and therefore, it is usual to place the 'negative' response at the top or left (Dixon and Leach, 1978). The initial format of long rows of up to forty-five questions in one block was broken down to five row sub-blocks, to make the questionnaire look less daunting and make lining up the question and the answer boxes easier.

The initial questionnaire was based on the Lee and Colley (1990) style of review questionnaire, subsequently developed as the Institution of Environmental Assessment review methodology (Coles *et al.*,1992) and the review methodology used in NRA Technical Guidelines for EA (Brookes,1993).

The selected questionnaire respondents were three reviewers who had not been directly involved with any of the ESs to be reviewed. The questionnaire rated each ES on a total of 150 factors, in 12 subject areas. Each factor was subjectively rated from either 'very poor' to 'excellent', or a factor that was not required to be included in a particular ES, e.g., a river corridor survey would not be required for a tidal defence project. The definitions of these ratings are shown in Table 6.1.

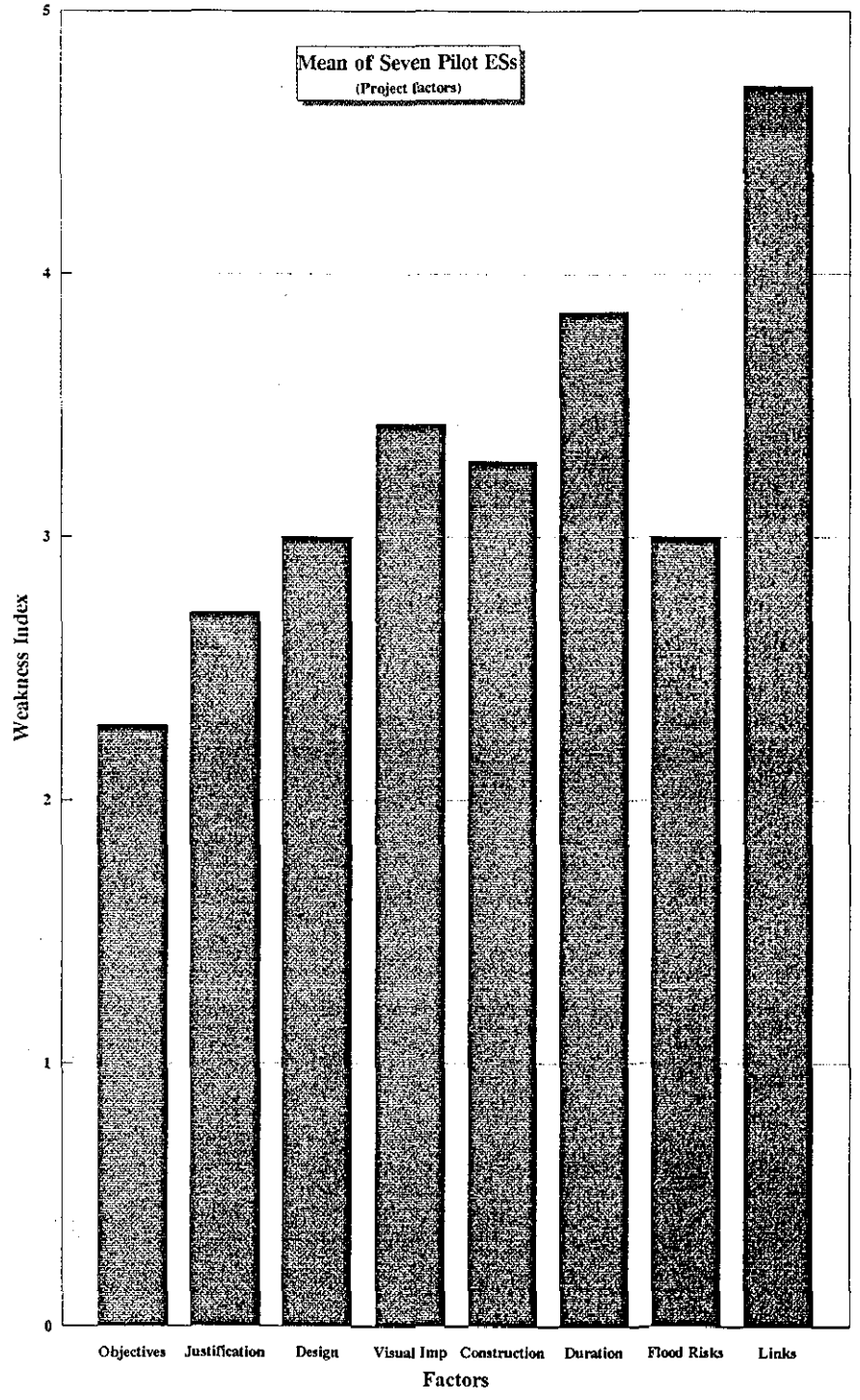
A pilot questionnaire was carried out on a total of seven ESs between May and September 1994. The results of the questionnaires were then transposed from the qualitative 'very poor' to 'excellent' ranges, to a weakness index

score ranging from 6 for 'very poor' through to 1 for 'excellent', as shown in Table 6.1. These ordinal figures were then fed into a computer spreadsheet (Lotus 123 Release 4 software). The mean of each of the factors for the seven pilot ESs for the three reviewers was calculated and outputted as a barchart graph. This output in graphical form provided a clear indication of those factors where there was a problem. The higher bars indicating 'weaker' scores as are shown in Figure 6.1.

Table 6.1 ES Review - Subjective Rating System and Weakness Index

Subjective Rating	**Definition**	**Numerical Weakness index**
Very Poor	important tasks poorly done or not attempted	6
Poor	significant omissions and in adequacies	5
Unsatisfactory	parts well attempted, but must as a whole be considered just unsatisfactory because of omissions and in adequacies	4
Satisfactory	satisfactory despite omissions and inadequacies	3
Good	only minor omissions and inadequacies	2
Excellent	no task left incomplete.	1

Figure 6.1 Example of Graphical Analysis from Pilot Review Questionnaire



Key - Weakness Index

1 - Excellent

2 - Good

3 - Satisfactory

4 - Unsatisfactory

5 - Poor

6 - Very Poor

Summary of Problems with the Pilot Questionnaire

Analysis of the pilot survey work indicated a number of problems which can be summarised as:

1. One reviewer appeared to be over generous in scoring most categories as 'excellent' on his first attempt at reviewing an ES. On his second attempt, with another scheme, he provided results which were of a similar nature to other reviewers. To overcome this problem, reviewers were to be briefed subsequently to score the ESs critically, giving only excellent scores when the ES criteria were completely fulfilled.

2. The front page of the questionnaire needed space to fill in details of the project and the scoring system needed highlighting with bold lettering.

3. The consultation list required to be extended after the experience of reviewing a numbers of ESs.

4. A final section for an overall impression of the ES was required. In addition, it was considered that it would be useful to add a section for the reviewer to note which were the five key issues discussed in the report, to review the similarity of perception of the reviewers.

6.3 Review of NRA ESs

Revised Questionnaire

The modifications to the questionnaire were made in the September 1994, increasing the total number of criteria to 174 in a total of 14 sections. A copy of the revised questionnaire is provide in the Appendix A - 2. A total of 14 ESs for NRA flood and coastal defence capital projects, which had been published during the period form January 1990 to November 1994 were reviewed.

The ESs were selected to cover a range of projects, very large to small projects, and urban and rural. In order to provide a view of national

consistency in ES production, four projects were selected from outside the NRA Severn-Trent Region, i.e. NRA Anglian and North-West Regions, which have different management systems for ES production. The 14 ESs selected are shown in Table 6.2

Table 6.2 The 14 ESs Selected for Review

River Flood Alleviation Schemes:	
I	River Soar, Flood Alleviation Scheme (FAS)
II	Lyme Brook FAS
III	Lydney FAS
IV	Shrewsbury FAS
V	Ouse Washes [NRA Anglian Region]
VI	River Irwell Flood Control Scheme [NRA North- West Region]
River Structures:	
VII	Abbey Mill Weir
VIII	Chadbury Weir
IX	Eckington Sluice
X	Whatstandwell Gauging Station
Tidal Defences:	
XI	Binn Wall Tidal Defence
XII	Mitchell's Salt Rhine Tidal Defences
XIII	Winder Moors Sea Defences [NRA North West Region]
XIV	Mill Beach to Goldhanger Tidal Defences [NRA Anglian Region]

The Implementation of the Review Questionnaire

The Institute of Environmental Assessment recommends two reviewers for each scheme to ensure a lack of bias and a range of experience (Coles *et al.*, 1992). In this review three reviewers were selected, to ensure that if there was any bias from a particular reviewer, however inadvertent, this would be balanced by the other two reviewers.

The data set from the questionnaires was transposed onto a computer spreadsheet (Lotus-123 Release 4 software), converting the subjective descriptive rating into a numerical weakness index to provide a representation of the data, which could be evaluated more readily (Figure 6.2).

CRITERIA	PROJECTS I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	Mean
PROJECT															
1.01 Objectives	2.00	2.33	2.00	1.67	1.67	1.00	1.67	2.00	1.67	2.00	1.67	2.00	1.33	1.67	1.76
1.02 Justification	2.67	2.33	2.00	1.67	1.67	1.33	1.33	2.00	1.67	2.67	1.67	2.67	2.00	1.67	1.95
1.03 Design	2.67	2.33	2.67	2.00	2.33	2.00	2.00	2.00	2.00	2.67	2.00	2.33	2.00	2.00	2.21
1.04 Visual Imp	2.33	3.00	2.00	1.33	2.33	2.00	1.67	2.67	2.00	2.67	3.00	3.00	2.67	2.67	2.38
1.05 *Construction*	2.67	2.33	3.33	2.33	2.00	1.67	2.67	2.00	2.33	2.33	2.33	2.67	2.33	2.00	2.36
1.06 Duration	2.33	6.00	2.33	2.33	2.33	2.00	2.00	3.00	2.00	2.33	2.00	4.00	2.00	2.00	2.62
1.07 Flood Risks	2.67	4.33	3.00	2.00	1.67	1.33	3.00	3.33	2.00	2.67	2.67	3.33	2.33	2.67	2.64
1.08 Links	2.67	5.33	2.67	1.33	4.33	2.00	4.33	5.00	4.00	2.67	2.67	2.67	3.33	2.33	3.24
SITE AND LOCAL ENVIRONMENT															
2.01 Maps	2.00	2.33	1.33	1.33	2.00	1.67	2.67	1.33	2.00	2.00	2.33	2.33	2.00	2.33	1.98
2.02 Area affected	2.00	1.67	1.33	1.33	2.00	1.67	2.33	1.33	2.00	1.67	2.33	2.00	2.00	3.00	1.90
2.03 *Photos*	2.00	6.00	1.67	6.00	2.67	1.67	3.00	2.67	3.67	2.33	2.33	4.00	3.00	6.00	3.29
2.04 Adj Landuse	1.67	2.33	1.67	2.00	2.33	1.67	2.00	2.67	3.00	2.33	3.00	2.67	2.67	2.33	2.31
2.05 *Site Designations*	1.67	2.00	1.67	1.67	2.00	1.67	1.33	1.67	2.33	2.67	2.33	2.33	2.67	2.33	2.02
2.06 Local Plans	2.00	1.67	1.67	1.67	3.00	1.67	1.33	2.00	2.67	3.00	2.67	2.67	4.67	2.67	2.38
2.07 Legal Rights	2.33	4.00	3.67	3.33	3.00	2.00	4.00	4.33	2.67	5.33	2.67	3.67	5.33	4.00	3.60
BASELINE CONDITIONS															
3.01 Search of existing data	2.67	2.00	2.00	2.33	1.33	1.67	1.67	2.33	2.67	2.67	2.33	2.00	1.67	3.00	2.17
3.02 *Recreation survey*	3.00	4.67	2.67	3.67	3.00	2.00	2.67	3.00	2.33	5.00	3.33	4.00	1.67	3.33	3.17
3.03 Aquatic spp	2.33	2.00	1.67	2.33	1.33	2.33	3.00	2.33	2.67	5.33	2.00	1.67	3.00	3.33	2.52
3.04 River Corridor	1.67	1.67	1.67	3.33	1.33	2.00	4.33	2.33	3.67	4.67	2.67	1.00	1.00	1.33	2.33
3.05 Terrestrial	2.00	2.67	2.33	2.33	1.33	3.67	1.67	4.33	2.67	5.33	2.33	2.00	1.67	2.67	2.64
3.06 Tree	2.67	2.67	2.33	2.00	3.00	3.00	3.00	2.67	3.00	2.00	3.67	2.67	2.33	3.00	2.71
3.07 Cons site designations	2.00	2.33	2.00	2.00	2.00	1.67	1.33	2.33	2.00	2.33	2.33	3.67	1.67	2.33	2.14
3.08 Ecological	1.67	2.33	2.00	2.00	2.33	1.67	2.33	3.00	2.67	4.00	2.00	2.33	1.67	3.33	2.38
3.09 Ornithological	2.67	2.00	2.33	2.67	1.33	4.00	1.67	2.67	3.33	4.33	1.67	2.00	1.33	2.00	2.43
3.10 Fisheries	2.00	1.67	1.67	3.67	1.67	2.33	3.33	2.33	2.67	4.00	1.67	3.67	2.00	3.00	2.55
3.11 *Invertebrates*	3.33	3.33	2.33	5.00	3.33	3.67	2.67	3.33	3.00	4.33	2.00	4.00	3.00	2.67	3.29
3.12 Spp list	3.00	3.00	2.67	5.33	1.67	2.33	3.33	2.67	2.67	4.33	5.33	2.00	2.00	3.33	3.12
3.13 Rare spp	2.67	3.67	2.67	5.33	1.67	2.67	1.33	4.33	2.33	4.33	1.67	3.67	2.00	3.67	3.00
3.14 Water Quality	2.67	2.33	2.67	3.67	1.67	1.67	2.00	2.00	2.67	4.67	2.33	2.00	2.00	2.67	2.50
3.15 Water flows	2.33	4.33	2.67	3.67	2.00	2.00	3.33	3.00	2.67	2.67	2.00	3.00	1.67	2.67	2.71
3.16 Flood flows	2.33	4.33	2.67	3.33	2.33	2.00	3.33	3.00	3.00	2.67	2.67	3.00	1.67	3.33	2.83
3.17 Biological	2.33	2.67	2.33	3.67	2.00	1.67	2.00	2.00	2.67	5.00	2.00	2.00	2.00	3.33	2.55
3.18 Geomorphology	2.67	4.67	3.67	4.33	2.67	3.00	3.33	2.33	3.67	4.33	2.00	4.00	1.33	2.67	3.19
3.19 Geology and soils	2.33	4.00	2.67	1.67	2.67	2.33	3.00	2.00	4.00	4.33	1.67	3.00	1.67	3.33	2.76
3.20 Ag Landuse	1.67	1.33	1.67	2.00	2.33	1.33	2.00	2.00	2.67	2.33	2.33	2.67	2.33	3.67	2.17
3.21 Landscape Assessment	2.00	2.67	2.00	2.00	3.67	2.67	2.00	2.00	2.67	2.33	2.33	2.67	2.67	4.67	2.60
3.22 Archaeological	3.00	2.33	3.00	2.00	2.67	2.33	3.00	2.00	2.67	2.33	2.33	2.33	2.33	4.00	2.60
3.23 Legal Rights	2.67	4.33	4.00	3.33	3.00	2.33	4.33	2.00	3.00	2.33	2.33	3.00	4.00	4.33	3.21
3.24 *H & S*	4.00	4.33	2.67	3.67	4.33	2.67	2.00	3.33	2.67	3.33	3.67	2.67	3.67	6.00	3.50
3.25 Other survey	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
3.26 Other survey	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
3.27 Uncertainty of data	2.67	4.33	4.00	3.00	3.00	2.67	4.33	2.67	2.67	4.00	3.00	4.33	1.67	3.33	3.26
3.28 Additional data	2.67	4.67	4.00	3.33	2.67	2.00	4.67	3.33	4.00	3.67	3.00	4.67	2.00	3.67	3.45

Figure 6.2 Example of Spreadsheet Analysis from Review Questionnaire

Such numerical data were not weighted, either for differing values of the individual factors or for any difference in the value between a very poor rating and an excellent rating. Whether the difference in rating values was linear or logarithmic was not relevant for this evaluation process. It was recognised that such an evaluation of the differential in rating values and weighting of individual factors in relation to each other was a research project in its own right.

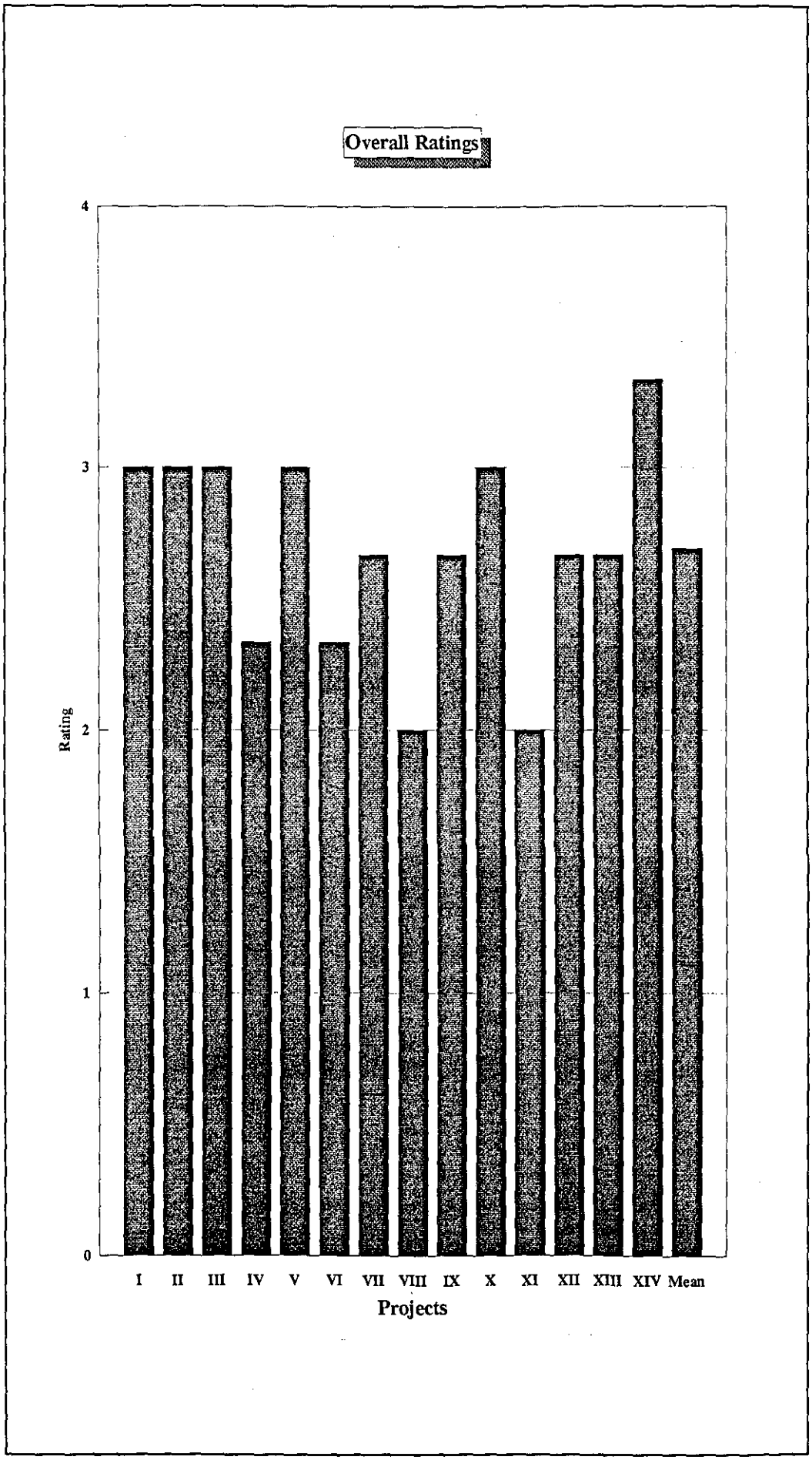
Each of the individual factors was then averaged over the fourteen projects to provide a mean weakness index. This mean figure shows the relative differences between the individual factors, some of which were consistently done well over the majority of the projects, thereby achieving a low weakness index (1 or 2), whereas other factors showed a consistent high weakness score (5 or 6) over all the projects, indicating consistent problems. To check whether median rather than mean figures would give more meaningful figures, these were tested but these were found to be falsely skewing the data, implying lower 'average' index scores and hence a reduced number of problem areas.

6.4 Analysis of the Review Questionnaire Data

In general, the survey indicated that the standard of ESs reviewed was low. A calculation of the mean of the three reviewers overall rating scores for the 14 ESs showed that only two scores achieved a rating which was deemed to be 'good' as shown in Figure 6.3. The majority were satisfactory, with one being unsatisfactory.

It was not expected that the mean of overall impression rating and the mean of all the factor ratings would show a close correlation. It is normally regarded that some factors are more important in an ES than other factors, for example, the 'need to have clear unbiased explanation of the impacts' is more important than the fact that 'the British Trust for Ornithology was consulted' (except if they were identified as a key stakeholder). However, there appeared to be an unexpectedly close correlation of the two means for all but two of the projects, as can be seen in final table of data in Appendix 2. These two projects are the ones which scored a 'good' overall rating, but whose mean of all the factor

Figure 6.3 Graphical Analysis of Overall Ratings of 14 ESs



ratings was higher than the overall impression rating. It is not suggested that this result of close correlation in 12 out of 14 ESs should be used to develop a system of review aggregation scoring, but the unexpected close correlation does indicate that the mean can provide a useful cross checking tool for such review evaluations.

General Review of criteria for the 14 ESs

In analysing the 14 project ESs, a general conclusion was that many failed to achieve a satisfactory standard because although many of the elements were present, they were in an inappropriate part of the document. A prime example is the location of the photographs. In many ESs the reader had to read the whole document before finding the photographs in the appendices. Conversely, some ESs had many pages of data in the main document, which should have been in the appendices with only a summary analysis in the main text of the document.

The Project: Was sufficient data provided to enable a non-specialist to visualise the project?

The majority of the projects achieved a 'good' standard in describing the objectives of the project and ES. Most projects provided an adequate description of the overall project in the text, but failed to use any graphical measures to help describe the project.

With the exception of one project, Shrewsbury Flood Alleviation Scheme (FAS), all the projects failed to provide a good clear visual impression of the whole project which was likely to be clearly understood by the layman. Many used segments of engineering drawings as the main visual reference material. Such drawings are rarely suitable for providing a visual impression of what the project would look like in the context of its surroundings, and typically lack any provision for easy reference of the relative human scale of the project. In the Chadbury Weir ES the engineering drawings had been redrawn by a landscape architect. This provided a more readable cross-sectional drawing with trees and shrubs included to help provide some indication of the scale.

The Shrewsbury FAS did have good clear three-dimensional sketches of the proposed project, but these were provided at the back of the appendices. No

diagrams or pictures were provided in the main text. The drawings had been prepared for an associated exhibition prior to publishing the ES.

In summary, the mean score for objectives and justification criteria was good, 'links to other projects' being unsatisfactory and the remainder of the criteria being satisfactory. Therefore, although only the 'links to other projects' criteria scored unsatisfactory, the majority of the other criteria also need to be improved to achieve the 'good practice' objectives.

Site and Local Environment Factors: Was sufficient data provided to enable a non-specialist to visualise the site and local environment?

To provide the reader with a visual impression of the project, it is important to provide maps, diagrams and photographs within the document. The best place for most such graphical information is at the front of the ES after the contents page to provide a visual introduction to the project. Table 6.3 provides a summary of the location of such visual reference material within each document. Ideally the visual material should be arranged at the front, rather than the middle, rear or in separate appendices. The ES for Abbey Mill Weir very usefully combines text and graphics. This enables text to be associated with maps and diagrams on the same page.

A series of colour photographs with associated descriptive titles, provide a visual impression of the study area. Cross-sections can assist in visualising the proposed project and any changes of level. Such diagrams should not be straight copies of the engineering cross-sections, but should be more in the style of landscape architects cross-sections, including human scale and vegetation.

Two of the ESs, Lydney FAS and River Irwell Flood Control Scheme, have used A3 sized Appendices in landscape format for all maps, diagrams and photographs. The advantages of having separate appendices are that you can read the main document text with the separate appendices opened at the appropriate pages for graphical images referred to in the text. The disadvantages of this system are that having two documents open at the same time takes quite a bit of room on a desk, and that a document which has only text and no graphical images can be less attractive, not only for poorer readers in the community, but also for normal readers.

Table 6.3 Location of Maps and Photos in ES Documents

Project	Regional Map	Location Map	Visual Appearance	Photos
River Soar	Front	Front	Front (cross-sections, with human scale)	Front
Lyme Brook	-	Front	Rear (plans)	-
Lydney	Appendix	Appendix	Appendix (cross-sections)	Appendix
Shrewsbury	-	Appendix	Appendix (oblique aerial sketches, with human scale)	-
Ouse Washes	-	Front	Front (cross-sections)	Front
River Irwell	Appendix	Appendix	Appendix (cross-sections, with human scale and photo-montages)	Appendix (photo-montage)
Abbey Mill Weir	-	Front	Front (sketches)	Front
Chadbury Weir	Front	Front	Front (cross-section)	Front
Eckington Sluice	-	Front	Middle (sketches, with human scale)	Middle
Whatstandwell GS	-	Front	Middle (plans)	Middle
Binn Wall	Front	Front	Front (cross-sections, with human scale)	Front
Mitchell's Salt Rhine	Front	Front	Front (cross-sections)	Middle
Winder Moors	Front	Front	Front (cross-sections)	Appendix (photo-montage)
Mill Beach to Goldhanger	-	Front	Front (plans)	-

1. Shaded boxes are those items which fulfil the required criteria of being located at the front of the document.

On balance then, to ensure reader accessibility to the documents, each should be stand alone, the main ES having a mixture of text and graphical images,

and appendices providing more detail images for readers who wish to refer to such information. The A3 landscape format can provide a useful document for a complex scheme such as the River Irwell Flood Control Scheme.

Maps: Was the provision of maps satisfactory?

The first map should be a map of appropriate scale enabling the reader to put the project in a regional context. Only six out of the 14 ESs reviewed had any such regional maps. The location map should follow on from the regional map and provide a clear indication of the area of study for the EA associated with the project. Only three projects, Chadbury Weir, Binn Wall and Winder Moors Sea Defences, provided maps which provided a regional, then local context for the project and surrounding study area (see Table 6.3). In the remainder, the location was unsatisfactory, either only in the appendices or totally divorced from the text to which they related. The use of the same map base, as in the River Soar FAS project, for the majority of the ES, provided continuity for the reader and a much easier way of assimilating the information. Many maps were based on Ordnance Survey map bases, which were poorly photocopied, providing no clear indication as to the difference in mapped areas of water/river, buildings and grassland, all shown as a plain white area, expecting the reader to decipher the landuse from the shapes created by thin black lines on the map.

The use of maps in some ESs, such as Mitchell's Salt Rhine Tidal Defences, contained too much information in a similar format. The latter had three different styles of cross-line hatching and one of shading, overlying each other to a great extent, creating room for confusion in the mind of the reader, until the different areas have been correctly discerned. The linear length of coastline was split into three separate sections, with two at the top of the page and one underneath, which led to some initial confusion as to which map related to which section.

Areas affected : Was sufficient information on the affected areas satisfactory?

The areas of visual and noise effect were rarely covered in wide enough detail in the majority of projects. The area mapped and surveyed tended to be quite restricted. The River Soar FAS project area mapped was not sufficient to

provide data required in order to assess a potential extra access route onto the riverbank, once the works had started on site. It is essential that all the areas that could potentially be affected, together with a buffer zone around the boundary of the main study area, are surveyed as part of the EA process.

Photographs: Was the provision of photographs satisfactory?

Only four out of 14 projects used photographs to illustrate the site and surrounding area. Two projects, River Soar FAS and Whatstandwell Gauging Station, used photographs of similar river structures to illustrate the visual appearance of the proposed structures. The Abbey Mill project used line illustrations of the mill one hundred years ago, both on the cover and in the text. Photographs of the current mill would have been more appropriate for both situations, possibly using photomontage techniques. Two of the projects (River Irwell and Winder Moors) used photo-montages to assist in the visualisation of the proposed options. With the advent of computer aided design and associated graphical rendering software, photomontages can now be produced quickly and relatively cheaply by many consultants. Three projects (Shrewsbury, Abbey Mill and Eckington Sluice) used artist's impressions of the proposed schemes. This can assist in helping the reader visualise the proposed scheme.

Adjacent Landuse, Site Designations and Legal Rights: Was the information provided satisfactory?

The failure of projects to adequately cover these aspects was generally as a result of poor description of these issues on clear maps covering a wide enough area of possible effect.

In a number of ESs (Abbey Mill Weir, Binn Wall, and Mitchell's Salt Rhine) the majority of the information was provided, but was not presented in the most appropriate order. Putting text, maps, diagrams and photographs together would have improved the ES from 'satisfactory' to a 'good' rating.

The reader is often keen to discover the proximity of any designated conservation sites, which may indicate key issues and reasons for objection to a particular project. In the Chadbury Weir ES, a clear indication of such sites was provided in a checklist at the front of this section of the ES. Although

and appendices providing more detail images for readers who wish to refer to such information. The A3 landscape format can provide a useful document for a complex scheme such as the River Irwell Flood Control Scheme.

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The reader is often keen to discover the proximity of any designated conservation sites, which may indicate key issues and reasons for objection to a particular project. In the Chadbury Weir ES, a clear indication of such sites was provided in a checklist at the front of this section of the ES. Although

such information was often provided in the other ESs, the reader would have to search each individual section of the site description chapter of the document to glean the same information. Only Chadbury Weir ES noted that particular types of site were not present using a checklist system.

Baseline Conditions: Were the baseline surveys sufficient?

The ESs generally provided a superficial description of the environment, covering most elements, but failed to provide even the most simplistic model or explanation of how the current environment had evolved, natural trends, the general environmental links and inter-relationships, e.g., between geomorphology, land management and ecology. The key constraining or limiting factors were not identified directly, e.g., the high ecological value of the Severn Estuary was noted as an 'area of high conservation value', i.e. a Ramsar site (Land Use Consultants, 1994). The fact that the geomorphology, tidal and riverine flow systems, and associated landuses created the right ecological niche for an area of salt flats and marshes to develop into an area of international importance for birds (and hence the Ramsar site designation) was not mentioned.

In assessing the potential effects on an environment, it is impossible to properly assess the effects of any new development unless even a simplistic model of the environment is considered. It is important to identify the key environmental features in such a model which are the constraining or limiting factors of environmental change, in order to be able to constructively analyse the potential direct and indirect effects of the development. The inter-relationship of environmental factors will be unique to each site.

Some of the projects described how the environment and its management had changed over time. An evaluation of environmental change in land use, geomorphology, hydrology, ecology, over time can provide useful indicators as to the key and limiting factors within that environment. Such studies can also indicate the relative importance of cultural heritage features, and support the possible argument for a positive change within that environment.

In general, most of the baseline information was deemed to be satisfactory, but generally failed to summarise the key issues represented by the data. None of the projects provided any consistent indication of the source of the

information to allow the reader to judge the reliability of the data or associated comments. The phrase 'no survey information' was common, with no explanation of whether any such information was judged to be needed for the ES.

There were a number of criteria that were consistently handled in an unsatisfactory manner, these being: recreation, invertebrates, species lists, geomorphology, legal rights and public safety. Tree surveys only provided an indication of the tree species, location and canopy size. Details of condition and heights of trees were not provided. The condition of a tree is a very important factor in determining the significance of the loss of that tree. Most ESs covered the ecological issues fairly well, with some explaining the significance of this information better than others.

Consultation: Were the range of consultations sufficient?

Not one of the projects provided a clear indication of who had been consulted and what the response or concerns were. The major lack of information in the ESs was consistently the consultation that must have occurred between NRA internal departments. The majority failed to note any consultation with any NRA staff whatsoever.

Unsatisfactory criteria means were scored for: English Heritage, County Ecologist, British Trust for Ornithology, angling clubs, Ramblers Association, land owners and owners of legal rights. Local residents did not seem to fare very well in terms of consultation scoring a mean grade of 'poor'.

None of the ESs had a communications plan detailing, who should be consulted at all the stages of the EA. The Shrewsbury ES did have a table detailing the consultation required as part of the monitoring process (Gould Consultants, 1993, section 10.1.1). This had been developed following the experience of the River Soar project, where a programme of monitoring requirements and consultees was prepared, following objections to the ES. Public awareness and general consultation, including press releases and special public meetings, all rated poorly.

Impacts: Were the full range of impacts sufficiently identified?

In general terms the impact criteria scored 'satisfactory' figures. The

identification of key issues scored a mean 'good' rating, whilst the explanation of methodologies, conflicting effects and safety implication scored 'unsatisfactory' grades.

Energy resources and irreversibility and the effects of site investigation scored 'poor' grades.

Effect Prediction, Magnitude and Significance: Were the indications of the likely magnitude and potential severity of the effects sufficient?

These criteria scored within the 'satisfactory' to 'unsatisfactory' levels. The low mean scores for this section and the proceeding section led to a more detailed analysis of effects and their predictions which is discussed in the next section of this chapter. The data from the ES Review Questionnaire indicated that the mean of the 24 effect criteria for this section of the review surveyed: 5 were 'good', 12 were 'satisfactory', 5 were 'unsatisfactory', and 2 were 'poor'. As only five were achieving a good practice standard, it was considered necessary to evaluate these criteria in some more detail to provide further insights into the problems within these factors of the review criteria. These will be discussed later in this chapter.

Alternatives: Were all the reasonable alternatives considered and adequately assessed?

In general, the justifications for choosing a particular alternative were not handled well. Many of the alternatives (which ranged in number from a project with no alternatives to one with 17 options) were not well described and the effects of the differing alternatives were not quantified and assessed. Of the 14 ESs, four did not consider the 'do nothing' option, as required by the guidelines - 'Environmental Procedures for Inland Flood Defence Works' (MAFF, 1992) and 'Coastal Defence and the Environment' (MAFF, 1993). Of these four ESs, two were produced before 1992, including one that was an ES for new gauging station at Whatstandwell, one in mid 1992 and the other in 1994.

Only Binn Wall ES provided a summary, in text form, of the potential effects of the alternatives. A simple matrix would have assisted this summary process.

Mitigation Measures: Was the information provided satisfactory?

Mitigation measures were rarely related to negative effects derived from the proceeding section of the ES. The effectiveness of mitigation measures was judged in all cases in an entirely subjective way. Generally the mitigation criteria were graded 'satisfactory', but the assessment of potential conflicts was not assessed in any project.

Enhancement: Was the information provided satisfactory?

Enhancement was similar in nature and covered in most projects in the same section as mitigation measures. Many projects did not refer to enhancements independently of mitigation. This is because MAFF will fund mitigation but not enhancement measures.

Monitoring Programme: Was an adequate monitoring programme provided?

Not one project provided a detailed specification for a monitoring programme. Most mentioned that there was a need for monitoring without detailing how or when this would be done. Criteria that fared 'unsatisfactory' were: brief for EA monitoring officer, post-project appraisal planned, EA quality assurance system, EA on progress meeting agendas and a liaison programme. No projects had what is now referred to as an 'Environmental Action Plan'. This was to be expected, as the ESs were produced before such recommendations were made in the guidelines. Chadbury Weir had an 'Environmental Action Programme' (Land Care Associates, 1994, pp. 44-46) which listed the measures required to ensure that the effect of the works was minimised. A monitoring programme tabulating, requirements, timescale and staff was included in the Shrewsbury ES. This had been developed for the table provided in the River Soar ES, as discussed earlier.

EA/ES Layout and Presentation

The layout and presentation was judged to be generally 'satisfactory'. All projects had a paragraph numbering system of some kind, but not all reports had page numbers. No reports had any form of indexing which could have aided the reader. As discussed earlier, the photographs were judged generally to have been used poorly. Chadbury Weir ES (Land Care Associates, 1994)

had a good set of photographs showing the site and its surrounds at the front of the report which provided a good visual picture of the project before you started reading the text.

Non-technical Summary

In an ES the non-technical summary should be a clear and concise summary of the project which introduces the reader to the main concepts and findings of the ES in a way that ensures the reader is not put off because the non-technical summary is too technical or verbose in content. It should allow the reader to understand the key concepts of the ES without having to read the main document with all the associated detail.

It should include the need for the project; the aim of the EA process and ES; the justification of the preferred option; and, a summary of the main effects of the project. The non-technical summary should be free from all technical jargon and phrases.

The non-technical summary should be able to be published and to be read as a separate document and should be included in the front section of the full ES to aid the reader. Text on its own will not necessarily provide sufficient description of the project and the inclusion of graphical description in the non-technical summary will aid all readers, from the technically competent to those with reading difficulties, to understand the basic concepts. This will require a plan of the location of the project, area of study, general photographs of the area, and diagrams of what the preferred option will look like.

The length of the non-technical summaries ranged in length from 2 to 23 pages (Table 6.4). The average length was 6.5 pages. Of the 14 projects, only five (Ouse Washes, Abbey Mill Weir, Chadbury Weir, Binn Wall and Mill Beach to Goldhanger) had any maps, photographs or diagrams to assist in the description of the summary of the ES. Whatstandwell ES had no non-technical summary whatsoever. A non-technical summary that is over four pages long will discourage poor readers from reading the complete non-technical summary.

The writing style will also affect the reader's accessibility to the ES. A highly technical style with many technical phases, acronyms and long sentences will be very hard for many lay people to understand and follow the

lines of argument justifying the project.

It is suggested that the non-technical summary should be no more than four pages of text; with supporting maps, photographs and diagrams, providing a clear visual image of the project area of study and the preferred option. The text should include a short description of the ES process and the needs and justification of the project. The main temporary and residual effects should be summarised. A simple matrix or table will enable readers to clearly understand such effects. The writing style should be clear and concise with short sentences and clear sub-headings to aid the reading process.

Table 6.4 Non-technical Summaries

Project	Pages in length	Maps included
River Soar	16	no
Lyme Brook	2	no
Lydney	23	no
Shrewsbury	7	no
Ouse Washes	4	yes
River Irwell	7	no
Abbey Mill Weir	6	yes
Chadbury Weir	2	yes
Eckington Sluice	4	no
Whatstandwell GS	0	-
Binn Wall	6	yes
Mitchell's Salt Rhine	3	no
Winder Moors	2	no
Mill Beach to Goldhanger	8	yes

1. Shaded boxes are those that fulfil the criteria for non-technical summaries

The Chadbury Weir non-technical summary provides the best example of such good practice. The remaining 13 all fall below such standards in one form or another, with the majority using just plain text, with no headings, in a similar technical style as the main document.

Emphasis: Was the information provided in an unbiased manner?
The ES reports were generally judged to be unbiased, with a satisfactory presentation of adverse effects. However, the unknowns and the prediction of uncertainty were not handled as well. In most cases they were not mentioned at all.

Key Issues: Was it clear to the reader what the key issues were?
The key issues identified by each reviewer were judged to be satisfactory. It was noted that all the projects failed to highlight the effect of the flooding problem on the local population as a key issue. This begged the question, why was the flood defence scheme being considered if there was no effect on the local community?

Overall Impression of ES: What was the overall impression of the ES?
The mean scores for all the fourteen projects reviewed by the three reviewers was 2.77, which indicated a mean grade of 'satisfactory' (tending towards 'unsatisfactory' rather than 'good').

6.5 Review of the Environmental Effect Analysis Procedures

The data from the ES Review Questionnaire discussed in the previous section indicated that of the 24 individual effect criteria surveyed more than 30% were below the 'satisfactory' review grade. The results of the review indicated this to be a key weak area in the process. As the technique of assessment of environmental effects lies at the heart of the EA process it was considered appropriate to review the methods in greater depth.

Each of the 14 ESs was evaluated for the range of effect criteria listed below:

1. Value - presence of effect evaluation method providing a quantitative or defined qualitative 'value' where appropriate, rather than a subjective written statement

2. Significance - presence of significance threshold values

3. Weighting - use of system for weighting various environmental effects

4. Matrices - use of matrices to display information

5. Methodology - description of evaluation methodology

6. Definitions - used to define of evaluation system components

7. Limitations - limitations of the methodology used

The results shown in Table 6.5 provide disconcerting reading. None of the ES assessments attempts to provide any guidance as to the value of any environmental features in any objective fashion. It is acknowledged that many features, such as aesthetics, are very subjective, but elements such as noise and water quality do have standard methods for valuing quality and agreed significance ranges. The Mill Beach to Goldhanger Tidal Defence ES (Posford Duvivier Environment, 1994) does attempt to introduce the concept of significance in relation to the effect value, but without using the concept of significance threshold. The Winder Moor Sea Defence ES (Environmental Management Consultants, 1991) is the only one which attempt to include risk, but does so again in a very subjective manner (similar to the subjective values of either, major or minor, and beneficial or adverse). It uses a matrix assessment method and quotes environmental impact guidelines (Department of Environment, Malaysia, 1988).

In summary the results of this more detailed review were disappointing. They indicated a consistent subjective handling of the evaluation process throughout all the ESs, even where standard quantitative methods already exist, for example, noise assessment.

Table 6.5 *Review of Evaluation of Analysis Criteria Present in 14 NRA ESs.*

No.	Project	Value	Signif icance	Weight- ing	Matrix	Meth odolo gy	Defin- itions	Limit ations
I	River Soar FAS	0	0	0	0	0	0	0
II	Lyme Brook FAS	0	0	0	0	0	0	0
III	Lydney FAS	0	0	0	✓	0	0	0
IV	Shrewsbury FAS	0	0	0	✓	0	✓	0
V	Ouse Washes	0	0	0	✓	0	0	0
VI	River Irwell	0	0	0	0	0	0	0
VII	Abbey Mill Sluices	0	0	0	0	0	0	0
VIII	Chadbury Weir	0	0	0	✓	0	✓	0
IX	Eckington Sluice	0	0	0	0	0	0	0
X	Whatstand well Gauging Station	*0*	*0*	*0*	*0*	*0*	*0*	*0*
XI	Binn Wall Tidal Defence	0	0	0	✓	0	0	0
XII	Mitchell's Salt Rhine	0	0	0	✓	0	0	0
XIII	Winder Moor Sea Defence	0	0	0	✓	✓	✓	✓
XIV	Mill Beach Tidal Defence	0	✓	0	0	0	✓	0

Key *Criteria present - ✓ Criteria absent - 0*

Table 6.6 Analysis of Evaluation of Effects Criteria Present in 14 NRA ESs.

No.	Project	Natural Trends	Direct/ Indirect	Short/ Med./ Long-term	Perma-nent/ Temp-orary	Cumul-ative	Revers-ible/ Irrever sible
I	River Soar FAS	0	0	0	0	0	0
II	Lyme Brook FAS	0	0	0	0	0	0
III	Lydney FAS	0	0	0	✓	0	0
IV	Shrewsbury FAS	0	0	0	✓	0	✓
V	Ouse Washes	0	0	0	✓	0	0
VI	River Irwell	0	0	0	0	0	0
VII	Abbey Mill Sluices	0	0	0	0	0	0
VIII	Chadbury Weir	0	0	0	✓	0	✓
IX	Eckington Sluice	0	0	0	0	0	0
X	Whatstandwell Gauging Station	0	0	0	0	0	0
XI	Binn Wall Tidal Defence	0	0	0	✓	0	0
XII	Mitchell's Salt Rhine	0	0	0	✓	0	0
XIII	Winder Moor Sea Defence	0	0	0	✓	✓	✓
XIV	Mill Beach Tidal Defence	0	✓	0	0	0	✓

Key Criteria present - ✓ Criteria absent - 0

More Detailed Review of Effect Analysis in the ESs

A further set of specific criteria were evaluated to review the techniques used by the 14 ESs to provide a decision-maker with information about the potential effects. These additional criteria were:

8. Natural trends of the baseline environment.
9. Direct/Indirect

10. Short-/Medium-/Long-term
11. Permanent/Temporary
12. Cumulative
13. Reversible/Irreversible

The results of this review are shown in Table 6.6. The only criteria used in the description of the effects of the project which were provided in the ESs with any consistency are whether the effects are permanent or temporary (50%); and, whether the effects are reversible or irreversible (28%). The general failure to address the concept of natural tends (0%), direct or indirect effects (7%) and cumulative effects (7%), indicates a general failure to conform to the requirements of the Department of Environment's guidelines (1989a), which although specifically drawn up for planning ESs, provide the only readily available UK Government guidance for the content of an ES.

Review of a Separate Group of ESs

The question now arose as to whether these problems were isolated to this particular group of ESs. In order to ensure that the results were not due to sampling errors, unique EA problems or the poor results from a particular group of EA consultants, another group of 13 ESs was selected from the set of water management ESs held in the library of the Institute of Environmental Assessment. This group constituted all the water management ESs held in the library which were published during the same time period as the original NRA group of 14. These ESs were reviewed for exactly the same 13 effect criteria as those above. Other sectors, such as roads projects, could have been evaluated as well, but it was considered that such additional data would not reveal any additional clues.

The results of this additional set of ESs, with the exception of Marine Drive Floodwall ES (Applied Environmental Research Centre Ltd, 1993), were not as good as the original set of 14 ESs (Tables 6.7 and 6.8). This led to the conclusion that the EAs of water management projects during the period 1990 to 1994 were generally of a poor quality.

Table 6.7 Analysis of Evaluation of Analysis Criteria Present in 13 Other ESs.

No.	Project	Value	Signifi cance	Weight ing	Matrix	Method ology	Defin- itions	Limit ations
1	Bryher Coastal Defences	0	0	0	0	0	0	0
2	Northern Sea Wall	0	0	0	✓	0	0	0
3	Northney Marina	0	0	0	0	0	0	0
4	Port Cressa	0	0	0	0	✓	✓	0
5	Mansfield WTW	0	0	0	0	✓	✓	0
6	Fleetwood Marsh WTW	0	0	0	0	0	0	0
7	Elmer	0	0	0	✓	0	0	0
8	River Medway	0	0	0	0	0	0	0
9	Ventnor	0	0	0	0	0	0	0
10	Marine Dive	✓	✓	✓	✓	✓	✓	0
11	Hythe Coast	0	0	0	0	0	0	0
12	Muddle- bridge	0	0	0	0	0	0	0
13	Chatham	0	0	0	0	0	0	0

Key Criteria present - ✓ Criteria absent - 0

Table 6.8 Analysis of Evaluation of Effects Criteria Present in 13 other ESs.

No.	Project	Natural Trends	Direct/ Indirect	Short/ Med./ Long-term	Permanent/ Temporary	Cumul-ative	Revers-ible/ Irreversible
1	Bryher Coastal Defences	0	0	✓	0	0	0
2	Northern Sea Wall	0	0	✓	✓	0	0
3	Northney Marina	0	✓	✓	0	0	0
4	Port Cressa	✓	0	0	0	0	0
5	Mansfield WTW	0	0	0	0	0	0
6	Fleetwood Marsh WTW	0	0	✓	0	0	0
7	Elmer	0	0	✓	✓	0	0
8	River Medway	0	0	0	0	0	0
9	Ventnor	0	0	0	0	0	0
10	Marine Drive	✓	✓	0	0	0	0
11	Hythe Coast	0	0	✓	0	0	0
12	Muddlebridge	0	0	0	✓	0	0
13	Chatham	0	✓	0	0	0	0

Key Criteria present - ✓ Criteria absent - 0

6.6 Discussions of the Comparative Review

The key factor emanating from this comparative evaluation of the 14 ESs and the EA good practice 'model A' was the lack of consistency in approach and coverage of the elements required for a good practice EA.

The use of a standard model for the EA process and the EA reports, including the ES, could improve the general review grades achieved. This standardisation would also improve the effectiveness of the EA process, in that all the possible issues would be dealt with in an organised and logical manner. The use of a standard model would also increase efficiency, in that all staff and consultants would be working to a model format. This model format would not lead to time being wasted developing individual formats for unique projects. The standardised model would also improve the efficiency of staff reviewing or contributing to the process, in that the content format would be similar, and hence improved ease of finding information in the reports. This would also lead to the development of standard levels of information being provided at different stages of the process. For example, the scoping stage would identify issues but would not normally provide data nor any analysis. However, there would be a requirement at the ES stage for a standard level of data in a summary form (with source details in terms of person or agency providing the data and the date provided). The analysis and evaluation of that data in an easily read format would be provided in the assessment stage of the EA.

If the standard format of ES is initially developed at the scoping report stage; the same format can be used in the environmental issues report stage, and then broadened out at the feasibility EA report stage. This will ensure the increased efficiency in the preparation of the final ES. The elements of the EA will be expanded and reviewed as the EA process develops in iterative stages from the scoping and feasibility stages to the final ES. The effectiveness of the EA process will also improve by the use of a standardised EA format and topics, to ensure all issues are investigated and dealt with in an effective manner at the appropriate stages of the EA.

A review system of some kind or other is needed to ensure that minimum legislative requirements are implemented and that good practice elements identified in earlier chapters and developed in the initial good practice 'model A' are also implemented. Many of the ESs had partially implemented some of the required elements, such as the provision of photographs and maps to provide the reader with a visual impression of the project, but these were not provided in the appropriate location within the ES document. It is suggested

that the review questionnaire developed for the evaluation of the 14 ESs is used to provide the review tool required for this element checking task.

Whilst the review criteria included for an environmental action plan to manage the delivery of the environmental issues and constraints on site, it was recognised that the actual format for such an environmental action plan needed to be developed further. This will be discussed in the next chapter of the thesis.

In addition to the need to develop environmental action plans, it was recognised that there is a need to provide guidance on the assessment of changes if they are required after the ES has been published. Such assessment needs to be provided as part of the environmental action plan process.

6.7 Conclusions

Opportunities to Improve EA Effectiveness and Efficiency

It was recognised that the comparative review of 'model A' and the 14 ESs had identified a number of problems in the EA process which needed to be addressed in the development of 'model B' (Figure 1.1) to improve EA effectiveness and efficiency. The prime opportunity for improving effectiveness was related to improved communication of information, i.e. the ability of decision-makers to take account and use the information provided in their decision-making processes. As discussed in earlier chapters, the communication of information is an important feature of the EA process and in general, the 14 ESs reviewed were poor at this task. The ESs appeared to be written as 'technocratic' reports, with little consideration of how the ES would be used. The elements of poor communication included a lack of structured provision of information to the reader, e.g., mitigation measures were rarely linked to effects; poor use of graphical images to provide the reader with information, e.g., a lack of photographs, diagrams and tables; the information was provided with a lack of context, e.g., sources of information not provided; and a lack of interpretation of the effects of the project; e.g., no mention of significance of effects.

To improve the efficiency of the process, it was concluded that

improvements can be made by the use of standardised EA procedures and formats to ensure that all aspects are covered in a structured and logical manner. As discussed in earlier chapters, the basic principles of EA are similar for any project whatever its size location or type, therefore, a standardised procedure and format for outputs such as ESs may be developed. The use of standardised formats overcomes the problem of each consultant 're-inventing the wheel' for each new project; and associated engineering staff having to acquaint themselves with a new format of ES for each project. The use of a review system in the form of a standard checklist as developed for this thesis can assist this task.

Improved Evaluation of Effects

The analysis of effects appeared to be entirely subjective in nature, normally using terminology such as 'major' and 'minor' effects, with few definitions if any. For those impacts that could be easily quantified using standard techniques, e.g., noise and water quality, these were neither quantified nor evaluated, when nationally recognised techniques and significance levels are readily available.

The projects did not have any complex environmental issues nor the need to value the loss of important environmental features for the greater community good, e.g., provision of improved flood defences. Simple techniques were appropriate in such cases, but it was disconcerting that only 50% used matrix techniques or tables to provide the reader with an indication of summary of effects.

The poor attempts at the evaluation of effects in the 14 ESs led to the question as to whether this problem was restricted to the group of 14 ESs, or whether water management project ESs in general suffered from the same shortcomings. Was this a problem caused by selection of poor consultants or the use of poor EA techniques? The results of the further 13 ESs reviewed led to the conclusion that this was a countrywide problem not restricted to the NRA nor to consultants working in one part of the water environment. It confirmed that the poor EA techniques were being implemented consistently over a wide range of projects and developers. A higher standard of ES than normal was found in the Marine Drive ES (Applied Environmental Research

Centre Ltd, 1993) which was due to the better practices implemented by this particular EA consultant. However, even this consultant failed to discuss the limitations of the evaluation system used; differentiate between short, medium and long-term effects; permanent or temporary; cumulative and irreversible effects. All of these elements (with the exception of irreversible effects) are recommended in the widely read Environmental Assessment: A Guide to the Procedures (Department of the Environment, 1989a).

Use of Review Systems

The review confirmed the need, as recognised in Chapter Five, for a review system that was more than just a pure presence or absence checklist, but also provided an indication of the qualitative grading of the information; and allowed the opportunity for comments and recommendations to be provided as part of the review process.

Key Recommendations for Development of Model B:

1. The communication of information should be paramount in the EA process to ensure that the appropriate information is provided to the decision-makers in a clear and concise manner. A simple non-technical summary should be provided at the start of the ES. The chapters should be written in a logical sequence in non-technical language, with summaries and conclusions provided at the end of each chapter. Maps and graphical images should be used in the early part of the ES to provide visual images of the existing area and the proposed project. The analysis of effects should be provided using magnitude and significance where possible, with a description of methodologies used, together with an indication of uncertainties, limitations and any additional information required. Signposts for the reader, such as titles, sub-titles, paragraph numbering and referencing make the ES document more user friendly.

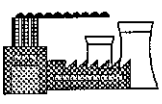
2. The consistent use of a standard format of ES will improve efficiency of the EA process. The contents of the ES will be expanded and

reviewed as the EA process develops through scoping and feasibility to the final ES report. The effectiveness of the EA process will be improved by the use of a standard EA format and topic list. This will ensure that all issues are investigated and dealt with in an appropriate manner and at the relevant stages of the EA.

2. A review system is required to ensure the EA process has covered all the issues and topics in an appropriate manner. This can also provide a quality assurance checklist to ensure the achievement of a 'good' standard for the report and hence the EA process.

3. The concept of an environmental action plan to manage the implementation of the ES through the design stages and on site was discussed in earlier chapters. However, none of the 14 ESs had any mechanisms which would effectively achieve this task. There was a need to develop a standardised format for the environmental action plan for use in future EAs which will be discussed in the next chapter.

Chapter Seven - Development of the New Good Practice 'Model B'



Chapter Seven
Development of the New EA Good Practice 'Model B'

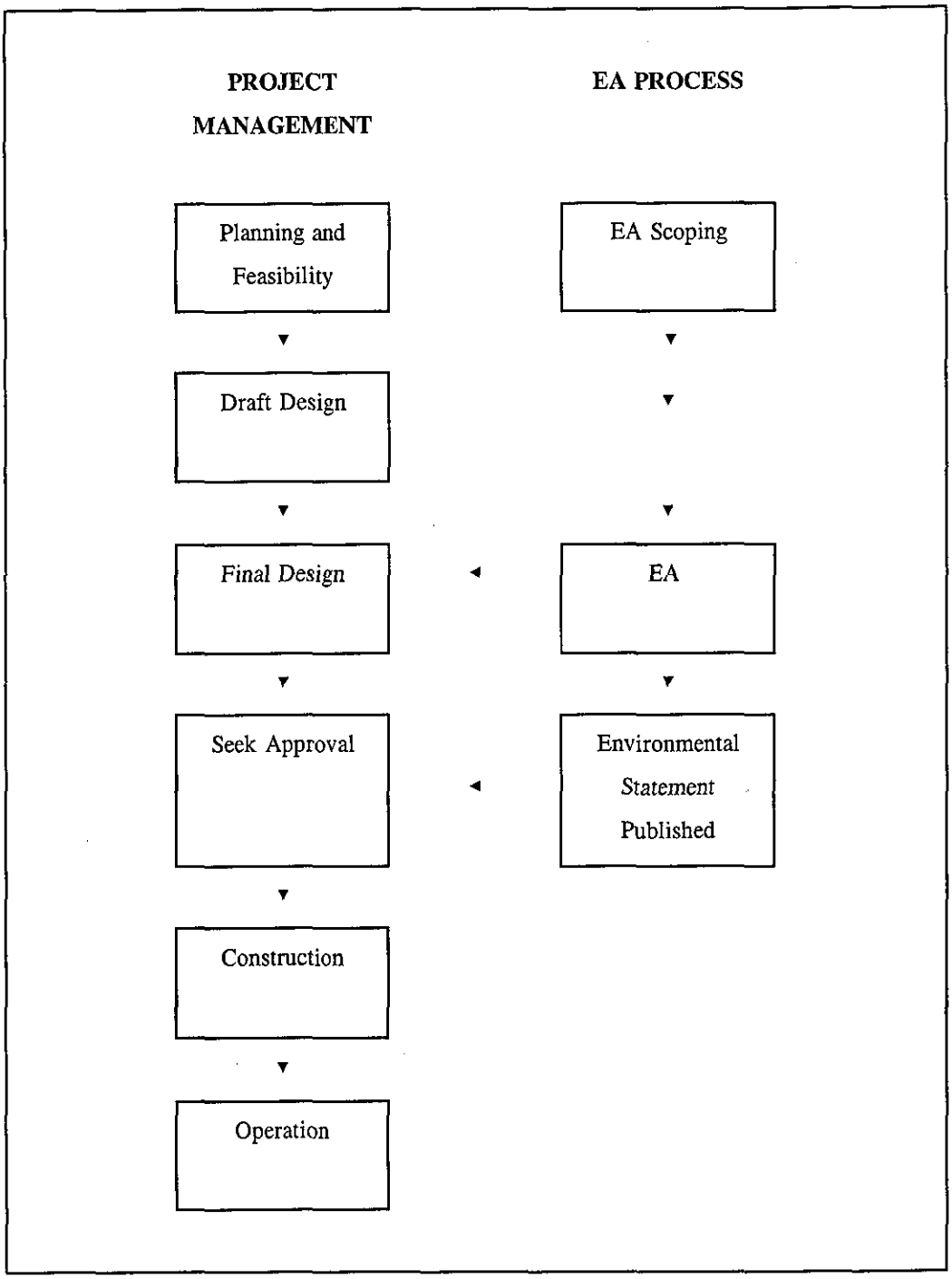
7.1 Introduction

This chapter seeks to further the research plan (Figure 1.1) by the refinement of 'model A'. This will involve developing both the procedural practice and the format of the ES in order to derive the good practice 'model B'.

The importance of the EA system to be integrated within the wider project management systems cannot be stressed enough. The traditional approach is for the EA process to assess the environmental effects of either a project or a range of options for a project. This approach can still be seen in texts such as Calow (1998, p. 510) where in 'Figure 19.1 Environmental assessment and the project cycle' the twin-track approach of EA is illustrated (simplified in Figure 7.1). The real potential of EA is only realised when it is used in an integrated fashion within the wider project management framework; feeding in

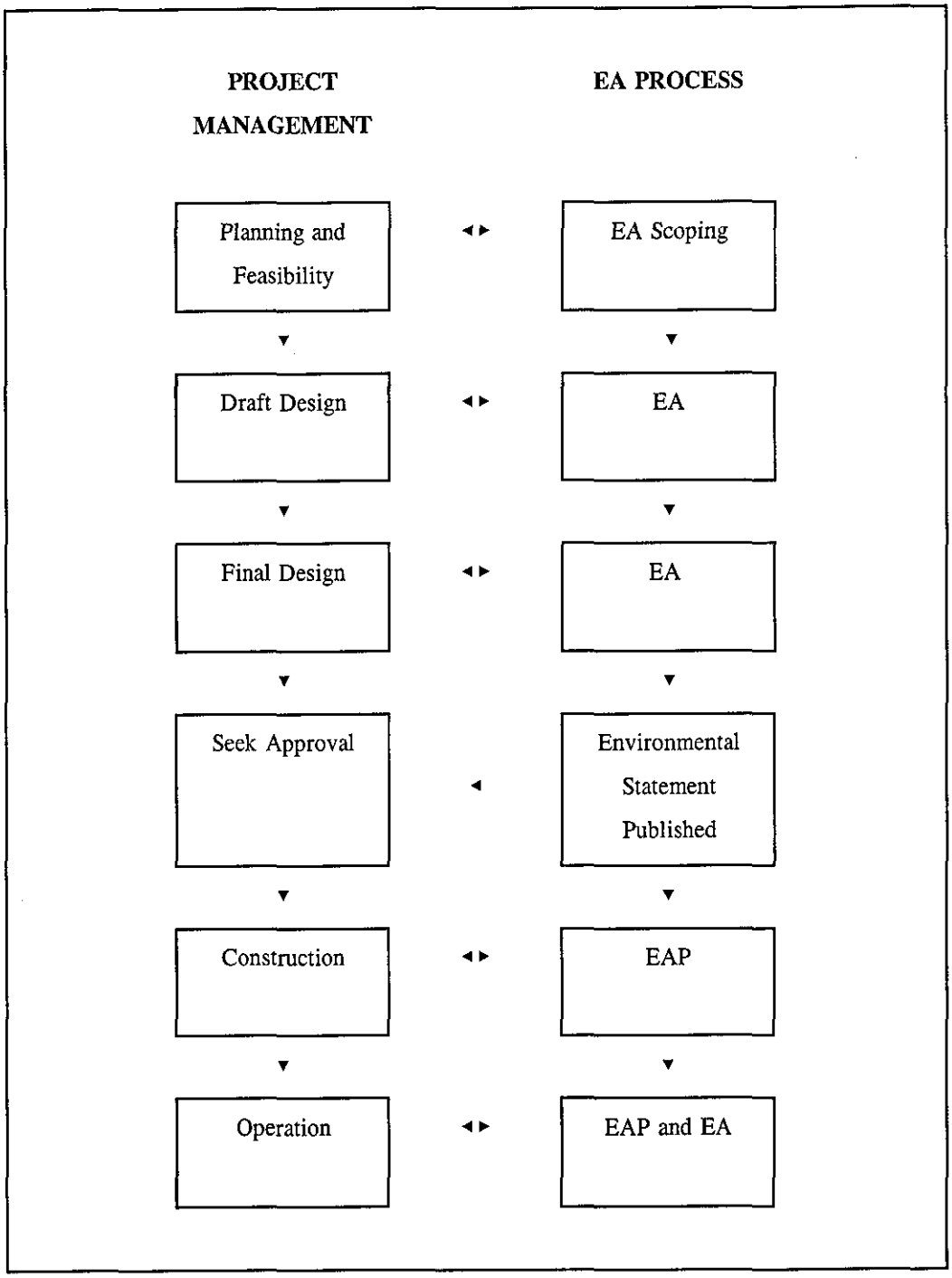
information regarding environmental constraints and opportunities from the very earliest stages in project decision-making and the wider development processes (Figure 7.2). All project staff should be accept personal responsibility for taking account of environmental issues, with the EA team leading and managing the EA sub-process within a wider project management process.

Figure 7.1 Non-integrated Project Management and EA Process (The 'Twin-track Approach')



The power of the iteration process for the development of options is recognised. The EA process, if used effectively, can help to seek and develop the most effective and efficient option, aiding the development of the project. On occasion this process will identify that there is no feasible option that can be implemented. To work effectively the EA process must be integrated within the wider project management process (Figure 7.2).

Figure 7.2 Integrated Project Management and EA Process



7.2 Objectives of New EA Procedural Framework 'Model B'

The preceding chapter identified a number of deficiencies in 'model A'. In reviewing these shortcomings and the review of the environmental ethics, policy, legislation and existing ESs for water management projects (Chapters Two and Three) the following objectives and procedure have been developed.

Objectives of Model B

The objectives for the new EA model are to:

a) fulfil the legal requirements of the UK legislation on EA;
b) fulfil the requirement of MAFF for an ES or a written justification to be published for all schemes;
c) identify and evaluate the potential environmental effects of all the reasonable alternative options for the scheme;
d) recommend an environmentally preferred option;
e) where possible, gain approval from English Nature and the Countryside Commission for the preferred option, as required by MAFF for scheme approval;
f) for the preferred option, identify the measures required to mitigate any adverse effects;
g) consult with all stakeholders associated with the project problem and affected by the preferred solution, and allow them to contribute to the decision-making process, as appropriate; and
h) if approved, ensure delivery and operation of the preferred option in an environmentally sensitive manner in accordance with all the agreed conditions and constraints, using environmental action plans and EA post-project appraisal techniques.

These EA objectives can be expanded to include a number of project management objectives to:

i) improve the effectiveness of EA process, ensuring environmental issues are taken into account in the decision-making processes at all stages of

project planning, design and implementation;

j) improve the efficiency of the EA process through better resource utilisation (staff and consultancy time and budgets) by the use of standardised EA procedures, i.e. 'model B';

l) provide effective guidance for EA and project management staff for the implementation the above objectives.

The model should provide the framework and guidance for the implementation of EA procedures for water management projects using the SI No. 1217 (Land Drainage) and SI No. 1199 (Planning) EA legislation. However, it is suggested that the same procedures could apply in principle for all projects requiring EA.

Applicability to Projects with little or no potential environmental effects
Projects with little or no potential environmental effects should follow similar stages and reporting mechanisms developed for the 'model B', but may have reports which are only one page in length for some stages of the EA process. Such a system is a prerequisite of a good practice environmental management system for an organisation such as the Environment Agency.

7.3 EA Procedural Framework for Flood Defence Projects

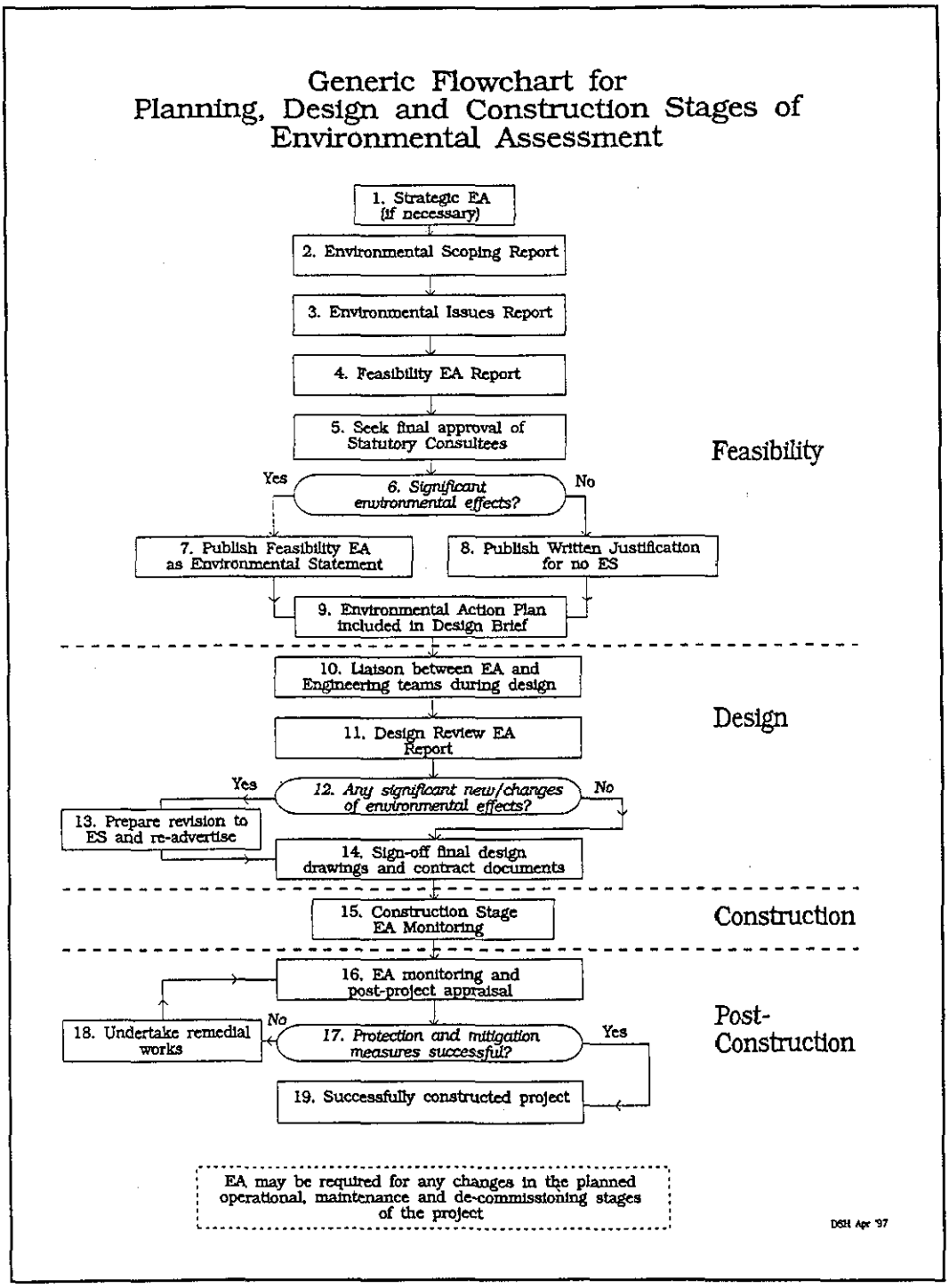
The overview of the EA procedures developed to provide for successful implementation of a project (from an EA point of view) is shown in Figure 7.3. This procedure was based on the need for the assessment of flood defence projects in the Severn-Trent Region of the NRA.

1. Strategic EA (if necessary)
A Strategic EA may be required for the input to the strategic Flood Defence Planning process. The procedure for developing the Strategic EA will be very similar to a project ES and include: Environmental Scoping Report; Environmental Issues Report; and Feasibility EA Report; which are all aimed to address the strategic rather than specific project issues. The Strategic EA will identify the options available for a decision to be made as to which

individual projects should be looked at. An example would be the Lower Trent Strategic EA Report (Mott MacDonald, 1994b) which identified the need to investigate the options for flood alleviation for the town of Gainsborough.

Individual projects are progressed, either from a Strategic EA report, or directly from a perceived local flood defence problem which has been identified by the Area office, on to the next stage of the EA process.

Figure 7.3 EA Flowchart



2. Environmental Scoping Report

This report will identify the scope of the required EA works, highlighting key issues to be addressed, and identifying the scope of the baseline surveys. Consultation should have started at this stage with consultees on the proposed contents of this report.

3. Baseline Studies/Environmental Issues Report

Environmental information will be required to provide a database, against which the effect of the impact of the works can be analysed. This information may be collected up to three years before the planned start date to ensure that an adequate amount of data, collected at the appropriate time of year, is available for use as a baseline description of the site and its environment in the analysis stage of EA. Such baseline information may be summarised in the form of an Environmental Issues Report identifying the key environmental issues which will influence the choice of engineering options studied in the next stage of the process.

4. Feasibility EA Report

The Feasibility EA Report should be developed in parallel with the engineering feasibility studies (feasibility of various options), assessing the potential effect of various options, and developing acceptable mitigation measures, consulting widely, including: landowners, environmental bodies and the public; to produce a report which includes:

- Project Objectives
- Baseline Environmental Survey
- Alternatives
- Impact Analysis
- Possible Protection, Conservation, Mitigation and Enhancement Measures
- Environmental Action Plan
- Technical Appendices

5. *Seek English Nature/Countryside Council for Wales and where appropriate Countryside Commission, Countryside Council for Wales, and English Heritage/Cadw approval*

Prior to making the final decision on whether there are any significant effects and that the Feasibility EA Report has adequately addressed all the issues required by the statutory consultees, written confirmation needs to be obtained from the statutory consultees confirming their comments and agreement at this stage of the EA process.

6. *Are there Significant Environmental Effects?*

After consultation with the statutory consultees and landowners, the Environment Agency will make a provisional decision as to whether there will be significant environmental effects as a result of the project.

Written confirmation should be obtained from the Local Planning Authority that planning permission is/is not required. (This may be worded as a request for a decision or written confirmation of their agreement to the use of SI No. 1217 EA legislation). This matter will have been discussed with the Local Planning Authority at an earlier stage in the EA process.

For SI No. 1199 (Planning) EA regulations which is explained in detail in the Department of the Environment's Environmental Assessment: A Guide to the Procedures (1989a), planning permission is required. If the likely effects are deemed by the Local Planning Authority to be significant, they will request that an ES is published and submitted with the planning application, as discussed in Chapter Three of this thesis.

The SI No. 1217 (Land Drainage) EA regulations require the Environment Agency to either publish an ES or Written Justification, depending whether or not there is a potential significant environmental effect.

For works in or within 2 km (the good practice zone of influence) of a SPA, SAC, Ramsar, SSSI, Scheduled Ancient Monuments or other site with statutory protection, the written agreement of the relevant authorities regarding environmental significance of works should have been obtained (Department of the Environment, 1994b).

7. Publication of the Feasibility EA as Environmental Statement

If the decision is to publish an ES, then the procedures outlined in SI No. 1217 (Land Drainage EA regulations) should be followed. For a SI No. 1199 (Planning EA regulations) when it has been determined that an ES is necessary, the scope of the ES should have been agreed with the Local Planning Authority at an early stage.

The published ES will normally be a development of the Feasibility EA and include:

I Non-technical Summary

II Environmental Statement:

- Project Objectives
- Baseline Environmental Survey
- Alternatives
- Impact Analysis
- Possible Protection, Conservation, Mitigation and Enhancement Measures
- Environmental Action Plan

III Appendices

- Technical Reports and Data
- Correspondence from Consultees

The public consultation period for SI No. 1217 is 28 days. If there are any objections, firstly these should be discussed with the objectors to see if an acceptable compromise can be reached. It is important to remember that what may now be acceptable to one objector, may not be now be acceptable to somebody else, who did not object to original proposals. Further public consultation is therefore required. This will normally mean publishing an addendum to the ES.

Written confirmation of objections should now be obtained. If, however, after discussions with any objectors, an agreed compromise cannot be reached, the matter should be referred to MAFF and the Minister for a decision. If additional information is requested by MAFF it will be required to be published under the SI No. 2195 regulations (UK Government, 1995d).

The SI No. 1199 (Planning EA regulations) ES requirements are slightly

different and the procedures are detailed in the booklet entitled Environmental Assessment: A Guide to the Procedures (Department of the Environment, 1989a).

8. Publication of the Written Justification for no ES

If the decision is to not publish an ES, then the relevant procedures should be followed. For SI No. 1217 (Land Drainage EA) a written justification is required to be published for public consultation and for SI No. 1199 (Planning EA) a planning application will be submitted in the normal manner.

The published Written Justification can be the non-technical summary of the Feasibility EA Report with comments from the consultees, and backed up by reference to the Feasibility EA Report.

For schemes that fall outside the normal remit of SI No. 1217 and SI No. 1199, the Environment Agency must ensure that appropriate environmental appraisal has been undertaken to be able to justify the 'environmental soundness' of the scheme, in accordance with the Environment Agency's duty to 'conserve and enhance' the environment.

MAFF Agreement in Principle (AIP)

This will be considered once:

- the ES has been published (where required) and all objections have been dealt with;
- the written agreement (conditional if necessary) of the statutory consultees to the works proceeding has been obtained;
- any agreements required for statutory authorities for works in or within the 2 km good practice zone of influence of a SPA, SAC, Ramsar, SSSI, SAM or other site with statutory protection, have been obtained (Department of the Environment, 1995a); and
- economic and technical criteria have been met.

9. Environmental Action Plan included in Design Brief

The Environmental Action Plan detailing the environmental objectives and management procedures should be updated, if necessary, in the light of any changes required in any ES post-publication process. The Environmental

Action Plan will be the prime reference source for the engineering design team, and will be included, along with the full ES (or Feasibility EA Report for projects which have a Written Justification published for them). The Environmental Action Plan will be discussed in more detail in section 7.5 of this chapter and should include:

- Summary of EA/ES procedures
- Environmental Constraints
- Objectives and targets to ensure delivery of the project, within the required environmental constraints.
- Details of environmental monitoring, auditing and quality assurance systems.
- Environmental specifications required in the contract documentation.
- Drawing summarising EAP.

10. Liaison EA/Engineering Teams during Design

During the design process, it will be good practice for the Environment Agency and design consultancy staff to liaise regarding the implementation of the environmental constraints in the design process. Attendance by environmental staff at all design progress meetings will be good practice, to ensure that environmental issues are designed into the initial design solutions, rather than around the final design solution, which can be very expensive to alter. Any significant changes required can be identified at an early stage and the need for publication of an ES addendum or revised ES can be programmed at an early stage.

11. Design Review EA Report

The final design drawings and contract specifications, should be assessed to ensure that all the requirements of the Environmental Action Plan have been included an that no new or required changes to the design will have a significant environmental effect. The assessment will be summarised in the form of a Design Review EA Report.

12. Any Significant change of Environmental Effects?

If there are any changes to the environmental effects, whatever their significance these should be noted in the Design Review EA Report.

Where there is a perceived new or changed positive or negative effect, all consultees shall be provided with a copy of the Design Review EA Report, and either a request for written comments; or notified of the Agency's decision that the effect is significant, and, therefore, a revised ES will be published; or the Agency's intention to proceed with the project as the effects will not be significant.

13. Significant changes? Yes: Prepare Revision to Environmental Statement and Re-advertise

The ES shall be revised in consultation with the statutory consultees, published, and be available for a 28 day consultation period. Any objections will be dealt with as before.

14. Sign-off Final Design Drawings and Contract Documents

The final design drawings and contract specifications, should be checked again to ensure there have been no further changes, or that the changes required by the revised ES have been incorporated in the contract documents. If any further engineering design changes have taken place, they should be assessed again to ensure that all the requirements of the Environmental Action Plan have been included an that no new or required changes to the design will have a significant environmental effect. The re-assessment will be summarised in the form of an addendum to the Design Review EA Report.

MAFF Approval

MAFF Approval will only be given when all environmental issues have been addressed, all statutory agreements in writing have been obtained, and the necessary EA/ES procedures completed. In cases of dispute, the matter will be referred to the Minister for Agriculture, Fisheries and Food for a decision.

15. Construction Stage EA Monitoring

The programme of monitoring, assessment of changes and auditing as detailed

in the Environmental Action Plan should be implemented.

If due to unforeseen circumstances, a change in the design is required, or a work method is proposed, then they should be assessed as part of the EA process. If the effect is considered either by the Environment Agency or one of the statutory consultees to be significant, then this element of the works may not continue until a revised ES has been published for a 28 day consultation period, and any objections dealt with.

16. EA Monitoring and Post Project Appraisal

The programme of monitoring and post project appraisal as detailed in the Environmental Action Plan should be implemented.

17. Protection and Mitigation Measures Successful?

The post project appraisal of the success of the objectives and targets detailed in the Environmental Action Plan will be documented.

18. Measures Successful? - No: Undertake Remedial Works

For those Environmental Action Plan targets which have not been met, a remedial programme of works will be implemented until the targets or agreed alternative mitigation works are successful, following EA of all such works; or with the agreement of all the statutory consultees, no further action will be taken.

19. Measures Successful? - Yes: Successfully Completed Project

Project successfully implemented, but there is a need to check that operational and maintenance activities will conform with requirements of Environmental Action Plan.

7.4 Model Environmental Statement

The model format for the ES has been discussed and developed in Chapter Five of this thesis. The review of the 14 ESs did not indicate a need to change the proposed format of the model ES. The main change from the 'model A' to

the 'model B' is the addition of the Environmental Action Plan (the development of which is discussed in the next section) and the need for guidelines on the assessment of changes (if they are required after the ES has been published and approved). The new guidelines also need to explain the legal and procedural context in relation to the EA process, and the model EA reports. At this stage in the EA model iteration it is not suggested that there is a need to change the basic format of the model ES. The next stage of the research plan is to field-test 'model B' (Chapters Eight and Nine), which will evaluate this chosen format in practice.

7.5 Development of Environmental Action Plans

The concluding section of the ES document now contains the Environmental Action Plan (EAP). The development of EAPs in the Midlands Region of the Environment Agency has arisen as a result of a combination of problems encountered with the traditional EA process. These were identified through interviews with both in-house EA staff managing the environmental process and external environmental consultants.

In summary, five needs were identified: (a) providing details of environmental parameters and constraints for work in SSSIs; (b) summarising such issues for the design team and external readers; (c) explaining how the NRA was going to implement the environmental constraints and mitigation measures; (d) explaining how any post-ES/EA report changes would be assessed and approved; and (e) the need for objectives and targets for successful post-project appraisal. Hickie and Wade (1997) discuss the development of EAPs in detail (a copy of the paper is provided in Appendix A - 19).

Impact Parameters

The use of acceptable impact parameters acting as a constraint on the design, construction and operation of a project can assist in the management of the environmental issues within the EAP. These can be described in terms of the three elements summarised below:

i) Magnitude of specific impacts in terms of quality/quantity such as:

- noise (e.g., limit of 10 dBA above ambient background noise levels)
- visual impact (e.g., all built structures associated with a new flood defence to be constructed in the vernacular architectural style)

ii) Time:

- seasonal (e.g., winter/spring; bird nesting or fish migration seasons)
- weekly (e.g., weekdays/weekends)
- daily (e.g., working day, peak traffic periods)
- others (e.g., tidal or flood periods)

iii) Spatial:

- distance (e.g., no construction plant within 10 m of a specified archaeological structure)
- zoning (e.g., no access to specific conservation zones or construction traffic to use certain routes only)

The publication of EAPs assists in the delivery of open and accountable ESs. The provision of objectives and targets enables all the decision-makers and stakeholders to clearly understand what the ES intends to deliver. The elements of an EAP are shown in Figure 7.4.

The concept of EAPs was identified as an important element of the good practice model. The development work on EAPs resulted in interim guidelines being issued to in-house EA staff in January 1995 to ensure that all new ESs include such elements. All ESs produced since that date have included a stand alone EAP, forming the last section of each ES. The EAP is used for inclusion as a prime reference in the engineering consultants briefs; communication of an environmental issues summary to all contractors and other staff; as a baseline document for environmental post-project appraisal; and overall

management of the EA process through to completion of the project.

EA has been described as a project management tool, and as such, must effectively help us manage the implementation of a project from the initial EA scoping stage through to the decision-making point and on to the successful completion of the project. It is considered that EAPs, developed from the analysis of existing shortcoming in the procedures, will help to effectively overcome some of the existing shortcomings of the EA process. This will be tested with the help of a case study in Chapter Nine of this thesis.

Figure 7.4 Environmental Action Plan Format
(from Hickie, 1997a)

ELEMENTS OF AN ENVIRONMENTAL ACTION PLAN

A - Management and monitoring final design and delivery of the project in accordance with the ES:

i) Summary of EA Process and the environmental constraints to be taken into account, in terms of protection, conservation, mitigation and enhancement measures.

ii) Management of change in project design and implementation, in relation to environmental effect;

iii) Communication programme for engineering consultants and contractors; residents, landowners, public, user groups and conservation bodies, etc.;

iv) Commitment of the Environment Agency to procedures and staff resourcing, normally a Project EA Officer (as an independent Environment Agency EA staff member) and an Environmental Clerk of Works (as part of the supervising Resident Engineering team) ; Environmental Protection Schedules to be checked by the Environmental Clerk of Works on a weekly basis; and Environmental Incident Forms and an associated reporting and follow up system.

v) EA quality assurance system.

B - Objectives and Targets for each environmental constraint:

i) Objective;

ii) Implementation statement;

iii) Target for objective (to be reviewed at post-project appraisal stage and remedial works instigated if necessary).

C - Summary of Environmental Specifications:

i) Workmanship, including procedures and limitations

ii) Materials

D - Drawing showing all constraints and comments

7.6 Conclusions

The 'model A' provided a good starting point for the integration of a range of EA needs into one framework for use on operational projects. However, the review of the 14 ESs in Chapter Six and the earlier discussion of ethics and political dimensions of the decision-making process highlighted the importance of communication of information to the decision-makers throughout the EA process. As has been discussed earlier, the decision-making events which influence project development will not just be a one-off events of approval or disapproval by a regulating authority. Decisions will need to be made throughout the development process such that the EA must influence decision-making throughout the project lifecycle. Failure to influence such decisions can only be detrimental to the environment in the longer term. Chapter Six also highlighted the need to develop the idea of EAPs (which had been present in 'model A' only as a concept) into a practical EA management tool for delivery of projects in an environmentally sensitive manner.

The 'model B' provided a much more prescriptive set of procedural steps and standard outputs for EA staff and consultants to follow. It evolved from the framework provided by 'model A' to provide a model which grows from the scoping stage through feasibility to ES and construction stages, using a standard format, and which may be expanded or contracted depending on the significance of the effects of the project. The importance of communicating information was emphasised, with the introduction of the EAP as the key element of the EA process to define and manage the key environmental issues and commitments. The use of internal quality assurance procedures such as the review checklist developed in Chapter Six was included to help staff implement the EA process and especially to improve outputs.

It was recognised that it was important for 'model B' to provide EA staff with adequate guidelines and explanation of the EA processes, if the model was to successfully promote the implementation of the EA process in a more effective and efficient manner.

It was proposed that the use of a standardised 'model B' should provide a more effective and efficient assessment of environmental issues and constraints

within the decision-making process of project development, implementation and operation.

The 'model B' was introduced as the Environment Agency, Midlands Regional EA procedure for use on all projects in 1995. The use of 'model B' was reviewed using two case study projects which are discussed in the following chapters of this thesis.