

**B886 - BUSINESS RESEARCH PROJECT**

**IMPLEMENTATION OF ENVIRONMENTAL  
ACCOUNTING**

**THE WAY AHEAD FOR A NEW 'GREEN AGENCY'**

Submitted for  
**The Open University**  
**Open Business School MBA**

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**September 1994**  
**Printed on Recycled Paper**

## ABSTRACT

This B886 Business Research Project was undertaken on behalf of the National Rivers Authority (NRA) into Environmental Accounting. The Consultant's Report concludes that it is vital for the NRA to be at the forefront of the environmental accounting debate, which is still in its infancy, and to achieve this aim will require full management commitment.

To ensure that the organisation is in a strong strategic position, essential when it becomes the Environment Agency in 1995, the report recommends the development of an Environmental Management System (EMS), encompassing four areas:

- Environmental Audit
- Environmental Policy
- Environmental Reporting
- Environmental Accounting

The Report examines current theoretical perspectives, NRA management, monitoring and control procedures, and its financial and information systems areas using a practical approach involving desk research, interviews, and a questionnaire. It examines 'best practice' in selected organisations known to be interested in the environment, and it suggests a timescale for the implementation of the recommended actions.

The Research Report defines the project and briefly describes the organisation. It details the research objectives and provides a methodology for the analysis using Systems Intervention Strategy. Recommendations made in the Consultant's Report are considered using course concepts in the light of their likely effects on resource requirements, information systems and implementation problems. The current and future management issues arising from the introduction of an EMS incorporating environmental accounting are explored.

The methods used in researching this project are discussed, including the availability of literature and the theoretical underpinnings of natural resource accounting. In analysing the Consultant's Report there is an explanation of the recommendation that environmental accounting cannot be introduced in isolation and that it should form part of an integrated EMS. Finally, the project is evaluated from the perspective of learning experiences gained.

## **ACKNOWLEDGEMENTS**

I would like to express my thanks to the NRA for giving me the opportunity to study B886 The Business Research Project and to Howard Pearce, Head of Corporate Planning, who suggested this topic, provided considerable assistance and who acted as my Organisation Mentor. Thanks are also due to all NRA personnel who gave up their time to discuss their roles and the subject, and in particular to Sue Timbrell for introducing me to the organisation and to Dave Stanley for his valuable contribution.

My thanks also go to the organisations which provided useful information and Environmental Reports.

The support, advice and encouragement offered by my tutor, Norman Powlesland, was invaluable in progressing the project.

THE  
CONSULTANT  
REPORT

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## EXECUTIVE SUMMARY

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Concern for the sustainability of natural resources has been increasing over the last decade and it is now emerging as an issue of significant corporate strategic importance. Pearce et al (1989) perceive that it is desirable for organisations to take a proactive stance towards ecology where:

*'...a society committed to sustainable development will shift the focus of its environmental policy towards an anticipatory stance, especially as reactive policy risks shifting the burden of environmental risks to future generations'.*

Hence, it could become essential for businesses to plan, monitor, control and report their operational impact on the environment. To achieve this it is necessary to establish reliable, efficient and effective measurement techniques for quantifying natural resource use, and to estimate the costs associated with minimising environmental damage.

The NRAs environmental protection task and consequently its requirement to be pioneering these methods will become increasingly significant when it, the Waste Regulatory Authorities (WRA) and Her Majesty's Inspectorate of Pollution (HMIP) assume the role of the Environment Agency. Two aspects of the NRAs impact on the environment are considered:

1. Internal use of natural resources and harmful substances.
2. External environmental effects of the operations of the core functions.

This report arrives at the following conclusions:

- The NRA must be recognised to be at the forefront of the environmental debate, particularly in the light of the change to the Environment Agency.
- The importance of continuing management commitment to ecological issues if the organisation is to become one of the leaders in environmental reporting and accounting in the UK.
- Research to date on the various methods of accounting for natural resources does not provide a definitive view or any practical measurement techniques. In fact environmental accounting is still very much in its infancy.

The report recommends the development of an Environmental Management System (EMS), of which 'green' accounting forms a key part, as this could play a major part in the success of this expansion of responsibilities.



The EMS would comprise:

- Environmental Audit
- Environmental Policy
- Environmental Reporting
- Environmental Accounting

An EMS would offer the following advantages:

1. Provide a framework for the establishment of working practices which aim to improve and report on environmental performance, effect cost savings, and enhance the organisation's public profile.
2. Facilitate the introduction of a comprehensive audit process, an extension of existing environmental policy and reporting, and finally, the introduction of accounting. This last phase would comprise both the internal accounting for the NRAs use of natural resources and external accounting for the activities of the core functions.

In making this recommendation the implications for the organisation of developing an EMS are considered in financial, management and information systems terms and a phased implementation is recommended. The timescale for this could be as follows:

Short-term (prior to the establishment of the Environment Agency)

- Extension of existing environmental policy.
- Publishing of environmental initiatives, achievements, problems and targets in the Annual Report and Accounts.

Medium-term (transition period to the Environment Agency and initial operation)

- Further extension of policy to include HMIP and WRA.
- Initiation of the audit process for all resources and operations following the energy audit on buildings.

Long-term

- Consideration of the issue of sustainability.
- Introduction of full environmental accounting.

## **1. REPORT DEFINITION**

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### **1.1 INTRODUCTION**

The National Rivers Authority (NRA) was established by the 1989 Water Act to regulate the newly privatised water companies. It performs an important role in safeguarding the water environment. The organisation is structured on a regional basis, comprising eight regions, a London office and a Head Office based in Bristol. Each region has statutory duties and powers under the 1991 Water Resources Act for seven core functions:

- Water quality
- Water resources
- Fisheries
- Flood defence
- Conservation
- Navigation
- Recreation

### **1.2 STRUCTURE OF THE REPORT**

This report is structured as follows:

**Section 2** explores the growing level of World and UK concern for ecological issues, and the initiatives established to recognise, monitor and reduce the associated dangers. It provides a definition of environmental accounting and some reasons for its rising prominence within major organisations, and its implications for the NRA.

**Section 3** provides details of the research methods and processes undertaken to produce this report. The introduction of environmental accounting would impact all functions, but the effect would be concentrated in the areas of finance, management and information systems; the current situation in the NRA in each of these areas is considered.

**Section 4** details the research findings including accounting methods now under discussion, disclosure requirements, and current 'best practice' in selected organisations.

**Section 5** provides the main conclusions concerning the current state of environmental accounting and a possible internal and external accounting strategy for the NRA. The change management issues and costs and benefits of developing an Environmental Management System (EMS) are considered.

**Section 6** recommends a comprehensive EMS to include environmental audit, policy, reporting and accounting and considers its impact on information technology systems.

**Section 7** highlights some management and implementation issues in the short-, medium- and long-term and suggests future actions.

### **1.3 OBJECTIVES**

The primary objectives of this report are detailed below:

- Define environmental accounting in a NRA context
- Identify an approach to integrate environmental accounting into the NRA organisation
- Determine the information systems implications
- Assess the resource requirements
- Suggest appropriate implementation procedures.

### **1.4 SCOPE**

This report examines the requirements necessary for the NRA to introduce environmental accounting into its established reporting procedures. Consideration is given to the form it should take, how it should be achieved, by whom and to what standards. Whilst the consequent information system and resource requirements are addressed, a detailed analysis of these areas falls outside the scope of this report.

## 1.5 TERMS OF REFERENCE

In researching this report the following questions have been addressed:

- What is the status of environmental accounting in the UK? Section 2
- What is the status of environmental practice in the NRA and how does it view environmental accounting? Section 3
- How is environmental reporting and accounting approached in other organisations? Section 4
- What are the strategic issues arising from the introduction of environmental accounting? Section 5
- How could environmental accounting be implemented? Section 6
- What are the implications of introducing environmental accounting? Section 7

## 2. DIAGNOSIS

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### 2.1 PROBLEM DEFINITION

The problem of the depletion of natural resources and the sustainability of the environment has become increasingly acknowledged over the last decade. The sociological, technological, economic and political factors affecting UK society are detailed in a STEP analysis in Appendix 1. These have arisen largely in response to the ecological and personal value forces in the community which are also included. The analysis highlights societal changes which have brought about both an increase in awareness and pressure from organised groups in the economic and political environment. Technological change occurs in response to the interaction of the other forces. The heightened public concern arising from these issues is fundamental to the development of the debate on environmental accounting.

With the rise in awareness of the dangers of the depletion of natural resources has come the call to increase their efficient and effective use. This requires the establishment of reliable disclosure methods to report on corporate performance and the development of techniques to measure, monitor and control resource use and mis-use. This task is complex not least because it requires a consensus view from many different regulatory and government bodies.

The costing of environmental impact is the subject of world-wide debate, largely as a result of the intangible nature of the major issues. The difficulty in devising methods to account for intangibles, for example goodwill, is on-going within the accountancy profession. The introduction of natural resource accounting will only serve to widen the controversy; because, whilst financial accounting deals with man-made capital, environmental accounting is concerned with natural capital.

#### 2.1.1 World-wide concern

World-wide ecological concern has been gathering momentum in recent years. The creation of United Nations (UN) working groups, the issuing of European Community (EC) directives, and the Montreal Protocol which set dates for the cessation of the production of ozone-depleting gases, have all contributed to changing public attitudes. The UN World Commission on Environment and Development *Our Common Future* (The Brundtland Report, 1987) brought the accountability aspects of ecological concern to the fore when it established the key principle of '*the polluter pays*'. This was followed

in 1991 when the UN Commission on TransNational Corporations InterGovernmental Working Group of Experts on International Standards of Accounting and Reporting (UN CTC ISAR) drew attention to the accounting implications. The report highlighted the need to disclose company information on environmental issues, policy, improvements, material costs and amounts, and response to legislation.

The EC has also stressed the significance of ecological considerations in the Eco Management and Audit Scheme (EMAS) which specifies voluntary reporting standards. The issuance of the EC Eco-Labeling Regulation (1991) is closely linked to the eco-audit, both of which are to apply to member states and organisations through a registration process.

### 2.1.2 UK concern

In the UK, the *Blueprint for a Green Economy* (Pearce et al, 1989) raised the issue of sustainable development, referred to as the '*constancy of the natural capital stock*', and the need for financial quantification of environmental factors. The Environmental Protection Act (1990) emphasised the involvement of costing environmental factors, including pollution control methods and the minimisation of waste production, by introducing both the concepts of 'Best Available Techniques Not Entailing Excessive Cost' (BATNEEC) and self-monitoring. The notion of environmental management has been emphasised by the British Standards Institute with its development of BS7750, requiring companies to assess environmental impacts, establish targets and audit performance.

Ecological considerations have started to influence company policy and an increasing number of organisations, in a wide range of industrial sectors, are reporting on environmental issues.

## 2.2 ENVIRONMENTAL ACCOUNTING

### 2.2.1 Definition

Environmental accounting has been described as '*covering all areas of accounting that may be affected by the business response to environmental issues*' (Gray et al, 1993). For the purposes of this report, this includes the following:

- Accounting for environmentally related costs and revenues.
- Developing accounting, control and management information systems to facilitate the measurement of financial and non-financial environmental factors.
- Establishing procurement and working practices which seek to minimise environmental impact.
- Introducing performance measurement, appraisal and reporting structures.
- Examining ways in which sustainability can become an integral part of the organisational paradigm.

This form of accounts differs from other environmental reports in that they '*organise the data in the form of records of stocks and flows or as inputs and outputs in order to produce a materials balance*' (Environmental Resources Limited (ERL), 1992). As such they can be a useful measure of sustainability by monitoring pollution levels and resource depletion.

### **2.2.2 Current thinking**

Environmental issues can and should be integrated into business practice in general and specifically into the accounting sphere since the financial implications of compliance with legislation are becoming increasingly important (Gray et al, 1993). In the short-term this can be achieved through the modification of existing systems to include items such as energy and waste treatment costing, the addition of environmental performance measurement in annual reports, and the inclusion of an environmental investment appraisal when considering new project proposals. In the longer term, however, as the 1992 EC plan *Towards Sustainability* suggests '*accounting concepts, rules, conventions and methodology*' will need to change to accommodate environmental factors. Problems will almost certainly arise from the need to quantify what are essentially qualitative issues.

### **2.2.3 NRA implications**

The high priority placed on environmental concerns by the NRA is exemplified by its mission statement:

*'We will protect and improve the water environment by the effective management of water resources and by substantial reductions in pollution. We will aim to provide effective defence for people and property against flooding from rivers and the sea. In discharging our duties we will operate openly and balance the interests of all who benefit from and use rivers, groundwaters, estuaries, and coastal waters. We will be business-like, efficient and caring towards our employees.'*

In line with this public pronouncement and its commitment to the enhancement of the environment, described in the internal Environmental Policy document, the inclusion of environmental accounting in its financial reporting structure would be a logical extension of these principles. The role of the NRA is likely to become increasingly significant in the light of the results of a survey of the general public undertaken by MORI in 1992. In response to the question *'What issues to do with the environment and conservation, if any, most concern you these days?'* the ones of most concern were the pollution of rivers, streams and water, and the destruction of the ozone layer, aerosols and CFCs. This coupled with the transition to the Environment Agency could hasten the requirement to produce environmental accounts due to public expectations of the newly formed body. The organisation's reputation during this period of dynamic change could be severely harmed if no action is taken to expand its environmental initiatives.

There are two components for the NRA to consider when planning these initiatives:

1. Accounting for the internal environmental aspects of the organisation, for example energy use, water use and recycling.
2. Accounting for the external environmental aspects of the organisation's operations, for example discharge control, pollution prevention and river rehabilitation.

It is perceived that the first of these could be instigated in the short-term whilst the second would be a longer term strategy. In the absence of environmental accounting standards there is scope to establish a format which is designed to fully meet the NRAs requirements. If the opportunity to be at the forefront of the design of environmental accounts is missed, then regulation requiring compliance with predetermined rules may result. A proactive stance is likely to be beneficial.



### **3. INVESTIGATION**

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#### **3.1 RESEARCH**

##### **3.1.1 Methods**

Desk-based research and contact internally with NRA personnel and externally with companies known to be participating in the environmental accounting debate have facilitated the production of this report. These have included practitioners in environmental reporting, the management consultancy firm KPMG Peat Marwick, and The Centre for Social and Environmental Accounting Research (CSEAR) at the University of Dundee. Communication with the official accounting bodies failed to provide any information on the status of natural resource accounting.

##### **3.1.2 Process**

The techniques employed to research the subject include extensive reading, a Regional Operational office visit, a questionnaire, and discussions with representatives from the following NRA offices:

- Head Office Corporate Planning
- Environmental Policy Unit
- Procurement
- Finance
- Information Systems

External contact was made by telephone, letter (an example of which is included in Appendix 2) and personal visits. An analysis of the questionnaire is contained in Section 3.2.4.

### 3.2 CURRENT SITUATION AT THE NRA

#### 3.2.1 Management, Monitoring and Control

Management commitment to the integration of environmental concerns into everyday working practice within the NRA can be found in various areas of the organisation including environmental policy statements, the Corporate Plan, procurement documents and environmental policy action plans. These include the work of the Environmental Policy Unit and the Environmental Steering Group. There will be a requirement to extend the nature and scope of these initiatives to include external factors with the initiation of the Environment Agency.

##### Internal

General factors of internal environmental significance to the NRA and which need measurement, monitoring, control and reporting are detailed in the NRA Environmental Policy Targets and Action Plan document, and are as follows:

- Energy use.
- Water use.
- Stationery (excluding paper).
- Paper recycling.
- Paper use.
- Recycling.
- Ozone depleters' use.
- Toxic substances' use.
- Tropical hardwoods' use.

Direct energy use and fuel consumption can be accounted for in terms of both monetary costs and quantity used; thus financial savings and improvements in efficiency can be targeted. The work on environmental policy planning and the monitoring of activities, responsibilities and progress against targets indicates the extent to which advances have

already been made towards the establishment of a comprehensive environmental reporting system. A key area where environmental concern is paramount is in the procurement department, where the inclusion of profiles of suppliers and contractors on database provides a useful source of environmental data. The maintenance of internal environmental checklists similar to those completed by external suppliers could be instrumental in the development of environmental reporting.

### External

Certain environmental factors are of direct relevance to the water industry in general and to the NRA in particular. Research to date has highlighted the industry due in part to its obvious ecological significance and in part to its additional requirement to measure not only water usage but also water quality. If comprehensive environmental accounting of all aspects of the NRAs role is to be reported, then this should include details of its regulatory function. This would necessitate the inclusion of a detailed breakdown of all the areas of responsibility, including water quality and water resources.

### **3.2.2 Financial**

Problems exist currently with the internal financial systems which originated at the inception of the NRA. The regions and Head Office operate different accounting systems inherited from the pre-privatised water companies and the information is collated to produce consolidated accounts which meet a prescribed format. This consolidation is undertaken on an income and expenditure basis. Income is received from the charging scheme and from grant-in-aid. Expenditure is made on capital schemes, such as flood defences.

The variations between regional accounting procedures and the specialised nature of environmental accounting information makes the enhancement of any of the existing diverse systems unfeasible. The Integrated Accounting System (IAS), currently under development and undergoing pilot testing at Head Office and South West region, will provide the opportunity to incorporate environmental accounting data into one financial system supporting all of the regions and Head Office.

### **3.2.3 Information Technology Systems**

Local area networks (LAN) and electronic mail (EMAIL) are useful methods of improving the dissemination of information and have the added environmental advantage of

reducing paper usage. The availability of systems at regional level offering interrogation capabilities for project details would be necessary to improve access to information.

The IAS should eliminate the current difficulties arising from the regional system differences, but the existing system specification does not make provision for the inclusion of environmental accounting information.

### 3.2.4 Questionnaire

The questionnaire was designed to examine the extent of awareness of 'green' issues within the NRA, and to provide details of existing and required information which would be a prerequisite for the implementation of environmental accounting. It was sent to forty-eight Regional and Head Office managers and it elicited a good response with thirty-eight replies received. An analysis of the results is contained in Appendix 3.

A high level of awareness of environmental initiatives was shown by the responses to the questionnaire with 97% of respondents aware of environmental policy and 50% environmental accounting. The extent to which issues are currently quantified depended on the role of the respondent and the region. But the consensus was that existing accounting systems could not record natural resource usage (85%) and existing IS systems were inappropriate for this use (88%). The majority (71%) felt that their department would benefit from the introduction of environmental accounting but most raised concerns about its introduction. These were primarily connected with the following:

- Shortage of manpower resources. (18%)
- Time required to implement and operate. (8%)
- Bureaucracy involved. (13%)
- Lack of IS system capability. (21%)
- Provision and recording of necessary data. (11%)
- Need for education. (29%)
- Need for management commitment. (24%)

### 3.3 CURRENT SITUATION IN SELECTED ORGANISATIONS

Seven major UK organisations were contacted representing different industrial sectors and with businesses having both primary and secondary effects on the environment. These vary from the direct use of natural resources by British Petroleum to the indirect use of energy and water reserves necessary as an operational prerequisite of all of the firms. A Norwegian company is also included in the analysis and the Dutch consultancy firm, BSO/Origin, was contacted but a response has not been received. The companies are:

- British Airways (BA)
- British Petroleum (BP)
- British Telecom (BT)
- IBM
- National Westminster Bank
- Norsk Hydro
- Thorn EMI
- Tesco

Most companies supplied annual Environmental Reports which are published in addition to their financial Annual Report and Accounts. All but Tesco of the companies studied report qualitative information on their impact on the ecology of the planet; giving details of their use of resources and the levels of waste and emissions produced. They also provide details of targets set to reduce usage and efforts being made to improve efficiency.

Three companies, BA, BP and BT, report bad news in the form of prosecutions brought against them for the infringement of regulations, and they highlight their subsequent remedial actions. Thorn EMI, BT, BP publish details of awards won as a result of their efforts to reduce the harmful effects of their operations on the environment. The findings are contained in Section 4.3 of this report.

## 4. RESEARCH FINDINGS

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### 4.1 ENVIRONMENTAL ACCOUNTING METHODS

A change would be required in traditional accounting methods to account for both physical and natural resource and environmental depreciation. Investigations are under-way into conceptual and practical methods and the associated problems of valuing natural resources. As yet, however, no appropriate measurement procedure in monetary and non-monetary terms has been agreed. Many countries are contributing to the debate on methodology but much of the available literature is focused on the development of national accounts and not on the specification of accounting techniques.

To assess both the costs of the internal consumption of resources and the external impact of activities necessitates the measurement of usage and the allocation of an economic cost to those resources. The latter demands the development of procedures to value natural assets which are categorised into three groups (Giannone and Carlucci, 1991):

- Subsoil resources.
- Natural physical environmental resources including air, land and water and aquatic eco-systems.
- Living organisms.

The quantification of natural capital in monetary terms requires the development of pricing systems based on 'intrinsic' valuation (Pearce and Turner, 1990). This involves the imputation of values for the provision of environmental services and for environmental damage including depletion, protection, restoration and pollution. They must reflect the amount a consumer is willing to pay for the use of an environmental service and the amount society is willing to pay to avoid damage to the environment. Whilst agreement is being reached on appropriate measurement techniques it would be possible to introduce both internal and external reporting systems for planning and control purposes and an auditing function to facilitate the measurement of resource usage.

Gray (1990) suggests the introduction of two new categories into accounting records. First, to separately identify expenditures with ecological impact and secondly to classify assets into natural (environmental accounting) and man-made (financial accounting) capital. This makes clear the distinction between economic capital and natural capital. Gray's classification allies the two aspects of accounting since either a fall in resource

consumption or changes in operating methods to reduce usage could result in a decrease in costs.

Despite the lack of official information on environmental accounting systems, methods suited to the operations of the NRA could be advanced.

#### **4.1.1 Internal methods specific to the NRA**

Internally it would be necessary to quantify internal resource utilisation and expenditure for each of the factors identified in Section 3.2.1. These accounts would contain targets, achievement levels and cost savings and would meet the criteria of measuring efficiency and costs consistent with the aim stated in the *Environmental Policy Targets Action Plan* to 'minimise resource use and waste'.

Appendix 4 suggests a possible accounting format, to be produced regionally and nationally, using the NRA categories listed in that document, including water, energy and paper use. To fulfil the aim of 'minimising or eliminating practices known to be harmful to the environment' Appendix 4 also suggests a format relating to the use of ozone depleters, toxic substances and tropical hardwoods.

#### **4.1.2 External methods specific to the NRA**

External methods could include, for example, the quantification of the cost to the environment of damage to water supplies, quality or recreational facilities resulting from the issuance of licences for abstraction.

The Environmental Resources Limited (ERL) (1992) report for the Department of the Environment on *Natural Resource Accounts for the UK* examines natural resource accounting methods for national accounts which are under development in various European countries. The Norwegian method divides the accounts into two sections, first dealing with quantitative issues concerning the provision of resources, and secondly, qualitative items regarding the provision of services. The accounts are structured to provide details of the following:

1. Material resources such as reserves of energy, forests, minerals and fish (quantitative) providing stocks and flows data on extraction, R&D, costs, pricing, and consumption.

2. Environmental resources such as recreational facilities and waste disposal (qualitative) providing details of usage and conversion of resources.

This method has been in existence since 1968 and has provided a useful means of assessing the environmental impact of policy decisions. It adopts a similar approach to the French system which was used as the basis for producing sample inland water resource accounts for the UK. This technique develops three accounts for the measurement of physical stocks of water:

1. Input-output table.
2. Global balance sheet.
3. Utilisation account.

No attempt is made to account for water quality. The input-output table shows:

- Initial stocks from soil and vegetation cover, groundwater, lakes and dams, and rivers.
- Primary inputs and outputs arising from evapo-transpiration from vegetation and natural outflows.
- Data on total water utilisation.

The global balance sheet analyses the water stocks and flows detailed in the input-output table, giving balances for primary and intermediate inputs, primary withdrawals and final uses. The utilisation account provides details of water usage by industry sector.

Using a simplified version of this French method, the ERL report proposes a framework developed around the available data. Table 4.1 groups the NRA regions into two water resource regions.

Table 4.1 Water Resource Regions

**Eastern England**

Northumbria and Yorkshire

Anglian

Thames

Southern

**Western England and Wales**

North West

Severn Trent

Welsh

South Western



Using these water resource regions a stocks and flows table and a utilisation account are produced in sample water accounts, as shown in Appendix 5. The former includes:

- Estimate of initial stocks of major water sources.
- Estimate of primary inputs and outputs.
- Estimate of internal discharge volumes.
- Agent account for water abstraction.

Factors additional to water quantity which have an economic value would also require inclusion, such as water quality, recreation and conservation.

## **4.2 DISCLOSURE REQUIREMENTS**

Current research suggests that the reporting requirements should include statistical environmental data and impact assessments which provide qualitative details, together with their cost significance. This gives both financial and non-financial details of an organisation's operations in relation to its use of natural resources and its impact on the environment. At present only about 100 of the 27,000 UK registered companies produce environmental reports.

Reporting environmental information should comprise two aspects, internal and external. They both have strategic consequences for the organisation in that they promote organisational efficiency (internal) and effectiveness (external) when compared to other businesses.

### **4.2.1 Internal environmental reporting**

The purpose of internal reporting is primarily to:

1. Show resource usage and cost.
2. Measure performance against previous years and published targets.

Internal reporting would also include environmental project appraisal. This would necessitate the development of a method of calculating the environmental cost of capital, the estimation of decommissioning costs and the allocation of environmental improvement costs. The estimation of an appropriate cost of capital figure raises a problem of valuation which is of specific relevance to the NRA since its assets are not traded in the market. Progress has already been made towards incorporating project appraisal with

the new procedure, reported in the Annual Report and Accounts, which requires environmental policy compliance for projects costing in excess of £10,000.

If environmental impact is not considered, then effectively a zero value is being placed on the costs and benefits arising from certain projects, for example recreational and this provides an unrealistic measure of the environmental effects of a project. This problem could be addressed through the use of cost-benefit analysis. The application of such analysis techniques to provide estimates of the value of social loss or gain of a particular projects is, however, beyond the scope of this report but it should be considered in the further development of environmental project appraisal.

#### **4.2.2 External environmental reporting**

External reporting provides:

1. Details of the organisation's impact on the environment.
2. A means of increasing the organisation's public profile.
3. The opportunity to be pioneering current 'best practice' (see Section 4.3).
4. Compliance with accounting regulations, as they become available.

In the absence of regulations, the information to be included and the format would be best made following an examination of the reports published by leaders in the field; whilst bearing in mind any constraints on the organisation to provide similar information.

Guidelines are being formulated by Government Departments concerning the style and approach to be adopted, although they do not provide details on content. Any system developed by the NRA should, however, take account of these initiatives. Recommendations made by the Department of the Environment's Advisory Committee on Business and the Environment (February, 1993) on the disclosure of information about environmental performance comprise:

1. Data should be held on public registers and should be centrally and electronically available.
2. Government should form a UK professional body for environmental auditors.

3. Reports should give information on the nature of operations to facilitate the identification of major environmental impacts and risks.

4. Priorities on key issues for each area of operations should be set.

5. Targets should be realistic and measurable.

6. An analysis of the current situation is necessary.

7. The relationship between environmental management and financial performance should be determined.

These factors are likely to have a bearing on any legislation brought in to regulate the production of environmental accounts.

#### 4.2.3 Environmental reporting and the NRA

The NRA currently produces the following reports:

**Internal** - monthly, quarterly and annual management reports.

**External** - annual Corporate Plan

- Annual Report and Accounts.

- annual R&D Review.

- annual, bi-annual or 5-yearly reports on the core functions.

- annual, bi-annual or 5-yearly reports on EC Directives.

The publication of environmental reports would require the necessary performance measurement monitoring and control procedures to be in place. Information could be included within the existing reporting framework or in separate reports. The mechanisms used by selected companies reporting on environmental issues are discussed in Section 4.3.

The requirements for the reporting of environmental factors which will be of significance to the Environment Agency are detailed in the '*Performance Planning and Reporting*' document produced by the Environment Agency Advisory Group (EAAG (94) 12)

Finance Sub-group. Its suggested financial and non-financial performance measures for six strategic activities are summarised below:

1. Environmental quality, for example surface and groundwater resources.
2. Cross-functional and specific policy objectives, for example BATNEEC.
3. Operational and regulatory activity and quality of service delivery, for example response times to pollution incidents and flood warnings.
4. General public awareness, satisfaction and participation in Agency activities, for example perceived contribution to improving the environment.
5. Environmental impact of the Agency's own activities, for example use of natural resources.
6. Value for money and efficient utilisation of human and financial resources, for example cost recovery via charges and efficiency savings targets.

#### **4.3 CURRENT 'BEST PRACTICE'**

Discussions were held with both BT and National Westminster Bank to examine their current thinking and practice regarding environmental reporting and their views on the implementation of environmental accounting procedures. Neither organisation quantifies natural assets in an accounting format, for example on the balance sheet, and both are reluctant to attempt this until standardised nationally agreed conversion factors are provided by the professional accounting bodies.

An analysis of the report structures and contents follows and a summary of the key issues included in the reports is provided in Appendix 6.

##### Presentation

There is little consistency in either the format of the reports or in the level of detail included. They also vary in style with some providing a separate category for each issue or resource type, for example emissions and energy, and others detailing the environmental effects of each business unit or functional area, such as chemicals (BP) or music (Thorn EMI). The former method facilitates inter-company comparisons and makes the assessment of the overall organisational environmental impact more straightforward.

Some reports are very industry specific, for example British Airways', which cannot be readily compared with the NRA.

Most companies make use of graphs, gantt charts or pie charts, and BT includes an index of the environmental factors contained in their report which is a useful addition. Several specify the type of paper used to print the reports, for example recycled, chlorine-free, pre- or post-consumer waste. BP and IBM include case studies which give a useful illustration of the practical steps that they have taken towards protecting the environment and minimising damage.

### Contents

BA's Environmental Report is technical, gives quantitative details on all aspects of its business, including congestion, tourism and fuel efficiency, but does not include financial costings of its environmental impact.

BP's 'New Horizons' document is produced in two parts, the first providing information on corporate environmental objectives and the second including data on each business area. Very limited financial information is included on savings made through increased energy efficiency.

BT's Environmental Performance Report '*highlights shortcomings, it records achievements and it acts as a stimulant for future action*'. Their approach has twice received the Chartered Association of Certified Accountants' (ACCA) award for corporate environmental reporting. The summary matrix of statistics on the company's main consumptions and emissions, which compares data for the previous two years, and the use of target symbols to indicate old, new and ongoing targets are particularly useful. Quantitative data is contained by issue, such as recycling, and for the first time in 1993 some financial information is provided where it does not '*compromise accuracy*'.

BT's treatment of environmental issues at both Corporate and divisional level and the costs of environmental disclosure were discussed at a meeting with Dr Chris Tuppen, Head of the Environmental Issues Unit. Their methods involve the identification and reporting of significant environmental impacts based on data collected by a three-layer measurement system encompassing the following:

1. A site audit on selected sites using interviews, site plans and photographs of good and bad practice.

2. Management reviews incorporating an internal audit function.

3. Corporate performance statistics.

The cost of producing 15,000 copies of the 1993 environmental report amounted to £25,000; 50 per cent of which were paper, printing and typesetting costs and 50 per cent design and artwork. Additionally, half-a-man year's central effort should be included and an undefined amount of resource throughout the organisation for the contribution of information.

IBM's Progress Report details targets and achievements in mainly qualitative terms. A section on each issue is provided which includes a description of the environmental impact of each factor, prior to giving details of the company's actions to reduce usage and improve efficiency.

**National Westminster Bank** A discussion with Tony Sampson, the Manager of the Bank's Environmental Management Unit, drew attention to the bank's commitment to the development of an EMS and their progress to date. The process undertaken involves an audit review which allows a benchmark to be agreed. Meaningful targets can then be set which are monitored within a control system. By employing efficient housekeeping methods economies are made and hence environmental benefits are gained, for example moves to minimise energy waste lead to cost savings. A holistic approach to the Bank's activities is taken and the impact on risk and business opportunities is considered. Environmental issues have been introduced into the reporting culture of the Bank where, on a quarterly basis, progress is shown against targets for each of the five business sectors. National Westminster has found that BS7750 is not directly appropriate to its own or its customers' needs and has consequently devised its own standards. This approach is reflected in the annual Environmental Report.

**Norsk Hydro** details its environmental responsibility and reports on the effects of its business on the environment within its Annual Report. Its goals, efforts towards continuous improvement and its life-cycle perspective are described; also it quantifies the use of toxins, levels of emissions, fines, and accident and safety records.

**Thorn EMI's** environmental report gives details of resource usage, policy, training, prosecutions and liabilities for each business area. The document takes a life cycle approach covering product sourcing, operations, product use and disposal or recycling arrangements for each sector. Very limited financial information is included.

Tesco includes a limited amount of information on '*community and the environment*' in its Annual Report and Accounts. It primarily deals with recycling and the reduction and re-use of packaging. No financial costings are disclosed.

All of the above organisations emphasise the importance of providing adequate staff education and training, and the management commitment necessary to progress environmental reporting and accounting.

None of the companies contacted are as yet publishing data to the level of that of the Dutch consultancy firm BSO/Origin which publishes estimates of the total financial cost of its impact on the environment. Their method accounts solely for the direct impacts of their activities, but their measurement procedures are perceived to be somewhat arbitrary in the absence of any official directives. If this type of approach were to be applied to the external operations of the NRA it would require the estimation of the financial cost of the duties performed by each of the core functions where they have an impact on the environment, for example the cost to the environment incurred by the issuance of abstraction licences or discharge consents.

## **5. CONCLUSIONS**

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The environment is now a strategic issue in many organisations where it is recognised to be of financial and non-financial benefit, helping to develop public image and promote competitive advantage. There could be considerable public relation gains for the NRA in adopting a high profile in the environmental accounting debate by communicating sound policies, attending conferences and reporting progress. These benefits could be achieved in the short-term without an immediate need for quantification of costs and usage. The reporting of environmental policy in the 1993-94 Annual Report and Accounts (p. 37) is a significant positive step.

If the NRA failed to respond to the environmental challenge the organisation could suffer damaging consequences particularly following the establishment of the Environment Agency. An opportunity would have been missed to be at the vanguard of the 'greening' movement by demonstrating environmental soundness and commitment to the ecology of its operations.

### **5.1 INTERNAL EFFECTS**

The introduction of environmental accounting would affect all working practices and would impact all functional units. Prior to any statutory requirement the continuance or adoption of the following methods would considerably enhance the NRAs profile with its stakeholders (government, EC, public and employees) and would place it in a strong position to provide the necessary external data when legislation becomes mandatory in the future:

- Instigate / encourage environmentally sound working practices.
- Implement / extend procedures which act as the precursor to the development of environmental accounting through the use of efficient housekeeping methods and target setting.
- Promote an ecologically aware organisational paradigm.
- Report both internally and externally on environmental issues, targets, progress, problems and achievements.



The key tasks affected would be:

- Performance measurement.
- Management monitoring and control.
- Project appraisal and costing.
- Health and safety factors.
- Information collection and processing.
- Emergency and incident responses.

Technological improvements would be required to reduce or eliminate the use of pollutants and to re-use and recycle where possible. It would become essential to measure and value the quantity and effects of the use of hazardous substances where substitutes are not available.

Steps have already been taken to introduce environmental considerations into the procurement domain concerning the purchase of items such as materials, vehicles and paper. This environmental awareness to reduce resource usage and minimise costs would also affect administration and personnel policy regarding travel, training and education.

## 5.2 EXTERNAL EFFECTS

It is likely to be several years before any official guidelines and legislation are available from the accounting bodies, the Government and the EC regarding the measurement techniques to be applied and the information to be reported.

Problems arise when applying accounting principles to the assessment of environmental issues, for example water resources. Water stocks and quality are difficult to measure and manage, not least because they have no market value. The related industries of recreation and conservation have a qualitative significance which is also difficult to measure as the assignment of economic values is largely subjective. For example, accounting for water quantity at a national level does not show whether supply meets demand locally and it fails to explain changes in stocks brought about by extreme climatic conditions, such as drought or flood. Many of these problems can be alleviated by the production of water resource accounts on a regional basis, as recommended in the ERL study (1992).

From the analysis of the disclosures made by the organisations surveyed in this report (see Section 4.3) it is apparent that the information produced in their environmental reports is not radically different from that contained in the NRA Corporate Plan and the Annual Report and Accounts; albeit they are providing more detail. The NRA could increase the amount of information published in these documents to include targets and performance data as measurement techniques are agreed and thus make rapid progress towards becoming a front-runner in the external reporting of environmental issues whilst the development of an environmental accounting system is underway.

### **5.3 MANAGEMENT, MONITORING AND CONTROL**

The inception of natural resource accounting requires a significant commitment from management in both financial and cultural terms. Its successful development and implementation calls for a change in paradigm within the organisation, raising awareness and demonstrating the importance of accounting for the use of natural resources both within the workplace and externally through the operations of the NRA in each of its core functional areas. This can be achieved through the continuation of the policy of providing on-going education and training and via a staff appraisal scheme.

The continuous monitoring and control necessary for the maintenance of accurate and timely environmental data could be accomplished by the assignment of ownership to key tasks. Effort could be minimised through the development of effective and efficient measurement techniques. The installation of metering at all sites has already facilitated the provision of accurate readings for water usage.

### **5.4 COSTS AND BENEFITS**

There are both costs and benefits to the NRA associated with the introduction of environmental accounting. They arise at a strategic level concerning public perception of the organisation, its increasing profile in the UK and Europe and its role as a regulator, and at an operational level regarding its need to comply with future legislation. A summary of the key costs and benefits, based on the National Environment Unit of KPMG Peat Marwick's view of the business benefits of environmental management (in Gray et al, 1993), is shown in Table 5.1. The factors may influence the decision whether to develop and implement an environmental accounting system prior to any legislative enforcement.

At an operational level, there are both direct and indirect benefits. The direct benefits accrue from reductions in resource consumption, such as raw materials and energy use

and lower waste production and fewer accidents. The indirect benefits of developing and implementing an environmental accounting system arise from improvements in organisational efficiency and effectiveness through the identification, measurement and controlling of costs and revenues, better staff morale, and enhanced community relations.

Table 5.1 Summary Costs and Benefits

Costs	Action	Benefits
Waste treatment and disposal	Programmes to prevent, recover, recycle	Financial savings and reduced risk
Clean up of contaminated land/water	Improved environmental control procedures	Reduced risk of causing pollution
Retrofit technology becomes expensive	Integrate environmental control at the design stage	Environment a strategic issue; cheaper solutions
Excessive water and energy bills	Review of use and design savings plan	Financial savings
Poor public image position	Devise environmental policy and programmes	Enhanced image with public and stakeholders

Implementation would also bring improvements in communication levels and environmental awareness, both internally and with authorities, legislators, government, suppliers and the public. If the accounting system forms part of a comprehensive EMS then the NRA could also gain in other areas such as insurance, through reduced premiums due to improved efficiencies.

Financial and time costs associated with the introduction of natural resource accounting can be broken down into fixed, one-off, variable and running costs. Fixed costs include the establishment of measurement techniques, controls and monitoring procedures and the provision of a data capture facility within the IAS system capable of recording and reporting the required information. This would incur some implementation, operating and maintenance costs. One-off costs arise from the design, purchase and installation of the necessary control equipment. Variable costs include the operating expenses of the equipment. Running costs would derive from the annual operation of the environment-related operations, including audit, control, recycling, disposal or treatment expenses.

Financial assessment of these factors is outside the scope of this report, and whilst the expense will not be insignificant, it will be unavoidable when environmental accounting

## Consultant's Report - 5. CONCLUSIONS

becomes a legal requirement. The long-term benefits of increased organisational efficiency and enhanced public profile could, therefore, outweigh the more immediate financing considerations.

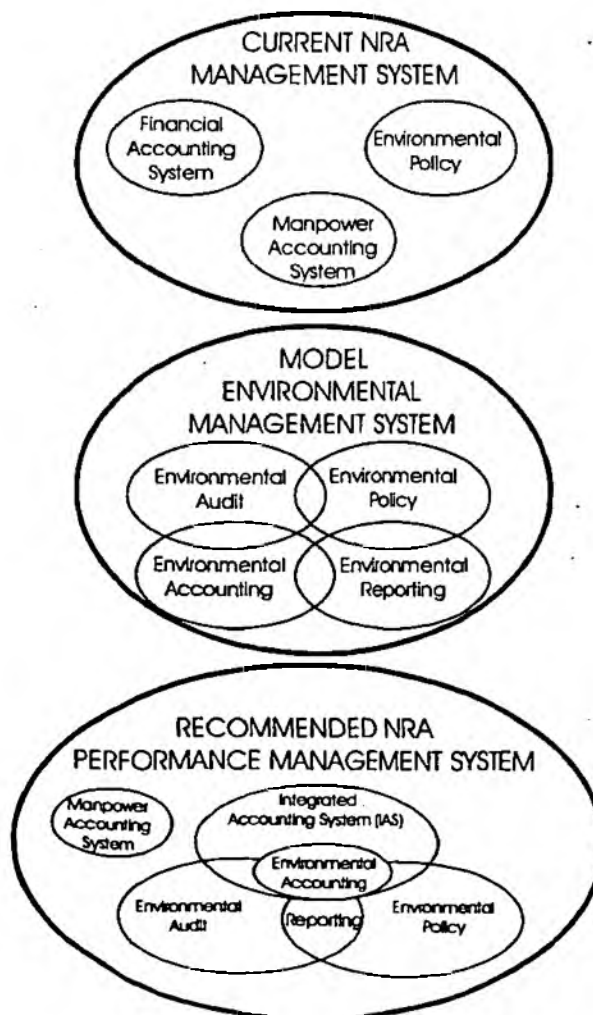
## 6. RECOMMENDATIONS

It is recommended that the NRA develop an environmental accounting system as an integral part of an EMS comprising the following aspects:

- Environmental Audit
- Environmental Policy
- Environmental Reporting
- Environmental Accounting

The existing system and the proposed system are shown in a systems map in Figure 6.1.

Figure 6.1 Systems map of the NRA Environmental Management System



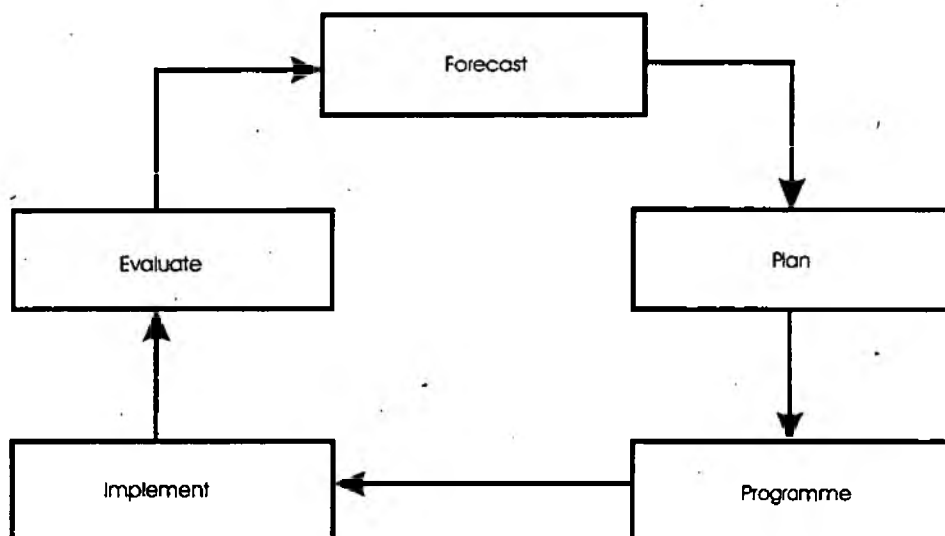
## Consultant's Report - 6. RECOMMENDATIONS

The EMS process is described below using energy management as an example:

- Use technological change to eliminate sources of inefficiency, for example through the use of alternative equipment, improved insulation and smaller vehicles. Audit
- Improve product use, for example by the use of public not private transport, reusable containers and recyclable materials. Policy
- Explore methods of changing consumer perceptions, for example by promoting awareness of energy costs at a departmental level. Reporting
- Measure usage and set targets for reductions in consumption in cost and quantity terms. Accounting

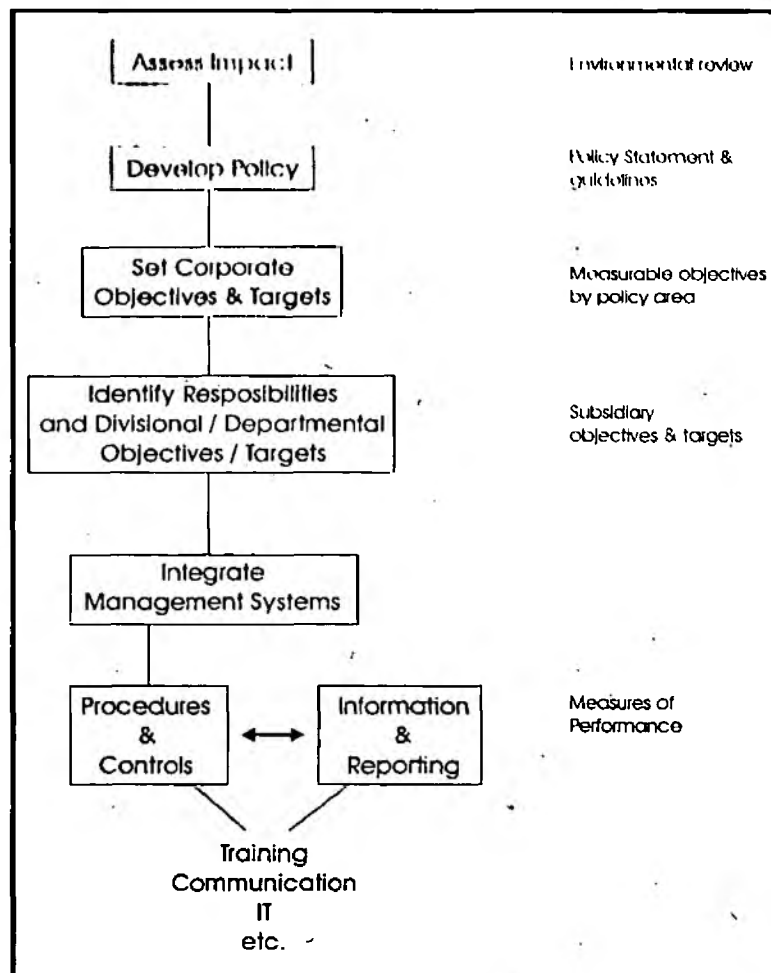
A continuing resource management cycle (shown in Figure 6.2) indicates the constituent steps at each stage of the EMS.

Figure 6.2 Resource Management Cycle



Sub-sections 6.1-6.4 examine the recommended stages for the development of an EMS. These need not occur sequentially or be undertaken in isolation, but would be part of an iterative process whereby each stage builds on the others and requires updating as a result of developments in other areas. This process (KPMG Peat Marwick in Gray et al, 1993) is shown diagrammatically in Figure 6.3.

Figure 6.3 Stages In Developing Environmental Management Systems



## 6.1 ENVIRONMENTAL POLICY

The development and issuance of environmental policy is a crucial prerequisite to the establishment of a full EMS. Considerable progress has been made within the organisation and current NRA policy comprises:

- Identification and prioritising of goals.
- Setting of specific targets based on these goals.
- Assignment of responsibilities.
- Monitoring of performance.
- Establishment of procedures for feedback and reward.

As resources become available an environmental audit could commence which would facilitate the quantification of techniques to measure performance, achievements, shortfalls and remedial actions in preparation for the introduction of environmental accounting.

Internally reporting of policy could be via newsletter, staff education and training. Externally it could be published in the Annual Report and Accounts, the Corporate Plan, a separate environmental document, or in a 'charter' which could, in addition, give prominence to the regulatory function as well as to internal performance.

## 6.2 ENVIRONMENTAL AUDIT

An environmental audit is described by the Confederation of British Industry (CBI, 1990) as '*the systematic examination of the interactions between any business operation and its surroundings*'. As such it explores all aspects of the organisation's functions with respect to legislation, emissions, effects on the local ecology and public perceptions of its work.

A SWOT analysis (see Appendix 7) provides a useful starting point for an environmental audit by identifying the NRAs internal strengths and weaknesses and the external opportunities and threats. Identification of these factors would be particularly pertinent at a strategic level as it would be a means of integrating environmental issues into the core functional areas for accounting purposes. Of the various types of audit detailed by Gray (1993) it is recommended that the most appropriate first stage would be an environmental survey; the structure of which is included in Appendix 8. This would give a detailed breakdown of the organisation's activities which could be used to compile physical, stock and flow accounts. Values could then be assigned as the measurement techniques are devised and implemented.

Detailed audits of key areas would be necessary after an initial review to incorporate issues such as legal and technical requirements. Figure 6.4 suggests a resource management sequence which could form part of the audit process.

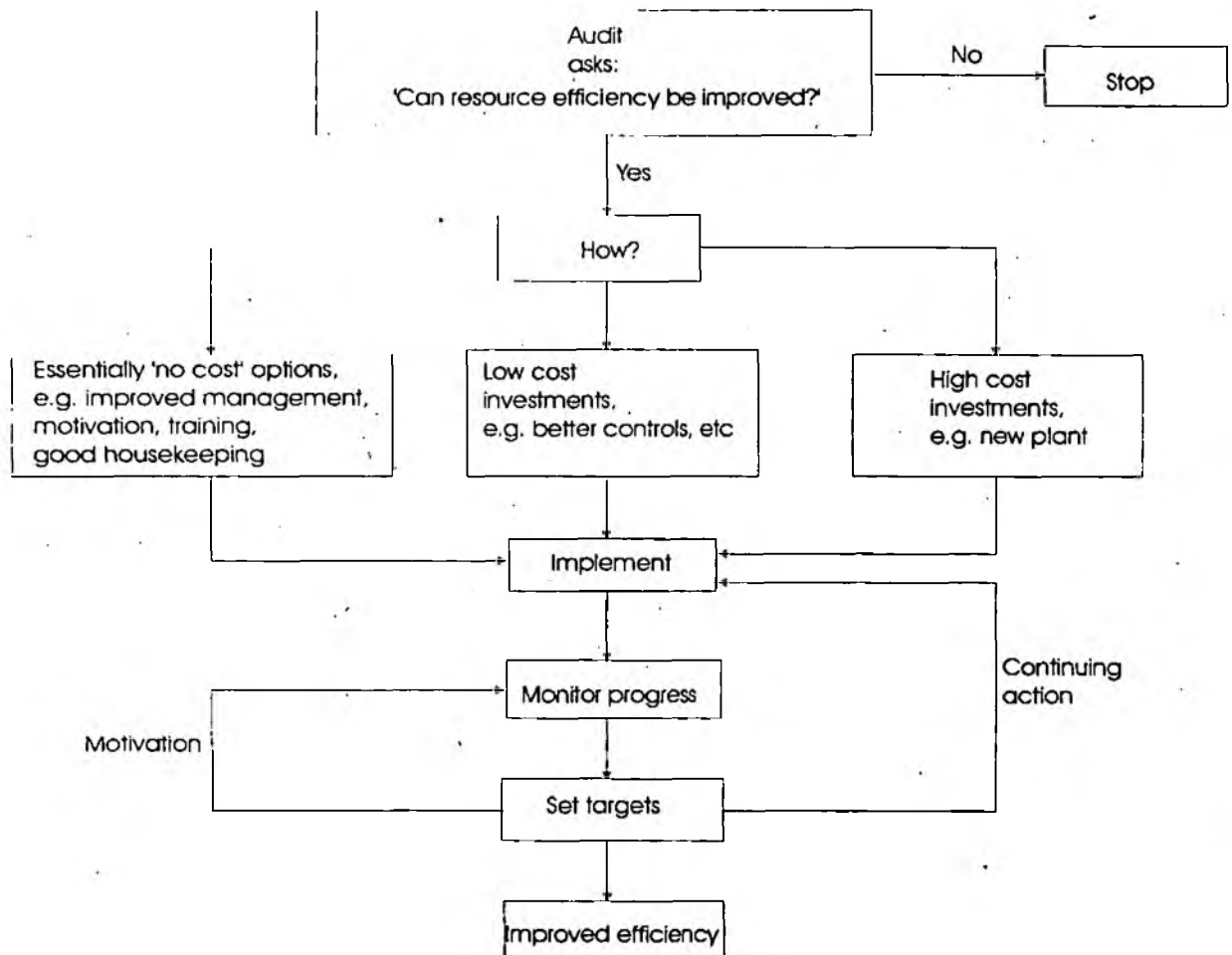
## 6.3 ENVIRONMENTAL REPORTING

The publication of a detailed environmental report and subsequently accounts in either the Annual Report and Accounts or in a separate document would necessitate changes to the NRAs financial, management and information systems in order to record, process and publish the information. Financially there would be a need to account for the effects



on valuation and costs of environmentally improving working practices, for example recycling and disposal.

Figure 6.4 Resource Management Sequence



The Annual Report and Accounts provides a useful vehicle for the inclusion of environmental policy, including targets and controls, in the short-term. In the longer term, however, it will be necessary to publish full environmental accounts detailing specific plans, costs, timescale and year-on-year comparative performance. If these are produced in separate documents or separate sections of the Annual Report the problem of conflicting roles between financial and environmental accounts, which arise as a result of the differing purposes and audiences of the two documents, is reduced. The former provides stakeholders, including Government and management, with data on the efficient

use of funds and grants, whilst the latter provides interested parties, including employees, special interest groups and pressure groups, with information on environmental performance. It would also be necessary to report on any negative aspects of the organisation's operations.

## 6.4 ENVIRONMENTAL ACCOUNTING

### 6.4.1 Internal Accounting

Due to the diversity of the existing accounting system and the nature of the data required for water resource accounts to be produced, it is recommended that an inhouse environmental accounting capability be developed in conjunction with the IAS development. One suggested method of integrating financial and environmental performance measures into an integrated accounting system supported by the IAS system could involve the use of a financial and environmental performance measures matrix (see Appendix 9). This would use the six strategic activity areas recommended by the EAAG for the Environment Agency with the NRAs core functions to incorporate both financial and non-financial data.

The effects of including environmental data on internal working practices in conventional financial statements, based on charts by KPMG Peat Marwick (in Gray et al, 1993), are shown in Table 6.1.

Table 6.1 Impact of the Environment on Conventional Financial Statements

PROFIT & LOSS ACCOUNT	
Revenue	Costs
Market growth	Clean-up
market decline	Effluent/emission control or reduction
product taxes	Waste treatment/disposal
	Insurance
Intangible benefits:	Fines
Forefront of environmental accounting	Health and safety claims
Public image	Plant depreciation
Ethical concerns	Compliance
Altruism	Waste minimisation
	Licenses/Authorisations
	Research and development

## BALANCE SHEET

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**Assets**

Land revaluations

Plant write-offs

New plant

Stock - net realisable value

Capital commitments

**Liabilities**

Breach of consents - fines/actions, damages

Remediation (pollution damage)

Contingent liabilities

Accounting for resource use in cost and efficiency terms would require costs to be allocated across departments. This could be achieved through the use of Activity Based Costing as a means of assessing direct usage for recharging purposes. Resource costs would need to be identified separately in management information reports and budgets.

### 6.4.2 External Accounting

A further recommendation concerning the format of environmental accounts for the NRA involves the valuation of the external impact of the NRAs duties performed by the core functional areas, as discussed in Section 4.1.2.

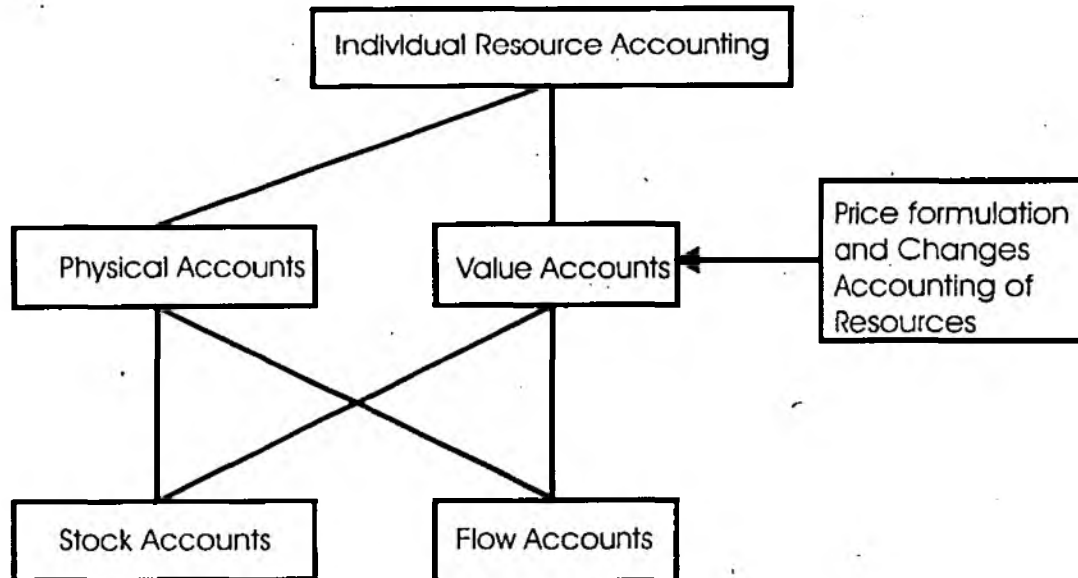
To 'price' the external effects of the NRAs responsibilities it would be necessary to undertake a detailed study into the methods of assigning resource values currently being expounded by economic theorists. Whilst this aspect of environmental accounting cannot be researched in depth for this report due to time and resource constraints a skeleton structure for individual resource accounts (Li, 1991) is shown in Appendix 10. This contains developmental environmental accounting categories which could be related to selected duties undertaken by each of the core functional areas. Li's (1991) '*System of Resource Accounting*' framework (see Figure 6.5) is based on the premise that physical accounting is undertaken first, followed by value accounting to produce individual resource accounts. These are then consolidated to produce multiple resource accounts.

## 6.5 INFORMATION TECHNOLOGY SYSTEMS

The systems implications of developing an environmental accounting system would involve the analysis of both internal and external requirements. Internally it would be necessary to identify the individuals and departments who are to input and receive the

information and to determine their requirements. Externally a review of current and planned legislation would be required, and consideration should be given to the audience expected to receive the published accounts.

Figure 6.5 System of Resource Accounting at the Individual Resource Level



The mechanics of producing the accounts are likely to involve the use of ratios, trends and comparisons. Trend analysis would require the ability to use cross-referencing to check for relationships between various environmental effects. The methods employed should use data which is both accurate and timely. Responsibility for the costing of environmentally related actions and processes should be allocated to those departments receiving the benefits.

It is understood that the IAS system could be enhanced to hold the necessary environmental data. The length of time for which data must be retained is likely to be determined by EC or UK legislation. Additional management and budgetary reports would be required and it would be essential to ensure that existing systems could be amended to facilitate the meeting of environmental targets, for example to reduce the internal use of paper additional capacity could be required on the EMAIL system.

For the Information Systems department to undertake changes to IAS a written specification defining the data requirements and outputs would be required. This would entail the definition of environmental accounting at service, activity, task and job level, in line with the IAS system. This would require the allocation of a budget to include an estimate of costs and the designation of a person responsible for the development project.

## **7. FUTURE DIRECTION**

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### **7.1 MANAGEMENT OF CHANGE**

The organisation will, in the short-to-medium term, be experiencing a period of dynamic change whilst it plans and executes the transformation to the Environment Agency. If it is also to commence the design, development and implementation of an EMS it will require management to adopt a proactive approach to change. Five factors instrumental in achieving successful change within an organisation have been identified (Alexander, 1985), and which the NRA is already progressing:

1. Provide sufficient resources in terms of finance, human, technical and time.
2. Maintain two-way communication between management and employees which facilitates the notification of policy and encourages the flow of ideas from staff on ways of improving environmental efficiency.
3. Ensure that the planned structure and system is compatible with the organisational paradigm which minimises any problems of resistance to change thereby optimising performance.
4. Promote employee commitment and involvement, possibly through an appraisal and reward scheme.
5. Develop a comprehensive implementation plan which could provide the necessary iterative structure and reporting mechanism against which progress could be measured.

By adhering to such a strategy it should be possible to prevent problems or at least to ensure that prompt corrective action is taken if they do occur.

### **7.2 ACTION PLAN**

#### **7.2.1 Review**

The first stage in the development of an EMS, of which environmental accounting would be a key part, could be to undertake a review of existing working practices to examine the management and technical issues facing the NRA. The former includes procedures, planning and leadership questions and the latter compliance with legislation and standards, evaluation and measurement.

### 7.2.2 Short-term

The following recommendations could be implemented in the short-term and would form part of an on-going strategy (see Section 7.3) to promote environmental awareness and would lay the foundations for the creation of an EMS incorporating environmental accounting:

- Develop a training program to educate staff about environmental accounting - what is it and what are its implications for current operations?
- Specify the IAS system requirements necessary to provide an environmental accounting data input and reporting facility.

Techniques such as brainstorming and quality circles could be used to achieve these aims. These could stimulate new ideas from all parts of the organisation for reducing natural resource usage and costs and would promote the feeling of responsibility and 'ownership' of methods introduced to measure environmental performance.

### 7.2.3 Medium-term

The review and audit process should be instigated, objectives laid down and prioritised and a phased implementation planned for these initial stages. This audit of key areas would facilitate the integration of the NRA with Her Majesty's Inspectorate of Pollution (HMIP) and the Waste Regulatory Authorities (WRA) into the Environment Agency.

### 7.2.4 Long-term

The additional benefits of producing environmental accounts for water could include the ability to forecast water shortages, the identification of non-sustainable abstraction levels and the estimation of industrial impact on water quality and quantity. Although, to benefit from these advances would require the definition, development and implementation of suitable measurement techniques and record keeping systems.

The long-term should see the introduction of environmental accounting into general business practice along with efforts to quantify sustainability. These actions are, however, only likely to occur when official guidelines are given by professional accounting bodies and government legislators. Pearce et al (1989) recommended the adoption of a proactive stance to the issue of sustainable development:

*'...a society committed to sustainable development will shift the focus of its environmental policy towards an anticipatory stance, especially as reactive policy risks shifting the burden of environmental risks to future generations'.*

There is world-wide debate on the definition, importance and measurability of sustainable natural resources, but no consensus views. Pearce et al (1989) describe the principle of sustainable development:

*'as "constancy of natural stock". More strictly, the requirement as for non-negative changes in the stock of natural resources such as soil and soil quality, ground surface waters and their quality, land biomass, water biomass, and the waste assimilation capacity of receiving environment'.*

With the dynamic situation facing the NRA the establishment of a program of sustainable development would be of considerable long-term strategic importance. Its significance is demonstrated by the fact that all of the external factors detailed in the STEP analysis in Appendix 1 have implications for the long-term sustainability of natural resources.

The International Chamber of Commerce *Business Charter for Sustainable Development* (1991) comprised sixteen areas of business practice where concern for the sustainability of the environment should be paramount, including:

- Corporate priority.
- Employee education.
- Facilities and operations.
- Research.
- Compliance.
- Reporting.

Many questions concerning sustainability are as yet unanswered, including for whom and for how long is the human interaction with the environment to be considered when assessing the economic consequences of environmental damage. Organisations will, however, become increasingly involved in environmental management and this entails the concept of sustainability. Consequently auditing, reporting and accounting functions are likely to become more and more significant. Gray et al (1993) suggest three ways in which an organisation could quantify sustainability:

1. Inventory approach.
2. Sustainable cost approach.
3. Resource flow-through/input-output approach.

The authors describe the differences such that the first two methods report **about** sustainability and the last reports **for** sustainability. The approach which could fit best NRA current practice and which could be further explored for the Environment Agency's purposes would be that of sustainable cost. This framework could be incorporated into existing reporting conventions which record the maintenance of capital investment in order to include natural capital maintenance for future generations. It is possible that the Environment Agency could report not only on efforts made to minimise any harmful effects arising from its internal operations, but also the results of its regulatory function preventing other organisations or individuals from causing environmental damage. For the moment, however, it would be necessary only to monitor progress and any new theories, particularly where they could impact the Environment Agency.

### 7.3 FUTURE ACTIONS

Additional research into current thinking on estimation methods for the allocation of values to environmental resources would be necessary before detailed environmental accounts could be suggested. On-going monitoring of the latest perspectives should be undertaken to ensure that the organisation is conversant with new ideas and can contribute to the debate whenever possible. This could be facilitated by:

- Documents such as '*Environment-Related Performance Measurement in Business : From Emissions to Profit and Sustainability*' (James and Bennett, 1994).
- Contact by professional accountants with the Chartered Association of Certified Accountants (ACCA), the Institute of Chartered Accountants in England and Wales (ICAEW) and The Chartered Institute of Management Accountants (CIMA).
- Attending conferences.
- Subscribing to journals such as KPMG Peat Marwick's quarterly '*Envirobrief*' and '*Social & Environmental Accounting*' and '*The Newsletter of The Centre for Social and Environmental Accounting Research*' (CSEAR), published quarterly by the University of Dundee.



## **Consultant's Report - 7. FUTURE DIRECTION**

- Liaison with representatives of the Environmental Units of businesses at the forefront of environmental issues.
- Strengthening management resources devoted to environmental control.
- Monitoring progress on environmental issues within the Department of the Environment and UK and EC legislation generally.
- Evaluating BS7750 and assessing its relevance to the Environment Agency.

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## **Appendix 1**

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### **STEP ANALYSIS OF THE NRAs EXTERNAL ENVIRONMENT INCLUDING ECOLOGICAL AND PERSONAL VALUE FACTORS**

#### **SOCIOLOGICAL**

'Green consumer' - increased awareness

Friends of the Earth

Greenpeace

Social disclosure - human resources

- fair business practices

- energy

- community involvement

- product related

- environmental

#### **TECHNOLOGICAL**

R&D environmental developments

Product / process design

Recycling

Waste management

#### **ECONOMIC**

Recession

Investment funds

Cost of liability/pollution insurance

Cost of litigation

Compensation funds

Retrospective liability

## ECOLOGICAL

Environmental pressures - depletion

- extinction
- erosion
- deforestation
- water resources etc.

Rectification of damage

## POLITICAL

BS7750

UN initiatives

1990 Water Act

1991 Water Resources Act

1990 Environmental Protection Act

Register of contaminated land

1991 EC Eco-Audit

1991 EC Eco-Labelling

EC Toxic Release Inventory

EC Freedom of Environmental Information

1992 EC plan *Towards Sustainability*

## PERSONAL VALUES

Business ethics

Environmental sensitivity

## Appendix 2

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3 Carnaby Road  
Broxbourne  
Herts  
EN10 7EF  
28th March 1994

BT Centre  
81 Newgate Street  
LONDON

Dear Sirs

I am currently studying for an MBA with The Open University. As part of my final year I am undertaking a research project into environmental accounting, using the National Rivers Authority as a case study. This research includes examining the current practical and theoretical status of environmental accounting and considering the problems encountered in measuring, costing and displaying the information. As part of this process I am investigating developments in the subject within organisations.

As your company is well known for its concern for environmental issues and is recognised as being at the forefront of moves to introduce environmental reporting into its accounting procedures, I would be grateful if you could provide me with any information which would assist me in my research.

I am examining ways in which energy, recycling, stationery, emissions and water can be costed in financial and efficiency terms. Additionally, I am looking at ways in which this information can be presented internally and to the public in the form of environmental accounts. The areas I am considering are:

Energy	- lighting/heating usage, transport, building maintenance
Re-cycling	- packaging, production methods, design, materials
Stationery	- usage, procurement policy
Emissions treatment	- atmospheric e.g. traffic / air pollution, waste incineration / treatment / collection, water
Water	- usage, pollution

I would be very grateful for any assistance that your organisation can provide.

Yours faithfully

Jill Dixon

## Appendix 3

### ENVIRONMENTAL ACCOUNTING QUESTIONNAIRE

This questionnaire is designed to measure the extent of awareness of 'green' issues within the National Rivers Authority (NRA). It is part of an Open University MBA business research project on Environmental Accounting, undertaken with the support of the Director of Finance. The replies will be used in an analysis of the information existing within or required by the NRA in order to implement an environmental accounting system.

I would be very grateful if you could complete the questions and return them to Jill Dixon c/o Corporate Planning Department, NRA Bristol. The information provided will be used solely for research purposes for the project.

### QUESTIONS

**Q1.** Which of the following statements best matches your view of environmental accounting? (please tick the relevant box)

An accounting system which quantifies water and energy usage

An accounting method which covers all areas of accounting that may be affected by the business response to environmental issues

The provision of recycling facilities and energy saving measures in the workplace

An information system which separately reports resource usage e.g. energy, water, wood

A project appraisal technique for assessing the environmental impact of new investment

0%
54%
0%
24%
22%

**Q2.** Are you aware of a) NRA environmental policy and b) environmental accounting?

a) environmental policy

b) environmental accounting

YES NO

YES NO

(please tick box)

97%	3%
-----	----

50%	50%
-----	-----

### Consultant's Report - Appendix 3

If your answer to (a) or (b) above is 'yes', please tick those areas which you have actioned:

ACCOUNTING FOR ENVIRONMENTALLY RELATED COSTS AND REVENUES

18%

FINANCIAL ENVIRONMENTAL MEASURES e.g. costs of energy used per annum

42%

NON-FINANCIAL ENVIRONMENTAL MEASURES e.g. amount of energy used per annum

50%

PERFORMANCE MEASUREMENT - APPRAISAL AND REPORTING

53%

INFORMATION SYSTEMS SUPPORT FOR DATA INPUT AND INFORMATION PROVISION

26%

PROCUREMENT AND WORKING PRACTICES TO REDUCE ENVIRONMENTAL IMPACT

74%

**Q3.** Are you aware of NRA project management procedures and their environmental requirements, and do you integrate environmental issues e.g. energy usage, water usage or recyclability, when specifying or defining new projects?

YES NO

78%	22%
-----	-----

(please tick box)

If your answer is 'yes', what evaluation methods are used?

**Q4.** Are you aware of any NRA research and development into more environmentally sound management practices?

YES NO

37%	63%
-----	-----

(please tick box)

If your answer is 'yes', to which project or initiative has this applied?

Name/example of project(s)

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**Q5. Do you monitor the following environmental issues?**

(please tick each that applies)

ENERGY CONSUMPTION	53%
WATER USAGE	42%
STATIONERY (excl. paper)	58%
PAPER RECYCLING	55%
PAPER USAGE	55%
RECYCLING e.g. plastics, bottles, tyres	18%
PESTICIDES	13%
PAINT AND SOLVENT USAGE	3%

**Q6. Does your department set quantitative targets e.g. to reduce energy use by 5% p.a. over the next five years, for the following environmental issues?**

(please tick each that applies)

ENERGY CONSUMPTION	42%
WATER USAGE	37%
STATIONERY (excl. paper)	32%
PAPER RECYCLING	29%
PAPER USAGE	34%
RECYCLING e.g. plastics, bottles, tyres	5%

**Q7.** Does your department have measurement procedures for the following in a) financial cost and b) resource consumption terms?

(please tick each that applies)

	FINANCIAL	CONSUMPTION
ENERGY CONSUMPTION	39%	37%
WATER USAGE	26%	34%
STATIONERY (excl. paper)	34%	24%
PAPER RECYCLING	13%	24%
PAPER USAGE	21%	26%
RECYCLING e.g. plastics, bottles, tyres	3%	5%

If you have ticked any of the above, what methods do you use to account for the financial costs and resource consumption of the following:

**a) FINANCIAL**

ENERGY CONSUMPTION	
WATER USAGE	
STATIONERY (excl. paper)	
PAPER RECYCLING	
PAPER USAGE	
RECYCLING e.g. plastics, bottles, tyres	

**b) CONSUMPTION**

ENERGY CONSUMPTION	
WATER USAGE	
STATIONERY (excl. paper)	
PAPER RECYCLING	
PAPER USAGE	
RECYCLING e.g. plastics, bottles, tyres	

**Consultant's Report - Appendix 3**

**Q8. Does your department have procedures in place to monitor practices known to be harmful to the environment, in a) financial cost and b) resource consumption terms?**

(please tick each that applies)

	FINANCIAL	CONSUMPTION
OZONE DEPLETERS	3%	16%
TOXIC SUBSTANCES - black list	0%	16%
TOXIC SUBSTANCES - red list	0%	18%
TROPICAL HARDWOOD USAGE	0%	13%
PCBs	0%	13%
ATRAZINE or SIMAZINE	0%	11%
OTHER (please specify)	0%	0%

**Q9. Could your existing accounting system be used to input information on natural resources usage i.e. plant or mineral resources such as wood, oil or gas?**

YES      NO

15%	85%
-----	-----

(please tick box)

If your answer is 'no', please explain the difficulties:

**Q10. Are existing IS systems capable of recording and reporting the quantity, volume and financial cost of natural resources used?**

YES      NO

12%	88%
-----	-----

(please tick box)

**Consultant's Report - Appendix 3**

**Q11. Do you think you and/or your department would benefit from the introduction of environmental accounting?**

YES      NO

71%	29%
-----	-----

(please tick box)

**Q12. Please outline below any problems and suggested solutions concerning the introduction of environmental accounting:**

<b>RESOURCES</b>	<b>18%</b>
<b>TIME</b>	<b>8%</b>
<b>BUREAUCRACY</b>	<b>13%</b>
<b>SYSTEMS</b>	<b>21%</b>
<b>DATA</b>	<b>11%</b>
<b>EDUCATION</b>	<b>29%</b>
<b>MANAGEMENT</b>	<b>24%</b>

I would be grateful if you could provide your name, department, address and telephone number should I need to contact you for additional information:

Name:

Dept:

Address:

Telephone:

**Thank you for completing this questionnaire.**

If you would like details of the final report please indicate here:

YES      NO

95%	5%
-----	----

## Appendix 4

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### SUGGESTED RESOURCE USE AND WASTE REPORTING FORMAT

Resource Type	Cost Operating	Type Capital	Cost £	Saving £	Target Consumption	Achievement Level
<b>Energy</b>	1 Direct consumption by fuel type					
	2 Pumping					
	3 Transport fuel use by fuel type					
	4 Transport accidents					
	5 Investment appraisal					
<b>Water</b>	6 Direct consumption					
	7 Meter installation					
<b>Stationery</b>	8 Direct (excl. paper) consumption					
<b>Paper</b>	9 Direct consumption					
	10 Recycling					
<b>Recycling</b>	11 System by type					
	12 Investment appraisal					
	13 Capital equipment					
	14 Transport					

**Notes:**

1 Posting of energy invoices to accounts for each energy source e.g. oil, coal, petroleum, electricity, gas and the recording of quantities used by measurement type i.e. kwh, tonnes, cubic metres

2 Recording of the amount and cost of energy used in pumping

3 Posting of transport fuel invoices to accounts for each fuel source e.g. petrol, diesel and the recording of quantities used

4 Recording of accidents by number and cost

5 Financial and non-financial costing of energy use for new investment projects

6 Posting of amounts of water used and monitoring costs for the meters

7 Posting of invoices for purchases of water meters and the recording of installation costs

8 Posting of invoices for purchases of various types of stationery and the recording of quantities used

9 Posting of invoices for purchases of each paper type e.g. recycled, non-recycled and the recording of quantities used

10 Posting of amounts of paper used and quantity internally recycled

11 Posting of costs and revenues for recycled materials by type e.g. plastics, tyres, batteries, bottles, corporate clothing

12 Financial and non-financial costing of investment in recycling technologies

13 Posting of equipment costs necessary to undertake recycling activities

14 Posting of transport costs and revenues associated with recycling activities

## SUGGESTED HARMFUL PRACTICES REPORTING FORMAT

Practice	Cost Operating	Type Capital	Cost £	Saving £	Target Consumption	Achievement Level
<b>Ozone</b>	1 Direct depleters consumption					
	2 Equipment					
<b>Toxic</b>	3 Direct substances consumption					
	4 Investment appraisal					
	5 Equipment					
<b>Tropical</b>	6 Direct hardwoods consumption					
	7 Investment appraisal					
	8 Capital equipment					

### Notes:

1 Posting of invoices for products with and without ozone depleters to separate accounts and the recording of quantities used

2 Posting the costs of alternative equipment or products

3 Posting of invoices for toxic substances to separate accounts e.g. red and black list substances, and the recording of quantities used

4 Financial and non-financial costing of investment in technologies which minimise or eliminate the use of toxic substances

5 Posting the costs of alternative equipment or products

6 Posting of invoices for products containing or not containing tropical hardwoods to separate accounts and the recording of quantities used

7 Posting the costs of alternative equipment and investment in technologies for flood defences

8 Posting of equipment costs necessary to undertake replace equipment utilising tropical hardwoods

## Appendix 5

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### SAMPLE WATER ACCOUNTS - STOCKS AND FLOWS

	Eastern England	Western England and Wales	Total
<b>INITIAL STOCK</b>			
Groundwater (seasonal storage only)	3,696	2,315	6,011
Lakes	467	1,097	1,564
Reservoirs	342	1,750	2,092
<b>PRIMARY INPUTS AND OUTPUTS</b>			
Precipitation	46,314	84,276	130,590
Evaporation	-26,449	-34,640	-61,089
River flows to sea	-15,533	-46,974	-62,507
<b>INTERNAL DISCHARGES (maximum consented)</b>			
Sewage Treatment Works	ND	ND	ND
Industry	ND	ND	ND
Sub-total	ND	ND	ND
<b>ABSTRACTIONS</b>			
(Actual)	ID <sup>1</sup>	ID <sup>1</sup>	ID <sup>1</sup>

ND No Data Presently Available

ID Incomplete Data Set due to Incomplete NRA Records

<sup>1</sup> Maximum Licensed Abstraction only supplied for two NRA regions

Source: Natural Resource Accounts for UK Inland Waters (October to September) 1989/90 (Units: million m<sup>3</sup>) in Environmental Resources Limited's (August 1992) Natural Resource Accounts for the UK Report for the Department of the Environment



## SAMPLE WATER ACCOUNTS - UTILISATION ACCOUNT

Agent		Eastern England		Western England and Wales	
		C	A	C	A
Domestic supply	gw	11,590	ID	1,000	ID
	sw	3,716	ID	3,609	ID
Industry	gw	435	ID	339	ID
	sw	797	ID	2,188	ID
Power Utilities	gw	ID	ID	2	ID
	sw	ID	ID	7,799	ID
Other Power Industry	gw	ID	ID	ID	ID
	sw	ID	ID	ID	ID
Agriculture Spray	gw	83	ID	21	ID
	sw	113	ID	56	ID
Other Agriculture	gw	ID	ID	135	ID
	sw	ID	ID	164	ID
TOTAL	gw	ID	ID	15,101	ID
	sw	ID	ID	1,469	ID
OVERALL		ID	ID	ID	ID

gw = groundwater

sw = surface water

C = Consented

A = Abstracted

ND No Data Presently Available

ID Incomplete Data Set

Source: Natural Resource Accounts for UK Inland Waters (October to September) 1989/90 (Units: million m<sup>3</sup>) in Environmental Resources Limited's (August 1992) Natural Resource Accounts for the UK Report for the Department of the Environment

## Appendix 6

### KEY ISSUES INCLUDED IN ENVIRONMENTAL REPORTS

	1	2	3	4	5	6	7	8
Energy	*	*	*	*	*	*		*
Water	*	*	*	*				*
Recycling	*	*	*	*	*	*	*	*
Emissions	*	*	*	*		*		*
Waste	*	*	*	*	*	*		*
Pollution	*	*	*	*		*		*
Transport	*	*	*	*	*			*
Conservation	*	*	*	*				
Efficiency	*	*	*	*			*	*
Prosecutions	*	*	*			*		
Training	*	*	*	*				*
Communication	*	*	*	*		*		*
Health/Safety	*	*		*		*		*
Harmful Subs.	*	*	*	*	*	*		*

#### Key

1	BA	5	National Westminster Bank
2	BP	6	Norsk Hydro
3	BT	7	Thorn EMI
4	IBM	8	Tesco

## **Appendix 7**

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### **NRA SWOT ANALYSIS**

#### **STRENGTHS**

Environmental awareness  
Staff commitment  
Technical expertise / professionalism  
Public perception  
24-hour environmental response  
Staff loyalty to organisational objectives  
Spending power  
Internal audit / quality assurance  
Geographical coverage

#### **OPPORTUNITIES**

Influence EC directives  
WRAs goodwill towards NRA  
Increased customer focus  
High profile for Environment Agency (EA)  
EA opportunity for integration  
EA economies of scale  
EC funding  
Self-regulation  
Develop 'one-stop-shop'

#### **WEAKNESSES**

Different income streams  
Co-ordination - size / responsibilities  
Long timescales  
Staff morale in some areas  
Government relationship  
Too much change - measurement of success  
Communications  
Culture / structure / infrastructure  
Regional diversity

#### **THREATS**

Economic / political climate  
Defensiveness of government / HMIP  
Reduced spending power  
Integration of three cultures into EA  
Imposition of government structure on EA  
Increase in EC bureaucracy

<b>Step 1</b>	<b>Get started</b>
<b>Step 2</b>	<b>Draw a systems flow of the NRA:</b> identify major categories of inputs, outputs and leakages
<b>Step 3</b>	<b>Provide a detailed itemisation of the elements in Step 2:</b> identify products and materials and related activities
<b>Step 4</b>	<b>Review each item with a view to minimisation:</b> refuse, reduce, reuse, recycle, substitute
<b>Step 5</b>	<b>Assess financial costs and benefits</b>
<b>Step 6</b>	<b>Identify crucial business factors:</b> points of conflict between environmental standards and business standards
<b>Step 7</b>	<b>Draw up a detailed action plan</b>
<b>Step 8</b>	<b>Review progress</b>
<b>Step 9</b>	<b>Refine the organisation:</b> <ul style="list-style-type: none"> <li>1. Identify upstream effects:- <ul style="list-style-type: none"> <li>people - housekeeping / office</li> <li>processes - products / services</li> </ul> </li> <li>Identify downstream effects:- <ul style="list-style-type: none"> <li>emissions / wastes</li> </ul> </li> <li>2. Separate analysis for individual sites, regions, lines of business activity</li> </ul>
<b>Step 10</b>	<b>Identify existing and potential law, industry standards, consents</b>

## Appendix 9

FINANCIAL AND ENVIRONMENTAL PERFORMANCE MEASURES MATRIX							
STRATEGIC ACTIVITY/ CORE FUNCTION	WATER QUALITY	WATER RESOURCES	FLOOD DEFENCE	FISHERIES	CONSERVATION	NAVIGATION	RECREATION
ENVIRONMENTAL QUALITY	ground/river/ estuary/costal	rainfall/rivers/ surface/ground	incidence/ extent	stocks/size	otters etc.		
SPECIAL POLICY OBJECTIVES	emissions/EC Directives	river flows	maintain/ improve	maintain/ improve			
REGULATION/ SERVICE QUALITY	pollution/ environmental monitoring		flood warning	monitoring/ enforcement licensing		enforcement	
GENERAL PUBLIC AWARENESS					collaboration/ publication	liaison/ collaboration	liaison/ collaboration
ENVIRONMENTAL IMPACT	-----		use of natural resources (water, fuel, power, wood, plastics etc.) -----				
	-----		reduction, re-use, re-cycling (water, fuel, power, wood, plastics etc.) -----				
VALUE FOR MONEY/ EFFICIENCY	fines	charging		licensing	collaboration	improvements/ collaboration	collaboration/ joint projects

## Appendix 10

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### INDIVIDUAL RESOURCE ACCOUNTS

1. natural resources:
2. type:
3. reporting period(19..):
4. prepared by:

---

measurement	physical	unit price	magnitude of value
unit A	amount B	C	D=B*C

---

5. opening stock
6. increase during  
the year  
(6=7+8+9)
7. new discovery
8. revalued increase
9. ....
10. decrease during  
the year  
(10=11+12+13)
11. exploitation
12. readjusted decrease
13. losses
14. net changes  
(14=6-10)
15. closing stock  
(15=5+6-10)=5+14

## **GLOSSARY**

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ACCA	Chartered Association of Certified Accountants
BATNEEC	Best Available Techniques Not Entailing Excessive Cost
CIMA	Chartered Institute of Management Accountants
CSEAR	Centre for Social and Environmental Accounting Research
DoE	Department of the Environment
EAAG	Environment Agency Advisory Group
EC	European Community
EMAIL	Electronic mail
EMAS	Eco Management and Audit Scheme
EMS	Environmental Management System
ERL	Environmental Resources Limited
HMIP	Her Majesty's Inspectorate of Pollution
IAS	Integrated Accounting System
ICAEW	Institute of Chartered Accountants in England and Wales
IS	Information systems
LAN	Local area network
NRA	National Rivers Authority
STEP	Sociological/Technological/Economic/Political
SWOT	Strengths/Weaknesses/Opportunities/Threats
UN	United Nations
UN CTC ISAR	United Nations Centre for TransNational Corporations Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting
WRA	Waste Regulatory Authorities