PLANNING FOR SUSTAINABLE DEVELOPMENT: THE WATER DIMENSION

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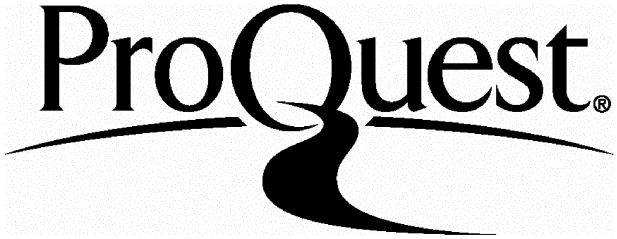

Abstract

Water is one of our most precious resources yet one which we all too easily take for granted. All types of man-made development requires a good supply of water but it is also essential to the healthy maintenance of the local hydrological environment whose functioning can be seriously affected by the water demands of towns and cities.

With the growing emphasis on sustainable development and all that it implies for the conservation of natural resources, planners increasingly need to take account of local water resources when considering proposals for new development.

The water industry must also extend its awareness of these issues in order to establish the co-operative working relationship between themselves and land use planners which is vital to achieve the right balance between development, the environment and water supply.

This thesis begins with an extensive examination of the theory and principles of sustainable development and goes on to explain the roles and responsibilities of the various organisations involved in planning for a sustainable water environment. The methods of implementing sustainable development are comprehensively investigated and it is concluded that although the water cycle and issues relating to it are complex, by entering into a partnership approach, local authority planners, the National Rivers Authority and water companies can provide a holistic understanding of the issues and recognise how they can transfer their knowledge and experiences to achieving sustainability of the water environment.

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Abbreviations

CPD	Continuous Professional Development
CPOS	County Planning Officers' Society
CPRE	Council for the Protection of Rural England
CMP	Catchment Management Plan
CSC	Consumer Services Committee
DoE	Department of the Environment
DP	Development Plan
EC	European Community
EIA	Environmental Impact Assessment
GIS	Geographical Information System
HBF	House Builders Federation
HMSO	Her Majesty's Stationary Office
MAFF	Ministry of Agriculture, Fisheries and Food
MP	Member of Parliament
NNR	National Nature Reserve
LPA	Local Planning Authority
NRA	National Rivers Authority
NRATR	National Rivers Authority Thames Region
OFWAT	Office of the Director General of Water Services
OPCS	Office of Population and Census Studies
PPG	Planning Policy Guidance note
RPG	Regional Planning Guidance
RWA	Regional Water Authority
SEA	Strategic Environmental Appraisal
SERPLAN	South East Regional Planning Conference
SERPLAN EMSG	South East Regional Planning Conference Environmental Monitoring Sub Group
SSSI	Site of Special Scientific Interest
TCPA	Town and Country Planning Association
UNCED	United Nations Conference on the Environment and Development
UDP	Unitary Development Plan
WSA	Water Services Association

Chapter 1: Introduction

Water is one of our most precious resources, and yet is one which all too easily we take for granted. The South East of England receives 14% of Britain's rainfall yet nearly 40% of the population live there. The national demand for water has grown steadily at about 1% per year since 1961 (ENDS, 1992). Development and building of all kinds impose an ever increasing demand on local water resources, a pressure which is likely to continue to be high. While a good supply of water is essential to any kind of man made development, it is also essential to the healthy maintenance of the local hydrological environment, whose functioning can be seriously undermined by the water demands of towns and cities. The time has come to consider whether the amount of rainfall should be regarded as a constraint to development.

Water is unique amongst the utility services for it has no national grid system which would allow it to be transported from an area of excess supply to one of excess demand. Moreover, the costs of water infrastructure in storage and pipeline facilities are enormous. Therefore planners increasingly need to take account of both the quantity and quality of local water resources when considering proposals for new development. In preparing a development plan or taking an individual decision whether to permit development, the local planning authority must weigh and reconcile priorities in the public interest. Their task is to ensure that the development needed as the economy grows can proceed in a way that respects environmental capacity constraints and other conservation interests. This has been endorsed by the Minister for the Environment and Countryside, Mr Robert Atkins MP when he stated that "water should be treated as a material consideration in planning decisions" (Atkins, 1994).

A number of publications highlight the problems (NRA 1993b, Gordon, 1993) including the DoE publication, Using Water Wisely which states:

"...Local planning authorities should take into account the likely future availability of water (and sewerage) services when preparing their development plans. However, as any owner of premises has a statutory right to obtain a supply of water from any water undertaker..and as the NRA exercises control over abstractions through licensing, the availability of those services is unlikely in most cases to be a material consideration in deciding whether individual planning permission should be granted.

The main need therefore is to address water service issues in strategic planning and in particular to take full account of water resources implications when deciding on the location of new development..." (DoE, 1992g).

The planning system therefore has an important role in preventing development where water is scarce. This has become a particularly relevant concern in the face of an increasing emphasis on sustainable development and all that it implies for conservation of natural resources.

The Government has declared its commitment to the principles of sustainable development, even to the extent of producing the Sustainable Development Strategy for the UK (DoE, 1994). It has also produced a mass of guidance and discussion papers but little in the way of practical implementation. Water is one of the most visible and important resources upon which any development proposal is directly or indirectly dependent. It should therefore be considered as one of the main dimensions of environmental capacity when considering the sustainability concept. It is particularly relevant therefore to write a thesis at this time which aims to explore the practical implementation of sustainable development with specific emphasis on water resource management. In addition, water has been given a high profile by both politicians and the media:

There is no aspect of natural resources much more important than water... This is a time to take stock of our attitude to water, to see whether we are using it in the wisest way." (Michael Howard, Secretary of State for the Environment in July 1992, also former Minister for Water in 1989)

Planners must understand the issues of sustainable development and all that it means in respect of the natural environment. *"They must get to grips with water issues quickly. It is their responsibility"* (Gordon, 1993).

Aims and Objectives

Much has been written about the theory and principles of sustainable development but little has actually been written concerning its practical implementation. This project aims to determine exactly what sustainable development means in both theoretical and practical terms and how planners should be incorporating these principles into their work. It was decided early on that the concept of sustainable development was so broad, that one element of the environment should be chosen as a case study. Water was identified as an important, non replaceable and non-substitutable environmental asset. It is also high on the political and media agenda, and its appropriate management is a concern in the South East of England. Therefore, this thesis uses examples from a variety of sources. The county of Essex has been used to illustrate various aspects of the water environment and the principles of and arguments for sustainable development. Essex Water Company has been used to gain an insight into demand and supply management in practice. Essex County and District Councils however do not materialise as the leaders in implementing sustainable development strategies for the water environment and so examples have been taken from other councils and regions as appropriate.

Many organisations are involved in water resource management. It is the second aim of this thesis to provide an insight as the responsibilities and roles of all the relevant organisations and explore how they presently work together and how this relationship could be improved in the future, to aid the implementation of sustainable development.

After having identified the problems of water supply shortages and increasing demands, the thesis aims to determine possible solutions and to discuss their merits and the possibility of practical implementation.

Finally, this thesis aims to help planners and professionals in the water industry to develop their understanding of the relationship between planning decisions and water resources and the implications that one has for the other.

Methodology

Several methods were used to obtain the information for this thesis. Three types of literature were reviewed: firstly, published articles and reports relevant to the area of research to achieve a general background knowledge of the development of the issues of land use and water resource management. Secondly, a review of recent legislation and planning guidance which included Governmental Circulars, Planning Policy Guidance notes (PPGs) and consultation papers. Finally, internal documents and papers obtained during consultation and interviews were reviewed.

Several conferences have been held on water resource management and its relation to land use planning over the last year, which is an indication of how contemporary the thesis is. Two main conferences were attended, the first in Cambridge, was held on 10th November 1993 and the second was hosted by the Town and Country Planning Association, on 22nd February 1994 in London, entitled Planning and Water - An Elemental Challenge. Both provided invaluable presentations and discussions on the topics covered in this thesis.

Interviews covered a wide range of professional and interest groups within the defined area of research. These included informal interviews with Mr Mike Gordon a planning consultant in Essex who has written many articles on this topic, Mr Simon Slater, who is working in the planning department at Newcastle University on methods to improve

integrated catchment planning and Miss Anne Simmons, Mr Dave Taylor and Professor John Gardiner, all from the NRA. Dr Janet Cockrane and Mr David Alborough from Essex Water were also interviewed for about two hours each, providing valuable insight into the values and priorities of a water company.

The interviews were of an informal type and carried out in person. This meant arranging interviews on the same day but after the conferences and the SERPLAN Environmental Monitoring Sub Group meetings (NRA) and visiting Essex Water Company. In order to obtain the qualitative data needed for this study, semi structured interviews were carried out using open ended questionnaires. These listed specific questions to be asked with the intention of encouraging respondents to answer as fully as possible and not to give answers from a pe-determined list of options. This approach allowed discussions to be developed further depending on the varying roles and expertise of each organisation. Personal interviews, although time consuming ensured that questions were answered fully and in sufficient detail, by the most appropriate person in each organisation. Also many interviewees were able to provide useful and up to date literature and data concerning the local environment.

Research Presentation

The thesis structure is summarised in Figure 1 and is as follows:

Chapter 2 Planning for Sustainable Development; gives an insight into the theory and principles of sustainable development and the guidance published by various planning organisations and the government to aid its implementation.

Chapter 3 The Water Environment - gives an insight into the hydrological cycle and the water environment in Essex. It goes on to examine the need for sustainability by outlining the environmental, economic and social sustainability factors which need to be considered throughout the thesis.

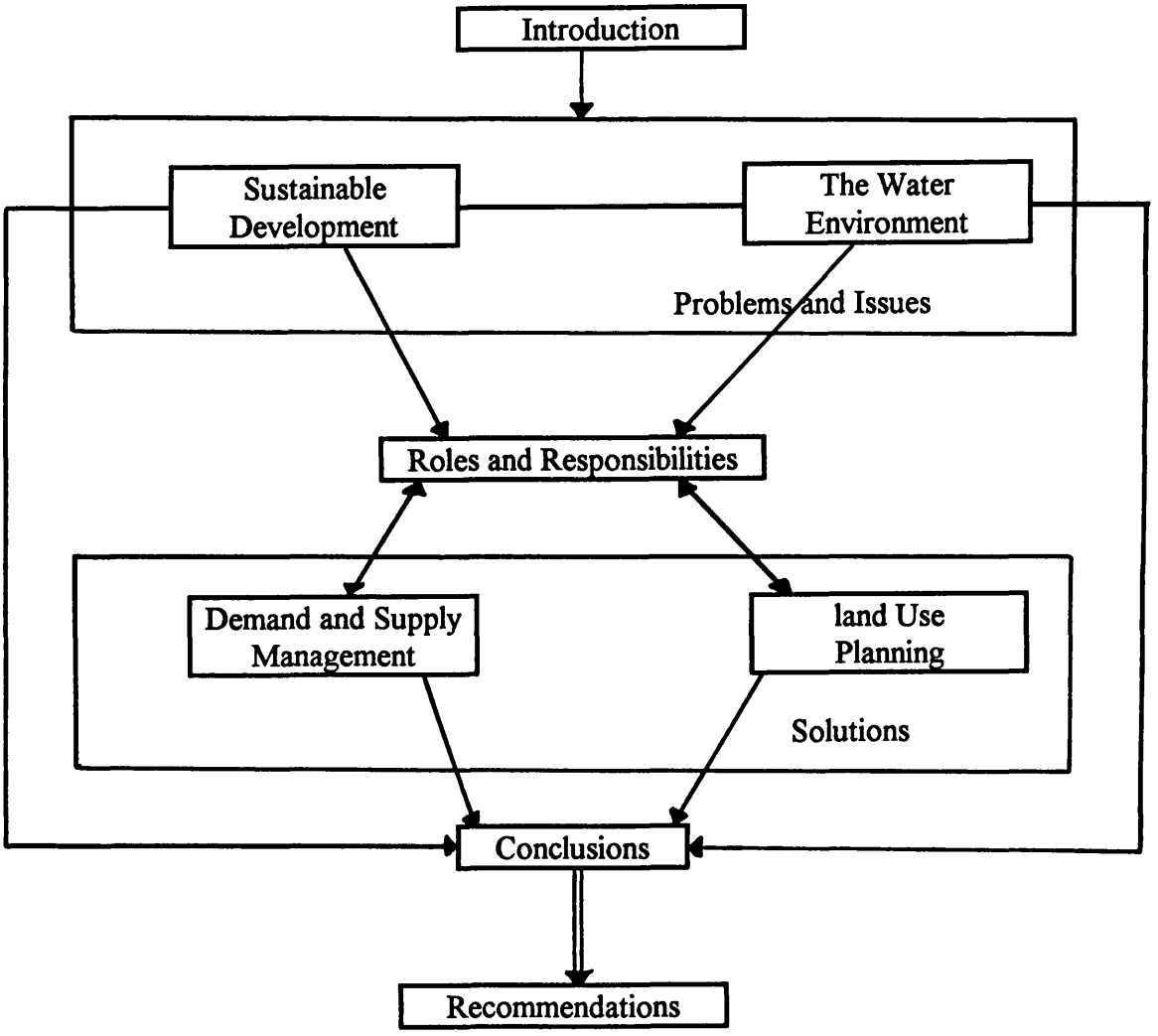
Chapter 4 Who Cares? The Roles and Responsibilities of Organisations Involved in the Struggle for Sustainable Use of Water Resources. This examines the mechanisms of water resource management at present, how each organisation interacts with the others and how the planning profession does or should fit in.

Chapter 5 Implementing Sustainable Development Through Demand and Supply Management of Water Resources. This chapter concentrates on how Essex Water Company has implemented their water resource management strategy and highlights the problems they face and areas where they need help from other organisations.

Chapter 6 Implementing Sustainable Development Through the Land Use Planning System. This examines the roles which planners have at present and explores areas where they could become more involved and help in achieving sustainable management of the water environment.

In Chapter 7, Conclusions are drawn from the research, concentrating on chapters five and six. Finally, a set of practical recommendations are presented regarding central government, the NRA, local planning authorities and the water sector.

Figure 1.1 The Structure of the Thesis



Chapter 2: Planning for Sustainable Development

Defining the Term "Sustainable"

Sustainable has become a fashionable word, indeed sustainable development has achieved widespread popularity and it is almost impossible to find anyone who is not in favour of it. However, the concept has claimed so much analysis that it becomes easy to dismiss it as too vague to be of any practical use. It does seem though that sustainable development is not simply a passing phrase and is being considered as a fundamental goal for our society.

The term sustainable development is used in a variety of contexts much wider than just environmental considerations. It may be used in an economic, social, political or environmental sense, or a combination of all four. As this thesis aims to propose and discuss policies and practices to achieve sustainability, it is imperative to establish clearly in what sense it is being used.

The most commonly quoted definition is taken from Our Common Future:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (World Commission on Environment and Development, 1987).

However, there is not one universal definition of the term, indeed there are several interpretations but it is not the purpose of this thesis to list them here. The definition chosen to be used in this thesis is from the World Conservation Strategy:

Sustainable Development aims to *"Improve the quality of human life while being within the carrying capacity of supporting ecosystems"* (World Conservation Strategy, 1991).

A convention appears to have been established in some quarters whereby the word sustainability has come to be almost exclusively an environmental term, meaning a situation, state or process which is sustainable in an environmental sense. However, this paper interprets the term in an holistic view, to cover environmental, social and economic impacts of man's use of natural resources.

This definition therefore should not be interpreted from an anthropocentric standpoint with the *"quality of human life"* being the central issue and the *"supporting ecosystems"* as a secondary issue. Both issues are equal, that is one of the fundamental principles of sustainability, that the ecosystems within which we live should be given the same importance as our own existence.

Principles of Sustainable Development

Sustainable development is based on the principle of stewardship, to protect the environment for future generations. This means that it is imperative to try to gain an understanding of the natural environment and determine what effects man's actions have upon it. The aim is to pass on to future generations an environment at least in its present state, preferably in an improved state. The term sustainable development is complex and as such there are several principles which need to be clarified before any policy decisions can be made. These are examined below.

The carrying capacity is the extent to which the environment can tolerate human activity without suffering unacceptable damage. Unfortunately, in many areas, we have at present only a scant understanding of the carrying capacity and a lack of basic data against which changes in the environmental quality can be measured. It is therefore necessary to undertake extensive state of the environment auditing to ensure a knowledge of at least what environmental capital is available at the moment. Obviously, continuous reviews will be a way of monitoring change to the environment.

Until such time as carrying capacities have been established and appropriate policies agreed, the precautionary principle should be applied. This principle simply states that it should be assumed that an activity might be damaging to the environment unless it can be proved otherwise.

The precautionary principle also applies to positive action. The UK Government's White Paper on the Environment states:

"Where there are significant risks of damage to the environment, the Government will be prepared to take precautionary action...even where scientific evidence is not conclusive, if the balance of likely costs and benefits justifies it. This precautionary principle applies particularly where there are good grounds for judging that action taken promptly at comparatively low cost may avoid more costly damage later or that irreversible effects may follow if action is delayed." (DoE, 1990)

It is widely agreed that sustainability policies will succeed only if they are based on the principle of equity; both inter-generational equity and social equity. Inter-generational equity deals with the long term time periods over several generations. Ideally, if every generation ensures the quality of the environment is passed onto the next generation, the time horizon need only concern itself with one generational time span. Social equity is based on the principle that no one group can impose solutions which condemn others to a much lower standard of living or disruption to their way of life.

State of the environment audits can also be used as tools to identify sustainability limits. This is basically a process of defining critical environmental capital (those elements whose loss or damage would be very serious). Other elements of a non-critical nature could be damaged or lost if the contribution they make to environmental capital can be replaced by compensatory action of equivalent worth. These non-critical elements which it is desirable to maintain should be identified as constant natural assets (English Nature, 1992b). This method of establishing limits to development has been termed the strong version of sustainable development as environmental considerations

act as a constraint on the achievement of other social goals. Development to meet other social and economic goals is allowed but subject to certain prior environmental conditions being met.

This view however concentrates on the environmental issues of sustainable development. In practice, it may sometimes be justifiable to trade off environmental capital on social or economic grounds. This interpretation of the term sustainable development is often referred to as the weak version.

One of the key tasks of strategic planning is to indicate which aspects of the environment can be traded off and which aspects are to act as sustainability limits. It is therefore necessary to consider the values and potential application of both versions of sustainable development in land use planning.

English Nature, in their document Strategic Planning and Sustainable Development, believe that it is the strong version of sustainable development to which planners should be committed. They argue this on a number of points.

Firstly, the weak use is degradable. This is because the weak use does not specify exactly how much weight should be given to environmental considerations which makes it easy to turn it into a "business as usual" position in which no substantial change in current policies or practices is required (English Nature, 1992b).

Secondly, the weak version may not be sufficient to protect the natural environment to the extent required, even if the weak version is not degraded and environmental considerations are genuinely given higher priority than previously in the balancing of interests. Because the environment can still be traded off against other interests, such as economic development, it is always possible for environmental protection to be outweighed in the balance. The experience of development on Sites of Special

Scientific Interest (SSSIs), which have high priority but are not inviolable, demonstrates this. Strong sustainable development, with its sustainability criteria acting as a prior limit on development, provides a stronger argument for certain specified levels of environmental protection to be achieved. By determining policy only within the boundaries set by environmental limits, certain aspects of the environment may be removed from the arena of trade offs.

Thirdly, the weak use requires each case to be argued on its merits, trading off the benefits, for example of habitat protection, with the development. This places a great deal of burden of environmental protection on the methods by which trading off is done. Decisions on the protection of environmental resources are made on a variety of criteria, with sometimes arbitrary and inadequate information.

Although the views of English Nature are valid, they are not grounds for completely invalidating the weak version of sustainable development. The adoption of the week version still implies a change, both in the objectives of national economic policy and in the conduct of government policy making in many fields. The use of environmental impact assessment of policies and development proposals is one area which could be extensively expanded.

Measuring Sustainability

It is generally agreed that sustainability is concerned with both the consumption of non renewable resources and the effects of human activity on the environment. This thesis intends to take this concept one stage further by considering the impact of using a renewable resource - water - in an unsustainable way. The consequences of unchecked resource use on supporting ecosystems are reaching the point of being unacceptable. It is necessary therefore to undertake an audit of the situation at the moment, define limits and/or trade offs which are both acceptable and sustainable and produce a strategy for the future. To this end, both demand and supply management are essential

and this thesis will consider each in turn (chapter 5) before turning to an examination of the planning system to determine its role, both at present and in the future, in sustainable water resource management.

Setting Sustainability Limits

If the strong version of sustainable development is accepted, sustainability limits will need to be determined for each separate environmental function or capacity, including renewable and non-renewable resources. For renewable resources, the concept of maximum sustainable yield offers the basis for such a limit, since this maintains the resource capacity. A minimum stock of an environmental resource, for example river length, needs to be determined, both in relation to demand and in relation to competing requirements, for example those of the nature conservation resource. In nature conservation, Ramsar sites, SSSIs, National Nature Reserves (NNRs) and other designations have already provided the basic framework for sustainability constraints.

While the basic idea of setting limits to environmental degradation is relatively uncontroversial, their determination in practice raises difficult questions. First, there is a lack of understanding of maximum sustainable yields, carrying capacity, critical loads and habitats which reduces confidence in the sustainability constraints which follow from them. Secondly, limits for different capacities must be co-determined since they affect one another.

These problems make setting such limits more difficult to determine but they do not invalidate the process. Any scientific uncertainty suggests a precautionary approach which should err on the protective side. Whilst it may not be possible to determine exactly how much of a habitat is needed to protect a species, it is possible to make an estimate on the precautionary side. The linked nature of environmental capacities requires co-operation between scientists in different fields. One aim of sustainability is to encourage environmental awareness and education so this can only be a good thing.

A third problem should be discussed. If sustainability limits are to be rigorously applied, they will clearly have opportunity costs, for example, in terms of development foregone or changed. This could be regarded as trade-offs between the various aspects of sustainable development - environmental, economic and social, which would render the process as the weak version. These three aspects are explored further in chapter 3.

The Scale of Sustainability

An important issue in setting sustainability limits is the scale on which this should be carried out, for example, over what geographical area do environmental capacities have to be maintained? In practice, the choice of scale will vary according to the environmental function under consideration. Two factors need to be considered:

Ecological/Scientific: Some sustainability limits are only meaningful at the global scale (e.g. carbon dioxide and CFC emission limits); others are meaningful on a regional scale (e.g. limits of nitrate pollution of aquifers). The appropriate scale for sustainability limits will therefore depend on the issue.

Administrative: For practical reasons, it may not be possible or desirable for sustainability limits to be determined at the scale most appropriate on ecological or scientific grounds if these do not coincide with administrative boundaries. This may prove to be a major obstacle in water resource planning when so many different bodies are involved. This will be discussed in chapter 4.

Practical Implications of Sustainable Development

In the last two years there have been a number of major developments in attempting to implement sustainable development in a practical way. These include the International Rio Summit in June 1992, the European Community's Fifth Action Programme entitled Towards Sustainability, and decisions by the European Environment Councils to adopt sustainable policies. In the United Kingdom there is a strong commitment to Agenda

21 (the international plan for practical implementation of sustainable development objectives within each country). The Government has set up a Local Agenda 21 Steering Group and has appointed a national Project Officer to advise local authorities on the initiative. In February 1994, the Government produced the UK Strategy for Sustainable Development as promised in Rio.

Several texts have been published by various bodies which have announced the indisputable association of planning and sustainability. The County Planning Officers' Society (CPOS) published Planning for Sustainability in February 1993 and the Town and Country Planning Association published its report on sustainable development entitled Planning for a Sustainable Environment. Michael Jacobs produced Sense and Sustainability for the Council for the Protection of Rural England, a 50 page report setting out the principles of and steps towards sustainable planning. The Department of the Environment has recognised the importance of linking sustainable development aims into planning policy guidance as seen in Planning Policy Guidance Notes 1, 3, 12, 20, and 21, and Regional policy Guidance note 6 (DoE, 1992a, 1992b; 1992c; 1992d; 1992e; 1991).

Planning for Sustainable Development

The key to successful implementation of sustainable development is an improvement in the way resources are distributed, at this time and through time. Planning, of course is fundamentally concerned with the distribution of resources, particularly where market mechanisms are inadequate. Planning in this context is the system of land use planning involving county and district authorities, regional planning fora and central government. Many of the changes required to make planning more sustainable can be achieved by local authorities on their own, within the current system. However, in some areas, strengthened national policy, legislation and commitment is required.

It can be argued, quite rightly, that planning has always been concerned with the protection of the environment. The planning system as we know it - based on the 1947 Town and Country Planning Act was designed in and immediately after the war years in a context of intense public concern about the balance between urban development and agricultural, forest and open land resources (Hall et al, 1994). So the system has always aimed to balance environmental concerns against those of other social and economic objectives. The question therefore which should be addressed is in what ways might a commitment to sustainable development require a planning authority to behave any differently than it has before?

The planning system aims to provide three basic aids to appropriate land use. Firstly, guidance to help people plan the use of their land confidently and sensibly, and to help planning authorities to interpret the public interest wisely and consistently. Secondly; incentives, in that by allocating land in their statutory plans for particular types of development, local authorities may stimulate that development; and thirdly, control which ensures that developers cannot ultimately insist for private reasons on a change which would be against the public interest and that people affected by proposals for change can have their views considered.

The present planning system is limited in its influence and is not capable of meeting all the concerns raised by a consideration of sustainable development. It is not so much that the system is unable to direct the location of development, but that very few issues relating to the form of development are within the scope of the planning system (Williams 1993).

Duncan McLaren of the Friends of the Earth believes that conventional development fails to consider adequately the needs of the protection of the environment or resource conservation for future generations and the well-being of dependent ecosystems. This could be because the carrying capacity of the land has not been fully evaluated or

understood and the precautionary principle not applied in practice. In order to overcome these problems, environmental costs must always be fully evaluated in our decision making process (McLaren, 1990).

Take for example a new housing development. Under a system of full sustainable development, and where the precautionary principle is applied, many questions need answering. These include: is the development really necessary?, has the location been fully assessed as to its appropriateness? and have all the impacts (economic, social and environmental) been taken into account? A full evaluation can only be undertaken through a full understanding of the undesirable impacts of different types and locations of housing.

For example, the resource impact of detached homes compared to tenement apartments is significantly greater. The area of land needed is much greater, as is the infrastructure of roads, sewerage and other services. The energy efficiency of the houses is less - by about one third on average. The lower population density of the former type of development increases dependency on motorised private travel and reduces the viability of local services and facilities. Finally the detailed design generates several concerns including the type of building materials used and the efficiency of the lighting and heating, unfortunately many aspects of which are presently out of the control of planning.

The process which decides where and whether a proposed housing development should go ahead should be able to take all these issues (and more) into account. However, in practical terms, most people accept that the total elimination of unsustainable development is not an achievable objective for the foreseeable future. Therefore one of the immediate objectives must be to reduce unnecessary consumption as far as possible and to encourage the use of renewable resources in a sustainable manner.

In the past the land use planning system has undoubtedly sought to protect the natural environment from the impact of development, mainly focusing on habitat protection and landscape enhancement. To this end, it has been an effective instrument for achieving the policy objectives of the 1940's, particularly the segregation of built up areas from the countryside (green belts) and the designation and protection of National Parks, landscape areas and nature reserves. However, it has been for less successful in responding to new kinds of environmental concerns. Only limited attention has been given to the protection of the environment from polluting land uses, or to the conservation and management of resources (E.g. water, fossil fuels) and recycling wastes (Hall et al, 1994). It is now necessary to envisage environmental planning as an integrated process which ensures that sustainability is built into the planning system as a primary objective.

Planning Tools in Use Today

Significant progress will only be achieved if planning policy is closely aligned to the relevant policies of central government. Therefore, central and local government must seek out a closer working relationship and develop a common sense of purpose and a coherent strategy.

Effective implementation of purposeful planning policy is essential if the objectives of sustainable development are to be achieved. Legislation, regulations and guidance are produced by central government but the process involves discussion and consultation throughout the hierarchical structure of the planning system since each level has a different function, perspective and responsibility according to their geographical area of influence. The following section aims to consider the different planning tools available to aid the implementation of sustainable development in the planning system.

There are several tools used to meet this aim. Central Government, through the Department of the Environment has passed many Acts of Parliament and issued

Planning Policy Guidance notes (PPGs) Regional Planning Guidance notes (RPGs) and circulars which aim to guide local planning authorities. In turn, these authorities produce development plans. County Councils produce structure, mineral and waste local plans in which key strategic policies provide a framework for local planning by district councils. District and Borough Councils produce local plans in which more detailed policies are issued to guide and control development in their areas. In London Boroughs and Metropolitan districts, Unitary Development Plans are used to combine the functions of structure and local plans.

Legislation

Since the publication of the UK Government's White Paper on the Environment, This Common Inheritance in 1990, there has been an increase in environmental concerns and awareness in governmental policy. Although this was produced too late to influence the Town and Country Planning Act which was enacted earlier in the year, the contents of the white paper initiated the Environmental Protection Act of 1990. In 1991, the Planning and Compensation Act was enacted. This requires development plans to include policies for the conservation of the natural beauty and amenity of the land and for the improvement of the physical environment. However, legislation is not the only tool which the government can use to influence the planning system and development on the ground.

Regulations

The Town and Country Planning (Development Plan) Regulations 1991 expressly require local authorities to take account of environmental considerations when preparing their development plans.

Environmental Impact Assessment of Projects

Many councils have been striving for a more environmentally sensitive approach to the developments that they consider. Their powers were significantly re-inforced by a

Directive of the European Community (EC) on "the assessment of the effects of certain public and private projects on the environment" which was adopted in 1985 (85/337/EEC). In order to implement the Directive, the British Government has made a series of statutory instruments, the most relevant of which is the Town and Country Planning (Assessment of Environment Effects) Regulations 1988-92. The legislative basis has now been incorporated into the Planning and Compensation Act 1991. This will allow the regulations to be extended to include projects not included in the original EC Directive. DoE Circular 15/88 explains the Regulations and the publications "Environmental Assessment, a Guide to the procedures" and the Essex Planning Officers' Association publication "The Essex Guide to Environmental Assessment" enables both developers and planners to implement the regulations.

In essence, Environmental Impact Assessment (EIA) is a process by which information about the likely environmental effects of certain major projects is collected, assessed and taken into account, both by the applicant, as part of his project design, and by the decision making body in deciding whether permission should be granted. The analysis of the environmental information enables an assessment to be made of possible effects of the project on the environment and provides the scope for modifying or mitigating these effects during project design. EIA has previously been carried out for projects such as power stations, industrial installations and housing developments. However, the consideration of environmental impacts of policies, plans and programmes commonly known as Strategic Environmental Appraisal (SEA), is currently receiving increased interest. Within planning it is especially relevant to development plans and the policies and programmes they contain.

Development Plans

Development plans lie at the heart of our planning system and planning decisions are to be taken in accordance with those plans unless material considerations indicate

otherwise. These material considerations include central Government's national and regional guidance and material representations from interested parties.

The strengthening of the plan-led system together with the requirement that local planning authorities should take account of the environment in its widest sense when preparing their development plans, has potentially enormous benefits for the environment. It means for example, that the quantity of development should be only that envisaged in the plan and take place in intended locations. Any critical aspects of the environment can be protected from adverse development.

Recent PPGs have emphasised the Government's commitment to sustainable development and the role of the development plans in helping to achieve it. Paragraph 3 of PPG1 states:

"The planning system and the preparation of development plans in particular can contribute to the objectives in ensuring that development and growth are sustainable. The sum total of decisions in the planning field as elsewhere should not deny future generations, the best of today's environment." (DoE 1992a)

The Government has made clear in PPG12 Development Plans and Regional Planning Guidance, its intention to work towards ensuring that development and growth are sustainable. Paragraph 1.8 of PPG12 states that:

"Plans must make adequate provision for development (the new homes and workplaces the nation needs) and at the same time take into account of the need to protect the natural and built environment." (DoE 1992c)

Chapter 6 of PPG12 entitled Plans and the Environment emphasises how local planning authorities have a key role to play in helping to achieve the vision for Britain and the environment in the 1990s as set out in the UK Government's Environmental White Paper This Common Inheritance (DoE, 1990). One major responsibility is to

ensure that development plans are drawn up in such a way as to take environmental considerations comprehensively and consistently into account. In this way, environmental improvement can be plan led, and individual development decisions taken against an overall strategic framework that reflects environmental priorities.

It emphasises the broadening purview of the planning system to embrace wider environmental concerns than those in traditional planning. Plan preparation should take account of the environment in the widest sense. Planners are already familiar with the "traditional" issues of green belt, landscape quality and nature conservation. Further dimensions are being brought into the realms of planning, for example, pollution control and energy efficiency. The challenge now is to ensure that newer environmental concerns such as global warming and consumption of resources are also reflected in the analysis of policies that forms part of the plan preparation.

Environmental Appraisal of Development Plans

Development plans have a key role to play in achieving sustainable development. The environmental appraisal of such plans is an essential tool to help this. PPG12, paragraph 5.52 sets out the concept and the scope of an environmental appraisal:

"Most policies and proposals in all types of plan will have environmental implications, which should be appraised as part of the plan preparation process. Such an environmental appraisal is the process of identifying, quantifying, weighing up and reporting on the environmental and other costs and benefits of the measures which are being proposed. All the implications of the options should be analysed, including financial, social and environmental effects. A systematic appraisal ensures that the objectives of a policy are clearly laid out ,and the trade offs between options identified and assessed. Those who later interpret, implement and build on the policy will then have a clear record showing how the decision was made; in the case of development plans this should be set out in the explanatory memorandum or reasoned justification." (DOE 1992c)

The good practice guide aims to enable every plan making authority to undertake environmental appraisal and to do so in a way which enables the preparation of good

development plans. Such appraisal must fit with the programme for statutory plans and be compatible with the process of public consultation. The proposed appraisal process is intended to be adaptable to every level of plan, and to the level of skills an authority either has within its plan making team or can realistically call upon.

There are three key tasks which an effective environmental assessment should address. First it must characterise the environment, looking at key assets, threats and opportunities in order to provide a baseline and context for considering the environmental effects of policies. Secondly, it must ensure that the scope of the plan covers the appropriate range of environmental concerns in order to secure consideration of appropriate policy and or proposal options to prevent omissions. Finally, it must appraise policies and proposals to establish their environmental effects; this is an iterative task which involves refinement, improvement and if appropriate, development of policy - proposal options which strive to remove inherent conflict within the plan; it will take place at several stages of plan making.

In practice, appraisal also performs a number of other functions each of which has advantages. The most important of these include the process and output of appraisal which contributes to an appropriate base for plan monitoring; this monitoring is a normal part of local authority work and its environmental aspects are vital to effective appraisal. The environmental appraisal is a developmental and learning process which raises environmental awareness and knowledge within the plan making team and the planning department, in turn this will contribute to improved policy making. Environmental appraisal is a means for introducing best environmental practice into plan making, for example with respect to developing land use - transportation strategies which minimise the number and length of journeys or selecting housing sites with opportunities for passive solar heat gain and minimal heat loss.

In combination, these tasks and functions enhance the environmental content and role of the plan. Appraisal provides the means for taking account of a wider range of environmental matters across all the work of the plan.

Development Plans A Good Practice Guide

This DOE document addresses the role of planning in achieving sustainable development. The potential role of land-use planning in influencing the use of scarce resources is only slowly being appreciated. It goes on to state:

"The concept of sustainable development is based on the principle of stewardship and responsibility in the use and management of resources and achieving a balance between economic growth and technological development and environmental considerations...Thus in meeting current needs what is valued most about the built and natural environment should be protected, and today's well being should not deny future generations the best of today's environment and being particularly aware of the impacts of developments on the environment which may be irreversible or very difficult to undo. Translated into the preparation of development plans, these issues need to be reflected in policies and proposals which overall make adequate provision for development and at the same time take account of the need to protect the natural and built environment" (DoE, 1992f).

State of the Environment Reports

In order to ensure that the planning system is taking account of the environment in plan preparation it is necessary to gather knowledge of their geographical area. At present, this is being carried out by writing State of the Environment reports for the area under the planning authority's jurisdiction, see for example The Essex Environment report, published in May 1992. (Essex County Council 1992) The purpose of this report was to describe and explain the current environmental conditions in the county. Twelve topics were chosen as those which cover the most important environmental issues in Essex. Where possible, information on Essex is compared with recognised standards or indicators and with previous years to determine whether conditions are improving or deteriorating. By bringing information on one topic, for example water, together from all the relevant organisations, (e.g. the

water companies, the National Rivers Authorities, OFWAT, conservation bodies and planning authorities), an evaluation can be made of any pressures being imposed on the environment.

This could be interpreted as an attempt to determine critical environmental capital and constant natural assets. The main issues and problems facing the county are identified so that action can be taken. It is hoped that the report will prove useful in several areas of planning including environmental impact assessment, planning inquiries and providing a base for environmental information when drawing up new policies in structure and local plans.

Although state of the environment reports are not required by law, Part II of the 1990 Town and Country Planning Act empowers local Planning Authorities to institute surveys of their area to examine environmental matters and requires them to keep them under review. Such matters include the principal physical and economic characters of the area and demographic information. This allows the planning authority to analyse the stresses which the population is imposing on the environment.

Conclusions

The principles and methods to measure sustainable development have been examined by several authors and it is clear that land use planning must have a major role to play in its implementation if it is to be successful. When discussing the levels of sustainable development, it would be ideal to advocate the "strong version" which sets limits to which man's activities can impact on the environment. Any development which poses a threat beyond these "limits" or to designated protected sites or environmental factors would not be permitted.

In reality all development impacts on the environmental to some degree. However, it is apparent that the present planning system is a system devised to protect the

environment primarily in terms of green space and picturesque landscapes with only limited attention being placed on polluting land uses or resource depletion. It is encouraging to read that there is some commitment to sustainable development and that the planning system is addressing its responsibilities towards sustainable development at all levels. The government has produced legislation, regulations and guidance on its principles and implementation within development plans and development control. County and district councils are compiling state of the environment reports to monitor environmental quality in their area and environmental strategies and charters in line with Local Agenda 21.

At the moment, the planning system allows protection of the environment to a certain degree with trade-offs being made with economic and social implications of a development to gain the greatest benefit for the community. In conclusion however, although much has been written concerning the principles of sustainable development, signs of actual implementation are much rarer.

Chapter 3: The Water Environment

Introduction to the Water Environment

The purpose of this chapter is to ensure that the reader has a full understanding of the terms used in water resource management and to examine the sustainability criteria for the water environment, which the planning system must respect and work within when striving towards sustainable development.

About 97% of water in the world is saline water in the seas and oceans. Of the remaining fresh water considerably more than one half is locked up in the ice sheets and glaciers and another substantial volume occurs as deep groundwater. The really mobile fresh water which contributes frequently and actively to rainfall, evaporation and stream flow thus represents only about 0.3% of the global total.

The Hydrological Cycle

The interdependence and continuous movement of all forms of water provide the basis for the concept of the hydrological cycle. Figure 3.1 outlines the hydrological cycle and integrates it with the treatment and delivery of water to the consumer. The heat of the sun makes the water in the seas, rivers and lakes evaporate. It then rises into the atmosphere in the form of invisible water vapour. As it rises it cools to the dew point and forms a cloud. When the cloud meets a cold patch of air, the water vapour condenses into water droplets and falls as rain, hail or snow.

The precipitation that reaches the ground surface may then follow one of several courses. First, it may flow into streams or rivers which eventually reach the sea. These rivers sometimes also flow into natural lakes or man made impounding reservoirs.

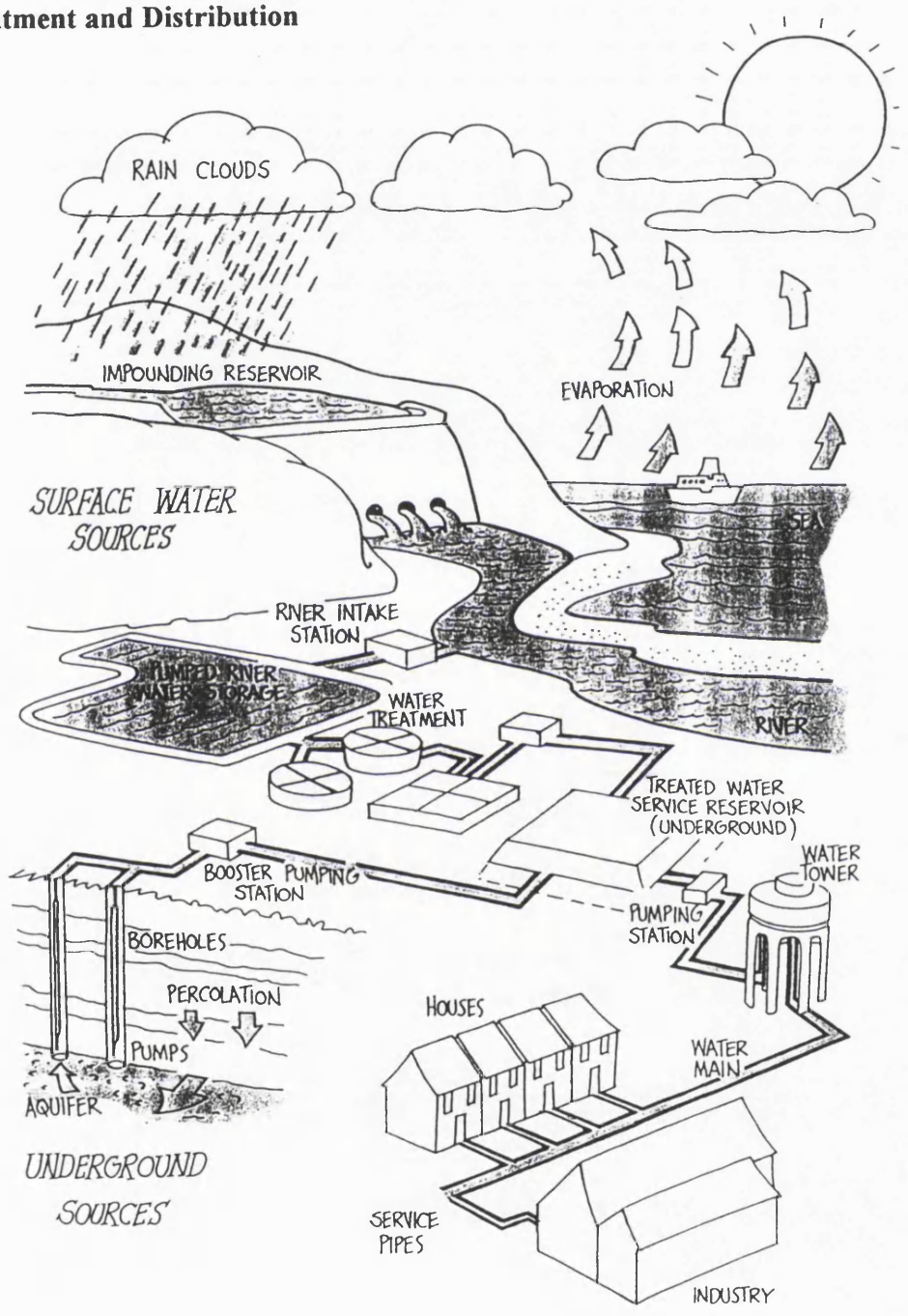
This water may move either by evaporation back into the atmosphere, or by seepage towards the groundwater, or by further surface flow into the oceans. Alternatively,

precipitation may infiltrate through the ground surface to join existing soil moisture. This may be removed either by evaporation from the soil and vegetation cover, or by through-flow towards stream channels, or by downwards percolation to the underlying groundwater. It may be held for weeks or months or even longer. The groundwater will eventually be removed either by upward capillary movement to the soil surface or to the root zone of the vegetation cover where it will be returned by evaporation to the atmosphere or by groundwater seepage and flow into surface streams and into the oceans.

Inevitably, there are simplifications and generalisations in the concept of the hydrological cycle and therefore it should be treated with caution. The implication of a smooth uninterrupted sequential movement of water is belied by both the complexity of natural events and the interference of man's activities. The cycle is short circuited when for example water falling as rain to the ground is immediately returned to the atmosphere by evaporation without being involved in stream flow, soil moisture, groundwater movement or the oceans. This is very important in areas of low rainfall as it explains the shortage of water. The amount of water which actually reaches the ground is therefore termed effective rainfall.

In the main, human interference takes the form of removal or diversion of water from its natural path to stores for distribution to human activities (domestic, agricultural and industrial uses). Water for mains supply comes from two sources: surface and underground.

Figure 3.1
The Water Cycle, and Water Collection, Treatment and Distribution



Source: Tendring Hundred Water Company, 1992

Surface sources include rivers, lakes and reservoirs which are fed by rainfall. Water is collected in impounding reservoirs created by building dams. There are also river intake stations where water is pumped from a river into a storage reservoir ready for treatment. Surface water then undergoes several treatment processes to make it pure enough to drink. This is sometimes referred to as the potable standard. It is then stored in a treatment water service reservoir. From here it is pumped into a water tower from where it enters the mains supply for domestic and industrial users.

Some of the rainwater soaks into the ground until it reaches impervious rock or clay through which it cannot pass and so is stored as underground sources. It may then travel horizontally through porous rock known as an aquifer. A borehole can then be sunk down into the aquifer and the water abstracted. From the booster pumping station the water goes into a treated water service reservoir, having been given the necessary purification treatment. The water is then ready to enter the water tower for distribution through the mains (see figure 3.1).

The Water Environment in Essex

Within Essex there are many flowing waters ranging from small brooks to large lowland rivers and their estuaries. They vary considerably in volume, quality and biological value. All the rivers rise within the county except the Cam which rises in North West Essex and flows across the border.

Essex has no natural lakes so its areas of standing water are either reservoirs which have been created over the last 100 years, ponds or former gravel extraction sites. These man made reservoirs store winter water for summer use. A network of boreholes, pumps, pipelines, tunnels and river channels gets the water to where it is needed. This network provides the water which the water companies, after treatment supply to homes and factories. Many factories and farmers also abstract water directly from rivers and from boreholes.

The other dimension to water resource management is that the rivers, wetlands and estuarine ecosystems depend on the same water sources as we do. It would be all too easy to dry them up in the search to meet our own needs cheaply. However, this would not be in the spirit of sustainable development and as guardians of the water environment, the NRA has vowed not to let this happen (NRA, Anglian Region, 1993).

The environment in Essex (and indeed virtually all of the Country) is not natural. If it was, it would be largely forest, immensely rich in marsh and wetlands but relatively poor in river flows because the natural forest would evaporate most of the rainfall. However, as most of the forests have been felled and the land drained and ploughed, there are relatively few natural wetlands, which we regard as precious assets; with artificial wetlands such as the Broads (which are old peat diggings) and gravel pits (the modern day equivalents).

Rivers in Essex support fisheries and navigation. They are prime sources of amenity and recreation and havens for wildlife. Many of them have been straightened, channelled, dredged and embanked. By abstracting water the flows of some rivers are reduced, but returning effluents increase others. (This thesis concentrates on the effects of removal of water and it is not the intention to consider sewage systems which could comprise a whole thesis in itself.) By drawing up their Water Resources Development Strategy; the NRA is providing a mainframe for working towards sustaining river flows. (NRA 1992) However, it will be through successful co-ordination and co-operation between all the agents in water resources planning and by ensuring they all understand how their work effects the water environment that a truly sustainable water management system can be provided.

In order to strive towards sustainable water resource management, it is first necessary to establish sustainability criteria for the water environment. As this thesis aims to take

a holistic view of the problems, issues and solutions, environmental, economic and social criteria are all examined below.

Environmental Sustainability

The main issue in environmental sustainability of water resources is that there is a need to reserve a proportion of effective rainfall in situ for natural water flows and ecosystems. In environmental terms this includes the protection of habitats and water dependent flora and fauna, the dilution, biodegradation and removal of pollutants, the maintenance of the amenity and recreational values of watercourses, the aesthetic value of water in the landscape and the prevention of saline intrusion into groundwater. In some regions, especially the South East of England, even in normal weather conditions, the rate of abstraction can exceed the natural supply of water for replacement. This results in lower than normal river flows and groundwater levels. In drought conditions such as those experienced between 1988 and 1992, these problems are exacerbated.

There are several ecological consequences of removing more water from the environment than is being supplied through natural replacement. Basically, drought conditions are imposed on the environment. In extreme cases, complete drying out of rivers has occurred. The problem of reduced flows has now reached such regularity that the NRA has undertaken a comprehensive survey of river flows in order to identify potential problems (NRA 1993a).

If environmental sustainability was taken to its most radical conclusion, we would be striving for zero impacts on the natural environment. However, in reality this could never be reached as there will always be a need to abstract water for human consumption. One of the most important roles of the water resource manager is to reconcile the conflicts between demand and supply so as to minimise environmental degradation. This will necessitate him having a full knowledge of the water

environment and the issues which affect demand, including those of land use planning. Appropriate management is required to ensure that any provision of additional water supplies is made consistent with maintaining the services and quality of the water environment over time.

This seemingly straightforward requirement raises key questions about the scale over which and the degree to which management should be applied and sustainability aimed towards. Does it, for example mean that all rivers and all water habitats in the whole country should be equally maintained as environmental resources, or is it permissible to allow some specific water bodies to be degraded as long as similar habitats are available or enhanced elsewhere? Is it necessary to ensure that all rivers can provide aesthetic and recreational services or can a sustainable development strategy allow stream specialisation where some watercourses effectively become pollution dilution and transfer systems while others are kept at high standards of purity?

It is not easy to answer such questions. It is, in essence a decision of whether to follow a strong or a weak sustainability pathway. In an ideal world, a strong pathway would always be favoured as environmental degradation is undesirable, but the real world imposes trade-offs and compromises. To some environmentalists any measures which deny the rights of life of non human species are suspect. Others would argue that only human preferences are relevant, in which case we need to develop methods of valuing individual environmental goods and services as one way of ensuring that maximum use value is derived from water and the water environment. Others have more personal concerns and desires, e.g. to protect specific local water or landscape features.

The costs involved in failing to provide enough raw water to meet abstractor needs are evident and can be roughly quantified but it is much more difficult to value the resulting environmental damage. In recent years efforts have been made to improve the methods available to estimate environmental values and damage costs. It is also true to

say these methods are still crude and the values obtained are heavily dependent on the method employed. The whole concept of environmental valuation is subjective and some would say political as political decisions will be paramount in deciding which environmental quality objectives are desirable and what acceptable environmental losses can be borne.

One of the methods advocated as a practical solution to determining the level of acceptable abstraction from water courses is that of establishing minimum acceptable flows (NRA 1993a). This basically entails setting limits in the level of water which is needed to be left in the water course to be adequate for ecological needs and for pollution dilution. This concept however, is not without problems. Priorities have to be set as to how adjustable they should be in extreme drought years and if economic or social sustainability should be given greater priority over environmental needs.

Economic Sustainability

When an economic definition of sustainable development is considered, the emphasis shifts towards the efficient long term use of water resources. Economic efficiency involves two interrelated elements:

Firstly, the allocation of available water resources between competing users and uses in a way which maximises the total welfare derived from the resource. Competing uses not only include households, industry and agriculture but also the so-called in situ uses such as wildlife, aesthetics and amenity protection, waste disposal, water based recreation and navigation.

Secondly, supply enhancement schemes should incur the least costs possible. In sustainability terms, these include economic, environmental and social costs. Potential benefits (again in economic, environmental and social terms) should always outweigh the costs if the scheme is to be justified.

At present, abstraction charges imposed by the NRA on water companies removing water from the natural environment only cover the costs of administration. This system of charging has been criticised for failing to meet economic sustainability. True costs of abstraction should reflect environmental costs imposed on the water environment.

There is also much discussion on the appropriate and fair way of charging the consumer for water. About 66% of water delivered to households is undeterred (DoE, 1992g). Payment is made on a flat rate basis regardless of the quantity used. Therefore, there is no incentive to reduce use or leakage or indeed change appliances to more efficient models (for example washing machines and dishwashers). It is concluded that by not using meters, the demand for water is kept at unnaturally high levels. This in turn allows water companies to justify new supplies which need to be paid for. New supplies may be developed which, by reducing demand through economic incentives or education, may be unnecessary. In addition, there is no means for the consumer to express his unwillingness to pay (although inability to pay may lead to unpaid bills and supply being cut off).

All water supplied by water companies to industry and households is at present treated to the standards set in the EC Directive 75/440/EEC for drinking water quality. In many cases, the end use of this water is not drinking and so water is being treated unnecessarily. This is wasteful financially as treatment is costly and environmentally since many resources are needed to treat water to drinking quality standards, including those of energy.

Social Sustainability

Measures which ensure the long term sustainability of the water environment or maximise the total value in use of water will not necessarily also ensure that all consumers are able to take enough water to satisfy their basic needs and maintain their

livelihoods. Low income households, for example may lack the ability to pay for sufficient water to maintain an acceptable quality of life.

Farmers could be forced out of irrigation if they are unable to compete with industry or the water companies for supplies. Sustainable development when defined in terms of social equity, human needs and the protection of distinct local communities, might require a rather different set of management strategies to be implemented.

Conventional supply of water is only one component of the water bill a household receives. A large proportion of the total amount and the reason for past rises are the result of several factors. These include the need to renovate and renew the supply and waste water disposal infrastructure, improve the quality of drinking water and to meet requirements of EC Directives such as the Bathing Water Directive and the Urban Waste Water Treatment Directive. All water charges have risen substantially over the last ten years. This has resulted in payment problems for many households: 24,000 households were disconnected for non payment in 1991-2. In very low income households, the water bill can take up to ten per cent of the total income (OFWAT, 1990).

Therefore, a social sustainability criterion should be the provision of a basic affordable water service to all households including the lowest income groups. The current unmetered pricing system does not seem to fit into this criteria since people are forced to pay for increased quantities and qualities of service whether they want them or not, in order to obtain any supply at all. Metering is being advocated as the answer to this problem as it gives households some choice over paying only for the quantity of water used and therefore should allow a reduction in bills. There have been several studies into metering which are discussed in chapter 5 since it is debatable whether they are actually meeting social sustainability criteria.

OFWAT have set three social sustainability criteria for water companies to meet. Firstly, the need for a hosepipe ban should not occur more that once every ten years. Secondly, voluntary water savings should not be advocated more than once every twenty years. Thirdly, it should not be necessary to implement rota cuts or standpipes more than once in every hundred years.

The final aspect of social sustainability concerns community development and employment generation. At present, established licences are given priority over new licences (which may be for more sustainable uses) may be denied. Although levels have to be set as to the total amount of water available for abstraction on environmental terms, it is conceivable that local economic development opportunities may be lost and that other resources (e.g. labour) are under-employed as a result.

Conclusions

It is imperative to understand that sustainable development is a combination of environmental, economic and social criteria, although the planning system will have the most influence over protecting the environmental sustainability criteria. With so many different elements involved in the sustainability of water resources, it seems evident that there is no single development pathway and no set package of management strategies which will satisfy all possible sustainability objectives. Water resources policy will inevitably involve trade-offs. What is important is that a full range of water management options are thoroughly assessed. Both water resource managers and land use planners must establish the priorities for the area under their jurisdiction. Only then can an appropriate strategy be developed.

The following chapter will outline the various roles and responsibilities of all the organisations involved in water resource management. With so many bodies involved, it is clear that a key determinant to the successful implementation of a strategy is adequate co-operation and consultation between these bodies.

Chapter 4: Who Cares? The Roles and Responsibilities of Organisations Involved in the Struggle for Sustainable Use of Water Resources

Introduction

The government, the National Rivers Authority (NRA), water companies and local authorities all have a part to play in bringing about a more efficient and sustainable use of water, as do industries and individual citizens. This chapter describes the relevant roles and responsibilities of each organisation and locates each in the overall framework of the water management industry. It also hopes to pose a question - whether the present formal structure is adequate and workable or whether achieving a sustainable approach to water resource use requires some modifications of present responsibilities and a more co-ordinated framework of the various organisations.

Planning and the Water Sector, The Institutional Framework and Responsibilities

In order to develop an understanding of the present complex institutional framework of the water sector and its interaction with land use planning, it is necessary to appreciate three aspects of their evolution since 1945:

Firstly, the loss of local government control over the water services. Local authorities have seen a gradual erosion since 1945 of their sewerage and water supply function, most notably with the 1972 reorganisation, which led to the regionalisation and rationalisation of the water sector.

Up until the reorganisation of 1972, the responsibilities for water supply, sewage and sewage treatment disposal were with the Local Authorities due to the perceived importance of these in relation to land use planning. Under the 1973 Water Act, the local authorities lost all responsibility for water and sewage to the new Regional Water Authorities (RWAs). The creation of the new RWAs was a "missed opportunity" since

the boundary changes were not along the same lines as the Local Authorities. The water catchment systems and regional planning scale in England are small enough to enable a useful level of contact with local land use planning authorities. Therefore the possibilities of an integrated approach to the management of water resources and the related environment were reduced.

The 1983 Water Act reorganised the Regional Water Authorities more along business lines, with the Government appointing regional managers in preparation for privatisation. The public, press and local authorities were excluded from regional meetings and instead Consumer Services Committees (CSCs) were set up in each region, to represent consumer views to each water authority. This finally finished the process of separating the Local Authority's functions of and influence over the water and sewage sectors. The coherence of planning authorities, RWAs, developers and other organisations now depends on their relationships and thus co-ordination and co-operation are imperative.

Secondly, there has been an increase in planning powers which affect the water services. Since 1945, there has been an increase in development plan and other statutory designations which directly or indirectly affect the water sector. Most notably, new regulations such as environmental assessment (Town and Country Planning (Assessment of Environmental Effects) Regulations, 1988), have meant that large scale water sector schemes such as sewerage treatment, incineration, reservoirs and land drainage have come under ever increasing remit of local authorities development control and plan powers. Now, an assessment of the environmental impacts of any large development (for example a large housing estate) is undertaken which includes a section on water resources.

The concept of strategic plans was established by the 1968 Town and Country Planning Act which stated that detailed local plans would be elaborated, and

development control administered. With the reorganisation of local government in 1972, the functions and effectiveness of the structure and local plans were split between two tiers of local authorities.

However, problems in co-ordination occurred as attempts to advance the role of the structure plan as an overall "corporate plan" failed. This seems to be a result of the different planning time scales for different public sector activities such as the regional water authorities and the uncertainty of long term investment plans. In addition, it is argued that RWAs were more concerned about controlling water charges in a time of cut backs and high inflation and so seemed to decide policy more closely in line with national economic policy than with the plans of constituent Local Planning Authorities (LPAs) or the needs of the community (Slater, 1993).

Under the 1973 and subsequent 1983 Water Acts, each Regional Water Authority must have regard to structure and local plans. However, through their programme of investment, the RWAs were often in conflict with the local authority and could prevent or direct development in areas not initially allocated in the plans. The Greater Manchester Council, before its abolition felt that a creeping conurbation had risen in the eastern area of Wigan as result of a major drainage scheme by North West Water (Slater, 1993).

Thirdly, the water services were privatised. The publicised aims of this exercise were to increase efficiency and improve river water quality but it is generally agreed that there was also a hidden agenda of shifting the huge expenditure needed to upgrade the backlog of investment and to meet tougher EC standards from the public to the private sector. Privatisation raised £3.9 billion for the Chancellor of the Exchequer but was counteracted by renouncing £4.4 debts and bestowing a "green dowry" of £1 billion cash injection just prior to privatisation.

Public pressure and concern for environmental protection at the time of privatisation led to a comprehensive, complex system of legislation and regulation. At the time, the NRA was given great significance and heralded as the strongest environmental protection agency in Europe.

The new structure seen in Figure 4.1 shows that the ten water and sewage companies have the same boundaries as the NRA with 29 water-only companies. The only changes since 1989 are that as from the first of April, 1993, Northumbria and Yorkshire NRA regions and Wessex and South West NRA regions have merged. Several water companies have also merged.

Organisations and their Roles and Responsibilities

Figure 4.2 shows the major actors in the water sector and their inter relationship with the land use planning system. The roles and responsibilities of the main agencies are explored below.

Department of the Environment

The first and most influential role of the Department of the Environment (DoE) is the power to introduce and enforce legislation and policy drawn up in the department. Such legislation includes the Water Act 1990 and the Water Resources Act, 1991. The second role is that of overall supervisor of the National Rivers Authority and the local planning authorities and president of OFWAT (through which objectives in water resource management are set and implemented). The first stated objective in water resources management is environmental protection which is achieved to a general extent by directing the activities of the NRA and local planning authorities.

Figure 4.1 The Boundaries of the Water Sector Since 1989

National Rivers Authorities

Water/Sewage Companies

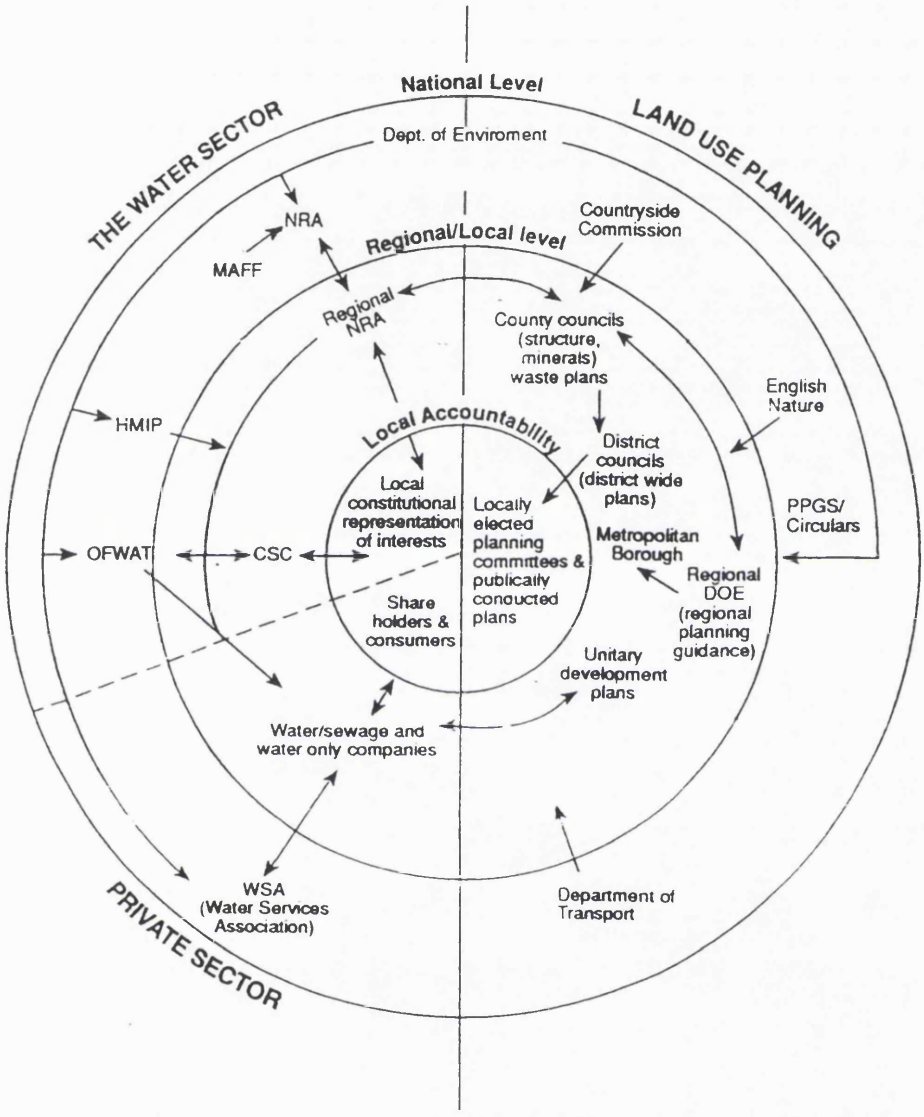
Water Only Companies

1. Newcastle and Gateshead
2. Sunderland and South Shields
3. Hartlepool
4. York
5. East Anglian
6. Cambridge
7. Tendring Hundred
8. Essex
9. Lee Valley
10. Colne Valley
11. Rickmansworth
12. Mid Southern
13. East Surrey
14. North Surrey
15. Sutton
16. Mid Kent
17. West Kent
18. Folkestone
19. Eastbourne
20. Mid-Sussex
21. Portsmouth
22. Bournemouth
23. West Hampshire
24. Cholderton
25. Bristol
26. East Worcestershire
27. South Staffordshire
28. Wrexham and E. Denbighshire
29. Chester

Note:
Lee Valley, Colne Valley and Rickmansworth Water Companies have now combined to become Three Valleys Water Company

Source: NRA Various

Figure 4.2 Links Between the Water Sector and Land Use Planning



Source: Slater et al, 1993

Secondly, the Secretary of State controls the NRA capital expenditure and ensures that it is spent wisely and in the most appropriate way to meet the objectives of both the environmental and human demands placed on the water environment. Occasionally, an application for abstracting water is refused by the NRA, or they see fit to place a condition on the licence, and as the director of the authority, the Secretary of State for the Environment has to adjudicate on any consequent appeals.

In striving for sustainability of the water environment, the Secretary of State has the power to decide if and when statutory minimum acceptable stream flows will be established and can introduce statutory river quality objectives and standards and designate water protection zones.

The Secretary of State has many concerns, but they tend to influence each other. By drawing up Building Regulations and Water Byelaws, the use of water in the home and by industry can be manipulated. Byelaws are employed to govern the use of water fittings and consumer durables, for example the maximum amount of water that can be used in a toilet flush or washing machines and dishwashers.

Finally, the DoE can act in an educative and informative role. The consultation paper "Using Water Wisely" was issued by the department in July 1992, the aim of which was to stimulate a wide debate on the objectives for and methods to implement sustainable water resource management. Unfortunately, to date, this document has not resulted in an action plan.

The Department of the Environment and the Secretary of State has great influence over land use planning in this country which was discussed in chapter 2.

OFWAT (Office of the Director General of Water Services)

The last function of the Secretary of State in relation to water resource management is to appoint the Director General of water services. OFWAT is the organisation furthest removed from land use planning but has a significant influence over water resource use.

Since the loss of the Government's control over the water companies through privatisation, there is a need to ensure the public is served in the most economical and efficient manner. Ten Consumer Services Committees (CSCs) represent the views of consumers in each water authority and the Water Industries Act of 1991 places a requirement on the Director to ensure the efficient and economical running of the businesses. At present, the Director has no specific duty to insist that water conservation or new technology is employed to help meet these objectives. However, in the light of a president being set by the gas and electric regulators to promote energy efficiency, this is being reviewed.

In terms of economic sustainability, the Director is empowered to regulate the water companies pricing methods. Several water companies are initiating large investment programmes to increase efficiency. The role of the Director is twofold. Firstly, he is responsible for ensuring that the programme is actually necessary. He assesses the efficiency with which existing supplies are utilised (including leakage control) and the need for capacity enhancement schemes. Secondly, he ensures that water prices are not set at unacceptably high levels in order to pass on the bill (for example investment programmes) to the consumer. Similarly, the profits made from land sales is monitored. Since the abolition of water rates, there has been ongoing discussions as to the most appropriate way of charging for water. OFWAT has clearly stated that metering and unit pricing is the preferred option.

Finally, the Director evaluates any policies his office proposes in relation to environmental sustainability criteria. He aims to *"further the conservation and enhancement of natural beauty and the conservation of flora, fauna and geological or physiographical features of special interest"* in line with section 3 of the 1991 Water Industries Act.

National Rivers Authority

Just as OFWAT is official watchdog of water companies in terms of efficiency and economy, the NRA was set up in 1989 as "the guardian of water environment". It is a non governmental public body but members of the NRA are appointed by Ministers from the DoE, MAFF and the Welsh Office. The Authority is answerable to Parliament as it has to abide to legislation, policy and guidance from the Secretary of State for the Environment. The NRA aims to be self financing and gains funds from County Council for flood defence programmes and charges for various water uses. A Treasury Grant is available to ensure the Authority has sufficient funds to operate effectively in the interests of the public and the environment.

In their national Water Resource Strategy, the NRA's mission is stated as to:

"protect and improve the water environment by the effective management of water resources and by substantial reductions in pollution...In discharging our duties we will operate openly and balance the interests of all who benefit from and use rivers, ground waters, estuaries and coastal waters...".

The document goes on to list the aims of the Authority, including to *"Manage water resources to achieve the right balance between the needs of the environment and those of the abstractors." (NRA Anglian Region 1993)*

The primary mechanism for ensuring the proper use of water resources is via the NRA's role as the licensing authority for water abstraction. All significant abstractions from surface waters and ground waters require authorisation from the NRA. A licence which specifies the location of abstraction, the maximum quantity and rate of

abstraction and the time period over which the water can be taken will be granted only if the NRA considers that the environment can tolerate removal of water. Thus the NRA aims to ensure only appropriate schemes are licensed.

Problems however are encountered because there is considerable protection for established abstractors. Anyone abstracting water before 1963 did not need a licence but when the licensing laws came into force, these people were able to obtain a permanent licence which can now be passed onto the new owner of the land or property to which the licence relates. These licences may be for unsustainable uses but the NRA has inherited this legacy and has to work around the problem. The problem is exacerbated to the extent that new licences can only be issued if they do not affect existing licence holders.

The NRA does have the power to vary or revoke any existing licence. However, compensation is payable at levels so high that it is a deterrent to the NRA. In addition, the NRA is obligated to meet the requirements of the water companies. These factors determine the extent to which the NRA can commit to sustainability, although it would be preferable to aim for strong sustainability (as defined in chapter 2) but the existing legislation restricts them to the weak version involving trade-offs and compromise.

The licensing system should however be used to strive towards sustainable development and use of the environment. Since 1968, all major abstractors have had to pay charges based on the total quantity they are licensed to abstract (not the amount actually abstracted). Fiscal measures are known to be effective in reducing unnecessary consumption but historically, these charges have been so low that they offer little deterrent. Industry abstracting directly from an aquifer pays 3% of the price of piped water from a water company. Even taking into account that the industry, if necessary for the processes involved, have to pay for the purification of the water, it is widely recognised, even by the DoE, that these charges *"do not bear any relation to the full costs imposed by particular abstractions including the costs imposed on the environment" (DoE, 1992g).*

The water companies own the supply reservoirs and all groundwater source works for removing water and delivering it to homes and industry. As the guardian of the water environment, the NRA is responsible for the effects of abstraction on the river systems further downstream. Therefore they guide and direct the actions of the water companies to ensure regular flows from the reservoirs. These are needed to ensure the rivers are able to support any abstractions licensed by the NRA, as well as retaining enough water to maintain recreational, environmental and amenity values. Many will also have special arrangements for dealing with crisis such as pollution incidents or droughts.

It is not practical to rely on the "good will" of the companies and so, in 1989 when the NRA was formed and the water companies privatised, the NRA drew up water resource management agreements with the water companies involved. The terms of these agreements can be renegiotiated to improve resource deployment. However, the NRA is under obligation to *"have regard to the statutory duties of the water companies"* (to meet demands for water). This may result in conflicts of interest. Environmental protection objectives which may be the reason for altering water flows, are inevitably compromised by the need to ensure that the companies provide adequate quantities of water to the consumer. The NRA has no power to object to water company demands for additional resources and has no influence over the consumer to use water more wisely.

Water/Sewage Companies

As their name suggest, these companies are responsible for water and sewage provision in their areas. The have the same boundaries as the NRA regions set out in 1989 and consequently there are ten such companies. The are regulated under the 1991 Water Industry Act and are monitored by OFWAT. The same Act compels them to make *"supplies available to persons demanding them"* (section 37) and to ensure an adequate and operational sewerage system is available. Although the water-sewage

companies have responsibilities for the treatment and disposal of sewerage, local authorities and water-only companies can act as their agents.

Water Companies

Since 1989, there have been several mergers of the water only companies and at present there are 22, serving about 25% of the population. They are private companies left over from the process of consolidation and regionalisation described earlier. The primary statutory duties of water companies relate to the supply of water.

Both types of water company, but especially the former RWAs have undergone internal restructuring and diversification into areas such as environmental services and property privatisation. They are private sector companies answerable to their shareholders and the turnover and profits of the regular business comes from supplying water.

Co-ordination within the Water Sector

The creation of a multitude of regulatory bodies since privatisation has made an already complex relationship among the water sector agencies dramatically worse. It is complicated by various agencies and functions now having different responsibilities - the water supply companies are answerable to the public whereas the pollution control and water resources agencies are more answerable for environmental protection.

Local Planning Authorities and Their Co-ordination With the Water Sector

From the above text, it could be assumed that land use planning does not have a part to play in water resource management. Indeed it is true that in the past, planners have considered their role to be insignificant and so have tended to merely undertake any interactive work with the water agencies in relation to their strategic planning and development control functions in a purely passive manner.

The main interaction with the water sector is with the NRA and private water companies over development control decisions, the creation of development plans and policies. Both the NRA and water companies have limited general development powers within certain areas and functions relating to their duties, but all types of development impacts on the water environment directly or indirectly. The co-ordination and relationships of local authorities with the water sector is generally hampered by river catchment boundaries not coinciding with local development plans, lack of planning spent in liaison and a general lack of understanding in both the water and planning sectors of each others' roles.

The NRA is a statutory consultee of the planning process with regard to any issues that will affect its responsibilities. Its importance in the planning process has increased with new legislation and guidance and is highlighted in PPG12, paragraph 6.19:

"Particular attention should be paid to the protection of groundwater resources which are susceptible to a wide range of threats arising from land use policies...Changes in land use may also affect the availability of groundwater resources by restricting recharge or diverting flows." (DoE, 1992c)

Paragraph 6.20 expands on this, *"The provision of the necessary services (particularly water and sewerage) can have significant implications for local environments. Plans need to take into account the effects on the environment of the land needed for this provision (for example, for new enlarged reservoirs) and of the necessary operations (for example, for increased groundwater abstraction and sewerage discharges). Development may need to be phased to allow proper time to ensure that the provision of utilities can be managed in a way which is consistent with general policies for the environment." (DoE 1992c)*

Governmental Circulars also address these issues. Circular 30/92 outlines the NRA's importance in preventing development in flood areas and its new groundwater protection zones. This has been complemented by an increased realisation within the urban catchments of the NRA of the important link of land use planning and their responsibilities relating to water. In addition, Local Authorities have been given new

responsibilities, due to guidance such as PPG12, to incorporate issues such as sustainability in their policies.

The private water companies are only advisory consultees and Circular 17/91 encourages co-ordination between the water industry and planning. However, several authors on this topic, for example Patterson 1987 and Synnott 1986 have found *'continual conflict and a general lack of co-ordination'* within the water sector just prior to privatisation. However, privatisation has led to an increase of interest in the planning system by the water companies for several reasons:

- Development plans can be used to predict the location, scale and timing of new demands for water-sewage services and therefore investment can be targeted accordingly.

- Water companies can attempt to halt, delay or relocate new development so it will coincide with their investment plans or ease the strain on existing services with tight NRA consents. There is increasing evidence that the NRA now has more direct influence on water companies investment programmes than local authorities. (Slater et al, 1993)

- The sale of land for commercial development to raise revenue for the water companies and the promotion of new reservoirs, sewage treatment works and incinerators increasingly requires close co-operation with the planning system.

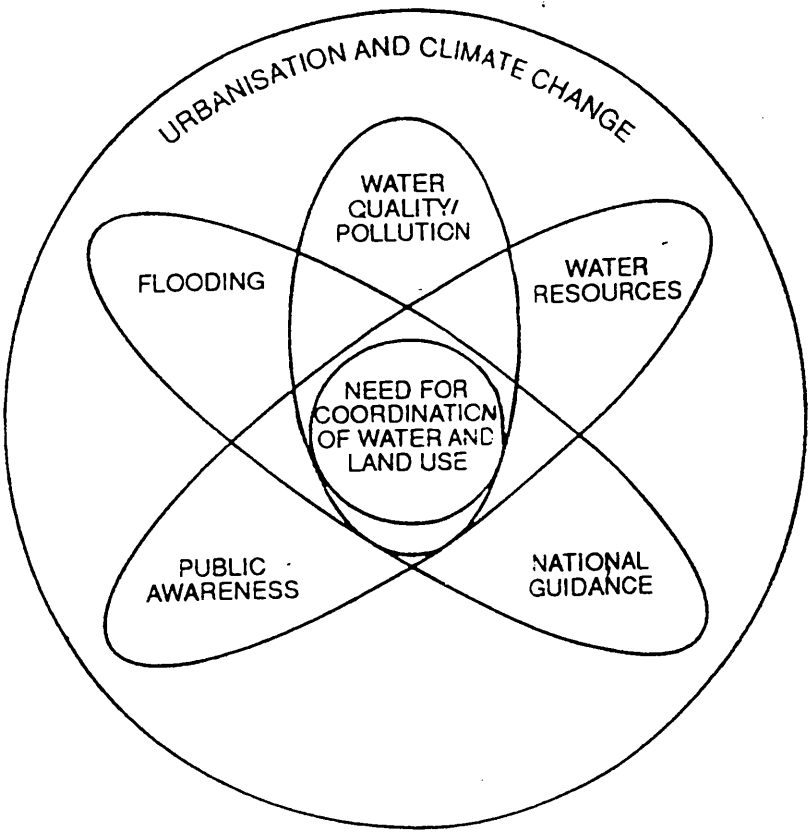
Conclusions

There are several differences in the operations of the various bodies involved in water resource management. The water-sewage role of the water sector is private while the regulatory role and landuse planning, which is also a regulator in a broad sense, is in public ownership. There is also a variation in the levels of operation of the various

bodies. At a national level, it is obvious that there is a considerable amount of conflicting interests between Government Departments, especially between DoE and MAFF in the NRA's functions. Most interaction between the NRA and other structures is at regional level while other regulators of the water industry interact between the national and regional levels. Finally, both the NRA and local authorities have a high degree of public input and accountability compared to the private water companies.

These different levels of operation, interaction and accountability have all led to an increasingly confused and uncoordinated water sector. Figure 4.3 show the issues which justify and necessitate water sector and land use planning co-ordination. Increased urbanisation and climate change could result in the increased occurrence of drought and flooding which all magnify existing concerns over flooding and water resources in various parts of the country. This underlines the necessity for co-ordinated planning. National guidance has taken many forms including new PPGs, circulars and consultation papers, all of which are mentioned in this thesis. The DoE consultation paper Using Water Wisely, is a good example of encouraging greater co-ordination although it lacks practical guidance in achieving better co-ordination and actual implementation.

Figure 4.3 Pressures for the Co-ordination of water and Land Use Planning



Source: Slater et al, 1993

Chapter 5: Sustainable Development Through Demand and Supply Management of Water Resources

Introduction

Sustainable development and use of water resources in the UK involves a multitude of agencies all having a sound understanding of the issues involved. The first section of this thesis has outlined the role of planning in terms of striving for sustainability, chapter 3 has defined the need to manage and plan in consideration of water resources and chapter 4 has examined the role of planning in the context of all the agencies involved in water resource management and planning.

This chapter aims to examine how demand and supply management of a natural resource - water - can contribute to sustainable development. Information has been gained from literature and interviews with Essex Water Company. All information was gathered before April 1993 and therefore before the company merged with Suffolk Water Company. The Issues have so far been discussed in general. They are now considered through a company which is actually facing and dealing with the issues raised. Essex Water Company acknowledges that as a discrete entity, Essex does have a water shortage. However, the company is not dependent solely on local resources. Their dependency on other regions' resources underlies the need to be forward looking in preparing future strategies. It is also necessary to be aware of the sustainability value of proposed options. Therefore the demand and supply management measures are assessed in relation to the sustainability criteria outlined at the end of chapter 3.

Demand Management

Demand for water has increased in line with development and increases in standards of living, and is expected to continue for at least the next generation. Given its current raw

water resources, Essex Water Company will be unable to satisfy demand in the next century. The Office of Water Services has set social sustainablility criteria and expects the company to ensure sufficient supply so that there is not more than one hosepipe ban in a ten year period, no need for major voluntary water saving on average more than once in every twenty years and no risk of rota cuts or use of standpipes on average more than once every hundred years (Essex Water Company, 1993). The company has a duty to ensure sufficient supplies for all those who demand it.

Estimating future demand for the next 20 to 30 years is very complex. Several factors affect demand and each is subject to some uncertainty. The population of the company's area has nearly doubled during the last fifty years. As living standards have improved and lifestyles changed, water consumption of each person has also risen dramatically.

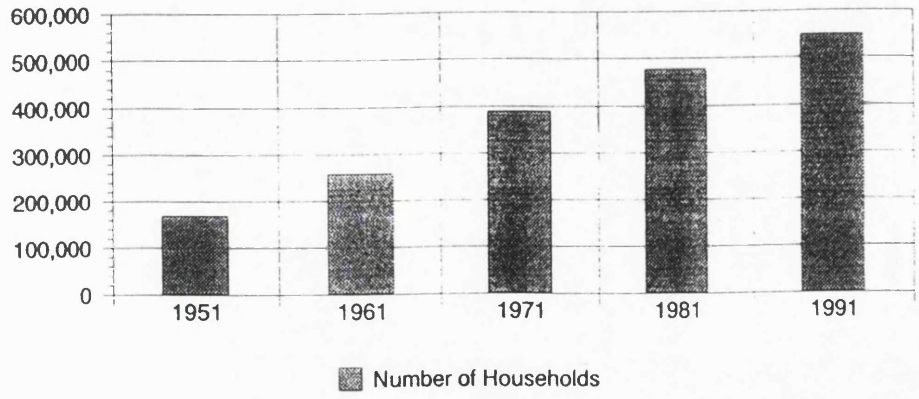
Essex Water monitors economic and demographic trends in its area of supply and relates these to the demand for water. It also uses data from the OPCS and Essex County Council. The main factor affecting demand is the population within the company's area. Since 1946 the population has risen by over half a million to 1.4 million in 1991 - a much greater increase than most areas in the UK. Estimates from the OPCS have projected that this area will continue to have a higher than average increase in population over the next 30 years. Their forecasts predict an increase in population of 100,000 by 2021.

In addition, the number of households has also increased substantially over the same period. Local and District plans suggest an increase of 100,000 by 2021, an increase of over 17% above the 1991 estimates of 568,000 (See figure 5.1). The average annual rate of increase forecast for the period to 2021 is 0.6%.

Apart from a growing population, the other main reason for this large increase in households is a marked decrease in average household occupancy. In 1971, 48% of homes had one or two persons in the households but by 1991, this had risen to 60%. In Essex, many of the households are comprised of young, highly mobile people who work in London. In general, this type of person has money to pay bills and enjoy a high standard of living. In addition, these types of smaller households use more water per person than larger households.

However, it is true that the general consumption trend indicates a doubling of water use by each individual over the period 1946-91. This is due to several factors including general improvements in the standard of living; changes in lifestyles; the increasing use of water using appliances such as washing machines and dishwashers. In addition, the increase in the number of cars (that need washing) and greater interest in gardens (that need watering) indicates a large increase.

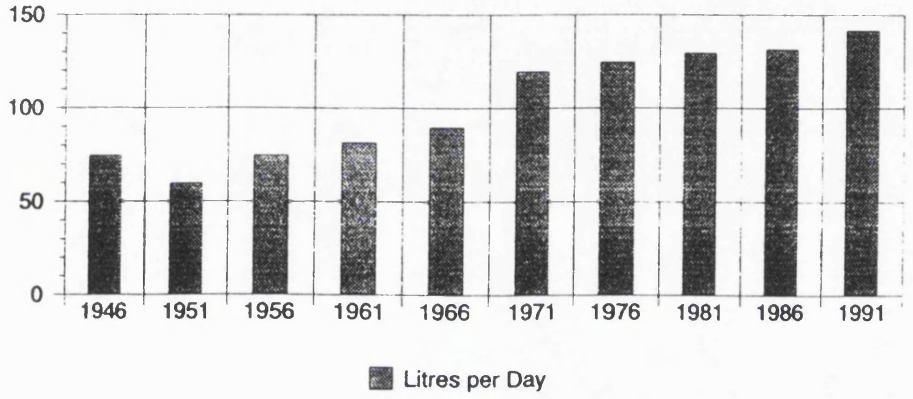
Figure 5.1 Number of Households in Essex Water Company Area



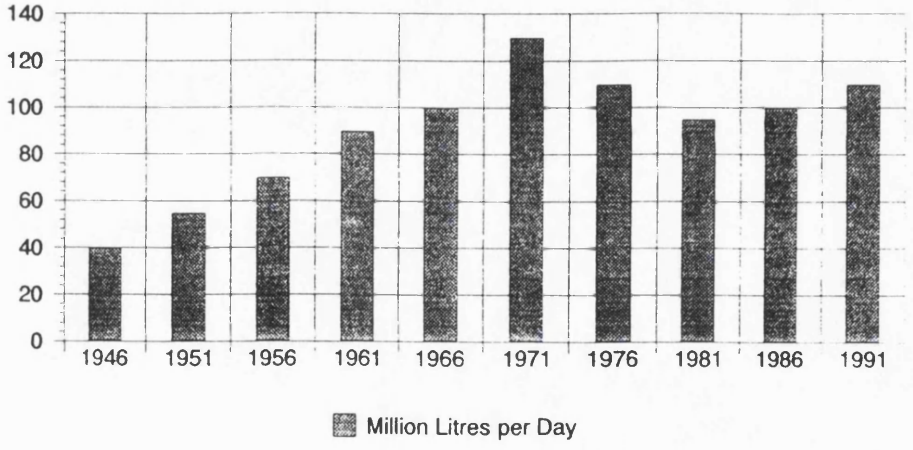
Source: based on Essex CC/OPCS/company information

As previously stated, Essex Water Company also monitors economic trends. Demand from industry peaked in the late 1960's and early 1970's and has flattened out during the last decade and is expected to continue to rise at a rate for the next ten years. The total consumption rates are illustrated in Figure 5.2.

Figure 5.2 a) Individual Water Consuption in Essex Wateer Company Area



b) Industrial Water Consumption in Essex Water Company Area



Source: Essex Water Company

The average daily demand for water is expected to grow by 25% from 1991 to 2021 an increase of 100 million litres per day to 510 million litres per day. Therefore the company expects to face deficits in supply before the turn of the century. This may be exacerbated by the loss or reduction of resources such as groundwater boreholes due to contamination; the long term effect of climate change or development of the East Thames Corridor beyond that already approved.

As the company is obliged by law to meet demand for water, they have prepared a strategy to ensure they are able to meet their customers' needs. The various aspects of this strategy are examined below in the light of national guidance and the NRA's views.

Metering

In contrast to nearly all other countries, only 26% of the water supplied by water companies in England and Wales is charged by volume. Commercial and industrial customers account for nearly all of this amount. The great majority of households still pay water charges based on the rateable value of their home as at 31 March, 1990 (DoE, 1992). However, recent legislation means that by the year 2000, existing rateable values will no longer be allowed as a basis for calculating water bills. Therefore Essex Water Company has to find alternative ways of charging for water and metering is one which several benefits. National surveys have however reached various conclusions as to the social benefits of metering. In these surveys, some customers had much higher bills than normal, others worried about their bills since the trials had highlighted how much water costs (only 25% of people could accurately forecast their bill prior to metering). The public gave varied responses as to whether they considered metering a fair method of calculating payment.)

In theory, metering should give customers the freedom of choice to use and pay for as much (subject to drought) or as little as they choose. It also brings the water industry in line with other utilities such as gas, electric and British Telecom. However, some people feel that if they are willing to pay for water in such a manner, then they should not be subject to restrictions (e.g. hosepipe bans).

Essex Water are already using meters. They were introduced for all industrial and commercial premises in 1981, and all new and newly converted homes have been metered since 1989. In April 1993, they began a programme to meter existing homes, the first of which were the Galleywood and Moulsham Lodge areas of Chelmsford. Metering encourages customers to be responsible for the pipeworks on their side of the meter, where an estimated 25% of total water leakages occur. Essex Water consulted OFWAT and the Eastern CSC who are both in favour of metering where appropriate and fully endorse the company's approach. Further, the NRA has stated:

"Before any new sources are developed, it is essential that water companies make sure they are doing all they can to reduce leakage and to carry out effective demand management. The NRA supports selective domestic metering, with an appropriate tariff, in areas where water resources are stressed. Where it can be shown that proper attention is not being given to the control of leakage, or where appropriate consideration has not been given to the introduction of selective metering, the NRA will not grant licences for new sources." (NRA, 1993)

Leakage Control

Essex Water company has 6000 km of distribution pipes, most of which is 60 years old, made of cast iron and has a joint about every 6 metres. Therefore, over the one million joints and rusting pipes, approximately 15% of the water put into the system does not reach the customers' pipework. This is however well below the average for the Country (latest figures for OFWAT estimate between 22 and 27% of water is lost through leakage)

(OFWAT, 1993). The company is therefore currently spending on average £5 million a year on leakage control including replacing pipes and the use of modern detection and repair techniques.

The government could impose mandatory leakage control targets but there are several reservations concerning target setting (CPRE, 1993). All companies vary in their efficiency and the costs which would be imposed to reduce leakage. Areas with scattered rural users could be required to spend more on saving water than it costs to supply it. Targets tend to be set at unambitious and unchallenging levels in order to be politically acceptable, some companies will find the targets too low, others too high. There would be no incentive to reduce leakage below the target level unless the targets were revised (and reduced) at regular intervals. In any case, the DoE does not advocate the setting of targets, rather they would prefer decisions concerning the size and objectives of projects to be made on a company by company basis.

Supply Management

Essex Water Company is obliged by law to meet demands for water and supplies over 1.4 million people and over 32,500 factories, offices, shops, schools and hospitals. This amounts to some 150 billion litres of water a year. The company does not have the responsibility of maintaining the water environment or to ensure minimum flows of rivers (which are the responsibility of the NRA).

However, it can only abstract water under the consent of the NRA who issue licences. The NRA take several factors into account when issuing such licences:

- the reasonableness of the need;
- the potential impact of resource depletion on existing abstractors;

- the potential effect on river flows (especially where low flow rivers and minimum acceptable flows have been identified);
- the potential effect on the water environment for example river and wetland ecology.

They may impose conditions on the licence to ensure any environmental sustainability criteria are met.

At the moment, Essex Water Company has several existing sources of supply. About half of the demand is met by taking water from the Rivers Blackwater, Chelmer and Stour during high winter flows and storing it in the large reservoir at Hanningfield and Abberton - about 51 billion litres. A small amount (2%) is drawn from boreholes (wells) within the company boundary.

The rest of the water is imported from North East London and from the Ely Ouse near Kings Lynn. This scheme which meets nearly one third of the company's water needs, was developed in the early 1970s. Since then, capacity and reliability has been improved but will soon be nearing its upper limit.

In the short term (5 years) the company will need to increase supply by some ten million litres per day at a cost of £6-9 million from two projects. The first would supply 4 million litres per day by re-opening abandoned wells in the Romford area. The high cost of long term water resources means that it is now economically viable to lay new mains from the wells to the company's works at Chigwell. The water will be treated there with other water imported from North East London.

Secondly, 6 million litres per day can be added to the company's resources by further increasing the capacity of the system to transfer water from the Rivers Blackwater and

Chelmer to Hanningfield Reservoir. This will enable the company to capture more of the peak flows when the rivers are in flood.

Even if these short term measures are successfully implemented along with effective demand management, Essex could still be short of water by the turn of the century. Therefore, it is necessary to consider longer term solutions now. Obviously this includes leakage control and metering but alternative options must also be explored.

Most treated sewage water is disposed of into the rivers and sea but its reuse is being investigated. It is stated NRA policy to encourage such practice wherever financially feasible and environmentally possible. Treated sewage from Brook End Sewage Works in Chelmsford (an Anglian Water works) is presently pumped many miles to the Blackwater Estuary. It is proposed to increase the standard of the final effluent and return it to the River Chelmer for re-abstraction downstream. Such schemes could add up to 30 million litres per day to present resources.

The possibility of pumping water into natural underground storage (aquifers) during the winter months has been rejected on the grounds of cost and technical difficulties due to the geology of the area. In addition, even if abstracting groundwater was economically viable, such projects would be environmentally unacceptable due to the geology of the area.

Transfers

In order to be certain to be able to meet the levels of future demands forecast, the only solution is to import more water from those areas where rainfall is higher. It is the responsibility of the NRA to investigate additional sources of water and to increase the volumes transferred through the existing Ely Ouse to Essex scheme. Additional water may

be brought from canal or via the River Trent but it is unlikely that extra water would be available from these sources all year round.

Transfers are also prone to pollution and have a relatively high risk of equipment failure. They can be expensive to operate and have to be designed to cope with peak demand. It is therefore imperative that Essex Water liaise, co-operate and have good co-ordination links with the NRA.

In addition it is likely that further water storage will be required to make use of the high winter river flows. Once again it is the responsibility of the NRA to designate a new reservoir site. They are currently considering a scheme near Great Bradley in Cambridgeshire. Essex Water Company is also undertaking complementary studies to review other sites which may be appropriate.

Any storage reservoirs would be developed with improved transfers which would reduce the associated effects of equipment failure or pollution. The potential resource from such transfers and reservoir construction could be over 100 million litres per day.

Sustainability Assessment of Demand management Options

In essence there are only two main demand management options: metering and leakage control. Metering however was introduced as an alternative method of payment from the present rate-based system. It was not introduced as a demand management measure. As the issue of resource shortages became imminent, it became apparent that demand management was needed. It was only then that it was stated that by paying by a flat rate, demand levels were kept at "unnaturally high levels". Metering was then advocated as a demand management tool. Its success has yet to be proved for logically, a water company which relies on income from water usage is unlikely to advocate the reduction of demand.

If however, metering does reduce demand then it scores highly in a sustainability assessment as it should reduce the need for abstracted water supplies thus safeguarding the water environment. It would ensure that minimum flows are maintained in rivers and would prevent the unnecessary construction of new transfer or storage schemes. This is in line with NRA and Government policy. In economic terms, metering is very expensive to install. In terms of social equity, there is no guarantee that bills will be reduced or even that people will be able to afford them.

On the other hand, reductions is leakage has clear cut sustainability advantages. Nationally, 22-27% of water entering the system is lost through leakage which constitutes a high proportion of waste in terms of disruption to the water environment (from where the water is abstracted) and in terms of purification costs (money and energy). To this end, there are obvious economic savings to be made by improving leakage control. In social terms, it should result in reduced bills and a lessening of the need for households to save water.

Sustainability Assessment of Supply Management Options

It is difficult to assess the level of sustainability that supply management could achieve since it is regulated by law. The law states that the NRA must find additional sources of water when demanded by a water company. Therefore, even if all options are found to be unsustainable, one option will still be used. Therefore, it is impossible for the NRA to implement a "strong" sustainable development strategy, as trade offs and compromises will always have to be made. The NRA appear to have a good understanding of the sustainability criteria in environmental terms and have tried to maintain a health environment. However, they have inherited a legacy of unsustainable abstraction licences which they are powerless to revoke (they do actually have the legal power but not the financial means to offer the compensation required by law). In economic terms, the costs imposed on abstractors are far below the true environmental costs. However, if prices

were to rise to meet these costs, the increases would be passes onto the consumer. This would conflict with social sustainability goals of affordable water for all.

Essex Water Company have tried to implement the most "all round" sustainable options. Abandoned wells which were once closed on economic grounds are now being re-opened to supply the growing demand. This confirms that economic sustainability does have a major role on determining the source of new supplies. Transfers from the River Blackwater and Chelmer must be preceded by thorough EIAs. Longer distance transfers have a track record of being unreliable, prone to pollution and expensive. They score very badly in a sustainability test. Therefore it is imperative that this option is only used as a last resort.

Finally, the most sustainable option to be considered is the re-use of treated sewage from the Chelmer Village sewage works. This is due to several factors. Firstly it will lessen pollution into the River Blackwater (if the water was pollution free, it would already be put back into the Chelmer); secondly, the Chelmer will have on increased flow nearer to its original (undisturbed) rate and thirdly, reusing water means there is less need to find new sources.

Conclusions

In conclusion therefore, it is clear that each water authority has a different perspective on sustainability. The water companies focus on economic and social criteria whilst the NRA is more concerned with protecting the natural environment. It is clear that increasing supply will result in environmental degradation to some degree and therefore it is imperative to fully employ demand management techniques.

It is also obvious that both the NRA and Essex Water Company have a major influence in the way water resources are managed. It is encouraging that the water company has short, medium and long term plans which have been considered by the NRA. It is also obvious however that the water company has no intention of ever objecting to a development on the grounds of a water shortage and indeed has not seen it as a constraining factor in the past. Similarly, the NRA, although the dominant authority in water resource allocation at source, do not appear to be against finding new sources rather than actively discouraging development in the area.

It would appear therefore that if water resources are to be an influential criteria in maintaining sustainable levels of development, the planning authorities have a major role to play in actual development control and ensuring liaison and consultation between all relevant organisations.

Chapter 6: Sustainable Development Through The Land Use Planning System

Introduction

It has been demonstrated in previous chapters how other organisations can influence water resource management. This chapter aims to examine the role which land use planning can play in contributing towards sustainable levels of development in relation to water resources. Essex planners are not the leaders in sustainable development initiatives in relation to water resource management. Therefore the role of land use planning is considered in general terms and not restricted to the County of Essex. Examples of good practice are taken from appropriate councils and regions.

The Role of Planning

The planning system and the use of development plans in implementing sustainable development have been examined in chapter 2 whilst chapter 4 has considered the planners involvement in the water sector. It is also summarised in the government's PPGs, especially PPG1 and its White Paper on the Environment, This Common Inheritance:

"The system provides guidance, *to help people plan the use of their land confidently and sensibly and to help planning authorities to interpret the public interest wisely and consistently;* incentive *in that by designating land in their statutory plans for particular types of development, local authorities can stimulate such development and* control*; which ensures that developers cannot ultimately insist for private reasons on a change which would be against the wider public interest and that people affected by proposals for change can have their views and interests considered." (DoE, 1990, para 6.9)*

There are four levels of planning which can contribute to sustainable water resource management and these are briefly clarified below to ensure it is clear from where the suggested "new directions" are derived from.

National Planning

The Secretary of State for the Environment issues PPGs and other guidance and legislation as outlined in chapter 2.

Regional Planning

Regional Planning Guidance is issued by central government and provides strategic policies for land use and development where there are issues e.g. water resources which although are not of national concern, apply across regions and need to be considered on a a wider scale than county. In its preparation, the regional guidance considers advice from the planning authorities within its regions, in the case of Essex, this is SERPLAN; the South East Regional Planning Conference. Within SERPLAN, the main water sector representation is from the Thames NRA and the following extract from the New Strategy For the South East Regional Statement 1990 illustrates the extent of the involvement with water issues:

Policy P2 "To have regard in the exercise of their functions, relating to sewage disposal, land drainage and water supply, to the objectives of the regional strategy and to advise planning authorities thereon. (refer to para 2.87)

2.87 The strategy points to ways in which the region's development patterns should continue to shift to accommodate changing social and economic circumstances. It also emphasises the need to revitalise areas already developed. These objectives will require re-equipment and renewal of the regions infrastructure such as drainage, sewerage systems... There is a history of co-operations between local planning authorities and statutory undertakers in these fields, and development of such co-operation will be doubly important as new institutional arrangements are put in place. This is a field where past studies of capacities and requirements have not been replicated... but it may be desirable for some future attention to be concentrated." (SERPLAN, 1990).

Generally, water is considered an important issue in the South East. They have recently set up regional meetings with Thames Region NRA (NRATR) to discuss the relationship between land use planning and the NRA and to determine how they can work together to help alleviate any problems. In addition, the new SERPLAN

Environmental Monitoring Sub Group (EMSG) set up in 1993, has a representative from the NRATR who is actively involved in the identification and implementation of action on sustainability indicators.

County Councils

County Councils are responsible for strategic land use planning in the form of structure, mineral and waste local plans. Essex County Council Forward Planning Policy Team has also produced a Coastal Strategy and a State of the Environment Report, and is in the process of preparing a Countryside Strategy and an Environmental Strategy.

The first function of the structure plan is to provide a statement of the overall strategy for development and use of land in the county. It outlines how development and conservation should be balanced and how development will be served by transportation and other infrastructure, including water and sewage.

The second function of the plan is to provide a strategic policy framework for planning and development control locally in line with regional and national policy and guidance. This is operative for a period of 15 years.

The main water resource issues at County level are water resource availability, groundwater protection and infrastructure provision, due to their strategic nature. The NRA are actively involved in structure plan writing and reviewing, demonstrated recently by their publication of "Guidance Notes for Local Authorities on the Methods of Protecting The Water Environment Through Development Plans" (NRA, 1994).

Essex County Council

Essex has been identified as a key water resource pressure point up to 2011 as it coincides with predicted future areas of growth and may lead to a new reservoir

scheme at Great Bradley in Camdridgeshire. It is by no means certain that the new necessary water resource schemes will be on line to meet the proposed new demand in the South East and therefore the need for NRA input at Regional level is seen as vital. The Thames Region NRA has clashed with the DoE over future housing figures and relations will undoubtedly become more fraught when the full implications of the East Thames Corridor are fully known.

In general, Essex County Council has a good relation with both Thames and Anglian region NRAs, (although Anglian NRA have difficulty in breaking down data to a county level) especially as the NRATR work together on the SERPLAN EMSG. Comments on the structure plan now seem to address wider environmental and development issues although the NRA have commented on issues beyond its remit. The issue of policies in development plans will be discussed later.

Borough and District Councils

These have the responsibility of producing local plans which allocate land for development in specific areas, the plan has a life of about 10 years. In Essex there are 14 districts councils, five water companies and two NRA regions, making the co-operation and consultation process within the County harder but all the more important.

Strategic water resource management is not really addressed in local plans. However, district councils have a second function of development control. All development has an impact on the environment, the implications are many and varied and so it is imperative that the planners are fully aware of the consequences of approving planning applications.

Interaction with the Water Sector

A developer will apply for planning permission to develop a site for example a housing estate. The NRA is a statutory consultee and is therefore consulted. The NRA may outline problems of water shortages in the area but these are not usually grounds for objections. The water companies are not statutory consultees but maybe consulted on large projects. The developer approaches the water company to supply water and remove foul water and the company is obligated to meet new water demands under the Water Industries Act 1991. The water company will have undertaken an audit of available resources and if there is no surplus water in their existing abstraction licences, they will approach the NRA for new resources. In turn the NRA is obligated to find resources for the water company. Similarly, the sewage disposal requirements have to be met.

In this circle of requests and obligations to meet requests, the issue of resource availability is only addressed by the NRA. The water company is not legally allowed to refuse to supply water and the NRA is not legally allowed to refuse to find available resources. The only protection for the environment they have are the "Protected Rights" which must not be impinged upon when supplying new resources. Protected rights include minimal river flows and rights of existing abstractors. Therefore, it is here that sustainable criteria must be set. As development increases in the South, especially in the South East, water is increasingly being transferred from the North.

It appears that the situation of a water resource and management problem in the South East is not adequately addressed by the water sector legislation and therefore there is a role for planners to play in sustainable water resource management.

Implementation of Sustainable Development

The TCPA has declared its dedication to sustainable development, demonstrated in its publication "Planning for a Sustainable Environment" (Blowers, 1994). There is also a

plethora of planning tools now available to guide planners from PPG12 to the Development Plans Good Practice Guide. However, these general guidance notes and declarations of support for sustainable development give little in the line of actual implementation. As is illustrated above, the water resource managers need the planning profession to help them implement sustainable development just as planners need other agents of environmental protection to help them reach sustainable development levels. The water resource managers are not fully reaching their environmental protection objectives.

Planners need to understand the implications that development has on the environment. They therefore need to change their perception of what planning actually involves, from merely plan making and development control to a more holistic custodian of the environment. They need to re-address their methods of both creating policy and putting it into practice in order to achieve sustainable development .

New Directions for Planning

How can planners in local government actually undertake environmental sustainable planning (and in this case water resource management) and what does it involve doing in practice? There can be no set of inviolable model policies since they need to reflect local circumstances but it is possible to identify key steps in the planning process and how to implement them (CPRE, 1993). They must be incorporated into all stages of the planning process from strategic planning through to development control as applied to specific sites. There are three stages to sustainable planning and these are discussed below.

1. Know the local Environment

Environmental protection has always been one of several objectives in planning but economic growth, especially job creation and meeting demands for housing, roads and retailing have more often than not taken precedence over the environmental objectives.

Up until now, the planning role has been to provide for these with the minimum of environmental impacts rather than the environmental criteria having equal weight in the balance. Some aspects of the environment have hardly been considered at all by planners in the past (e.g. water resources). However, the "new approach" to planning calls for consideration for all environmental aspects, not just those which of "traditional planning concern". The environment needs to have highlighted status in planning decisions.

There is also a need to remember that the environment does more than provide resources for society; it is the critical life support system for human society. As it is damaged and degraded, the capacity of the environment to cope with human pressures may reach limits which if exceeded may be irreversible and permanently damaging to the environment. This applies to all resources, not just those termed "scarce" or non renewable but all resources which like water, although termed renewable its inappropriate use may cause damage to dependant ecosystems and amenity.

Such an "environmentally-led" system must have at least a basic knowledge and information base of the local environment and conditions including water quantity and quality. This has been undertaken in several local authorities by state of the environment reports as outlined in chapter 2. Water companies like Essex Water undertake audits of water resources and predict future demand forecasts on a regular basis in order to secure additional supplies from the NRA before actual development demands more water. The NRA undertake several surveys of the water environment and have a sound knowledge of the ecosystems, hydrology and resource availability in their area.

The Anglian Region NRA also monitor other regions' water availability and potential supply for the South East and collaborates with the water companies in proposing new water resource developments such as new reservoirs and transfer schemes. The

environment does not always (indeed it rarely) fits into neat delineations of the local authority boundaries (except that river boundaries are used as divisions between some local authorities). Therefore the planning system needs to consider the environment in a wider perspective than just the area under its jurisdiction. Several impacts of a development will be imposed upon the environment outside of its jurisdiction and so state of the environment reports should be undertaken in one form or another at regional levels (e.g. SERPLAN) and at a national level. The Government has in fact produced a UK Environment Report (DoE 1993c), and although incomplete, it does indicate the state of the national environment. Future reviews should indicate trends of environmental quality and therefore identify problems to be addressed. The SERPLAN EMSG has decided not to undertake a state of the environment report but is drawing up a list of measurable sustainability indicators to measure the impacts of its regional guidance and strategic plans.

There is a need to work with local groups with a knowledge of the local environment for example in Essex, the Essex Wildlife Trust, the local branch of English Nature, CPRE and Anglian and Thames Region NRA. It is necessary to identify trends in environmental quality (to establish the current direction of environmental change and the likely pressure points); critical environmental problems (to identify specific dangers e.g. low flow rivers, aquifer replenishment problems); pressures on different aspects of the environment (which would provide useful advance information on the impacts of certain kinds of policy and development). In Essex, the main pressure on surface and groundwater can be identified as a rising population requiring a large number of small housing units and large developments such as the East Thames Corridor. In this time of recession, industrial expansion does not seem to exacerbate these problems. Analysis of this information should provide the basis for formulation of future housing policy. Essex County Council are setting up a GIS system which will enable planners to relate development proposals with census data and environmental factors. Various

reports have also addressed the issue of water resources including the Essex Environment and The Golf Report. They also have a strong EIA team.

2. Identify Issues and Set Objectives

Environmentally led and sustainable planning should start from the recognition that all social and economic choices are environmentally bound and all development has some impact on the environment. If there is adequate knowledge of the environment and the pressures being exerted upon it, the problems can be addressed by setting objectives for the future. Key problems should be identified, the aims of which must be to reverse the direction of environmental change and to avoid unnecessary damage, minimise the adverse environmental impacts and place greater emphasis and weight on the environment on planning decisions. The only way to completely stop further environmental degradation is to refuse planning permission altogether and as this is impractical, conditions can be negotiated and designs modified.

Targets can be set for key environmental indicators over a chosen target time period e.g. five years. In the case of water, the Secretary of State for the Environment has already set a "target" that water should not be a planning constraint by the year 2006. This however, implies that water is a constraint at the moment, but this thesis demonstrates that this is not being identified as the case in practice. Target setting has its problems but these have been examined in chapter 5, under leakage targets for water companies. Qualitative objectives can also be set along the lines of what the character of the environment should be like by the target date.

3. Implementation

For some environmental criteria e.g. water resources, the planning system may only have a minor or partial influence on environmental trends and therefore should concentrate on directional objectives and leave the other objective setting to more relevant organisations (NRA, water companies). District authorities could set a target

for reduced water consumption or higher water efficiency even though more precise quantitative targets would only be appropriate on a larger scale. When setting objectives, it may be necessary to prioritise, identifying those which are critical and those which may be over ridden in situations of unavoidable conflict, which is the practical implementation of trade offs discussed in chapter 2.

As State of the Environment Reports are the means of collecting knowledge on the environment, environmental impact assessment is the mechanism for ensuring any potential impacts of a development are considered before planning permission is granted. It will be demonstrated that development plans can be the means of setting objectives and to ensure they are considered in land use planning issues.

(i) Environmental Impact Assessment (EA)

Environmental Impact Assessment is the prediction and evaluation of the impacts of a development on the environment and is as such a procedural tool to aid the decision making process. It aims to prevent environmental degradation by giving the decision makers better information about the consequences that development actions could have on the environment, but cannot in itself achieve that prevention. Strategic Environmental Appraisal (SEA) is the formalised systematic and comprehensive process of evaluating the environmental impacts of a policy, plan or programme and its alternatives (Therivel, 1992).

It is needed at each stage of the planning process, it is fundamental to decision making and will determine what kinds of projects that will later come forward. SEA needs to be included as an integral part of the plan making process as advocated in PPG12.

The process of scoping involves identifying and assessing the types of significant environmental effects which may be caused by the proposed development. In relation to water resources, this is relatively simple since consumption per household can easily

be forecast and any industrial process should have a fair idea of the level of predicted water use. However, "knock on effects" must be considered such as amenity and recreation demands of new residents, etc.

Questions regarding environmental capacities and objectives must be addressed in order to ascertain whether the development can be regarded as "within capacity limits" and therefore can be classified as "sustainable development". As usual, economic and social criteria must be considered along side those of the environment but they should be in balance in a three way split. The development should not be assessed as to how the environmental impacts can be minimised with the presumption of the development going ahead.

(ii) Development Plans

If the planning system is to be "environmentally and objectives-led", it would require different kinds of development plans. At the moment, structure and local plans (and UDPs) set out policies and general principles and criteria to be applied in development proposals. The new development plans should specify new directions and targets for key environmental assets and services. They should describe the environment planned by the authority for the given target year in the future e.g. in ten years time. These will include desired strategic directions and levels of environmental quality.

The Draft Regional Guidance for the South East gives a summary of the issues at strategic levels:

"Water resources already present problems in certain parts of the South East, and the opportunities for new water resource developments are constrained by availability of water from the regions rivers and land available for reservoirs.... Planning must ensure that demand and provision of water keep pace with each other and that the relationship is sufficiently robust to take account of inevitable fluctuations in rainfall." (DoE 1993b)

It goes on to say that local planning authorities must ensure through consultation with the NRA and the water industry that proposals in their development plans are realistic in terms of adequate supply and sewerage infrastructure and will not compromise environmental objectives. It may be necessary to locally adjust the rate of development proposed to meet limitations imposed by the ability of infrastructure to meet demands for water.

Local Planning Authorities should also have a programme regarding provision of necessary major infrastructure. After 2006, availability of water sources should not be treated as a constraint on development as provision should be allowed for. This will require the allocation of land for infrastructure for water services and sewage disposal. The implications of such provision includes the environmental impacts should be considered in determining the distribution and programming of development within the region (DoE 1993b).

The NRA has introduced its model policies for Local Authorities to base their development plan policies on. They have however, after all they have previously stated about water resource management being a strategic concern, discussed the issue of availability of water resources only as a local - district concern. Below is the NRA's stated concern:

"The development of water resources for water supply is becoming increasingly difficult. The NRA is concerned that the provision of water for development does not have a detrimental impact on existing uses. In some areas, over abstraction has resulted in reduced flow rates in rivers. Further abstraction in such locations will exacerbate this problem. In practice, this allows no significant new all year round abstractions, and is therefore an important issue in terms of development control. Consequently, there is a growing need to plan for new strategic water resources which will not harm the environment; these may require the construction of new reservoirs or the expensive transport of water over long distances. This can have a critical impact on the viability or timing of new development."

They go on to give a guidance statement which could be included in development plans: *"The LPA should not normally permit development which increases the requirement for water unless adequate water resources which already exist or will be provided in time to serve the development and without detriment to existing uses. The NRA looks to the Local Planning Authority to support water conservation measures."*

Their justification for this policy is:

"Developments should be limited to locations where adequate water resources already exist or where new provision of water resources can be made without adversely affecting existing abstraction, river flows, water quality, agriculture, fisheries, amenity or nature conservation, and where it coincides with the timing of the development."(NRA 1994)

In their pilot studies of the above model policies in Essex, Thurrock Borough Council participated and had an uptake rate of 75-100%.

(iia) Structure Plan Policies

In reviewing their structure plan policies, some County Councils in the South East of England have included policies concerning water resources. Essex County Council is only in the formative stages of revising its structure plan policies and therefore no new policies can be taken as examples from its Structure Plan. The following examples give an indication of the concern and action taken by three County Councils. Essex County Council should review these structure plan policies and aim to include policies which promote sustainable development in relation to water resources.

As one of the driest counties in England, Kent County Council is obviously concerned about the impacts that new development will have on the water environment and resources in the area. This is addressed under the heading Natural Resources, a chapter that includes policies on water and energy for the first time.

The first policy addresses the issue of resource availability and the second is concerned with the development of necessary infrastructure to meet new water demands.

Policy NR1: Local authorities will consult the National Rivers Authority and water and sewage undertakers on the preparation of local plans and on planning applications which are likely to have significant implications for water or waste water services. In considering development proposals, regard will be had to the availability and potential availability of the necessary water supply, sewage and waste water capacity.

Policy NR2: The development or expansion of water supply or waste water facilities will normally be permitted, either where needed to serve existing or proposed development in accordance with the provisions of the Structure Plan or adopted local plans, or in the interests of long term water supply and waste water management, provided that the need for such facilities outweighs any adverse land use or environmental impact, and that any such adverse impact is minimised. (Kent County Council, 1992)

Berkshire County Council have a section specifically on water resources and identifies several concerns about the availability and use of water resources including the dry winters and warm summers of 1988-92; over abstraction; and the NRA statements concerning the need to augment resources in the area. They therefore have a policy which specifically addresses this issue:

Policy LD6: Proposals for development will only be permitted where existing water resources are adequate, or where they can be augmented in time to support the proposed development without adversely affecting existing water resources, water quality, amenity or nature conservation.

They also state that they will work in co-operation with the NRA and both should be *"satisfied that adequate resources are available before development is permitted and that where resources need to be augmented, this can be undertaken without any significant adverse environmental effects". (Berkshire County Council, 1992)*

Buckinghamshire County Council identifies three key areas of concern:

- the need to promote demand management measures to ensure future supplies
- to establish the extent of over abstraction and
- the need for additional supplies.

The resultant policy states:

Policy W1: Development will not normally be permitted where, in the opinion of the Local Planning Authority, after consultation with the NRA, it is considered:
a) that adequate water resources do not exist;
b) that the proposal is likely to have a detrimental effect on the existing abstractions, water quality, amenity and nature conservation;
c) that the proposal is likely to contaminate ground waters, ponds, lakes or watercourses. (Buckinghamshire County Council, 1993)

All three authorities have demonstrated that they are aware of the problems facing the South East in terms of water resources and acknowledge that they have a role to play in controlling development which effects the sustainability of the water environment. The policies vary in the degree to which they commit themselves to preventing development on water shortage grounds, and really only Buckinghamshire County Council state that "development will not normally be permitted". The other councils give the impression that development would be allowed but the timing must be line with the NRA and relevant water companies' resource management and infrastructure phasing policy.

(iib) Local Plans

As previously mentioned, the strategic issue of water resources per se is not usually addressed in local plans. In a study by the University of Newcastle, it was found that some local plans have recognised that the NRA will have a key role in evaluating the potential water impacts of development proposals. Policy EO3 of the Cambridge Local Plan states:

"The council will require measures to be taken to safeguard rivers, streams and sources of water supply from potential pollution arising from any new development to the satisfaction of the NRA" (Slater et al 1993).

Salisbury Local Plan notes that any development proposals that might have impacts on water source catchment areas (identified by the NRA) will be sent to the NRA for their

"advice, guidance and recommendations". In general, local plans do recognise that the water sector should play a central role in determining planning proposals that have important implications on the water environment. However, it is usually in respect of conservation, recreation and amenity values of the water environment instead of the wider and more strategic issue of water resource availability. It is not suggested that local plans should not address the issue of water resource availability. Moreover, it is advocated that they must take this issue into account. Plans should include policies which ensure all planning applications must consider both the potential demand for water that a development would incur and the availability of resources to meet that demand.

All types of development plans should set out its environmental, economic and social sustainability objectives. They should act as a framework for the development plan and their status within the written document should reflect this. Such objectives should therefore precede and inform the key policies of the plan.

The inclusion of objectives which are not "traditional" land use policies has been highly criticised by the DoE despite the explicit statements in PPGs 1 and 12 that sustainable development should be the aim of the planning system (Jacobs, 1993). However, authorities must continue to include them in their plans. Since limiting water consumption will almost certainly be a requirement of sustainable development, the DOE has no grounds to object without being inconsistent with its own guidance. So there is a strong case for local authorities to include objectives if not policies in their plans even if not direct land use issues on the basis on PPGs 1 and 12. The more authorities that do this, the more pressure there will be on the DoE to concede this critical point.

If these objectives continue to be discouraged in development plans by the DoE, local authorities must use alternative means of presenting their commitment to sustainable

development. Such means include environmental strategies and Local Agenda 21 initiatives which, although have no legal status, can be cited in planning decisions.

(iic) Development Plan consultation

Officially the NRA is a statutory consultee in development plan reviews but in reality often only plays an advisory role in land use planning. Ideally, the NRA needs a planning liaison team along the lines of the Thames Region NRA team lead by Professor John Gardiner. He outlined the opportunities for the NRA and local authorities:

"There is clearly an opportunity in the 1990s for the NRA to develop a synergy with local authorities in terms of establishing support for the interests of the water environment in the planning system". (Gardiner, 1994)

The NRA should establish links with planning authorities, development control officers and other interested bodies, especially developers, and should aim to clearly state reasons for objections and conditions on planning applications to ease the inquiry stage. A fuller involvement at an early stage would lessen the need to appear at development plan public inquiries thus saving both time and resources

The main results were an increased credibility of the NRA as an influence on land use planning, Their more business like approach in handling replies on planning applications caused a more positive response from planners as they regarded them as more informed of the planning system and willing to negotiate and understand the planners position.

The water sector must also change from being reactive to proactive in land use planning, and continue to be involved in the SERPLAN Environmental Monitoring Sub Group and the housing allocation discussions.

Water companies could help by using development plans to predict levels and location of future demands, promote redundant sites for alternative sites, be more pro-active in consultation on development plans at draft stage and put forward formal objections at deposit stage. Consultation between the NRA and Water companies is lacking and needs addressing - the NRA wants to co-operate with the water companies but is also the body responsible for prosecuting a water company for a water pollution incident from a sewage works.

Finally, the NRA are more involved with planners than planners are with water companies since their remit is more in line with traditional planning. However, it is imperative to have a three way consultation process.

(iid) Co-ordination Reactive Servicing of Development plan Sites

Water companies generally use development plans land allocations as a way of predicting the future location and timing of demand so as to plan their investment plans accordingly. However, problems still exist in water companies being unwilling to speculatively service a possible future site until development actually occurs (a risk private companies will not take). Patterson comments on the problems in 1987 and these appear to be still pertinent today:

"the coherence of planning policies must depend upon the relationship between local government, the regional water companies and other organisations especially developers" (Patterson, 1987).

However, there is a legal requirement for a connection to a site once the local authority has granted planning permission and development is going to occur. This is 3 months for water and six for sewerage. However, under sections 41 and 98 of the 1991 Water Industries Act, there are various exemptions and in general water/sewerage companies supply on demand. Developers have five years to start

development on a site from the date of planning permission being granted before the permission is revoked.

(iie) Proactive use of the Development Plan

It is possible for water companies to attempt to use the development plan to influence development to areas where there is spare capacity in sewerage treatment or alternatively phase development to allow for the necessary treatment works to come on line. Legislation dealing with the provision of necessary infrastructure is complex and section 106 of the 1990 Town and Country Planning Act states that the inadequacy of water and sewerage infrastructure should no longer be a material consideration in refusing planning permission or as is stated in section 70 of the Act as part of a planning obligation. This is because, as mentioned in circular 16/91, the water companies have new powers to requisition water supplies and sewers and to levy an infrastructure charge on the developer. However, Desmond Heap comments:

"shortfalls in capital investment and practical difficulties in meeting new demands for new treatment capacity on the time scales allowed, pressure the local plans and development control process to hold back development pending improvements in sewage treatment". (Heap, 1993)

This highlights the need for co-ordination and co-operation in the development plan process at an early stage and for water companies to be regarded as a statutory consultee along with the NRA.

Also the House Building Federation (HBF) have commented on a recent consultation paper by OFWAT that the infrastructure charge should be abolished as it was often over £2000 in some areas and represented a cross subsidy from new home buyers to households that are existing water users.

Since 1989 Water Act, the NRA are statutory consultees for development plans whilst in Circular 30/92, local planning authorities are only advised to *"consult the appropriate water/sewage undertaker on any planning application which is likely to have significant implications" (DoE, 1992).* The water services association has continued to press the DOE without success for the water/sewage companies to be given statutory consultee status.

When a local authority proposes a site in an adopted development plan the water and sewage company has to eventually service the site, even though private developers will usually be expected to make various contributions. However, to service the site the water company usually has to develop treatment works or other installations which often require planning permission and may be in another local authority area. This can lead to many problems but highlights the need for co-ordination between planning authorities as well as between planners and water resource managers. Conversely, there may be problems of boundary overlap with water companies responsibilities in a local authority which has consequences for the local authority.

(iii) Public consultation and participation

There is a need for open and accountable planning system with maximum consultation and participation with local residents and interest groups. It is necessary to ask the public what they would like the environment to be like in ten years time, what they are prepared to give up and the price they are prepared to pay for environmental benefits. Other methods of consultation and participation include local fora and partnerships with environmental groups which can be introduced as a Local Agenda 21 initiative.

(iv) General Co-ordination and Co-operation with the Water Sector

Many water sector and planning issues overlap due to the diversity and complexity of relationships of the water cycle and land use. Problems are exacerbated by the different boundaries and responsibilities of the agencies affecting it (as examined in chapter 4).

In general terms the lack of co-ordination within the water sector is apparent by conflicting and often duplicate responsibilities, between the NRA and water companies; an overlap of time and resources on commenting on development plans; and the NRA's water quality objectives causing uncertainty for sewerage infrastructure investment.

Better co-ordination could lead to greater efficiency and cost savings, whilst helping it to meet new environmental standards and maintain the already stretched water resources. It would also allow LPAs to benefit from the direct economic factors as well as the wider social and environmental ones. Lintell described the potential of co-operation for the planning system with the water sector as an

"opportunity of addressing a number of vital environmental concerns, such as the maintenance of adequate water resources and the protection of water related wildlife habitats which lie largely outside of the planning system. On the other hand the planning system provides a useful mechanism for regulating the issue of land use which of course impacts on the water environment." (Lintell 1992)

The water sector needs to co-ordinate internally between the NRA, and the water and sewage companies but in order to reach a holistic approach to water resource management the help of the planning profession is needed. Water Managers are notorious for being "water centric" and are prepared to incorporate external requests and requirements only in so far as they do not upset their overall water strategy. This could explain the low priority attached by water planners to LPA development plans which are based largely on non water criteria and are thus held with little importance.

The NRA has recognised the importance of holistic planning and the need for adequate co-operation between interested organisations with the introduction of their Catchment Management Plans (CMPs). The ideas, methods and development of CMPs hope to provide a multi functional approach to cover all the NRA's responsibilities:

Catchment Management Planning in the NRA is a procedure designed to create a consistent framework by which its diverse responsibilities can be applied in a co-ordinated manner. It represents an agreed strategy for realising the environmental potential of a catchment. The impetus lies not only in the internal efficiency of the NRA but also in a constructive basis for work in conjunction with other parties (NRA 1993).

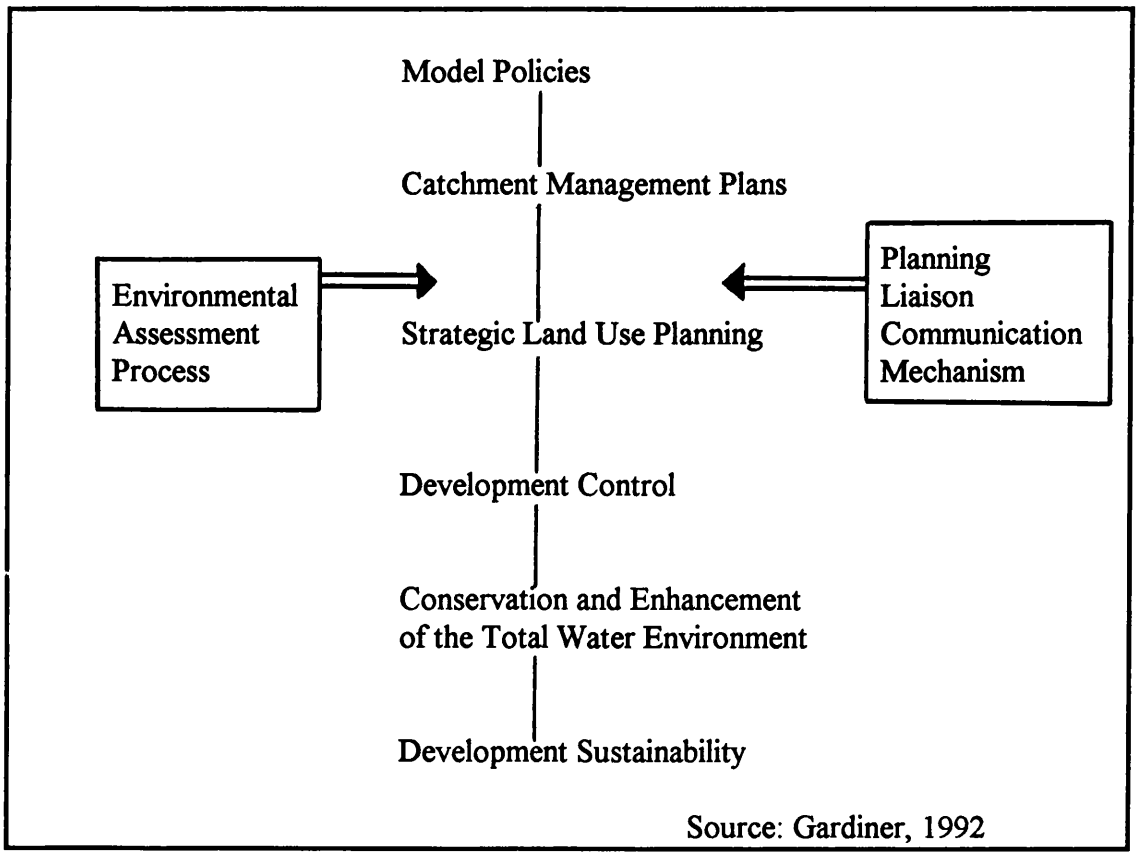
Lintell who has studied the relationship between Integrated Catchment Planning and the planning profession, has made various comments on the weakness of CMPs. He argues that the initial plans were not holistic in the sense that they sought to address the effects rather than the causes on adverse changes to the wider environment, ignored the implications of land use change in the wider catchment and concentrated on river corridors. Consequently they appeared in isolation to the land use planning development process. In addition there seems to be little if no consultation with statutory and non statutory organisations during preparation. However, as new plans are being drawn up they have taken account of these comments and so have been improved.

Local authorities are aware of CMPs but are uncertain how they integrate into the development plan process for their area. Berkshire County Council for example, on commenting on the Blackwater CMP expressed concern about the lack of reference to the planning system in achieving NRA set objectives. In a survey by Slater in 1993, only four of the existing CMPs acknowledged the existence of development plans but not one development plan mentioned CMPs (Slater, 1993). If the two policy documents could be more co-ordinated, the implications of development on the water environment could be adequately addressed by both organisations.

The Thames Region NRA (NRATR) can be used as a good example of how the water sector is striving to work with the planning profession. Professor Gardiner of the

NRATR has the view that there are opportunities for the NRA and local authorities to develop a "synergy" in terms of support for the interests of the water environment in the planning system. The technical services department of the NRATR have developed a systematic approach involving changes in structure, proactive and reactive relations with the LPAs. Figure 6.1 demonstrates how they would like the two organisations to interact. One of the important issues addressed by NRATR is the way both planners and water resource managers relate to the EIA process. They also advocate the use of SEA at all levels of work. Planning liaison which is involved with the processes of CMPs in the form of catchment liaison groups should be used to increase the

Figure 6.1 The NRA Thames Region Initiative



understanding not only amongst the local authorities but the wider public of the NRA's general role, duties and future plans.

They developed their model policies in response to the UDP process which began in the London Boroughs in 1989-90. They worked together in both the development plan and development control processes. They also ensure that CMPs are in line with development plans. This is very important in the light of local government re-organisation where the development of new development plans for new councils will give the water sector and planners a fresh opportunity to start working together.

The DoE Good Plan Guide stresses the importance of co-ordinating role of the development plan which:

"can provide the basis for action programmes which detail the proposed means of implementing policies. References to management plans can be included in development plans and can be included in supporting material. Separate management plans can be used to provide detailed guidance for implementation agencies and complement and influence the broad development plan." (DoE, 1992 para 5.58)

The Way Forward

If the techniques and methodologies of auditing, objective setting, environmental assessment, co-ordination and co-operation are to be successfully implemented, they need to be regarded as "standard" planning practice. This involves several commitments from planning departments. Obviously planners need a sound understanding of principles, practice and problems of sustainable planning and the environment. It is fundamental therefore that planning students are taught environmental issues in planning courses; planners in practice are able to attend sustainable development seminars as part of their continuous professional development and members have access to appropriate literature and advice on such topics. After all

it is ultimately the members of the environment or planning committees that agree projects, plans and proposals to implement sustainable development.
It is clear from the previous text that for the planning system to achieve environmental objectives, they need to achieve horizontal integration with other departments in the council and vertical integration with other tiers of local authorities, Government and other organisations with responsibilities for environmental protection.

Finally, it is imperative that the implementation of projects and plans are monitored against environmental objectives to measure their success. It is not adequate for example to have policies in development plans if they are dismissed on appeal. Discrepancy between government guidance and Secretary of State appeal decisions is a contemporary subject which is under scrutiny by many students at the moment (for example out of town shopping and town viability and vitality) but is too large a topic to be discussed here.

Potential Problems

The implementation of sustainable development policies is not and will never be without problems. Actual implementation has proved very difficult and it will never be possible to please everybody. Public bodies such as councils aim to create policies to improve the environment for the public as a whole but also take into consideration economic and social sustainability criteria.

Essex Water Company has polled their customers and have concluded that generally the public would like the environment protected but they are ultimately not in favour of any increase in their water bills. Whether this is due to ignorance of environmental issues or priority setting of personal economics against environmental protection is not known but in this time of recession it is likely to be the latter.

The other major problem in implementing sustainable development is one of scale. As outlined in chapter one, it can be related to several scales including ecological, geographical and administrative boundaries. It could be said that Essex, as a county does have a water resource problem and is not locally sustainable as only 35% of water supplied in Essex is of local origin, the rest being imported from outside the administrative boundary.

However, there are few environmental problems in the Essex water environment resulting from water demand as water is moved into the county from other areas. The environmental problems created by the Ely Ouse system or other transfer schemes are not widely publicised and indeed are frequently denied in private interviews!

As a Country, England does not have a water shortage problem but in temporal and geographical terms there are water resource management problems. The Secretary of State for the Environment has stated in the Regional Planning Guidance for the South East, that these problems will cease to be a planning constraint after 2006 and so technical innovation will again be relied upon to overcome environmental problems.

Conclusions

The planning system may only have a minor or partial influence on environmental trends of some issues such as water resource management. They should therefore concentrate on directional objectives and leave the setting of objectives in strategies to the expert organisations like the NRA and water companies. The planning system can contribute to sustainable development by ensuring adequate implementation of environmental assessment and SEA of their plans, policies and projects.

Development plans provide an ideal opportunity to ensure environmental issues are considered in all development decisions. Adequate explanation of policies will provide

developers with information which can guide their applications. Policies can directly control or guide development to appropriate scales and locations.

Planners are ideally placed to encourage consultation, co-ordination and co-operation between the planning sector and the water industry. It should be a continuous process to ensure a good relationship and understanding of each others work and priorities and to ensure that all parties strive to work together, not against each other.

Chapter 7: Conclusions and Recommendations

Conclusions

The publication of the UK National Strategy for Sustainable Development in January 1994 places sustainable development as official policy of the UK Government. In addition, the major role of the local authorities in delivering sustainable development has been recognised by organisations at all levels from the UNCED to community based pressure groups. Within these local authorities, the planning system is ideally placed to implement the principles and in many cases has been the first to feel the effects of the debates and changes called for. The government has recommended that development plans promote sustainable development through the use of SEA and EIA. PPGs have demonstrated that sustainability is really here to stay as an objective of the planning system.

In any case, the planning system has always been a tool for environmental protection and as a mechanism to shape land use and wider economic behaviour to conform to publicly decided goals. The main problems concerning sustainable development involve the identification of environmental capacities and how planning should react to these constraints in practice.

In the case of sustainable water resource management, the objective is not simply to conserve water per se to ensure availability of supplies in the future, as in most cases, reduced consumption today will not increase the quantity of potential supplies in the future. However, reduction in current consumption is important to reduce the environmentally unsustainable use of abstracted supplies where levels of abstraction are already creating environmental damage. A sustainable level will only be reached when the extractive supply level is compatible with maintaining sufficient resources within the natural water environment to ensure its ecological status.

It is generally agreed that over abstraction is not merely confined to the forty low flow rivers identified by the NRA (NRA 1993) and the issue needs further investigation (CPRE, 1993; English Nature, 1992a). The present system of abstraction licences where existing users are protected irrespective of the sustainability of the use of that water must be reviewed. Various alternatives have been suggested. A levy could be charged on both authorised and actual consumption or abstraction permits could be tradable (CPRE, 1993). However, further investigation into the potential use of tradable permits and their environmental consequences is required in order to assess their benefits over the present system. Tradable permits could prove very useful in areas of high irrigation for example in East Anglia. English Nature suggest that all abstractions should be reviewed periodically in order to monitor actual use; monitor the effects on the environment and to determine the sustainability and appropriateness of their use. The NRA must be given the power to revoke or alter any licence as a result of such reviews.

The principles of sustainable development have been examined. Ideally, the three criteria (environmental, economic and social) should be in balance but the planning system has more influence and concern over environmental sustainability. Therefore planning guidance and discussions tend to concentrate on this aspect. It is important for planners to take economic and social criteria into account in their work although this may lead to conflicts with environmental considerations. This is demonstrated in the fact that one of the main obstacles to sustainable water resource management is the government refusal to regard water as a constraint to development. Although Robert Atkins (Minister for Environment and Countryside) in his speech to the TCPA conference in February 1994, stated that it should be a material consideration in planning decisions, he went on to state that all demand in the UK can ultimately be satisfied by moving water to areas of excess

demand. On this basis, the availability of water is unlikely to prevent development and may at best effect its timing.

Although water resources may (or may not) be the decisive factor in determining whether development should take place, it is certainly an important factor to be considered along with several others in the South East region. These include the exacerbation of rising populations, transport congestion, pollution and waste disposal sites; increasing impacts on nature conservation; green belt designations; decreasing land availability and the lack of self sufficiency (for example in energy). Through a system of thorough SEA and EIA, there must be a case for steering development elsewhere in the UK. After all, is it possible to go on allowing ever more growth and development in the South East and still talk in terms of sustainable development? (Gordon, 1994).

It seems apparent that there is a need for a strategic approach to development. When taking account of water resources (and many other aspects of development) the NRA should make it clear to planning authorities the extent to which water resources may meet development demands without causing environmental damage. It is not advocated that people should be forced "to live where it rains more", but to consider what measures might be taken or institutions created to encourage growth and development elsewhere. In regional and new town policies, it is possible to identify the location of growth and development. In addition, strengthening the role of the regions, by providing them with appropriate powers and resources and giving real meaning to subsidiarity through the devolution of government, would reinforce the attractions of living and working in the regions and help to act as a balance to "the centralising force of London" (Gordon, 1994).

Regional planning has several advantages. It would be possible to base the region's administrative boundaries on ecologically valid areas such as water catchment areas rather

than simply population size, unrelated to the ecosystems. Environmentally sustainable economic development, transport and other activities could also be organised on a regional basis. A nation-wide system of regional environmental audits should be created against which to assess development proposals. This would allow the government to openly demonstrate its commitment to sustainable development and an environmentally led planning system in practical terms. However, the present government appears to be firmly against regional planning, demonstrating this by dismantling the only regional system in the UK - that of Scotland.

Therefore, it seems that the lower tiers of government must exert pressure from below, forcing the government to acknowledge a need for change. This will only work if local government officers and planners demonstrate their commitment, enthusiasm and responsibility to sustainable development. An indication that planners have yet to appreciate their pivotal role in relation to sustainable water resource management was demonstrated in the poor turn out of planners to a TCPA conference on "Planning for Water" held in February 1994, when the NRA launched its "Guidance Notes for Local Planning Authorities on the Methods of Protecting the Water Environment Through Development Plans" (NRA 1994) and where there was good opportunity for open discussion of issues of concern.

This latest document underlies (as do many recent NRA publications and conferences) the enthusiasm of the NRA to work with and influence planners. They are also concerned about the inadequacy of their role as a consultee and advisor if planners fail to listen. In addition, planners have the legal means to prevent and regulate development in circumstances where the NRA can recognise the problem but is powerless to control.

Local authority planners and the NRA must work together. At present, there are few linkages between Catchment Management Plans (CMPs) and development plans (DPs) but there is great scope for improvement. In a survey by Slater in 1993, only four of the existing CMPs acknowledged the existence of the DPs but not one DP mentioned a CMP. Although CMPs are relatively recent productions, there has been sufficient time to allow for co-operation (Slater 1993). However, most DPs do contain policies of relevance to the water sector. The best and most comprehensive policies on water (e.g. Buckinghamshire County Council Structure Plan policies) show evidence that they work closely with the NRA. These links should be encouraged and built upon as examples for other councils.

One problem may be the spatial variation in the levels of fit between CMPs and DPs. However, both agencies produce development policy documents with important land use and water implications and therefore there is a need for more effective co-ordination to ensure that there is some degree of symmetry in the adopted policies.

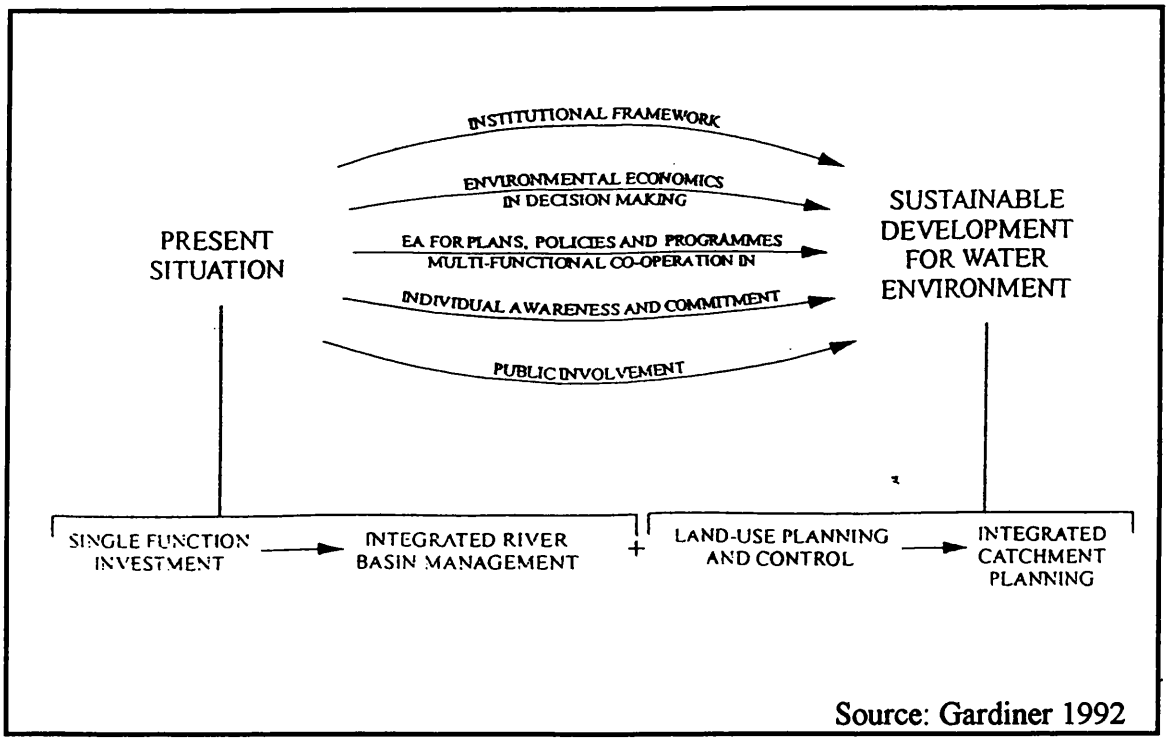
Thames Region NRA provides a good example of how the NRA is trying to work with LPAs. They have issued clear guidance about their region's objectives which planners are using to strengthen the implementation of their plans. Their "institutional model" could provide the basis for a more effective working relationship between the NRA and LPAs in other regions. However, they still need to answer the question of how to include private water companies

These water companies must take a holistic approach to sustainable water resource management themselves. They must not assume the only solution to predicted water shortages is to increase supply. They must have aims to reduce leakage and consumption through metering and aim to induce environmental benefits through consultation and co-operation with both the NRA and LPAs.

There are likely to be increased environmental and economic pressures that will force the two policy areas of water resources and land use planning to closer levels of co-operation. This is enforced by the need for greater SEA of policies, plans and projects and an overall strategic approach to water supply and demand. A national strategy for water resource management is called for based upon the integrated catchment management approach of the CMPs which will address the issues of and ensure sustainability of water use and the conservation of freshwater and wetland habitats. Such an adequate strategy can only be achieved with full co-operation and co-ordination between all water sector and land use organisations.

The goal of sustainable development for the water environment can be achieved if Local Planning Authorities, the NRA and private water companies enter into a partnership approach. Water is one of the most visible and important sustainable resources upon which any development proposals are directly or indirectly dependant. The water cycle and issues relating to it are complex yet a holistic understanding is necessary to recognise how individual agencies can develop and transfer knowledge and experiences to achieve sustainability of the water environment. Prof. John Gardiner, from the NRA summarises this very neatly in figure 7.1.

Figure 7.1 Pathways to Sustainable Development for the Water Environment



Source: Gardiner 1992

Recommendations

- The UK Government should promote the role of regional and strategic planning in co-ordinating the water agencies and land use planning issues as it is the most effective level to implement the principles of sustainable development of the water environment as well as sustainable transportation and economic growth.

- The consultation document "Using Water Wisely" was published in July 1992. This must be translated into an action plan as soon as possible. The Government should define the procedure and definition of relocating large developments away from water resource problem areas as mentioned within the document.

- The Government should also produce a PPG on sustainability within which the issue of water resources should be addressed. This could act as a fore-runner to the PPG on

Planning and Pollution which has yet to be finalised. Within this document, the Government should take the opportunity to clarify the relationships between the water sector and land use planning and set out a systematic approach to consultation and co-operation of both development and management plans. Other PPGs should also be reviewed (e.g. PPG3 on Housing) to encourage consultation with the NRA and water sector.

- Strategic water issues should be discussed in an open manner with representatives of the NRA, water companies and LPAs in either informal, ad-hoc meetings or more formal regular meetings. Many councils have set up environmental fora as part of their Local Agenda 21 initiative and these could provide a good opportunity to promote co-ordination of the key players in sustainability of the water environment. It is also important to promote a greater communication and understanding of the relationships between each organisation and this could be carried out through CPD workshops, seminars or even job swaps. Planning and environmental studies students should also gain a sound understanding of these issues at university.

- Each agency can contribute to the overall understanding of the issues by providing information that their agency collects in a standardised format, (for example, LPAs - housing and population information; NRA - state of the environment and abstraction rate information and water companies - demand and supply forecasts). This should be stored in a GIS which is accessible to all and which is regularly updated.

- Finally, planners should set the example to other professions. They should demonstrate their commitment to sustainability of the water environment in their work by discussing NRA model policies, CMPs and water companies land management plans and then incorporating them into their development plans.

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