

**Water Quality
Management Series**

A REVIEW AND DISCUSSION DOCUMENT

PROJECT: PHASE 1

Development of a Strategy to Control Eutrophication in South Africa



Department of Water Affairs and Forestry

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EXECUTIVE SUMMARY

In 2002 the Directorate of Water Quality Management of the Department of Water Affairs and Forestry (DWAF) initiated a project that has the ultimate objective of developing a national strategy for eutrophication control. The project is envisaged as a two-phased one, with the first phase having the following objectives:

1. Undertaking an international review with particular reference to test cases or projects that have been or are being undertaken that have relevance to the South African situation;
2. Undertaking a national review of where eutrophication problems exist;
3. Undertaking a review of possible causes for the problem sites identified; and
4. Providing a terms of reference for Phase 2 of the project.

This report contains the findings of tasks 1-3 and makes suggestions for follow up actions during Phase 2.

The main strategic conclusions and lessons that can be reached from the international scan and the survey of the regional offices are that:

1. Developed countries perceive eutrophication as a long-term strategic priority environmental and water quality problem to which they are prepared to allocate appropriate resources. This is because of the high value that society attaches to the recreational and ecological aquatic environment. Accordingly, the government agencies responsible for the management of aquatic resources within these countries have been obliged to develop and implement appropriate strategies for eutrophication control. Political processes ensure that this is carried out through parliamentary monitoring and public reporting.
2. South Africa's environmental and water policy reflects a strong message that aquatic resources and water quality are priority issues and that appropriate strategies should be developed and implemented to prevent degradation. The survey of the South African regional situation demonstrates that eutrophication can be regarded as a national water quality problem in that it has severely degraded certain aquatic systems, and also affects the fitness for use of many water resources throughout the country. With increasing development, it has the potential in the future to affect all water resources.
3. The survey has indicated that regional offices currently lack the capability to implement desirable eutrophication management programmes for water resources under their jurisdiction, as desired by published policy and prescribed by legislation (the National Environment Act and the National Water Act). The issue of eutrophication has not received adequate attention from DWAF policy makers and planners. The situation could become even more exacerbated with the institutional advent of Water Management Agencies within the WMAs. There is therefore an urgent need to rectify this situation.

The major issues to be faced by phase 2 of this project include the following:

1. **Focus of Central Government:** DWAF's should reinforce its role of:
 - Ensuring that eutrophication is given appropriate status as a national water resource problem, specifically so as to promote the allocation of resources (human, financial and technical) to deal with the problem.
 - Providing the country with appropriate direction (through published policies, strategies and guidelines) on how eutrophication should be controlled.
 - Monitoring and reporting on the national status of the problem.
 - Promoting the development of national capacity through activities such as training, research, and awareness campaigns.

2. **Preparation of an Official DWAF Policy Statement:** The development of an official policy statement from DWAF leadership reflecting on the need to manage the eutrophication problem is a prerequisite. This should emphasise that the issue is a priority and commits personnel within the organisation to the development and implementation of a workable strategy. Without this, DWAF personnel in the regional offices (and the affected communities) will continue to treat the topic as a low priority issue. A draft of a previously prepared statement (drafted by Mzuri Consultants following a Water Research Commission workshop in 2001) that might form the basis of such a policy statement is included in **Annexure 7**.
3. **Development of an Official Eutrophication Strategy Document:** The development of an official national strategy document that contains all the elements of actions needed to control the problem throughout the country. It is the opinion of certain parties that current water resource strategy documents do not give sufficient attention to eutrophication. Such a strategy should contain elements of assessment, monitoring, capacity building, consultation, objectives, and implementation of catchment actions. It should also spell out the role of DWAF, WMAs, local authorities, users, industry and affected communities. An initial document that could form the basis for the development of this strategy is presented in **Annexure 8**.
4. **Mobilisation of Resources and Capacity:** DWAF should allocate initial resources (from internal personnel) to oversee the process. At the very least this should be a professional person with the mandate to ensure that both of the above documents are prepared.

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1. INTRODUCTION

Anthropogenic nutrient enrichment of water resources is a global water resource problem (Rast and Thornton 1996). It is most evident in highly populated and developed areas where water-borne sewage systems and agricultural practices contribute to elevated loads of nutrients into receiving natural water systems. The nutrients promote the growth of biological material in receiving systems causing a wide array of water quality problems (Dunst *et al.* 1974). South Africa itself has some of the most highly enriched surface waters in the world (NIWR 1985; van Ginkel *et al* 2000).

Water resource authorities in South Africa have tended to regard eutrophication as a problem that does not merit a high priority because of the perceived low return for the high cost of nutrient control (Walmsley 2000; 2001). As a consequence the issue has received little management attention in terms of policy and strategy development, monitoring, reporting, capacity building, or research. However, avoidance of the eutrophication issue cannot be considered as an option any longer since recent national environmental legislation (National Environmental Management Act (NEMA – Act 107 of 1998) and the National Water Act (NWA - Act 36 of 1998) has necessitated that new pollution and waste management approaches should be taken. This is also supported by statements in the Department of Water Affairs and Forestry (DWAF) strategy for the management of South Africa's water resources based on the Water Act of 1998 (DWAF 2002).

In 2002 the Directorate of Water Quality Management of DWAF initiated a project that has the ultimate objective of developing a national strategy for eutrophication control. The project is envisaged as a two-phased one, with the first phase having the following objectives:

1. Undertaking an international review with particular reference to test cases or projects that have been or are being undertaken that have relevance to the South African situation;
2. Undertaking a national review of where eutrophication problems exist;
3. Undertaking a review of possible causes for the problem sites identified; and
4. Providing a terms of reference for Phase 2 of the project.

Mzuri Consultants were appointed to carry out the first phase of the project. This report contains the findings of tasks 1-3 and is intended to form the basis of a participatory process during which the terms of reference for Phase 2 are identified.

2. CONCEPTS OF EUTROPHICATION

There is vast amount of published literature on the topic of eutrophication which highlights its importance as a water resource management problem (e.g. Stewart and Rohlich 1967; Vollenweider 1968; Dunst *et al.* 1974; Toerien 1974; Walmsley and Butty 1980; Ambio 1990; Klapper 1991; Rast and Thornton 1996; European Environmental Agency 1999; Australian and New Zealand Environment and Conservation Council (ANZECC) 1999; United Kingdom Environmental Agency 1999; Canadian Department of Environment 2000; Walmsley 2000). For the purposes of this report there is no intention to provide a new review of these. However, **Annexure 1** of this report contains an excerpt from a recent Water Research Commission publication (Walmsley 2000) that provides an overview of the key technical and scientific concepts relating to eutrophication and its management.

3. INTERNATIONAL REVIEW

3.1 Methodology for the Scan of Countries

A scan of eutrophication (nutrient management) was done of select world wide web areas via the internet using the search software *Copernic Agent Personal*. *Copernic* is a website search software that allows for specific web areas to be searched and provides a list of the most frequently visited sites on these webs that deal with specific topics.

The search yielded information from the main countries and regions where eutrophication is considered to be a problem and where policies and approaches have been put in place. The results of the separate scan searches of select web areas are provided on a separate CD (**Annexure 2**). For each web area, these are presented in the order of their importance (popularity) and contain the details of the website names and URL addresses.

In addition to the websites, key technical material in the form of policies, approaches, guidelines and reports was downloaded and has also been placed on the CD. These documents provide detail on the eutrophication policies and practices of the various regions and respective countries.

3.2. Results

This section presents an outline of the way in which some of the major developed countries have gone about developing strategies for managing eutrophication. Very few of the underdeveloped countries have attempted to develop or implement strategies for eutrophication management, and therefore were not included in this survey.

3.2.1 United States of America

Eutrophication is recognised as a national water resource problem and, accordingly, the USA has official policies and programmes in place that reflect this high priority. The Environmental Protection Agency (EPA) is the main federal agency that facilitates the development of policy and the implementation of regulations.

The USA approach to eutrophication is based on two principles. Firstly, that total integrated watershed management is the basis of sound water resource management and eutrophication is considered to be a problem that is only part of watershed management. Secondly, nutrient enrichment from cultural practices is a problem that requires specific policies and management actions.

The USA strategy for reducing cultural eutrophication is based on five key elements. These are:

1. Nutrient criteria should be based regional and water body type characteristics. This is because criteria cannot be established as a single set of national numbers or values as there is too much natural variation from one part of the country to another. The EPA has defined 14 regions. Furthermore, the expression of nutrient enrichment and its measurement varies from one water body type to another (e.g. streams, wetlands, estuaries, lakes, reservoirs, coastal waters).
2. Guidance methodology for the development of criteria based on water body type and regions are critical to implementation of any management programme.
3. A country-wide management network is essential. The EPA has a countrywide system that consists of EPA regional technical and financial support operations each led by a Nutrient Co-ordinator (a specialist responsible for providing guidance to the States and Tribes in the specific region).
4. The development of nutrient criteria for use in decision-making, States and Tribes will develop eco-regional nutrient criteria values for water body types that can be used as the basis for the setting of water quality standards, the issuing of discharge permits, the assessment of total daily maximum loads to water bodies, and as decision-making benchmarks for management planning and assessment; and
5. There will be monitoring and evaluation of the effectiveness of nutrient management programmes.

The USA guidance manuals for assessing and managing eutrophication are extensive and cover all types of ecosystem throughout the country. These include:

- The Nutrient Criteria Technical Guidance Manual: Rivers and Streams
- The Nutrient Criteria Technical Guidance Manual: Lakes and Reservoirs
- The Nutrient Criteria Technical Guidance Manual: Estuaries and Coastal Waters
- Technical Guidelines Manual for Assessing Wetland Condition

The outline contents of all the above manuals have been placed on the accompanying CD.

The EPA has set up an incentive system by which local authorities and states can motivate for federal funding to support “*Watershed Initiatives*”. A *Watershed Initiative* represents a project whereby, on the basis of community values and objectives, a specific watershed receives funds to support the implementation of agreed management actions. The scheme has been ongoing since 2000 and several watersheds have received funds for rehabilitation of their eutrophication problems. The USA also has numerous examples of where whole lake systems have been rehabilitated in terms of eutrophication problems. Some of these rehabilitation programmes have been ongoing for more than 15 years (e.g Lake Okeechobee in Florida).

3.2.2 Canada

Canada has a well-developed approach to the protection and management of its aquatic environment (<http://www.cciw.ca>). The management of surface water resources is considered part of integrated environmental management and falls under the jurisdiction of the Department of Environment (<http://www.ec.gc.ca>). The system is characterised by the following features:

- There is a federal Environmental Protection Act (1988) that legislates for management of the environment in an integrated way. Environmental management enjoys a high political priority and there are regular five-yearly reviews of the Act by a Parliamentary Committee on Sustainable Development and the Environment. The problem of nutrient release into the environment has long been an item on the political agenda. In both the 1988 and 1994 parliamentary reviews the Canadian government was called on to comprehensively assess whether the problem of nutrients was being adequately dealt with;
- The Environmental Protection Act (1988) is the only federal act to directly address environmental concerns related to nutrients. It gives the federal government the authority to regulate nutrients that can cause excessive growth of algae and aquatic weeds, as well as to deal with toxic substances, hazardous waste and air pollution. Phosphorus in laundry detergents is the only nutrient source currently regulated and laundry detergents may not contain P in concentrations greater than 2.2% w/w;
- There is a bilateral international Canada-United States Great Lakes Water Quality Agreement (1972) that is aimed at rehabilitating these important water bodies. It commits both countries to remove P from detergents and effluents, as well as to monitor the Great Lakes for trends and emerging water quality issues;
- There appears to be a relatively well-operated system of federal, provincial and territorial institutions that support environmental protection through the provision of support in the form of research, monitoring, information and professional advice; and

- Federal, Provincial, Territorial and local community organizations have all responded to the eutrophication problem by instituting a variety of nutrient control activities (e.g. legally enforceable acts, promotion of best management practice guidelines, partnership initiatives, volunteer rehabilitation programmes).

The rehabilitation of the Great Lakes in Canada possibly represent one of the best cases of where water quality management has succeeded in achieving set goals through cooperative international programmes (see www.ec.gc.ca/ecosyst/background.html). Nutrient loading to the Great Lakes has been greatly diminished over the last 20 years with a resultant improvement in water quality.

3.2.3 Australia

Water resource and land management has a relatively high profile in Australia (<http://www.erin.gov.au>). There are both federal (commonwealth) and State laws that deal with water resources and the environment (e.g. The Water Resources Act (1974) and the Environmental Protection and Biodiversity Conservation Act (1999)). At both the federal and State levels, water resources are strongly aligned with land and agriculture. Federal water resource policy is handled by the Department of Agriculture, Fisheries and Forestry. Each of the States or Territories have equivalent government departments that deal with legislation and regulation of land and water resources.

Eutrophication was not considered a major problem until the 1991 River Darling algal bloom. This event led to a complete change in the Australian water resource management's perceptions and attitude towards eutrophication and its management. The last decade has, therefore, seen an escalation in activities aimed at understanding and managing eutrophication in Australia (ASEC 1996). These have included:

- Nutrient management strategies;
- Algal management strategies;
- A senate enquiry into toxic algal blooms;
- Major research funding initiatives; and
- Community education programmes.

Most of the Australian States have developed and implemented policies targeted at both diffuse and point sources of phosphorus. These have included better farming practices to ameliorate nutrient losses to streams and guidelines for the use of buffer strips and other techniques for sediment and nutrient interception. Also included have been options for improved sewage treatment, P precipitation, off-river disposal and effluent re-use (www.dwlc.nsw.gov.au).

A recent initiative, aimed at introducing and implementing a National Water Quality Management Strategy, is complete (Australian and New Zealand Environment and Conservation Council/ Agriculture and Resource Management Council of Australia and New Zealand 2000 - ANZECC). In this strategy eutrophication management is integrated into a holistic approach that:

- Identifies the environmental values that are to be protected in a particular aquatic system. These values are based on particular values or uses of the aquatic resource. Stakeholders are implicitly involved in this process;
- Identifies the management goals for the system and then selects relevant water quality guidelines for measuring performance. Water quality management objectives are then set and these must be met;
- Develops performance criteria to evaluate level of management compliance;
- Develops monitoring programmes that focus on the water quality objectives; and
- Initiates appropriate management responses where objectives are not being met.

The strategy has proposed that six ecosystem types are considered as each require different approaches (flowing waters - upland and lowland, standing waters – reservoirs/lakes and wetlands, estuaries, coastal and marine waters). Specific indicators should be selected to assess the condition of each of these ecosystem types. The strategy recognises nutrients as an issue and has suggested appropriate indicators for assessment. This includes both concentrations and loads. Interim trigger levels for assessing possible risks and adverse effects have been proposed. These differ for the six respective ecosystems that have different sensitivities. Management approaches also take into account the current condition of specific aquatic systems and the socio-political setting.

A set of guideline documents has been produced by ANZECC (2000) that is of relevance to South Africa – a complete download of these has been made available on the attached CD ([Annexure 2](#)).

3.2.4 Europe

Concern about elevated nutrient concentrations and adverse eutrophication effects has prompted many strategies at international, national and local levels. An important element of these strategies are the goals set, particularly numeric targets (e.g. 50% reduction in nutrient loads or complete installation of wastewater treatment plants) since these allow for progress to be measured (EEA 1999). Some of the major measures and actions in the European Community over the last 20 years have included:

- Strategic
 - Goals established for what is desired;
 - Target reductions in nutrients;
 - Environmental quality standards;
 - NO_x standards;

- Point Sources
 - Point source reductions to water;
 - Waste water tertiary treatment;
 - Industry best available technology;
 - Reduction policy;
- Agriculture
 - Controls on agriculture;
 - Manure restrictions;
 - Manure storage;
 - Silage storage;
 - Fertiliser restrictions;
 - Cultivation;
 - Financial instruments;
- Products
 - Eco-labelling;
 - Detergents;
- Atmospheric inputs
 - Atmospheric sources;
 - BAT in industry;
 - Voluntary agreements;
 - Combustion installations; and
 - Traffic

Most of the above measures, and others, have been incorporated into legislation, and or international agreements.

The European Union 5th Environmental Action Programme introduced several significant measures requiring member countries to carry out certain actions. These have included:

- A 30% reduction in NO_x emissions;
- Regional targets for ammonia emissions;
- An action programme for integrated groundwater protection and management;
- A 1991 Nitrate Directive ((91/676/EEC) to reduce or prevent pollution of water caused by application of inorganic fertilizer and manure on farmland;
- A 1991 Urban Wastewater Treatment Directive (91/271/EEC) to reduce pollution from domestic effluents. This sets emission standards for urban wastewater discharge and requires the stepwise introduction of comprehensive treatment facilities. Standards for total N and P are related to the size of the population of the area serviced and the designation of sensitive receiving areas. A technical

compliance date of 1993 was set, but this has subsequently been extended several times (currently set at 2005); and

- A Water Framework Directive that will introduce ecological criteria into performance measures and mean that one of the key criteria for judging compliance will be on the attainment of “good ecological status”.

Although many of the EEC member countries have been unable to completely fulfill obligations to the above, it is evident that nutrient enrichment and eutrophication still have a relatively high priority in the EU.

This is evidenced by:

- The implementation of these Directives by some countries, and the large budgets allocated for implementation (SCOPE 1999);
- Countries such as Germany, Netherlands and Denmark attempting to designate all their waters as being nutrient sensitive;
- Continued monitoring and research of aquatic ecosystems and their eutrophication status (e.g. EEA 1994, 1998 – see EEA documents on the CD); and
- Evidence of an arrestation of upward trends and an improvement in certain regions of Europe (EEA 2001).

There are numerous international commissions and agreements that deal with the protection of specific river systems and the marine environment from eutrophication. These are agreements to restrict the discharges of nitrogen and phosphorus. Some of these include:

- The Helsinki Convention (HELCOM) to protect the Baltic Sea (requiring a 50% reduction in nutrient loads). There is a Baltic network (Bernet) which is monitoring and reporting on the situation. Some of the Bernet reports are included on the CD in Annexure 2.
- The Paris and Oslo Convention (OSPAR) to protect the North Sea and Atlantic (requiring a 50% reduction in nutrient loads).
- Danube Action Plan (www.ceit.sk/wwwisis/sap1.htm) that is intended to reduce pollutant loads into the Black Sea. Eutrophication is cited as one of the major problems.

Most of the EC member countries have their own eutrophication strategies that focus on reducing and managing the impacts of eutrophication (e.g. in the United Kingdom – Environment Agency 1998). It is accepted that the general mechanisms of nutrient enrichment are understood, that nutrient reduction needs to be implemented. However, costs and benefits appear to be the major policy stumbling block that is preventing wider implementation of many EC Directives in Europe.

The example of the United Kingdom is a useful one in terms of the approach which has been adopted to managing eutrophication. Following preliminary discussions in 1997 with stakeholders a preliminary report

on the status of eutrophication was published. This was widely distributed with the aim of seeking the views of major stakeholders and other interested parties before finalising the strategy. A consultation period of approximately 12 months was then allowed followed by a document with the national accepted strategy (Environmental Agency 2000). The Environmental Agency has recently published its first progress report on what it has achieved in terms of implementing the strategy (Environmental Agency 2002). All of the UK documents are contained on the CD (**Annexure 2**).

3.2.5 Summary points

These summary points cover some of the main elements of policy and strategy that have been adopted by countries where eutrophication is considered to be a problem.

1. Eutrophication is a major water resource problem in most of the industrialized countries (e.g. USA, Canada, European Union Countries, and Australia). All of these countries have recognised that the issue is a long-term strategic one and have developed appropriate strategies to minimize nutrient inputs into the aquatic environment.
2. The EEC, Canada, Australia, the USA, and some countries of the EEC have all recently assessed previous policies, quantified the extent of the problem and, through broad participation of society, developed accepted national strategies. These strategies have mobilized institutions (academic, parastatal, governmental, business and non-governmental) to address the problem. Research and monitoring activities form an integral part of their strategies. All actions are geared towards quantifying nutrient sources, their impacts, and approaches to reducing the loads of nutrients into the aquatic environment.
3. The European and North American regions have many international water bodies (fresh and marine) and international rivers that are common to several countries. Regulatory directives and international agreements on nutrient reduction have been set in place. Some countries of the EEC have been unable to meet their obligations to nutrient reduction targets that were set nearly 10 years ago. Economic and social considerations appear to be the cause of this.
4. Eutrophication management strategies have been developed so as to incorporate all aquatic ecosystem types (running waters, standing waters, wetland areas, estuaries and coastal waters).
5. The development of strategy is highly dependent on societal perspectives and the values of stakeholders and the public. For example, in Europe and North America there is a strong environmental and recreational value attached to water resources, therefore the public is unwilling

to accept even low levels of eutrophication. In addition they are willing to see public resources invested in the control and rehabilitation of the problem. In South Africa this may not be the case.

6. It is recognised in the industrialised countries that success to developing and implementing eutrophication management strategies lies in the acceptance of certain key points, notably:
 - Anthropogenic eutrophication is reversible, but the problem requires a long-term approach.
 - A collaborative approach between government, business and communities is required. However, government must play the lead facilitation role.
 - The issue cannot be solved by a single technical intervention. The problem requires the implementation of a suite of actions (social, economic and technical).
 - Research, monitoring and reporting activities are prerequisites to the decision-making that is required.
 - Eutrophication should not be regarded as an independent problem, but rather one that is handled in an integrated way along with all other water quality issues.

4. ASSESSMENT OF THE STATUS OF EUTROPHICATION AND ITS MANAGEMENT IN SOUTH AFRICA

4.1 Survey Methodology

It was agreed that the project would involve a survey of the country's nine regional offices in order to establish answers within several key areas that might concern strategy. The questionnaire (see Annexure 3) was designed to establish the extent of the problem in the each of the 19 Water Management Areas (WMAs – see Figure 1), as well as to obtain information on affected water resources. In addition, questions were posed in order to obtain information on monitoring and management programmes, as well as training needs.

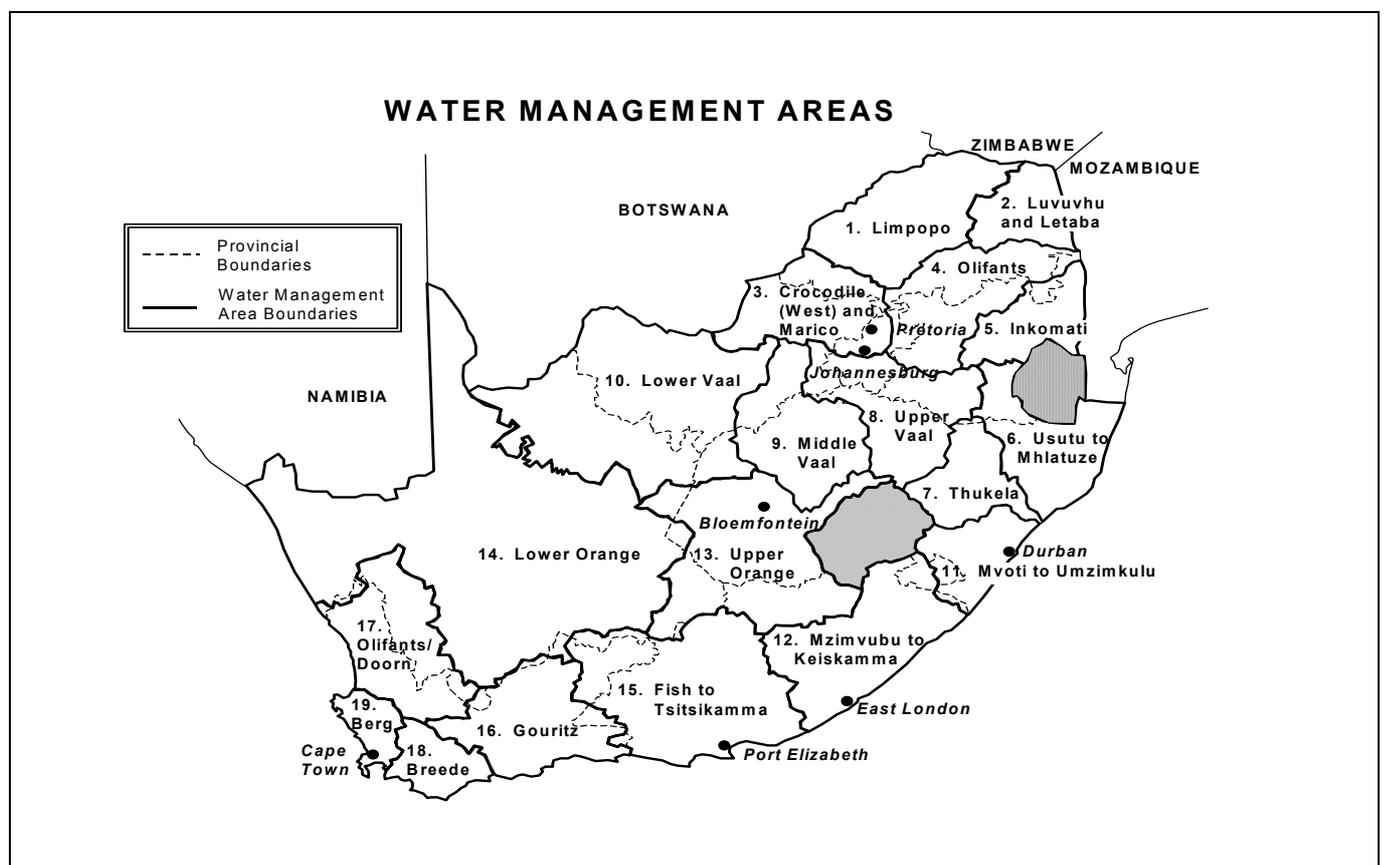


Figure 1: Map of South Africa showing the 19 Water Management Areas.

The questionnaire was sent to each of the country's nine regional offices with the request that responses should be returned for each of the WMAs. Questionnaires were also sent to select municipalities and water utility companies. The questionnaires were sent out in early November 2002 with the request for responses by the end of November 2002. A telephonic follow up campaign was carried out during December 2002 and early January 2003, which yielded answers from all of the regional offices (see list in Annexure 4). The survey therefore succeeded in obtaining feedback for all of the WMAs with the exception of Limpopo and

the Lower Orange. In addition replies were received from several municipalities (Johannesburg, Pretoria, Mossel Bay) and key Water Utilities (Rand Water, Mgeni Water, Bloem Water).

4.2 Analysis of Replies

The analysis of the replies is summarized in table form in **Annexures 5 and 6**. A comment on each of the questions is provided below

Question 1. Based on the complaints received by you from water users and communities, how do you rate eutrophication as a water resource problem in your management area?

The responses (see **Annexure 5**) indicate that only two of the WMAs consider eutrophication to be a high water quality problem that is pervasive throughout the particular WMA, notably Crocodile/Marico and the Berg. Five (and possibly seven) of the WMAs consider eutrophication to be a low problem whilst ten WMAs consider the problem to be of medium concern.

The responses to this question must however be considered in relation to the responses to Question 2 (see below) which indicates that although the eutrophication problem might be medium to low in some WMAs, there are localised areas where the problem is severe in almost all WMAs.

Question 2. Please indicate where eutrophication problems occur, the level of intensity, the type of problem, and the possible causes.

The responses provide an indication that eutrophication problems are widespread and varied (see **Annexure 6**). They also indicate that the main cause of eutrophication is the discharge of treated sewage and domestic effluents into watercourses. In some situations agricultural practices which release nutrient from both point and non-point sources are cited as being responsible. Drainage from dense settlements in the more highly populated WMAs is also cited as being important.

Question 3. Where severe eutrophication problems occur, have you put into place any eutrophication management actions? If so indicate where and what action?

On the basis of the replies it can be concluded that, apart from actions that regulate the discharge of treated sewage into water courses, there are not any comprehensive integrated eutrophication management programmes being practised anywhere in South Africa. The country has continued to implement policies and regulations that were defined and developed more than a decade ago (e.g.

the 1mg/l P regulation and effluent water quality standards) without developing and implementing any new approaches.

Question 4. Is routine eutrophication monitoring and reporting carried out by your office?

There are some WMAs which have catchments within which comprehensive eutrophication monitoring programmes are in place (e.g. Crocodile/Marico; Upper Vaal, Vaal Dam, Vaal Barrage; Umgeni; Mzimvubu; Upper Orange). However, it is evident that this is not the case for all WMAs. Very little monitoring appears to be taking place in systems where eutrophication problems have been cited (compare responses to this question to the list of water bodies where problems are occurring).

Question 5. Do you feel that your staff is fully conversant with the topic of eutrophication and its management?

The majority of the regional offices and institutions have indicated that the staff is not fully conversant with the topic of eutrophication. Regional offices such as the Western Cape and Gauteng appear to have personnel who are familiar with the topic whereas other regional offices report deficiencies in knowledge. A positive point is that the Water utility companies appear to be well aware of the problem and how to deal with it.

Question 6. Would your staff like to receive more information or training on eutrophication and its management?

Almost all the regional offices and institutions, which were consulted, have indicated that they would like to receive more information on the topic, as well as receive training to improve their skills and knowledge. Some of the feedback, comments and requests include requests for information, and comments such as:

- Management information.
- Prevention (specially diffuse nutrient source reduction)
- Affects reduction (algae bloom minimisation)
- Can it be reversed/mitigated?
- The causes of eutrophication.
- The Water Quality Status of the Hartbeespoort Dam and the environmental management of Hartbeespoort Dam
- What is currently available?

- Aquatic weeds. Algae and algal blooms. Management of local authority infrastructure and the need to reduce nutrient input. Nutrient budgeting for reservoirs.
- With the high staff turnover training new officers are important but time to achieve this is restrictive and the priority ranks eutrophication down.
- Explain the process and monitoring. How does it affect river health?
- Practical short and long term management options of eutrophication.
- Estimation of the cost implications of eutrophication.
- General eutrophication overview.
- Algae and eutrophication.
- Overall training on the nature of eutrophication problems.
- Implementation of monitoring programmes.
- Biomonitoring.
- Water quality monitoring.
- Interpretation of water chemistry data.
- Toxicity testing.
- How to combat the above proliferation of algae.
- How is eutrophication detected? How do I test for eutrophication?
- Causes and negative effects of different species of algae in the dam, and info on algae removal.
- Nutrients reduction as a principal means to control and manage eutrophication.
- Management options in the spirit of co-operative governance

Question 7. Do you think that the current national policy and strategy for management of eutrophication requires revision?

Comments on this question confirm that DWAF has no official written policy on eutrophication and many of the responses mention this point. There appear to be mixed opinions within DWAF that policy requires review. The comments on this question include:

- I'm not aware of any dedicated eutrophication policy. Various levels of strategy apply. At the lower level strategy has to be verified and reviewed more frequently. Policy is needed to specify DWAF's intent with respect to nutrient management.
- Communication of policy is essential. A fair question is "What policy?" Most WQM staff know nothing of eutrophication, it's causes or consequences. As with this questionnaire, it is priority 47 (b), if that. Line function, staff turnover, training new staff continuously and looking for personal advancement are higher priorities, and will continue to be unless professional technical staff are free to concentrate on work issues, such as eutrophication. Unless all strategies and policies are complementary, effort in any area will be diluted.

- Unless staff at grassroots level are involved and committed, any policy development will be a waste of time.
- I have not seen this document – when last was it revised/would have helped if this was made available with this questionnaire?
- Better legislation and how to enforce it. More Departmental awareness. Input from the regions.
- The above “no” is based on the new Eutrophication Monitoring Programme that has been espoused by DWAF. As this is a new programme, a revision is not appropriate although improvements are probably possible.
- Eutrophication of rivers has not received as much focused attention as that of dams.
- We may need to extend the Special Phosphate Std to other areas, especially near impoundments.
- I have not seen this policy and do not know what the document looks like.
- More information is required to know the link of eutrophication related algae with aquatic ecosystem particularly for cases when it can result in fish kill.
- Point source pollution management tools are lacking.
- I am not aware of a formal national eutrophication policy or strategy in place at the moment, so it would be good to know what is available and how it could be implemented and improved.

Question 8. Would your region/institution be prepared to participate in the development of a national strategy? This will involve commenting on draft documentation, and possibly participating in a workshop.

Most of the regional offices have expressed a desire to participate in any follow up to develop a national strategy.

Question 9. Do you have any comments that you would like the Directorate of Water Quality Management to take note of?

There were numerous general comments which the respondees felt should be communicated to the Directorate. These include:

- The positioning of the proposed policy within the evolving hierarchy of WQM policies and strategies is important. This includes the relationship and integration of the proposed policy with other policy.
- Uncertainty round restructuring makes questions difficult if not impossible to answer.
- Crocodile-Marico - Extremely serious problem in this region. This office initiated an “action group” recently to start addressing the problem. Assistance to this group is required. External stakeholder members of this group are prepared to provide assistance and committed to in obtaining funds, should it be required in managing the eutrophication in the Roodeplaas Dam. Should an impoundment be

identified for the purpose of a case study, the Roodeplaat will be an ideal option. This Dam is close to the IWQS, HO and the Regional office.

- More information regarding the sustainable management of our water resources should be made available to the public. Public Awareness Campaign urgently needed.
- Johannesburg Municipality requested a copy of policy and strategy doc and keep us informed of developments.
- I am aware that Mr H.H. Bosman from the Department's Water Utilisation Section has been involved in some monitoring activities.
- Please note that staff turnover is a major problem, there is no point training staff that will not stay to work. See KZN WQM staff turnover details to understand the severity of the problem. Further training will also increase staff requirements to complete line-function duties. At this stage if one staff member leaves, the entire capacity to appreciate eutrophication collapses. The capacity to run forums and maintain contact with local authorities and academic institutions will be severely hampered by the leaving of a recently trained staff member.
- Provide a career in WQM for staff. Jobs are not enough, and you cannot grow knowledge and experience if you only provide "a job" as is currently the case. Refer to recent WQM: Deputy Director's meetings for a description of the severity of the problem. Additional loading of work onto loyal senior Assistant Directors & WPCOs is not the answer to increasing work load – more workers are needed, not more professional students being carried to their next job.
- Holistic progressive training of career WQM staff. Currently training concentrates on the flavour of the month. Unless staff understands water treatment processes, they will not grasp the need for eutrophication management, algal blooms, chemical quality problems, etc. Ditto dam water quality, ecology, biodiversity etc.
- Eutrophication monitoring needs to be undertaken throughout the WMA. When algal blooms reach severe status, the solutions and management should have been implemented 10 years previously. Thus at best there is a reactive approach, and lip service at best is only paid to the precautionary principle. Ecology responds to drivers at levels far below the detection limits of instruments, and more attention needs to be paid to the early warning signs which we do not yet even know that we are missing. Similar policy/strategy needs to be developed for wetlands and estuaries, to name but 2 important categories of the water resource. Currently little is known about the system functioning or importance of individual components by Regional DWAF staff, nor why we should protect them.
- Integration between various tiers of Government must be facilitated and driven. Currently it is ad hoc and poor. Individual officers are left to devise, organise and run cost-effective local environmental training courses in order to facilitate and clarify roles. Line-function work has to be rescheduled in order to accommodate this, so that time may be saved at a later date in order to prevent fruitless expenditure of resources (see points 1 & 2 above).

- The control of effluents released by for example Waste Water Treatment Works must receive urgent attention.

Many of the answers are not specifically related to eutrophication, but more to the way in which DWAF manages WMAs. This does emphasise the point that eutrophication cannot be considered as an isolated issue.

4.3 Summary of Findings

The results of the survey can be summarised as follows:

1. Eutrophication water quality problems are currently being experienced throughout South Africa. Almost all WMAs report that eutrophication problems are being experienced to some extent. In some WMAs these problems are persistently severe and widespread (e.g. Crocodile/Marico and Berg) thus constituting a priority water quality problem, whereas in other WMAs the problems are less severe and are restricted to specific water courses. The problems are varied and include: excessive algal and aquatic weed growth, presence of toxic algae, chemical problems which to some extent affect the fitness of use of the affected water resource.
2. Apart from implementing the prescribed requirements of existing legislation (e.g the 1 mg/l P standard and effluent disposal regulations), there do not appear to be any comprehensive long-term eutrophication management programmes in place anywhere in the country.
3. Although a national monitoring programme has been launched by DWAF, this does not appear to have been adopted in all the regions (WMAs). Consequently, the eutrophication problem is still largely an anecdotal one with insufficient quantitative description of its extent and impacts.
4. Most of the personnel in the DWAF regional offices require training in the topic in order to increase their level of awareness and understanding of how to deal with the problem. There is also a need to improve the flow of information on the topic throughout DWAF.
5. In general the regional offices highlighted the absence of a formal or official policy statement on the topic of eutrophication by DWAF and expressed a willingness to participate in the development of such a policy, as well as a national eutrophication strategy.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The main strategic conclusions and lessons that can be reached from both the international scan and the survey of the regional offices are that:

1. Developed countries perceive eutrophication as a long-term strategic priority environmental and water quality problem to which they are prepared to allocate appropriate resources. This is because of the high value that society attaches to the recreational and ecological aquatic environment. Accordingly, the government agencies responsible for the management of aquatic resources within these countries have been obliged to develop and implement appropriate strategies for eutrophication control. Political processes ensure that this is carried out through parliamentary monitoring and public reporting.
2. South Africa's environmental and water policy reflects a strong message that aquatic resources and water quality are priority issues and that appropriate strategies should be developed and implemented to prevent degradation. The survey of the South African regional situation demonstrates that eutrophication can be regarded as a national water quality problem in that it has severely degraded certain aquatic systems, and also affects the fitness for use of many water resources throughout the country. With increasing development, it has the potential in the future to affect all water resources.
3. The survey has indicated that regional offices currently lack the capability to implement desirable eutrophication management programmes for water resources under their jurisdiction, as desired by published policy and prescribed by legislation (the National Environment Act and the National Water Act). The issue of eutrophication has clearly not yet received attention from DWAF policy makers and planners. The situation could become even more exacerbated with the institutional advent of Water Management Agencies within the WMAs. There is therefore an urgent need to rectify this situation.

5.2 Recommendations

In light of the above, the issues for a terms of reference for phase 2 of this project could include the following:

- 1. Preparation of an Official DWAF Policy Statement:** The development of an official statement from DWAF leadership reflecting on the need to manage the eutrophication problem is a prerequisite. This should emphasise that the issue is a priority and commits the organisation to the development and implementation of a workable strategy. Without this, DWAF personnel in the regional offices (and the affected communities) will continue to treat the topic as a low priority issue. A draft of a previously prepared statement (drafted by Mzuri Consultants following a Water Research Commission workshop in 2001) that might form the basis of this policy statement is included in **Annexure 7**.
- 2. Development of an Official Eutrophication Strategy Document:** The development of an official national eutrophication strategy document that contains all the elements of actions that are needed to control the problem throughout the country. Such a strategy should contain elements of assessment, monitoring, capacity building, consultation, objectives, and implementation of catchment actions. It should also spell out the role of DWAF, WMAs, local authorities, users, industry and affected communities. An initial document that could form the basis for the development of this strategy is presented in **Annexure 8**.
- 3. Mobilisation of Resources and Capacity:** DWAF should allocate initial resources (from internal personnel) to oversee the process. At the very least this should be a professional person with the mandate to ensure that both of the above documents are prepared. Outsourcing to consultants is not recommended as it will not build ownership and capacity within DWAF.

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ANNEXURE 1

CONCEPTS OF EUTROPHICATION

ANNEXURE 2

**INTEGRATED CD CONTAINING ALL REPORT AND PROJECT
REFERENCE MATERIAL**

ANNEXURE 3

SURVEY QUESTIONNAIRE

ANNEXURE 4

**CONTACT PEOPLE FROM WHOM
REPLIES WERE RECEIVED**

ANNEXURE 5

AREAS WHERE EUTROPHICATION PROBLEMS OCCUR

ANNEXURE 6

REPLIES TO GENERAL QUESTIONS

ANNEXURE 7

**EXAMPLE OF A PROPOSED DWAF CORPORATE STATEMENT ON A POLICY FOR
EUTROPHICATION MANAGEMENT**

ANNEXURE 8

**OUTLINE OF ISSUES TO BE DEALT WITH IN THE DEVELOPMENT OF A STRATEGY FOR
EUTROPHICATION CONTROL**