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The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

TECHNICAL BRIEF

Eutrophication

Guide to catchment-scale assessments for surface waters

The WRC has funded extensive research into managing an age-old pollution problem.

Eutrophication – an old problem revisited

Eutrophication is the enrichment of waters with plant nutrients that results in increased production of algae and aquatic macrophytes. Together with an associated deterioration in water quality, it renders water less fit for use.

For more than three decades eutrophication has been recognised as a priority water quality problem. Whereas early research achieved considerable success in building capacity to address this issue, such capacity has not been maintained. A recent study on the eutrophication status of a number of South African reservoirs showed that the extent of eutrophication has, in fact, increased since the problem was first identified in the 1970s.

This points to the inadequacy of policies and approaches to control eutrophication in the past and indicates a strong need to remobilise and redevelop South Africa's capacity to manage eutrophication. With regard to related research needs, the assessment of the eutrophication problem has been identified as the highest priority research area.

In 2003, the then Department of Water Affairs & Forestry (now the Department of Water Affairs) published a generic protocol for undertaking catchment-scale water quality assessment studies in support of catchment-management strategy development. In planning and executing eutrophication research and capacity-building initiatives, it was considered important to ensure that these initiatives yield products that align closely with the department's protocol, thereby ensuring that future eutrophication management strategies are compatible with broader catchment management policies and procedures.

Three research products that meet these requirements have consequently been produced:

- A guide to assess eutrophication-related water quality for rivers, lakes/reservoirs and lacustrine wetlands;
- An Internet-based nutrient enrichment assessment protocol (NEAP), and
- A course outline and training material for a short course in eutrophication assessment.

Guide to assess eutrophication-related water quality

The Guide sets out the key components of an investigation required to assess the eutrophication status of a catchment or sub-catchment, with a view to developing management options that take into account the needs and aspirations of stakeholders and also the constraints imposed on a particular catchment. It is structured around six management questions, each of which is designed to be answered through the execution of a corresponding eutrophication assessment task.

The tasks corresponding to the six questions comprise the following:

1 Characterisation of current eutrophication status and historical trends;
2 Engagement with water-related institutions and stakeholders;
3 Formulation and recording of eutrophication-related water quality issues, concerns, problems and opportunities;
4 Projection of eutrophication-related water quality impacts of future water-related development scenarios;
5 Formulation and prioritisation of eutrophication management options; and
6 Monitoring and auditing of the implementation of eutrophication management strategies.

Each of these tasks, in turn, consist of a number of components, varying from a maximum of 12 components (in Task 1) to a minimum of 1 component (in Task 6), with 22 components overall. The components are uniformly structured, ensuring that users are guided through key subsections in

a manner that ensures that components are all addressed comprehensively.

Some of the components differ only slightly from those in the government assessment guide, especially from where they inform the process of developing a catchment management strategy and are not specific to the eutrophication problem as such.

The application of the guide would help a user to undertake an eutrophic-related catchment water quality assessment study in a manner that mirrors the key features of the Department of Water Affairs' ***Catchment Water Quality Assessment Guide***. This would, in turn, support the development and implementation of catchment management strategies to address the causes and consequences of eutrophication.

Web-based nutrient enrichment assessment protocol

NEAP has been designed as a simple-to-use, Internet-based, phosphorus-based, eutrophication screening tool for lakes and/or reservoirs. As such it provides a non-data intensive means of determining the trophic status (degree of nutrient enrichment) of open-water environments.

NEAP V1.0 has been calibrated for use under South African conditions and, in particular, for use in reservoirs as opposed to lakes. As a screening tool, it can be used to inform options for management by providing a rapid approximation of the level of eutrophication in a particular reservoir.

Despite the simplicity of the tool, it is extremely important that NEAP users understand that eutrophication is not simply a function of phosphorus loads and concentrations, but that a wide variety of biophysical and chemical factors can enhance or constrain the observed level of eutrophication in a particular water body.

To date, appropriate management strategies directed against eutrophication have been seriously constrained by a widespread lack of understanding of the problem, particularly at the decision-making level.

Short course in eutrophication assessment

The need to rebuild capacity for the assessment and management of eutrophication provided the motivation for designing an eutrophication assessment short course based on the ***Eutrophication Assessment Guide***. Course material has consequently been prepared primarily for water resource managers and practitioners as well as for freshwater scientists and, secondarily, for students at tertiary training institutions. In designing the course, a two-tiered approach was followed.

The first tier serves as a general introduction to eutrophication and its assessment at a catchment scale. It is aimed, among others, at managers who need to understand the objectives and scope of a catchment eutrophication assessment study.

The course provides participants with a broad overview of eutrophication and nutrient enrichment, especially in South African rivers, reservoirs and lacustrine wetlands. Furthermore, it imparts knowledge on approaches to deal with the problem through legislation (the National Water Act) and the basic approach and steps needed to undertaken a catchment-scale eutrophication assessment study. This tier also serves as an introduction to the more detailed second tier short course designed for those actively undertaking catchment-scale eutrophication assessment studies.

The second tier course enables the participant to use the ***Eutrophication Assessment Guide*** as a manual and to apply the NEAP Web-based software to undertake a hands-on eutrophication assessment for a specific catchment. Furthermore, the participant gains a broad overview of the key tasks in a catchment scale eutrophication assessment study, is able to decide on the scale and depth of the study area and has the knowledge to participate in a detailed eutrophication assessment study as part of a catchment assessment study.

The future

Besides being of immediate value, the research achievements to date should be seen as a platform for further development of eutrophication assessment and capacity-building tools. It is therefore important that application of the new research and capacity-building products be promoted, and that feedback from users be captured and used to refine, further develop and extend the scope of the products.

Further reading:
To obtain the ***A Guide to Catchment-scale Eutrophication Assessments for Rivers, Reservoirs and Lacustrine Wetlands*** **(Report No: TT 352/08)** contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565; E-mail: orders@wrc.org.za; or Visit: www.wrc.org.za