New from the WRC

Report No: 1852/1/10

An investigation of the potential use of ocean colour remote sensing to assess the influence of variations in freshwater inputs to coastal ecosystems: Phytoplankton and sediment dynamics of the Natal Bight (S Bernard & M Smith)

New Case 2 ocean colour projects from the Medium Resolution Imaging Sensor (MERS) have been analysed for the first time in South Africa, providing a preliminary qualitative ability to synoptically map phytoplankton biomass, suspended sediment and dissolved organic material in the Natal Bight. Preliminary findings indicate that the default MERIS 'Algal 1' and 'Algal 2' products are not effective in the Case 2 waters of the Natal Bight and that the Case 2 Regional processor is more accurate and robust in these inshore water types, but appears to function less well in mesotrophic and oligotrophic waters, among others.

Report No: 1800/1/10

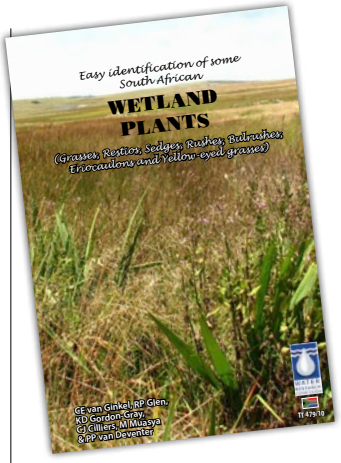
Knowing, caring and acting: Making use of socio-cultural perspectives to support biophysical 'conservation' initiatives (K Nortje, I Jacobs, M Aucamp, N Funke, WF Strydom, J Clover, M Patrick, E van Wyk, B de Wet & E Masekoameng)

Among others, this three-year project sought to investigate local socio-cultural perspectives of conservation, and specifically water conservation; to develop a conceptual understanding of the theoretical underpinnings that explain why individuals and society do not know, or care or act in the context of freshwater conservation; and to examine how the conservation planning process is influenced by the knowing, caring, acting dynamic and local socio-cultural perspectives.

Report No: TT479/10

Easy identification of some South African wetland plants (CE van Ginkel, RP Glen, KD Gordon-Gray, CJ Cilliers, M Muasya & PP van Deventer)

Wetlands are recognised as one of the richest and most productive ecosystems on earth. Associated with wetlands are



a wide range of specially adapted plant species giving food and shelter to a variety of animal life. While a list of wetland plants in southern Africa had been published in 2010, there was until now no field guide available for the layman or student on wetlands plants in the country. This field guide focuses primarily on obligate wetland plants, paying special attention to grass-like plants. In total, 290 species of plants are covered.

The book is printed on high-quality paper and includes many colour photographs and illustrations. It sells for R200.

Report No: KV 248/10

Biologically enhanced primary settlement: A scoping study to determine bioflocculant opportunities for locally grown crops and their associated waste for COD, N and P removal in small rural WWTWs (C Lutchamma-Dudoo)

This scoping study was undertaken into the roles that biological flocculants can play in municipal wastewater treatment. Extensive jar testing with different products and extraction methods showed that the products tested were capable of enhancing the reduction in the COD of the water from around 30% to over 60% when compared to conventional sedimentation. Other benefits include the reduction in suspended solids and turbidity.

Report No: 1692/1/10

A comprehensive investigation of the Kuils-Eerste River catchment's water pollution and development of a catchment sustainability plan (A Thomas; W Chingombe; J Ayuk & T Scheepers)

This research seeks to address issues regarding water quality arising from land cover type change and urban sprawl in a predominantly agricultural catchment in Cape Town. The Kuils River and Eerste River are two important rivers that run through the eastern part of the Cape Metropolitan Area. Although these catchments form part of urban developments, significant portions of the Eerste-Kuils river catchment have agricultural lands; hence it has both urban and agricultural sources of non-point source pollutants. The study aimed to develop a working document for adapting the catchment into a sustainable system.

Report No: 1543/1/10

Industrial wastewater remediation via wet-air oxidation using immobilised transition metal catalysts (SF Mapolie; S Ray; J Darkwa & J van Wyk)

Industrial effluents are routinely polluted with a range of organic materials, many of which are toxic and difficult to remove. Various approaches have been employed to remediate these industrial effluents. Included among the methods used is wet air oxidation. All of these methods are energy intensive and are usually carried out under extreme conditions. This project investigated the potential use of catalytic wet air oxidation.

Report No: 1677/1/10

A guide to the development of conservation plans for threatened southern African fish species (JA Venter; PSO Fouché; W Vlok; NAG Moyo; P Grobler & S Theron)

WRC funding was granted to develop a conservation framework applicable to threatened fish species in southern Africa's highly diverse and important freshwater ecosystems. There are a number of factors threatening the ecological functioning of rivers in southern Africa. The effluent and seepage from mines, industries, agriculture and human settlements have already caused serious, and sometimes irreversible, changes in water quality in river systems.

A substantial number of freshwater fish species from South Africa are on the IUCN Red List. Among others, the project aimed to determine the current distribution of *Opsaridium peringueyi* (Southern Barred Minnow) and other species in the genera in its historical distribution range; to characterise the habitat and habitat preferences of the species and determine threats to its survival etc. Ultimately, a generic conservation framework has been drawn up for threatened African fish species.

Report No: 1718/1/10

An operational information tool for the efficient operation and maintenance of small water treatment plants (CD Swartz)

Among others, this project investigated the existence and characteristics of operational information management systems used by other countries, which could serve as a basis for a South African system; aimed to developed an operational information tool for South African small and medium-sized water treatment plants; and develop training aids for the application of this information management tool.

Report No: 1719/1/10

The development of an analytical system for ß-N-Methylamino-L-Alanine and investigation of distribution of producing organisms and extent of freshwater contamination (TG Downing)

The neurotoxin ß-N-Methylamino-L-Alanine (BMAA) has been identified as a potential risk to human health as it is implicated in Alzheimer's disease, Parkinsonism and Amyotrophic Lateral Sclerosis. The possibility of sustained exposure to BMAA via drinking water supplies prompted the establishment of local analytical capacity for the neurotoxin, urgent verification of the production of BMAA by free-living cyanbacteria, the evaluation of the distribution of BMAA producing free-living cyanobacteria in South Africa and the extent of BMAA contamination of surface waters. Since biotoxins are often present in low concentrations, large volumes of water needed to be concentrated to be able to quantify BMAA.

In order to assess the extent of free BMAA contamination of water, a concentration method needed to be developed.

Report No: KV 255/10

A review of studies on the Mfolozi Estuary and assocated flood plain, with emphasis on information required by management for future reconnection of the river to the St Lucia system (GC Bate; AK Whitfield & AT Forbes)

This report is aimed at gaining an understanding of how the Mfolozi/Msunduzi river and floodplain link with the functioning of the St Lucia ecosystem. Structured around 14 contributions from various scientific disciplines, the end result is an endorsement for the relinkage of the Mfolozi and St Lucia estuaries and the implementation of measures that will reduce any excessive input of sediment from the former into the latter system.

Report No: 1540/1/06

The influence of sludge conditions on the soil conditioning properties of sewage sludge (JJ Schoeman & M Murigwathoho)

The objectives of this investigation were to determine the various conditioning agents (organic and inorganic) used in sludge treatment at different concentrations on the properties of sewage sludge; and to develop an operating guideline for the use of dewatering agents for sewage sludge treatment.

Report No: 1624/1/10

Chemical sampling and analyses for environmental risk assessment using the Wits Basin as a case study (E Chihobvu; B Zhao & W Pulles)

In South Africa there has been limited work done on the development of methodologies for determination of sample size and quantifying uncertainties in geochemical sampling and analyses. This, in turn, may result in lack of confidence in the long-term predictions of geochemical modelling for Environmental Risk Assessment and problems in obtaining approval of mining authorisations, water use licenses and mine closure plans. This report addresses this deficiency in geochemical sampling and analyses and proposes two methodologies: one for quantifying uncertainties in geochemical sampling and analyses as a function of sample size and analyses and the other for determining the optimum sample size to ensure data quality.

Report No: 1640/1/10

Ambient temperature ferrite process: Adapting the laboratory-scale process to treat acid mine drainage (WV Alexander & N Ristow)

The Ambient Temperature Ferrite Process (ATFP) was developed at laboratory scale using a synthetic mine-water made up of ferrous sulphate, sodium sulphate and hydrochloric acid. The pH adjustments were made using sodium hydroxide, and aeration was achieved using bottled air. Calcium was identified as an inhibiting ion in the formation of ferrite. In order for the ATFP to operate 'properly', the removal of ferrous iron from solution and the production of ferrite from this ferrous iron precipitate needs to occur. In order to determine the economic feasibility of this process developed in the laboratory, a larger-scale operation was required treating real acid mine drainage and reagents more likely to be used on a larger scale. The researchers were therefore contracted to determine, among others, the most suitable site for the pilot-scale test; to prove the technology at laboratory scale treating actual AMD; to design and construct a portable pilot scale plant; and to prove the technology at pilot scale at a mine and develop design and operating parameters to allow for confident up-scaling to full-scale plants.

Report No: 1830/1/10

Scoping level assessment of how water quality and quantity will be affected by mining method and mining of the shallow Waterberg coal reserves west of the Daarby fault (PD Vermeulen; M Bester; L-M Cruywagen & GJ van Tonder)

The Lephalale region of the Waterberg contains the third-largest coal reserve in South Africa. The study area is located west of the town of Lephalale and stretches to just west of the town of Steenbokpan in the west and all the way to the border of Botswana. A need was identified to determine the potential impact of planned expansion of the mining enterprises in the area, which is characterised by low rainfall and limited water resources. Among others, the scoping level study sought to consolidate existing information on the different aquifers in the study area and their geohydrological parameters; pre-mining water quantity and quality of water resources associated with the Waterberg coal field; the acid generating potential of the geology found in the study area; and predict what the impact will be of additional mines in the area.

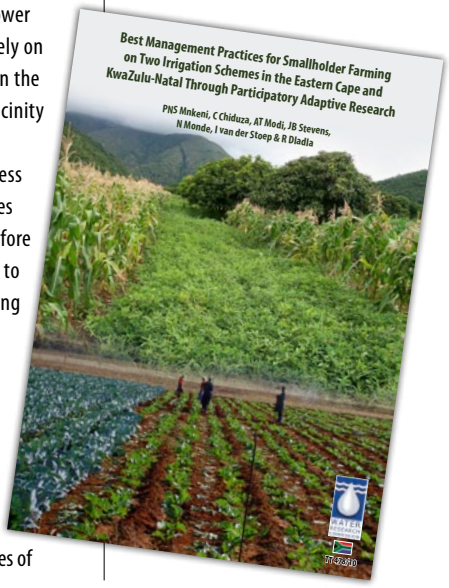
Results indicated that some areas were more prone to acid generation; however decant models indicated that there was no possibility of the pits ever reaching decant levels, with the highest recorded rise being between seven metres 50 years after mining has stopped. It was concluded that the most effective way to preserve the water quality was to keep acid generating material dry as it would not be possible to flood this material once the mine closes due to the small volumes of water in the study area. The additional mines and power stations will impact negatively on the quality of groundwater in the area, and boreholes in the vicinity of the mines are likely to be dewatered. Due to the aridness of the region, these boreholes are unlikely to recover, therefore precautions should be taken to minimise the impact of mining on the groundwater.

In summary, the study concludes that the addition of new mines to the area will have a deleterious effect on the quantity and quality of groundwater in the study area. The already small volumes of water that is available in the study area will be reduced further by the excavation of new mines.

Report No: TT 478/10

Best management practices for smallholder farming on two irrigation schemes in the Eastern Cape and KwaZulu-Natal through participatory adaptive research (PNS Mnkeni; C Chiduza; AT Modi; JB Stevens; N Monde; I van der Stoep & R Dladla)

This project was commissioned by the WRC in 2004. Its main objective was to carry out research in Zanyokwe and Tugela Ferry irrigation schemes with a view to develop and implement technologies and knowledge useful for farmers in order to improve their livelihoods and those of surrounding communities. Participatory research methodologies were employed where the smallholder farmers and other stakeholders were involved in project activities from the initial stage to the end. Weak or poor institutional arrangements, lack of stable markets, dysfunctional irrigation infrastructure and poor crop management were found to be factors leading to poor performance of the schemes. Based on these findings, an action research programme was developed aimed at getting a better understanding of the underlying causes of the constraints and ways to address them.



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