WORKSHOP PROCEEDINGS

3/31/2013

"We are the Olifants" - Key Stakeholder Workshop for the Upper Olifants River Study

Lead Authors: Nikki Funke and Karen Nortje

Workshop Proceedings

"WE ARE THE OLIFANTS" - KEY STAKEHOLDER WORKSHOP FOR THE UPPER OLIFANTS RIVER STUDY

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Projects that have supported this workshop: The CSIR Parliamentary Grant funded "Land Use Practices that Sustain Water Resources" project and The Olifants River Forum (ORF) funded "Upper Olifants River Study" research

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ISBN Number:

978-0-7988-5607-2

Date:

March 2013

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"WE ARE THE OLIFANTS" - KEY STAKEHOLDER WORKSHOP FOR THE UPPER OLIFANTS RIVER STUDY

FOREWORD BY MR DICK KRUGER

It has been known for more than a decade that many rivers and streams in the Upper Olifants River Catchment are severely polluted. There has, however, also always been uncertainty about the sources and nature of the pollution. This has resulted in allegations and accusations based more on perceptions and emotions than on facts.

In 2009, the Olifants River Forum proposed that the following research should be conducted: an assessment of eutrophication and chemical pollution in surface waters of the upper Olifants River system, and a study of the implications of these impacts for aquatic ecosystem health and the health of human water users. The Chamber of Mines, on behalf of its coal producing members in Mpumalanga, wholeheartedly endorsed this proposal. The Chamber envisaged that the study would identify the sources of pollution and enable the implementation of remedial measures.

While the Chamber of Mines' expectations were met in terms of the quality of the research outcomes, the Chamber's members were concerned that these research outcomes would be relegated to "library shelves." The Chamber therefore urged the Olifants River Forum to ensure that a programme be put in place for the dissemination of the results and engagement with the relevant authorities to address the identified sources of pollution.

This Workshop was the first step in that process and it was gratifying to see the considerable interest expressed in the results of the study and the willingness of the various stakeholders to become part of the remedial process.

Dick Kruger
Deputy Head: Techno-Economics
Chamber of Mines of South Africa

March 2013

Workshop Proceedings

"WE ARE THE OLIFANTS" - KEY STAKEHOLDER WORKSHOP FOR THE UPPER OLIFANTS RIVER STUDY

FOREWORD BY DR PAUL OBERHOLSTER

The Olifants River is one of the main river systems in South Africa, and has been described as one of the most polluted rivers in southern Africa, with Loskop Dam acting as a repository for pollutants from the upper catchment of the Olifants River system. The quality and availability of water in the Olifants River Catchment has become a complicated challenge. This is largely the outcome of industrial, agriculture and mining activities, as well as a sharp increase in urbanisation. As a result of increased urbanisation, municipal services have been placed under even greater pressure to address water supply and sanitation backlogs.

A three year study conducted by the Council for Scientific and Industrial Research (CSIR) and other institutions to identify critical water quality variables (e.g. chemical, physical and biological) in the upper Olifants River and its tributaries, and to determine their thresholds was completed in 2013. The outcomes from this study can be used to develop appropriate water quality management responses, to be used as decision support tools, or possible remediation measures.

To put the scientific knowledge generated in this study into practice, a stakeholder workshop was held with the different stakeholders in the upper catchment of the Olifants River. The diversity of the stakeholders and professionals targeted brought together different kinds of knowledge, experiences and approaches to discuss ways of remediating the Upper Olifants River Catchment. The overarching goal of the workshop was to provide the opportunity for dialogue and knowledge sharing amongst scientists, stakeholders and water managers, to encourage the development of partnerships and to identify water management priorities.

Dr Paul Oberholster
Principal Researcher and Upper Olifants River Study Project Leader,
Natural Resources and the Environment
Council for Scientific and Industrial Research

March 2013

EXECUTIVE SUMMARY

The Upper Olifants Key Stakeholder Workshop took place at the CSIR Knowledge Commons on 26 February 2013. The workshop participants included representatives from national government, provincial government, local government, mining, industry, agriculture, conservation and research.

The workshop aimed to transfer the findings of the Upper Olifants River Study to the workshop participants, with a specific focus on how the findings are relevant to the stakeholders in the catchment. The workshop also aimed to build relationships between the workshop participants, and to give them a forum to discuss ways to mitigate the problems in the catchment. The Upper Olifants Key Stakeholder Workshop was based on the Upper Olifants Research Uptake Strategy that was produced by Nikki Funke and Karen Nortje in March 2012 as part of the stakeholder engagement component of the Upper Olifants River Study.

The Upper Olifants Key Stakeholder Workshop started with a brief summary of the relevance of the scientific research for the stakeholders in the catchment. This session served to bring all stakeholders, regardless of technical background or level of familiarity with the research, up to date with what the project team has been working towards during the past three years, and can thus be seen as a key dissemination activity for the project.

The feedback session was followed by a networking session that allowed the workshop participants to get to know each other better and to talk about their interests in the research. The networking session also allowed people the chance to speak to people they would normally not have an opportunity to interact with, and in so doing, the session created a space for new networks to be formed.

The networking session was followed by a second key dissemination activity: facilitated interactive break-away sessions that focussed on sharing experiences around key issues in the catchment, and on practical ways in which scientists and stakeholders can help each other to move towards mitigating some of these issues.

Session A consisted of two parallel sessions: one focusing on Loskop Dam and the other on “Protecting the Upper Olifants”. After Session A, Ms Jackie Dabrowski gave a short overview of the Fish Kill Website and how it can be used to report fish kills. Session B introduced some of the management tools that have been developed as part of the Upper Olifants River Study: the Soil Water Assessment Tool (SWAT) Model and ways to help municipalities move towards Green Drop status. Session C covered river and wetland restoration in two parallel sessions, with a focus on the River Phosphate Sensitivity Index (RPSI) and acid mine drainage (AMD) Screening Tool, and Wetland Restoration Tool respectively.

The workshop ended with a summary of the key outcomes that emerged from each of the sessions. Overall, there was a strong call for the different stakeholders in the catchment to cooperate more closely and for everyone (and not only a few) to become active in efforts to remediate the catchment. The workshop participants expressed their concerns about the impacts of the wastewater treatment works (WWTW) in the catchment. There were discussions about finding new ways and improving upon existing mechanisms to hold municipalities accountable for the non-functioning of these treatment works. A concern was also raised about the Department of Mineral Resources (DMR's) apparent lack of involvement in the Upper Olifants River Catchment, particularly with regard to managing the impacts of abandoned mines. On a more technical note, positive comments were made about the various tools that had been applied or developed as part of the Upper Olifants River Study, as many of these facilitate the identification of priority areas for intervention. It was emphasised that it is also important to determine how these tools can complement existing tools that are being used by DWA in the management of the catchment. The workshop ended with an appeal to all workshop participants to carry on the workshop discussions and a promise to share the Upper Olifants River Catchment stakeholder list, workshop report and future dissemination materials produced as part of the Upper Olifants River Study with everyone present.

GLOSSARY OF TERMS

1) **Anoxia**: The depletion of dissolved oxygen levels.

2) **Channelled Valley Bottom**: Linear fluvial, net depositional valley bottom surfaces which have a straight channel with flow on a permanent, seasonal or ephemeral/episodic basis. The straight channel tends to flow parallel with the direction of the valley (i.e. there is no meandering), and no ox-bows or cut-off meanders are present in these wetland systems.

3) **Ecological condition**: The term "ecological condition" refers to the state of the physical, chemical, and biological characteristics of the environment, and the processes and interactions that connect them.

4) **EcoRegion:** Regions of relative homogeneity in ecological characteristics or in relationships between organisms and their environments. Boundaries are not distinct and one region merges into the next.

5) **Eutrophication**: The process of nutrient enrichment of a water body resulting in the excessive or "weedy" growth of algae and plants like hyacinth. Usually associated with a decline in ecosystem health and biodiversity, with increasing dominance by undesirable species such as cyanobacteria (blue-green algae).

6) **Floodplain**: A floodplain is an area of land adjacent to a stream or river that stretches from the banks of its channel to the base of the enclosing valley walls and experiences flooding during periods of high discharge.

7) **Green Drop (GD)**: "The Green Drop regulation programme seeks to identify and develop the core competencies required for the sector that if strengthened, will gradually and sustainably improve the level of wastewater management in South Africa. This form of incentive- and risk-based regulation holds the intent to synergise with the current goodwill exhibited by municipalities and existing Government support programmes to give the focus, commitment and planning needed" (DWA, 2011).

8) **Green Drop Certification (GDC)**: Green Drop Certification is awarded to wastewater systems that obtain scores of 90% when compared against the criteria set for wastewater management.

9) **Hydroperiod**: The seasonal pattern of the water level of a wetland: the wetland's hydrologic signature. It characterises each type of wetland, and the constancy of its pattern from year to year ensures a reasonable stability for that wetland.

10) **Lake Turnover**: A physical process that occurs in lakes when reducing ambient temperatures in autumn, allowing mixing to occur between surface and bottom layers of water and resulting in an isothermic (constant temperature) water column.

11) **Macrophyte:** An aquatic plant that grows in or near water and is either emerged, submerged, or floating.

12) **Marsh zone**: Zone dominated by herbaceous plant species.

13) **Meadow zone:** A zone dominated by sedges and grasses. They may be low in species diversity (with as few as a single dominant species), but relatively rich in some of the rarer species adapted to saturated soil conditions.

14) **Nonpoint Source Pollution:** Nonpoint source pollution (or diffuse pollution) is a pollution source that originates from land use activities taking place over a large spatial area. It is distinct from point source pollution in that it does not originate from a specific pipe (e.g. sewage effluent) that can easily be identified and monitored. Rather, the pollution originates from a large land surface area with no specific point of inlet into the water resource (e.g. pesticides, nutrients and sediment that originate from agricultural land use activities).

15) **Nutrients:** Any material that organisms take in and assimilate for growth and maintenance. This includes nitrogen (N) and phosphorus (P).

16) **Pan:** A wetland which occurs predominantly in depressions in crest positions in the landscape which has a circular or oval shape.

17) **Pansteatitis / steatitis:** A disease characterised by inflammation of body fat in animals fed a diet high in polyunsaturated fats and low in vitamin E (AKA Yellow fat disease). Pan = widespread and severe fat inflammation .

18) **Phosphorus:** Often considered the key nutrient that regulates primary production (algal growth) in water. Because of the three main elements (N, P and C), it is usually the least abundant.

19) **Point Source Pollution**: Pollutant loads discharged at a specific location from pipes, outfalls, and conveyance channels from municipal wastewater treatment plants, individual waste treatment facilities, factories etc.

20) **Pollutant Loads:** Quantity (i.e. kg or tonnes) of a pollutant discharged by a stream or river over a specific time period (i.e. daily, monthly or annual loads). Pollutant loads are a function of pollutant concentrations and streamflow and provide more comparative information for assessing the level of impact originating from different rivers and associated catchments.

21) **Seepage:** A type of wetland occurring on slopes, usually characterised by diffuse (i.e. unchannelled, and often subsurface) flows.

22) **Unchannelled Valley Bottom**: Linear fluvial, net depositional valley bottom surfaces which do not have a channel. The valley floor is a depositional environment composed of fluvial or colluvial deposited sediment. These systems tend to be found in the upper catchment areas.

23) **Waste Water Risk Abatement Plan (W_2RAP)**: The W_2RAP guideline plans for and applies a risk-based approach to raise and sustain wastewater performance. W_2RAP draws on many of the principles and concepts from other risk management approaches, in particular the Water Safety Plan (WSP), the multi-barrier approach and Hazard Analysis and Critical Control Points (HACCP).

24) **Wetland Classification and Risk Assessment Index:** An index based on manifestations of ecological processes in natural wetland ecosystems.

25) **Wetland:** "Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil" (Republic of South Africa, 1998).

26) **Waste Water Treatment Works (WWTW):** A facility designed to receive the wastewater from domestic sources and to remove materials that damage water quality and threaten public health and safety when discharged into receiving streams or bodies of water.

CONTENTS

INTRODUCTION

On 26 February 2013, a range of key stakeholders came together to participate in the Upper Olifants Key Stakeholder Workshop at the CSIR Knowledge Commons in Pretoria. These stakeholders included representatives from national government, provincial government, local government, mining, industry, agriculture, conservation and research.

The aim of the Upper Olifants Key Stakeholder Workshop was two-fold. Firstly, the workshop aimed to transfer the findings of the Upper Olifants River Study to the workshop participants, with a focus on the relevance of these findings for the different stakeholders in the catchment. Secondly, the workshop was about building relationships between the workshop participants and giving them a forum to discuss ways to mitigate the problems in the catchment.

The Upper Olifants Key Stakeholder Workshop was based on the Upper Olifants Research Uptake Strategy that was produced by Nikki Funke and Karen Nortje in March 2012 as part of the stakeholder engagement component of the Upper Olifants River Study. In particular, the workshop aimed to address the "Transfer Findings" and "Build Relationships" components of the strategy.

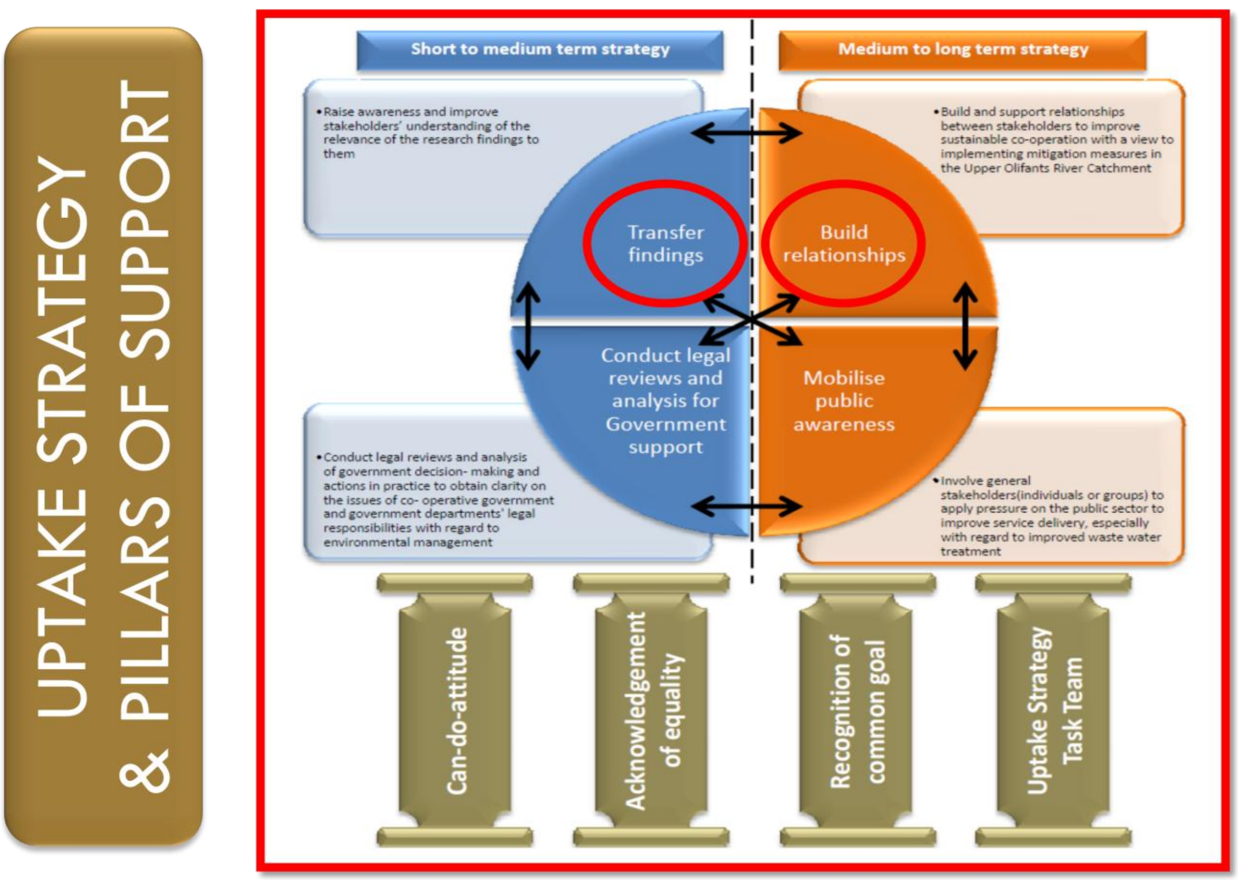

FIGURE 1. UPTAKE STRATEGY DIAGRAM WITH PILLARS OF SUPPORT. THIS DIAGRAM SUMMARISES THE OBJECTIVES OF THE UPPER OLIFANTS RESEARCH UPTAKE STRATEGY AND ALSO INDICATES THE FOUR PILLARS THAT THE STRATEGY DEPENDS ON TO REALISE THESE OBJECTIVES.

STRUCTURE OF THE WORKSHOP

The structure of the workshop is based on the scientific findings and the Upper Olifants Research Uptake Strategy that the three year Upper Olifants River Study has resulted in. The workshop started with a brief summary of the relevance of the scientific research for the stakeholders in the catchment. This session served to bring all stakeholders, regardless of technical background or level of familiarity with the research, up to date with what the project team has been working towards during the past three years, and can thus be seen as a key dissemination activity for the project. This feedback session built on the background information document that was distributed to the workshop invitees, together with a popular report of the research done in years 1 and 2.

The feedback session was followed by a networking session that allowed the workshop participants to get to know each other better and to talk about their interests in the research. The networking session also allowed people the chance to speak to people they would normally not have an opportunity to interact with, and in so doing, the session created a space for new networks to be formed.


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THE UPPER OLIFANTS RIVER STUDY

In 2009, the Olifants River Forum approached the CSIR's Natural Resources and Environment Unit to assess the extent and impacts of the pollution in the Upper Olifants River catchment. The result has been a more than three-year, multi-institutional, transdisciplinary study, which will be completed by July 2013.

Year one of the study saw researchers identifying three main sources of impacts on the quality of the Upper Olifants River and its tributaries. These are acidification of parts of the system and inputs of metal ions and sulphates via acid mine drainage; industrial effluent containing a variety of potential pollutants and genotoxicants; excessively high nutrient inputs from wastewater treatment works and agriculture and microbial pollution from wastewater treatment works. These pollutants result in ecosystem effects such as widespread eutrophication (nutrient enrichment) of the river, increased potential for bioaccumulation of metals, as well as human health effects related to microbial pollution.

In **year two** of the study, the researchers tried to pin-point the exact sources of pollution and the impact of this pollution on the health of the aquatic ecosystem. From this research, recommendations were made regarding rehabilitation options for the catchment and about how to improve its overall state.

In **year three**, the final year of the study, the focus is on the completion of tasks related to quantifying land use impacts on water quality and related ecosystem health effects, on remediation and mitigation options, and on communicating the findings of the project to key stakeholders and water resource managers.

A stakeholder engagement process has been running parallel to the technical research process described above. This process has aimed to identify the information needs of key stakeholders in the Upper Olifants Catchment and to link these with the technical research outputs where relevant. *The Upper Olifants River Study Key Stakeholder Workshop* supports this process by aiming to strengthen the relationships between the project's technical experts and stakeholders. This will be done by briefly presenting the relevance of the technical work to the stakeholders in the catchment. This summary will be followed by facilitated, interactive group sessions focused on key areas of concern within the catchment. The aim of these sessions will be to share experiences around these issues and to identify opportunities for cooperation between researchers and stakeholders to move towards the effective mitigation of some of these issues.

The Olifants River, flowing through Mpumalanga and Limpopo to Mozambique, is perceived as one of southern Africa's hardest working rivers.

This river supports a number of strategically important economic activities which include mining, electricity generation, agriculture and industry.

These activities have, however, had severe effects on the river and its aquatic ecosystem.

The Upper Olifants River catchment, located upstream of the Loskop Dam in Mpumalanga, has been particularly badly affected.

OLIFANTS · RIVER · FORUM

FIGURE 2. PROJECT-STAKEHOLDER COMMUNICATION IN THE FORM OF A ONE-PAGER SENT TO ALL WORKSHOP INVITEES

The networking session was followed by a second key dissemination activity: facilitated interactive break-away sessions that focussed on sharing experiences around key issues in the catchment, and on practical ways in which scientists and stakeholders can help each other to move towards mitigating some of these issues.

Session A consisted of two parallel sessions: one focusing on Loskop Dam and the other on "Protecting the Upper Olifants". After Session A, Ms Jackie Dabrowski gave a short overview of the Fish Kill Website and how it can be used to report fish kills. Session B introduced some of the management tools that have been developed as part of the Upper Olifants River Study: the SWAT Model and ways to help municipalities move towards Green Drop status. Session C covered river and wetland restoration in two parallel sessions, with a focus on the RPSI and AMD Screening Tool, and Wetland Restoration Tool respectively.

The workshop ended with a summary of the key outcomes that emerged from each of the sessions.

WORKSHOP SESSIONS

Plenary Session: Overview of the Upper Olifants River Study

Presenter: Dr James Dabrowski

Summary:

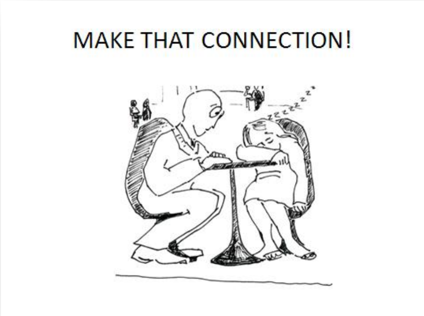
Dr James Dabrowski gave an overview of the three year Upper Olifants River Study. He started by characterising some of the main land use activities that are negatively impacting the Olifants River, one of the hardest working rivers in South Africa. These activities, which include energy generation, coal mining, ferrochrome and steel production, urbanisation and agriculture (crop production and intensive feedlot operations), have resulted in negative environmental impacts, including a general deterioration in water quality, eutrophication of river systems and dams (particularly Loskop Dam), frequent fish kills, deterioration in fish health and declining crocodile populations. From 2006 onwards, stakeholders in the catchment were becoming increasingly concerned about these impacts, particularly about the water quality in the catchment. Therefore, in 2009, the Olifants River Forum (ORF) contracted the CSIR to investigate the sources and impacts of pollution in the Upper Olifants River Catchment and to develop and recommend remediation and management options aimed at improving the state of the catchment. Microbial contamination, phosphate pollution and metal contamination associated with AMD are key drivers influencing water quality and ecosystem health in the catchment. The project team has succeeded in developing a number of tools that can be used to improve decision-making related to improving land management activities and water quality in the catchment. These include the development of a Soil Water Assessment Tool (SWAT) model characterising phosphate pollution, the RPSI and the Wetland Restoration Tool. Dr Dabrowski mentioned that this workshop is an important forum for communicating the research results of the Upper Olifants River Study, and for further discussing remediation and management options for the catchment.

"… and thanks to Nikki and Karen who asked us to share our 'feelings'"

FIGURE 3. DR DABROWSKI DURING HIS PLENARY ADDRES

Speed dating – a networking opportunity for key stakeholders in the Upper Olifants

Facilitator: Ms Karen Nortje



Summary:
In this session workshop participants were given an opportunity to share information about themselves with other workshop participants in a structured way. The workshop participants were divided into two groups, an outer and an inner group. While the inner group remained stationary, the outer group moved clockwise, and each pair was given three minutes to ask and answer the following three questions:

1. Who am I?
2. What is my job?
3. Why am I here?

"… I have never spoken so much in my life!"

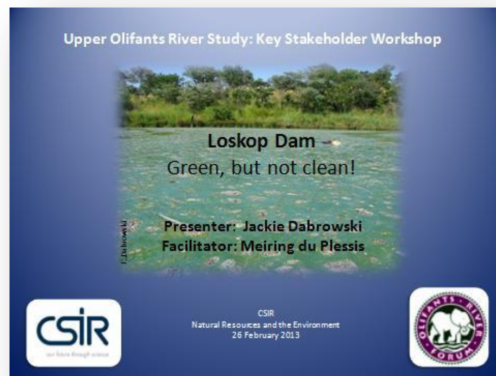
FIGURE 4. PARTICIPANTS DURING THE 'SPEED-DATING FOR SCIENTISTS' SESSION

The idea behind this session was for people to make connections with other people that they would not normally speak to or approach in a workshop setting. It links to an important part of the Uptake Strategy in that its purpose is to facilitate networks and relationships between the stakeholders of the Upper Olifants River Catchment.

Session A

Parallel Sessions A	
A1: Loskop Dam	**A2: "Protecting the Upper Olifants"**
Focus on how stakeholders and researchers can cooperate more closely to protect the dam.	Focus on what stakeholders are currently doing to protect the Upper Olifants River Catchment and what else can be done.

A1: Loskop Dam



Presenter: Ms Jackie Dabrowski
Facilitator: Dr Meiring du Plessis

Summary:
Ms Jackie Dabrowski gave a presentation on the water quality impacts observed in Loskop Dam during research conducted for the Upper Olifants River Study. Loskop Dam was built in 1939 to supply water for irrigation purposes to downstream agricultural areas. The dam provides water to 16,117ha of farmland via 480kms of irrigation canals. In addition, Loskop Dam attracts 6000 visitors annually to participate in recreational activities such as fishing. Impacts on the water quality of the dam could potentially affect these visitor numbers, as well as agricultural exports to the European Union, valued at R 1 billion per annum. It is therefore very important to protect Loskop Dam.

> The Precautionary Principle: "*When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically* " (United Nations, 1992).

Data was collected at various study sites in the dam. Ms Dabrowski provided a summary of the extent of each of the observed water quality impacts, the current available data gaps, and the relevant key stakeholders responsible for addressing the identified impacts. Some of the observed impacts that were presented include: key water quality indicators for irrigation, total phosphorus, sulphates, metal concentrations in the water, algal blooms, oxygen depletion, the dietary quality of algae as fish food, pansteatitis in Mozambique Tilapia and pansteatitis in Nile crocodiles.

Ms Dabrowski concluded her presentation with the findings that the identified external inputs into Loskop Dam have altered the chemistry of the water in the dam, which has led to significant water quality impacts. Given that South Africa is a water scarce country that is currently facing significant water quality challenges, and despite the current knowledge gaps with regard to water quality impacts in Loskop Dam, Ms Dabrowski recommended the application of the precautionary principle in water management in the dam and in the Upper Olifants River Catchment as a whole.

Key Questions for this Session:

- How can stakeholders and researchers cooperate more closely to protect the dam?
- What are some of the catchment management solutions that will prevent further degradation of the water quality in Loskop Dam?
- What are some of the management solutions for Loskop Dam to ensure effective monitoring of and response to water quality problems?

Key Outcomes:

Water quality in Loskop Dam

- There is a need to learn from the initiatives in place at other dams to deal with water quality problems. A short-term (but costly) solution to controlling algal blooms in the transitional zone of the dam is to install SolarBees, which mechanically stir the upper layers of the water column, preventing algal growth.
- Additional monitoring points, and analysis of additional parameters such as metals and vertical profiles, is needed at Loskop Dam. It still has to be decided whether national or regional Department of Water Affairs (DWA) should be primarily responsible for this.
- There is a need for better monitoring equipment (particularly a boat), and for determining how different stakeholders could contribute towards the cost of monitoring the dam.

Water quality in the Upper Olifants River Catchment

- There is a need to identify and specify the extent of phosphate pollution from various sources in the catchment in order to be able to determine where remediation efforts should mostly be targeted.
- More initiatives should be established in the Upper Olifants River Catchment to facilitate water re-use and the sale of by-products from water treatment processes. The issue of water re-use and the sale of water treatment process by-products could be investigated by the Strategic Water Partnership Network.
- Attention has to be paid to municipalities, and particularly the issue of non-functioning WWTW. It is important to investigate how the private sector could contribute resources and skills to upgrading and maintaining WWTW, given the many institutional and other challenges that local government is facing.

A2: "Protecting the Upper Olifants"

Presenter: Dr Paul Oberholster
Facilitator: Dr Vik Cogho

Summary:

Dr Paul Oberholster gave a presentation on how one could go about protecting the Upper Olifants River Catchment. In his opening statement he specifically noted that the focus of the session was not supposed to be on the science "stuff" and finger pointing (i.e. apportioning blame), but on generating some ideas on remediating the eutrophication (nutrient enrichment) in Loskop Dam. The Olifants River is strategically important to the economy of South Africa due to its importance in the energy production supply chain. Not only does it supply water for essential services; it is also a transboundary river that is shared with Mozambique.

Most of the activities impacting the system take place in the upper reaches of the catchment. Land use practices, such as agriculture, mining and urbanisation, affect the river's quality and the ecosystem services it provides. The eutrophication of Loskop Dam is a symptom and not the source of the problem. The problem is caused upstream from the reservoir.

> *"… We need the answers! Are the feed lots licensed? Irrigation schemes, are they licensed? If we don't have numbers it will be difficult to answer the questions. Are farmers moving towards certain technologies to fertilise? We need to take the biggest risks first – low hanging fruit. You need to prioritise. Minimum effort, biggest impact!"*

In conclusion, Dr Oberholster indicated that there is not only bad news. For example, there are positive actions and attitudes that should be built upon, such as grape farmers using compost tea instead of chemical fertilisers. In addition, the treatment of AMD by some of the mines in the region also helps to reduce the AMD load in the Klipspruit River. There is also an increase in wetland restoration. Since 2008 a reduction in sulphate concentrations in Loskop Dam has been observed, while 2012 was the first year since 2008 that Loskop Dam did not experience a bloom of cyanobacteria.

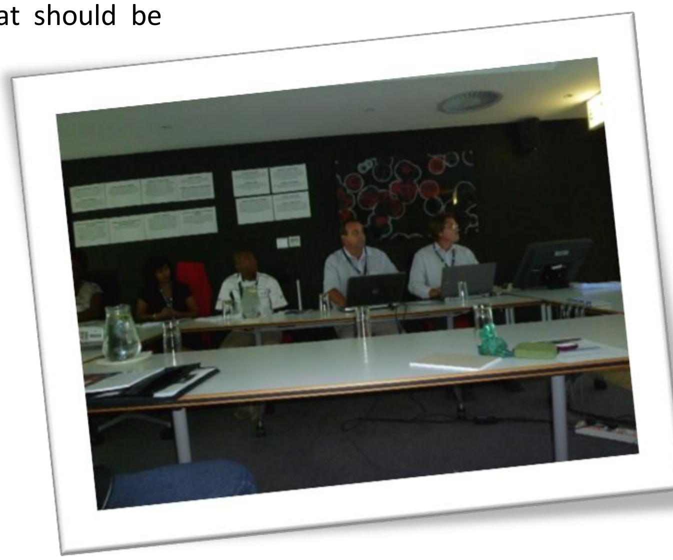


FIGURE 5. DR PAUL OBERHOLSTER PRESENTING ON PROTECTING THE UPPER OLIFANTS

Key Questions for this Session:

- What is currently working in terms of mitigation actions in the Upper Olifants River?
- How can we improve what is currently working?
- What is currently not working in terms of mitigation actions in the Upper Olifants River?
- What other mitigation actions are required and where? And how can we improve this?

Key Outcomes:

- Participation from all stakeholders needs to be increased.
- Stakeholders need to continue to ask difficult questions of themselves and each other.
- More data is needed on no-point return flows and interaction between sulphates and eutrophication.
- There needs to be a shift on the part of DMR to also participate and work together with the rest of the stakeholders
- More progress is needed in terms of Catchment Management Agency (CMA) establishment.

Introducing the Fish Kill Website

Presenter: Ms Jackie Dabrowski

Summary:

In this session the Fish Kill website (www.orf.co.za; click on "Report Fish Kills"), which was developed as part of the Upper Olifants River Study, was presented to stakeholders. The website is a web-based tool aimed at facilitating rapid reporting and recording of fish kill events in the Upper Olifants River Catchment. The purpose of the presentation was to demonstrate to the workshop participants how this reporting tool works in practice.

Given that fish are excellent indicators of water pollution, the fish kill website was developed to reduce the time that passes between observing a fish kill and responding to it. Once a fish kill incident is reported on the website, the information regarding the fish kill is immediately emailed to the parties responsible for investigating the cause of the fish kill and responding to it. The website also offers an opportunity for entering historical fish kill data onto the website. The database of fish kills stored on the website will enable water quality managers and other concerned stakeholders to highlight and prioritise locations needing attention.

Visit:

WWW.ORF.CO.ZA

Session B

Parallel Sessions B	
B1: Informing management: Introducing the SWAT Model	**B2: Informing management: Improving municipalities' Green Drop scores**
Focus on introducing the SWAT Model and explaining its potential usefulness to stakeholders.	Focus on how the municipalities in the Upper Olifants River Catchment can improve their Green Drop scores with support from CSIR researchers.

B1: Informing management: Introducing the SWAT Model

Presenter: Dr James Dabrowski
Facilitator: Ms Vasna Ramasar (standing in for Dr Marius Claassen)

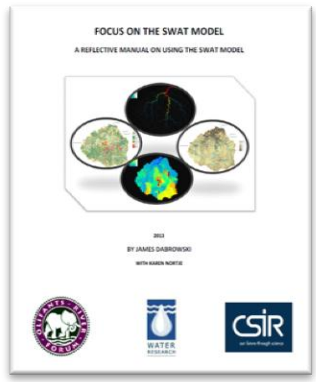
Summary:
Dr Dabrowski introduced the SWAT Model and explained its potential usefulness to stakeholders. He started the presentation by explaining the problem of eutrophication in Loskop Dam and elaborated on the sources of increased nutrient input into the system, including crop production, livestock production, mining, treated sewage, untreated sewage and products such as detergents. The impacts of eutrophication include human health impacts (human drinking water supplies, irrigation of crops, livestock), ecosystem health impacts (fish kills, alteration of food webs), agricultural impacts (choking irrigation canals, decrease in the lifespan of expensive irrigation equipment), aesthetic impacts (impacts on property values, impacts on recreation and tourism and associated revenue) and financial impacts (eutrophication is extremely expensive to treat).

An integrated catchment approach is needed to manage eutrophication, and it is important to address the causes and drivers of eutrophication and not only the symptoms. Dr Dabrowski listed some important questions that need to be asked about how to manage eutrophication in Loskop Dam. These are:

- To what extent can the system assimilate additional phosphate loading, without changing the current trophic status of the system/dam?
- Will proposed phosphate reduction strategies result in an improvement in the trophic status of a system/dam?
- Are point sources or nonpoint sources the major contributor to phosphate loading in the system?

- Which land use activities are responsible for high phosphate loading in the catchment?
- Which WWTW have the greatest impact on phosphate loading?
- Which sub-catchments within a large catchment area are responsible for the high load contributions?
- What is the expected change in phosphate loading if a land use is changed to another land use activity?

While water quality monitoring can help answer some these questions, it is dependent on the extensiveness of the monitoring network, which is always limited by financial and logistical constraints. It is here where the SWAT Model can prove to be a useful management tool. The SWAT Model predicts the impact of land management practices on water, sediment, and agricultural chemical yields in large, complex catchments with varying soils, land use, and management conditions over long periods of time. In particular, once a model has been established and calibrated, it can be used for scenario analyses to determine which land management practices may lead to improvements in water quality.



The overall objective in applying the SWAT Model as part of the Upper Olifants River Study has been to assess its applicability and ease of use (particularly with respect to data input requirements):

- *Phosphate load modelling:* Model point (sewage and industrial discharges) and nonpoint (agricultural runoff) source nutrient load inputs to the Olifants River upstream of Loskop Dam.
- *Identification of spatial trends:* Identification of the location of important sources of phosphate loading in the catchment.
- *Identification of temporal trends:* Identification of temporal trends in phosphate loading and the potential link to eutrophication and algal blooms in the Olifants River and Loskop Dam.
- *Scenario development:* Modelling point source reduction scenarios and the implications for phosphate loading and eutrophication.

The SWAT Model helped in the following ways:

- **Prioritised sub-catchments responsible for high input of ortho-phosphates**
    - Steenkoolspruit identified as an important source of ortho-phosphates in the system.
- **Prioritised drivers of ortho-phosphate pollution**
    - Witbank and Loskop Dam are heavily influenced by WWTW (point sources).
    - Middelburg Dam is more influenced by nonpoint sources.
- **Prioritised land use activities responsible for nonpoint source pollution**
    - Mining and agriculture identified as important contributors to nonpoint source phosphate loading.

- **Supported decision-making with regards to remediation**
  - Implementation of 1 mg/l ortho-phosphate effluent standard can significantly reduce phosphate loading in Witbank and Loskop Dam.
  - Implementation of a 0.1 mg/l ortho-phosphate standard may be "masked" by the influence of nonpoint source loading.
- **Identified potential catchment drivers of eutrophication in Loskop Dam**
  - Combination of low dam levels (prolonged dry period) followed by high phosphate input as a result of very high rainfall early in the start of a wet period.
- **Identified errors in model by comparison to measured data**
  - Nonpoint source pollution appeared to be over-predicted.
- **The SWAT Model provides a good spatial and temporal overview of phosphate loading in the catchment, which can be highly beneficial in terms of managing eutrophication in the catchment.**

There are also some advantages and disadvantages when using the SWAT Model:

Advantages	Disadvantages
• Freely available (open-source) for use with commercial and open-source GIS software	• Data intensive (weather, soil, crop characteristics, catchment characteristics, land use management etc.)
• Freely available software for calibrating (SWATCUP) and visualising (VIZSWAT) SWAT output data	• Time consuming (gathering, formatting and entering data and calibration)
• Freely available literature (i.e. manuals and theory)	• Familiarisation with auto-calibration software (i.e. SWATCUP) is essential
• User forums on the internet (*groups.google.com/group/arcswat; groups.google.com/group/swatuser*)	• Routine monitoring data (i.e. DWA) does not necessarily correspond with model outputs
• Simple interface	
• Easy to add to and edit SWAT databases	
• Simulates other high priority water quality parameters (i.e. nitrogen, sediment, bacteria, dissolved oxygen and pesticides)	

Key Questions for this Session:

- How can the SWAT Model be applied in the Upper Olifants River Catchment in future?
- What would you like to get out of SWAT?
- What are the needs and opportunities around data sharing?

Key Outcomes:

- The SWAT Model could be very useful to DWA and there is a need to investigate how it can be aligned with existing tools that DWA uses, including decision-support tools.
- A number of data gaps exist, e.g. sediment is not monitored at all and there is lack of information about the threshold concentrations causing algal blooms. These data gaps make calibration very difficult. How can these data gaps be addressed?
- Accurate and detailed measurements coming out of wastewater treatment works would also help considerably with the application of the SWAT Model.
- Dr Dabrowski would like to explore opportunities for the SWAT Model to continue being applied in the catchment, e.g. by providing training to interested people. While the model is not particularly difficult to use, it is nonetheless very labour intensive and people who apply it need to be patient and persistent.

B2: Informing management: Improving municipalities' Green Drop scores

Presenter: Mr Wouter Le Roux
Facilitator: Mr Pieter Viljoen

Summary:
Mr Wouter le Roux gave a presentation on how CSIR and other stakeholders could assist in improving municipalities' wastewater treatment processes, and, by implication, their Green Drop scores. Mr le Roux emphasised the fact that WWTW are one of the main drivers of water pollution in the Upper Olifants River Catchment. The current challenges facing municipalities relate to a lack of skills, funding, knowledge, human resources and too much "red tape".

The facilitator of this session, Mr Pieter Viljoen from DWA: Water Quality Planning, initiated a discussion on how stakeholders could assist with the process of improving wastewater treatment. He requested everyone present to come up with three conventional ideas and three radical ideas on how wastewater treatment could be improved.

The stakeholders in the session summarised the main problems characterising wastewater treatment. These problems are 1) Ageing infrastructure; 2) Insufficient training of WWTW operators and 3) WWTW not having the capacity to process the inflow they receive. Other challenges include vandalism of WWTW and the appointment of select "agents" by the municipality, which creates the perception that work is taken away from other potential employees and results in strikes. It was noted that the Green Drop assessment serves as a "name and praise" public recognition incentive and that all municipalities have to participate in this assessment process. However, there is no financial incentive for municipalities to participate or perform well. Lastly, the privatisation of WWTW was discussed. This option was however described as externalising an internal problem and as therefore only presenting a short-term solution to the problem of non-functioning WWTW.

FIGURE 6. MR PIETER VILJOEN FROM DWA FACILITATES THE SESSION

Key Questions for this Session:

- How can stakeholders work together in order to promote efficient wastewater treatment (and Green Drop scores)?
- List three conventional ideas on how wastewater treatment could be improved.
- List three radical ideas on how wastewater treatment could be improved.

Summaries of Stakeholders' Ideas for Supporting and Improving Wastewater Treatment:

Sector: CSIR

Conventional Ideas:

1) Add an extra financial incentive for Green Drop certification.
2) Bring WWTW into the public eye to create public awareness.
3) Prosecute non-conformance.
4) Have technicians on site at WWTW to maintain operations – At the moment, WWTW have to make use of municipality approved technicians to fix problems on site. This is an issue because repairing problems is not a competitive process and currently there is no incentive to resolve problems in a particular time frame.
5) Allow competent WWTW operators to control their own budget - Operators of some WWTW do not control their own budgets as these are centralised with the municipality. This causes problems with repairing minor plant issues as it takes time to apply for the necessary budget.
6) Provide training to develop skills for WWTW operators/personnel.

Radical Ideas:

1) Run an ad campaign on TV/radio channels to promote efficient wastewater treatment (make efficient wastewater treatment a trend)
2) Privatise WWTW (short term).
3) Centralise WWTW (long term).
4) Provide a monetary incentive to WWTW operators to attain Green Drop status. (Funding!)
5) Provide a monetary incentive to municipalities to attain Green Drop status. (Funding!)
6) Provide onsite security to WWTW to prevent vandalism. (Funding!)

<u>Sector: Mining Industry</u>

Conventional Ideas:

1) Use the mines' sophisticated financial and procurement systems to streamline purchasing for WWTW.
2) Provide technical consultancy services to WWTW.
3) Put performance targets on the operations of WWTW in the contracts of responsible politicians.

Radical Ideas:

1) Build a fish pond fed with WWTW effluent in front of the municipal offices, or in the mayor's office.

General Ideas:

1) Provide adequate leadership – careful choice of WWTW managers.
2) "Adopt a plant" – Companies can enter into a contract to run a WWTW for two years.
3) Identify what the actual issues are, how deep/old the legacy problem is, whether education is an issue, and appoint operators with a Grade 12 qualification. Such operators will have a better understanding of "life" and not "politics/unions".
4) Create pride – Green Drop is great, but a quarterly meeting would benefit all plant managers, where comrades/colleagues could assess each other and individuals could "nudge" each other.
5) Create a spreadsheet listing 10 common root causes, then assess all 156 sewage plants using a "Robot System". Those in the "green" space identify what they're doing right and communicate best practices. Those in the "red" space develop a team dynamic to improve solving problems. "Red" plants visit "green" plants, incentivise "red plants" to get from "red" to "green" and create a sense of guilt (the opposite of pride).
6) Re-use ideas, e.g. fertiliser and grey water.
7) Key performance indices/performance contracts need to be implemented.

<u>Sector: WRC</u>

General Ideas:

1) Provide a neutral venue to help facilitate high level discussions for officials.
2) Training/workshops for operators/municipalities/councillors.
3) Will help pay for a "braai" next to a WWTW!
4) Help fund "remote call a technician" central system that can provide WWTW with technical assistance to operate and maintain systems.
5) Pressure on communities to replace toilets with VIPs. This will put pressure on municipalities for improved wastewater treatment – decentralise on site sanitation.

<u>Sector: Municipality</u>

General Ideas:

1) Address skills and resources – training to be facilitated by DWA.
2) Address ageing infrastructure – funding back work.
3) Address domestic and industrial development – plant capacity met during developmental programme (politicians).

Sector: DWA

Conventional Ideas:

1) Support municipalities in areas where they are being challenged.

Radical Ideas:

1) Implementation of Regulation 17 to address skills and training and appoint qualified process controllers.

General Ideas:

1) Put a Rand value to the re-use of water to extract metals such as aluminium.

Sector: Agriculture [Agron (013 262 6671)]

General Ideas:

1) Closed water systems on farms for water re-use.
2) Monitoring of water quality on farms (EuroGAP).
3) Grey water usage on farms, municipalities, golf courses etc.
4) Training, records, management systems.
5) Water management on farms – green footprint.

Sector: Sanbi Wetlands

Conventional Ideas:

1) Look after our wetlands, protect and limit development on wetlands.
2) Rehabilitation of wetlands treating wastewater.

Radical Ideas:

1) Create integral wetlands to assist in treating wastewater.
2) Reduce loads of grey and black wastewater to treatment plants.
3) DWA – make officials/managers accountable.

Sector: Community

Conventional Ideas:

1) Mobilise awareness and understanding amongst local every-day people.
2) Communities should be made more aware of and connected to their own bodily excrement!
3) Employ more skilled people.
4) Make working and doing a good job at the WWTW a sought after employment option.

Radical Ideas:

1) De-romanticise the "white-toilet" and introduce alternatives not only in rural areas but in richer suburbs!

Sector: Unknown
General Ideas:

1) ZLED
2) PINCH-WATER treatment plant
3) Treat at source.
4) Design limits, technology, best at least cost, management or audit of the Green Drop system.
5) Provide performance based bonuses.
6) Improve public understanding.
7) DWA should nationalise plants – autocratic management.
8) Assist municipalities to address poor performance, get buy-in from decision-makers within municipalities to secure budget to implement plans in response to (poor) Green Drop results.
9) Research other regulatory mechanisms which are currently not in place, but which could help in addressing the regulatory challenges.
10) DWA should facilitate the involvement of the private sector.

Session C

Parallel Sessions C	
C1: River Restoration: Introducing the River Phosphate Sensitivity Index and AMD Screening Tool	**C2: Wetland Restoration: Introducing the Wetland Restoration Tool**
Focus on introducing the River Phosphate Sensitivity Index and AMD Screening Tool and explaining their potential usefulness to stakeholders.	Focus on introducing the Wetland Restoration Tool and explaining its potential usefulness to stakeholders.

C1: River Restoration: Introducing the River Phosphate Sensitivity Index and AMD Screening Tool

Presenter: Dr Paul Oberholster
Facilitator: Dr Carin van Ginkel

Summary:
Dr Paul Oberholster started by explaining that in order to be able to successfully restore and manage rivers, it is vitally important to understand the capacity of streams or river

ecosystems to retain nutrients through physical-chemical processes or biotic assimilation. This means understanding the phosphorus sensitivity of the system, and how the system will respond to increases or decreases in phosphorus loads. A related important concept is the “self-purifying capacity” of a stream. This concept refers to the capacity of a stream to reduce nutrient loads within a relative short distance if the capacity of the stream is not overwhelmed by excessive nutrient loading.

The first set of objectives of this part of the Upper Olifants River Study was to: (1) Determine the sensitivity of the Upper Olifants River Catchment to increases in P loads using a variety of modified P sensitivity indices in combination with river characteristics and phytoplankton occurrence; (2) Identify both small and large order streams in the catchment that show evidence of eutrophication and therefore require mitigation of increased P loads; (3) Outline best management practices to reduce P loads of these rivers and streams

The RPSI Tool was therefore developed to determine the sensitivity of the Olifants River regarding phosphate loads in different parts of the river.

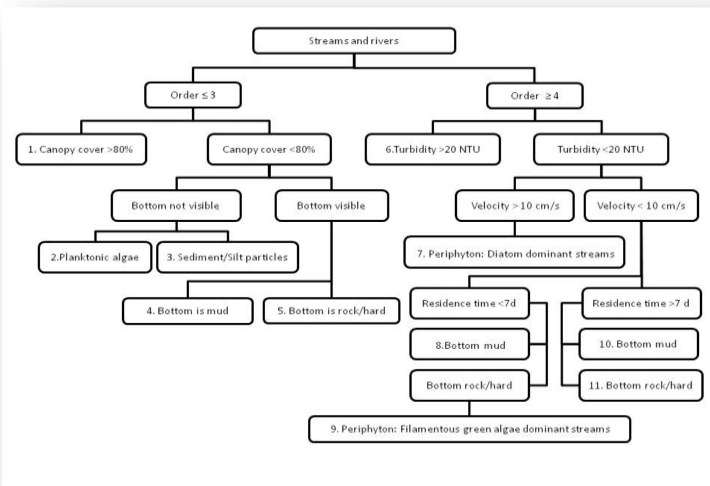


FIGURE 7. PHOSPHOROUS RIVER SENSITIVITY INDEX

The second set of objectives for this part of the Upper Olifants River Study was to use existing and historical data sets, including physical, chemical and biological parameters, to develop and evaluate an eco-toxicologal screening tool (EST), aimed at categorising AMD impacted stream reaches for restoration purposes. The rationale behind developing this tool is that the Olifants River is not equally impacted by AMD everywhere, and it is important to prioritise areas for mitigation.

Key Questions for this Session:

- How, when and in which environments can these tools be used practically?
- Who can use these tools?
- Do these tools need to be adapted to work better in certain environments?
- Will potential users require support from CSIR researchers?

Key Outcomes:

- The RPSI and EST tools are useful in that they enable the stakeholders in the Upper Olifants River Catchment to prioritise areas that need to be remediated, and start implementing management actions accordingly.

- Preliminary research results show that if phosphates are reduced in the upper catchment, in other words, it the sources of phosphate pollution are targeted, Loskop Dam will respond in the long term. In the meantime, however, instream remediation may be the best response.

- There is potential for DWA to make use of these tools in order to prioritise areas for intervention, and this potential should be explored.

- Mitigation actions need to be implemented with regard to WWTW in particular. Again, the point was raised that the private sector could become involved in supporting municipalities in terms of skills and capacity when it comes to the functioning of WWTW.

- The issue of non-functioning WWTW has become a national priority and should be elevated to a higher political level, particularly because DWA's current responses to the issue do not seem to be working.

- With regard to AMD, there is considerable concern about the environmental impacts caused by abandoned mines and who should take responsibility for these. What exactly is the role of DMR (an actor who has been largely absent from stakeholder discussions about issues in the Upper Olifants River Catchment) with regard to abandoned mining operations?

- Concern was also expressed about mining and power station developments that are planned for the Wilge River, an important tributary to the Olifants River that is able to contribute to improving the ecological state of the Olifants. Another view on the issue of these developments was that their environmental impacts will be limited, because of the regulations that the responsible companies have to adhere to.

C2: Wetland Restoration: Introducing the Wetland Restoration Tool

Presenters: Ms Liesl Hill and Mr Peter McMillan
Facilitator: Dr Steve Mitchell

Summary:

The Wetland Classification and Risk Assessment Index (WCRAI) was presented by Ms Liesl Hill and Mr Peter McMillan. Ms Hill gave an overview of the WCRAI, which was followed by a practical example of how the WCRAI is used in the field.

One of the objectives of the Upper Olifants River Study is to develop new tools or use existing tools that can support mitigation and management efforts of wetland and river resources in the catchment. The WCRAI is a tool that was developed to classify types of wetland and to assess their ecological condition. In addition to this, the index was developed and designed with a broad application potential in mind that enables non-wetland experts to, in a simple way, distinguish between different wetland types and to assess their ecological condition as well as the ecological changes that are taking place in the wetland over time.

The WCRAI includes metrics of biotic and abiotic conditions and is based on: 1) wetland characteristics (such as wetland types, landform, hydrology, wetland size, wetland boundary and hydroperiod), 2) Assessing relevant attributes of the ecosystem that respond to stressors (e.g. aquatic organisms, algae, macrophyte layers etc.). 3) Ecological status (based on the A to F river health categories for the present ecological state of a river).

This tool has proved very useful to industry, which is looking for a standardised approach to assessing and classifying wetlands. The index provides a simple way of assessment as opposed to conventional methods, which require several days of fieldwork for the classification of each wetland.

"… make as many relevant observations as you can; but you don't have to record things like 'little Johnny was having a pee in the wetland' …"

The shortcoming of the WCRAI is that it does not provide in-depth detail and cannot be used in all settings. For example, this index cannot be used to meet the requirements of the environmental impact assessment (EIA) procedure under current legislation, which requires more detail on the class of impacted wetlands.

The WCRAI is however useful in providing internal and continuous monitoring and management of impacts on wetlands by individual organisations, mines, industry and other commercial ventures.

Key Questions for this Session:

- How can the WCRAI be used to support mitigation and management efforts of wetland and river resources in the catchment?
- Who should be using the WCRAI, and for what purposes?

Practical example of how the WCRAI is used in the field:

Participants were presented with a wetland scenario and with the help of the presenter, Mr McMillan, analysed their observations. They subsequently filled in a field sheet (a computerised spreadsheet/programme), which then produced a report sheet. This practical example showed participants the ease-of-use and scope of the WCRAI when needing to classify types of wetlands and assessing the ecological condition of a wetland.

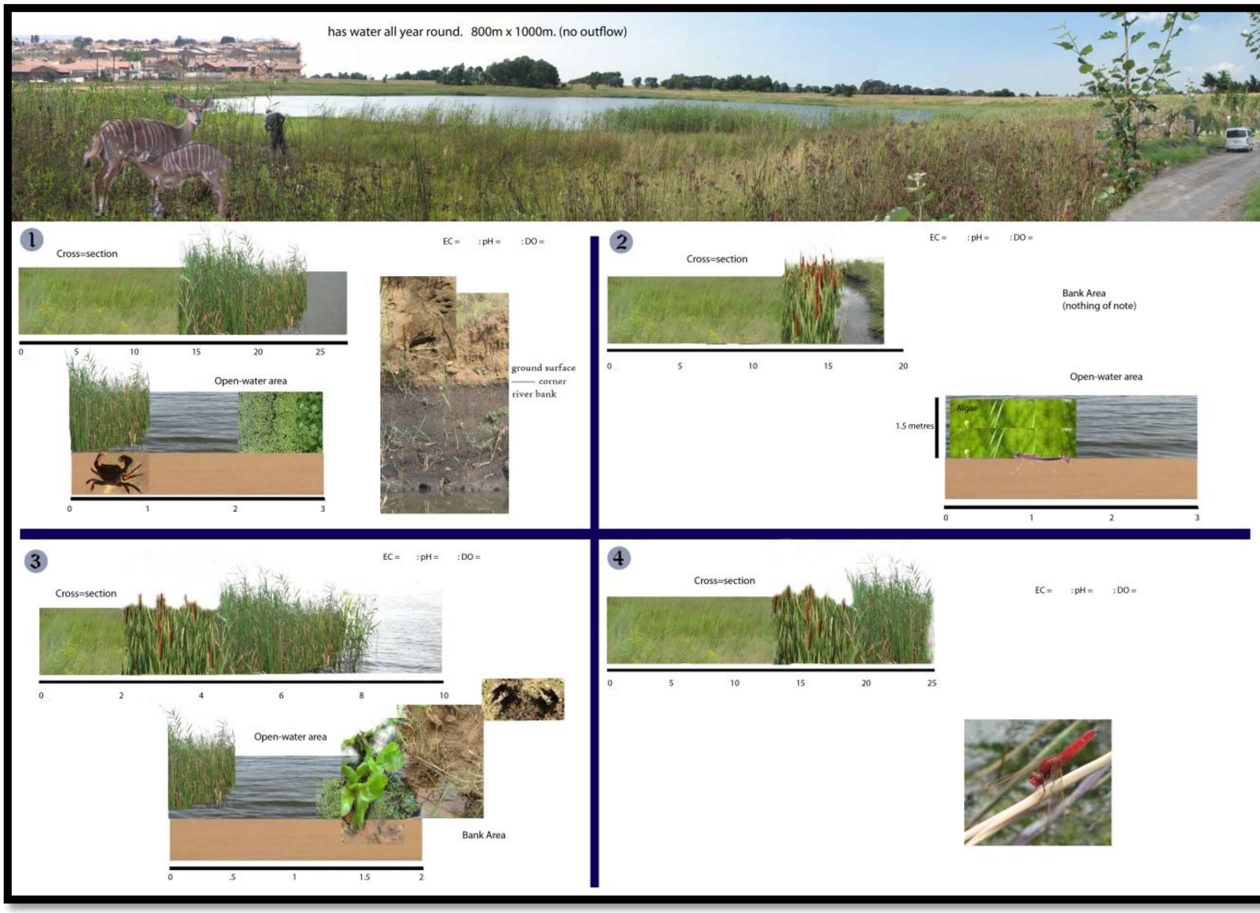
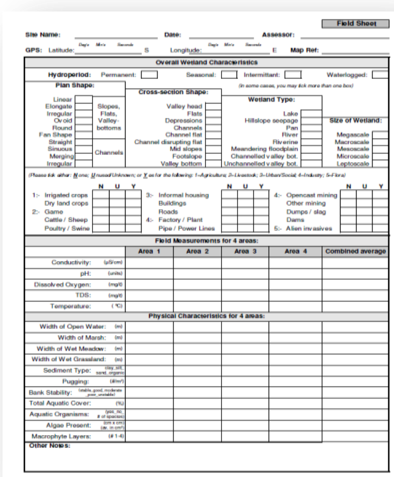


FIGURE 8. WETLAND SCENARIO SHEET

Field Sheet



Field Sheet

Site Name: Date: Assessor:

GPS: Latitude: (Deg's Min's Seconds) S Longitude: (Deg's Min's Seconds) E Map Ref:

Overall Wetland Characteristics

Hydroperiod: Permanent: Seasonal: Intermittant: Waterlogged:

(In some cases, you may tick more than one box)

Plan Shape:		Cross-section Shape:	Wetland Type:	Size of Wetland:
Linear	Slopes, Flats, Valley-bottoms	Valley head		
Elongate		Flats	Lake	
Irregular		Depressions	Hillslope seepage	
Ovoid		Channels	Pan	
Round		Channel flat	River	Megascale
Fan Shape		Channel disrupting flat	Riverine	Macroscale
Straight	Channels	Mid slopes	Meandering floodplain	Mesoscale
Sinuous		Footslope	Channelled valley bot.	Microscale
Merging		Valley bottom	Unchannelled valley bot.	Leptoscale
Irregular				

(Please tick either: None; Unused/Unknown; or Yes for the following: 1–Agriculture; 2–Livestock; 3–Urban/Social; 4–Industry; 5–Flora)

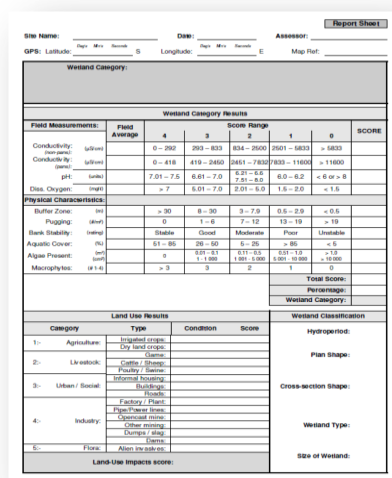
	N	U	Y		N	U	Y		N	U	Y
1:- Irrigated crops				3:- Informal housing				4:- Opencast mining			
Dry land crops				Buildings				Other mining			
2:- Game				Roads				Dumps / slag			
Cattle / Sheep				4:- Factory / Plant				Dams			
Poultry / Swine				Pipe / Power Lines				5:- Alien invasives			

Field Measurements for 4 areas:

	Area 1	Area 2	Area 3	Area 4	Combined average
Conductivity: (µS/cm)					
pH: (units)					
Dissolved Oxygen: (mg/ℓ)					
TDS: (mg/ℓ)					
Temperature: (°C)					
Physical Characteristics for 4 areas:					
Width of Open Water: (m)					
Width of Marsh: (m)					
Width of Wet Meadow: (m)					
Width of Wet Grassland: (m)					
Sediment Type: (clay, silt, sand, organic)					
Pugging: (#/m²)					
Bank Stability: (stable, good, moderate, poor, unstable)					
Total Aquatic Cover: (%)					
Aquatic Organisms: (yes, no, # of species)					
Algae Present: (cm x cm) (av. in cm²)					
Macrophyte Layers: (# 1-4)					

Other Notes:

Report Sheet



Report Sheet

Site Name: Date: Assessor:

GPS: Latitude: (Deg's Min's Seconds) S Longitude: (Deg's Min's Seconds) E Map Ref:

Wetland Category:

Wetland Category Results

Field Measurements:		Field Average	Score Range 4	3	2	1	0	SCORE
Conductivity: (non-pans):	(µS/cm)		0 – 292	293 – 833	834 – 2500	2501 – 5833	> 5833	
Conductivity: (pans):	(µS/cm)		0 – 418	419 – 2450	2451 – 7832	7833 – 11600	> 11600	
pH:	(units)		7.01 – 7.5	6.61 – 7.0	6.21 – 6.6 7.51 – 8.0	6.0 – 6.2	< 6 or > 8	
Diss. Oxygen:	(mg/ℓ)		> 7	5.01 – 7.0	2.01 – 5.0	1.5 – 2.0	< 1.5	
Physical Characteristics:								
Buffer Zone:	(m)		> 30	8 – 30	3 – 7.9	0.5 – 2.9	< 0.5	
Pugging:	(#/m²)		0	1 – 6	7 – 12	13 – 19	> 19	
Bank Stability:	(rating)		Stable	Good	Moderate	Poor	Unstable	
Aquatic Cover:	(%)		51 – 85	26 – 50	5 – 25	> 85	< 5	
Algae Present:	(m²) (cm²)		0	0.01 – 0.1 1 - 1 000	0.11 – 0.5 1 001 - 5 000	0.51 – 1.0 5 001 - 10 000	> 1.0 > 10 000	
Macrophytes:	(# 1-4)		> 3	3	2	1	0	
							Total Score:	
							Percentage:	
							Wetland Category:	

Land Use Results

Category		Type	Condition	Score
1:-	Agriculture:	Irrigated crops:		
		Dry land crops:		
2:-	Livestock:	Game:		
		Cattle / Sheep:		
		Poultry / Swine:		
3:-	Urban / Social:	Informal housing:		
		Buildings:		
		Roads:		
4:-	Industry:	Factory / Plant:		
		Pipe/Power lines:		
		Opencast mine:		
		Other mining:		
		Dumps / slag:		
		Dams:		
5:-	Flora:	Alien invasives:		
Land-Use Impacts score:				

Wetland Classification

Hydroperiod:

Plan Shape:

Cross-section Shape:

Wetland Type:

Size of Wetland:

OUTCOMES AND WAY FORWARD

Facilitator: Ms Nikki Funke

The wrap up session focused on giving a brief summary of the outcomes of the day and outlining a way forward for the workshop participants. Each facilitator was asked to give a five minute summary of the highlights of their session.

Ms Nikki Funke gave feedback on the Loskop Dam session on behalf of Dr Meiring du Plessis (who had to leave early). The focus of the session had been on how to bring about improved stakeholder cooperation and improved management of the dam and the catchment. The issue of WWTW featured strongly in this session, and the point was raised that it might be good to involve the private sector in helping to support and maintain WWTWs. The issue of water re-use was also discussed. In terms of the management of Loskop Dam, a point was made about learning from the remediation practices in other dams, for instance Rietvlei Dam and Hartbeespoort Dam. It is also important to address the limitations regarding the monitoring of Loskop Dam and sourcing the necessary funding to purchase the equipment needed for monitoring and research purposes. Finally, it is important to decide where the priority areas for remediation are, and to invest in these areas.

Dr Vik Cogho gave feedback on the discussions in the "Protecting the Upper Olifants Catchment" session, which had centred on three questions: "What is currently working; what can be done to improve this, and what is not working?" Dr Cogho said that the Upper Olifants River Study had definitely increased awareness about the state of the catchment, and that this awareness provides a basis for stakeholders to work from. There are some water quality and related initiatives that are already in place, and that need to continue working. These include controlled release schemes, water treatment plants and water reclamation plants. At the same time, however, there is a lot that still can be done. Here it is important to involve all stakeholders in the catchment; a CMA could help consolidate such efforts. It is also important to prioritise areas for intervention – to focus on addressing the big issues first before addressing the smaller issues. In terms of what is currently not working, the interaction between stakeholders is not good and needs work. Some stakeholders in the catchment are very active, whereas others are too passive. The regulators in the catchment (DWA and DMR) also need to cooperate more closely. All stakeholders should support the regulators, and everyone needs to start playing by the rules.

> *"…lots of people are doing stuff, but there are also people who just sit and don't do anything …"*

Ms Vasna Ramasar summarised the discussion that had taken place in the SWAT Model session. This session addressed the future use of the model, the question of what stakeholders would like to get out of the model and the question of data sharing. The discussion in this session was focused on specific questions, such as how the SWAT Model deals with uncertainty, and on broader questions, such as how to align the different hydrological land use models available and how to integrate the SWAT Model with what is currently being used at DWA. Finally, in terms of data sharing, Ms Ramasar said that it is important to find ways to move forward in terms of data sharing and filling existing data gaps.

"…it's time for 'out of the box' thinking as far as WWTW are concerned, because 'in the box' thinking simply hasn't worked…"

Following Ms Ramsar, Mr Pieter Viljoen gave feedback on the "Improving municipalities' Green Drop scores" session. Mr Viljoen made the point that it may be time to start thinking out of the box as far as non-functioning WWTW are concerned. One of the suggestions that came out of his session was something as simple, yet radical, as hosting a braai for municipal managers at one of the WWTW. Mr Viljoen said that he believes the time has come to engage the Minister of Water and Environmental Affairs on ways to address the issue of non-functioning WWTW. This is because the strategies employed to date do not seem to be working. One of the reasons why things are not working the way they should is because it is very difficult to prosecute municipalities.

In terms of the River Restoration session, Dr Carin van Ginkel indicated that both the RPSI and the AMD Screening tools facilitate the prioritisation of certain areas for intervention in the Upper Olifants River Catchment. Dr van Ginkel also raised concern about the management of abandoned mining operations, and about future developments along the Wilge River.

FIGURE 9. THE WORKSHOP PARTICIPANTS AT THE UPPER OLIFANTS KEY STAKEHOLDER WORKSHOP, HELD AT THE CSIR KNOWLEDGE COMMONS ON 26 FEBRUARY 2013. THE PARTICIPANTS REPRESENTED A RANGE OF SECTORS INCLUDING NATIONAL GOVERNMENT, PROVINCIAL GOVERNMENT, LOCAL GOVERNMENT, MINING, INDUSTRY, AGRICULTURE, CONSERVATION AND RESEARCH.

Dr Steve Mitchell spoke about the Wetland Restoration session. The WCRAI was presented in this session. In essence, the tool is designed to raise a red flag if a problem is developing in the vicinity of a wetland so that interventions can take place. The WCRAI can also be used by non-specialists. In fact, the tool has been adopted by Eskom and is currently being used throughout South Africa. A question that was asked in this session is how the WCRAI fits in with the methods that DWA uses to monitor and test wetlands. The point was also made that this tool is not designed to conduct EIAs.

Finally, Ms Funke concluded the session by thanking everyone who attended the workshop and asking the workshop participants to build on the ideas that had emerged from the workshop and to carry on their discussions by emailing and meeting with each other. Ms Funke promised to send out an Upper Olifants River Catchment stakeholder list, the stakeholder workshop report and other dissemination materials that will be coming out of the Upper Olifants River Study.

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