



NeWater

D.3.8.5. ORANGE RIVER BASIN TRAINING & DISSEMINATION INITIATIVES



**Report of the NeWater project -
New Approaches to Adaptive Water Management under Uncertainty**

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Orange River Basin Training & Dissemination Initiatives

- Policy Summary (D.3.8.5)

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Preamble

This Policy Summary overviews the initiatives in the Orange Basin to disseminate the knowledge developed by NeWater.

New Ideas Disseminated in the NeWater Orange River Basin

There have been four major achievements produced by WP 3.8 in the Orange River Basin.

1. *The introduction of the concepts of adaptive management.* While it can be said that only a seed has been sown, it is anticipated that the impacts of this will be long-term and significant. Usefully, the project team have been appointed to write policy in South Africa which includes adaptive management, so the prospects of this thinking becoming incorporated into management are great.
2. *The valuation of wetlands in the basin.* This has been an area of a major deficiency in knowledge in the basin (and elsewhere). The impacts of this information are already being experienced in the basin and in other places.
3. *The hydrological scenarios for the basin coupled with a determination of water vulnerability.* This information fits into what is a very important topic in most countries of the world and in this basin as well. The work that was done for NeWater has been extended to the rest of South Africa and is sure to become crucial information for management in the basin. There were already expressions of interest from the likes of the transboundary basin commission (ORASECOM), DWAF and the Water Research Commission.
4. *A re-look at the tools for determination of environmental flows.* This science had outgrown itself and the methods have become detached from their usefulness for management. As an outcome of NeWater, a seed has been sown where new and more appropriate tools will be determined that embrace the concepts of adaptive management. Again the NeWater team has the opportunity to implement this new thinking as they have

separately been appointed by DWAF to carry out an Environmental Flows Assessment for a major river in the region.

Dissemination of these New Ideas

- The approach that has been followed by the NeWater team has been the presentation of new ideas to workshops and conferences, as well as the production of high-impact books that describe the product. Two of these books have been produced, one on the valuation of wetlands and the other on the water scenarios for the Orange Basin.
- It was found that the project was never fully accepted by important stakeholders in the basin as they had been *effectively* excluded in the project proposal phase. While there had been attempts to include the basin commission, the target person had failed to take up the responsibility. This has had the unfortunate consequence of limiting the dissemination of new ideas to them.
- It is important that international projects such as this one, link to the projects that are already being done by other agencies. By keying into the overall work of the basin, the chance of uptake of ideas is increased.
- The project duration was too short to be able to see real change in policy circles. Such changes take a long time to be achieved, and while seeds have been sown and information delivered, it is difficult to assess the degree to which this has been adopted amongst policy makers.

Recommendations

The main message of NeWater i.e. adaptive management, remains an untapped message that now needs to be strongly broadcast to stakeholders. It is most unfortunate that the project should finish just as the most interesting and useful information was beginning to emerge. The greatest challenge will be how to foster the adoption of adaptive management in the minds of catchment managers, who all already believe that they practise this but clearly do not.

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Introduction and Aim of this Report

One of the central themes of the NeWater project has been to develop the science of adaptive management as part of IWRM. In the process this required to involve stakeholders in a way that would facilitate the development of adaptive management within individuals and institutions in the case study basins.

While the involvement of stakeholders is key to this process, this has been reported on separately in deliverable D.3.8.4. Instead, this report aims to report more on the training initiatives offered by NeWater as well as on the dissemination of the NeWater products to stakeholders.

Dissemination of NeWater results at conferences and workshops

World Water Week - Stockholm 2006

NeWater played an active role in the 2006 World Water Week in Stockholm (22nd August 2006) after being invited by Zissimos Vergos of DG Research and the EU Water Initiative to participate in a special session called "Practical Implementation of IWRM in Africa".

The overall objective of the workshop was to address barriers to the promotion of a knowledge-based approach to adaptive IWRM, looking at Africa in particular. The workshop was a joint one with the Challenge Programme on Water and Food, which brought the practical aspects of IWRM into the debate.

The sessions began with presentations describing the implementation of IWRM in Southern, Eastern and West Africa, where there were impressive accounts of both management and research activities. These were followed by the experiences of the Challenge Programme which looked at IWRM, water productivity and poverty reduction, models of transboundary governance and reservoir planning.

The contribution of the EU Water Initiative, as presented, is partly through the efforts of the Research arm of the EU. Chris Dickens of the INR in South Africa presented the NeWater project and its objectives in the Orange River basin. He illustrated the successes and failures of IWRM in the basin, highlighting how there are different views of this from official and stakeholder perspectives, with many officials stating that Adaptive Management (AM) was well implemented, but other

stakeholders suggesting that the very failure to implement policy in the basin reflected a lack of AM. He then presented some threats to the success of IWRM and also opportunities for doing things differently in order to chart a way forward. The key message given was that projects such as NeWater should be grounded in reality, so that when the project withdraws, it leaves behind an altered way of doing things. His presentation was followed by a description of the Rivertwin project in Benin, presented by Prof. Karl Stahr.

The workshop then broke into four groups tasked with answering questions that had been posed by Zissimos Vergos. These questions were designed to probe the way that research, including that on IWRM, could more effectively make a difference in Africa. These working groups entered into vigorous discussion, culminating in a list of statements that summarized the outputs of the workshop. These were collated by Mr. Vergos for SIWI.

Overall the participation at this workshop and conference was a great success. Besides the above workshop, there were a number of other meetings that were attended at the World Water Week, most noteworthy a meeting between delegates of the African Ministers of Water and the EU Water Initiative. Together with other networking that took place, these were valuable opportunities to promote integrated water resources management and to profile NeWater in this.

CAIWA conference – Basel 2007

The Orange Basin team and stakeholders participated in full at the CAIWA conference, in three of the main workshops.

1. Roundtable Discussion – IWRM & EU International cooperation: the Orange example.

At this workshop two stakeholders from the Orange, Prof. Roland Schulze from the University of KwaZulu-Natal, and Mr. Roy Tomson from Rand Water, were invited to be participants and to present to the meeting. It was useful for stakeholders to participate in this high level interaction around the objectives of NeWater. This workshop stressed the need for AM in future approaches to water management, with the climate issues raised by Pro. Schulze key in presenting the changing future.

2. Bridging science, policy and the implementation of environmental flows.

A second workshop held at CAIWA addressed the issue of environmental flow methods in particular when these are “locked” and need the input of adaptive management to facilitate their implementation. The process was initiated by Chris Dickens from experience in the Orange basin and following a communication on the NeWater supported eFlows Network which generated great support from stakeholders. This workshop was a valuable opportunity to convey this proposal to the wider community.

3. Roundtable Discussion: Governance and Institutional Aspects of Adaptation of Water Management to Climate Change.

This workshop asked three questions:

- What are the major challenges for water resources governance of climate change adaptation? What are weaknesses of current governance?
- What new policy development is needed to guide adaptation in the water sector?

- What are research priorities for adaptive water governance that is responsive to climate change?

Chris Dickens was one of the panel members and helped to present the situation from the Orange basin perspective. The workshop generated useful discussion and the results were captured as part of the CAIWA outputs.

Wetlands Indaba – Kruger Park South Africa 2008

This conference was organised by the wetland fraternity in South Africa, and provided an ideal opportunity to profile the work that NeWater was doing on the evaluation of wetland goods and services in the upper Orange basin. Doug Macfarlane and Caroline Sullivan both presented the NeWater work from their different areas of specialisation. This led to a great deal of discussion. The NeWater presentation was bolstered by the distribution (for the first time) of the hard copies of the new NeWater publication “Keeping the Benefits Flowing and Growing: Valuation of the benefits of wetlands in the upper Orange-Senqu Basin” which was drafted by the Orange NeWater team. It is certain that this book is going to become a key milestone in wetland valuations in the Orange.

Wetland valuation workshop – Oxford 2008

Following the success of the Kruger Park conference, a joint Orange basin and EU workshop was held in Oxford, hosted by Caroline Sullivan with 40 participants. The project financed stakeholders to travel from the Orange to attend this workshop, including some key role players such as Dr. Guy Preston (initiator and director of the iconic Working for Water programme in South Africa); Dr. John Dini (director of the sister Working for Wetlands programme); David Lindley (WWF); Donovan Kotse (wetland specialist) and Matseliso Mphale (from the University of Lesotho) and Ms Monyake (representing the Government of Lesotho). These stakeholders were matched by a list of senior academics from mostly the UK, with Dr. Mike Acreman (CEH) possibly the most well known.

Environmental Water Allocations – Port Elizabeth 2009

This major international conference held in South Africa in February 2009 with 35 countries represented was an opportunity to disseminate the central product of NeWater which is to introduce adaptive management into what has become a major part of water management, the science of environmental flows. This follows on from what was initiated at the CAIWA conference. Chris Dickens presented a strong motivation to include adaptive management in flow assessment and implementation of environmental flows, rather disturbingly noting that the current science had gone beyond what was needed for the implementation of this management regime and that the overly complex models that are being developed are not appropriate. This presentation was echoed by some key speakers at the conference, essentially those from the USA and South Africa. Part of the proceedings was a pre-conference workshop on reallocation of water, that was hosted partially by Katharine Cross of the IUCN as part of the NeWater EFlows initiative.

Water management in the Orange River Basin – Bloemfontein 2008

This conference was organised within the Orange Basin by Free State University, in particular Prof. Maitland Seaman. The object of the conference was to review the state of the water resources and the research being done in the Orange basin. This was again an ideal opportunity to disseminate the products of NeWater to important stakeholders. Copies of the NeWater “Keeping the Benefits Flowing and Growing: valuation of the benefits of wetlands in the Orange-Senqu River Basin” booklet were also distributed at this conference and Chris Dickens presented an overview of what NeWater had achieved during its tenure. Again, the central theme of NeWater, i.e. the value of

adaptive management, was strongly stressed and generated much interest in particular in relation to environmental flows.

Participation of Stakeholders at NeWater General Assemblies

NeWater GA in Mallorca

Three stakeholders from the Orange River basin were invited to this GA. They were;

- Mr. L. Potloane, Chief Executive of the Lesotho Highlands Development Authority
- Mr. P. Pyke, DWAF and Chair of the Technical Task Team of the Orange/Senqu River Commission (ORASECOM).
- Mr. O. Katai, DWA in Botswana and a Commissioner on ORASECOM.

The latter two persons were nominated by ORASECOM, the basin commission, while the former was selected by the case study team as he was an important role player in one of the key countries in the basin i.e. Lesotho who otherwise would not have had the resources to attend.

These three stakeholders played an active role in the GA, assisting with the presentation of the Orange case study. Later in the proceedings Mr. Potloane presented the outcomes of one of the brainstorm sessions.

From discussions with these stakeholders there was a mixed reaction to their participation. Mr. Peter Pyke in particular was sceptical of the prospects for NeWater as he did not see anything at the GA, including the Market Place, that would be of benefit to the practitioners in the basin. His perspective was that adaptive management was “alive and well” in the South African Department of Water Affairs and Forestry and that there was nothing new to learn from NeWater. This view that he adopted was unfortunate for the case study as he persisted, as the project matured, being sceptical that NeWater would offer anything of value. This has negatively hampered progress with the case study despite the fact that relations between him and the case study team were excellent.

Mr. Potloane unfortunately left his position of employment immediately on his return, so this investment in him was wasted. He no longer works in the water industry.

NeWater GA in Hungary

Mr. David Lindley, who has been a most influential person in wetland management in the basin was invited to this GA. He works for the WWF and Mondi Wetlands Project in the capacity of a stimulator for the rehabilitation of wetlands.

While attending the General Assembly David Lindley had 3 objectives:

1. Attend the General Assembly in the capacity of a stakeholder representing the Orange River basin to present stakeholders conditions, aspirations and needs from the Orange River basin;
2. Collect ideas from on-going NeWater research and activities developed in other case study river basins;
3. Report to the General Assembly the impressions that a stakeholder of the Orange River basin gained from the discussions held during the 5 days of the General Assembly.

Progress made in achieving the above objectives

Presenting the conditions, aspirations, and needs of an Orange River stakeholder: A “market place” session, was held to discuss the NeWater research programme in the Orange River basin with researchers who were interested in collaborating with the Orange River team on a variety of adaptive water management research projects. David Lindley assisted Chris Dickens and Caroline Sullivan present the current research happening in the Orange River basin, as well as the needs for additional research that some stakeholders felt important to do. A number of potential partners visited the Orange River booth, and expressed an interest in future partnerships. Further discussions were then held over the remainder of the General Assembly to determine the feasibility of working together. By the end of the assembly it was felt that a few of the potential partnerships explored would result in additional research projects being started in the Orange River Basin, especially in the context of wetland management.

Ideas from on-going NeWater research and activities developed in other case study river basins: The 2 days spent visiting the many different stalls in the marketplace proved to be highly stimulating. It became quite apparent that the many issues facing the Orange River basin were quite similar to many of the other river basin case studies. For example, important lessons were learnt from the success of the public participation held in the Amudarya River basin, and the way this was done. The wetland rehabilitation work of the Rhine was also extremely relevant to the Orange River basin.

Impressions of a stakeholder of the Orange River basin: A plenary session of the General Assembly was held where a panel of stakeholders representing all the river basin case studies were provided with the opportunity to provide their impressions and to identify any gaps of the research being undertaken. The assembly where then provided with an opportunity to question these impressions. David Lindley’s impressions are listed below:

1. “One highlight that stood out was the number of scientists working together on water resource management in a multi-disciplinary and multi national way, producing an array of amazing research being undertaken. The combination of brainpower being harnessed is truly astonishing, and demonstrates the importance of multi disciplinary teams working together across international boundaries.
2. One gap that was identified was that of meaningful stakeholder engagement from the beginning of the research being undertaken. It became evident that in many instances this did not always occur, and many stakeholders were brought in after the research had begun. Experience has showed that in order to develop a partnership of trust with stakeholders, especially government departments who have the responsibility to manage water resources, such as the Department of Water Affairs, this is vital if the research being done is to be implemented. Stakeholders cannot be brought into the process half way through, or even worse when the research has been completed. Running short courses for stakeholders to implement the research which they have not been involved in developing, carries a high risk of failure.
3. It was not clear from attending the General Assembly how the capacity and competency of stakeholders was to be developed to implement the research. This needs to be given some careful thought. All too often the training that takes place is essentially a transfer of information from trainer to learner via short courses, which seldom results in the development of meaningful capacity and competence to implement what has been taught, especially in developing countries.” David Lindley drafted a document for NeWater together with Dr. Jim Taylor of WESSA, on the development of stakeholder capacity. This is not presented here. .

NeWater GA in Egypt and Seville

Unfortunately budget constraints prevented any further involvement of stakeholders in the GA as the cost to bring such people from the basin proved to be prohibitive.

Training workshop on Adaptive Management in IWRM held in the Orange River Basin

Held in Maseru from 10-12th March 2008

Considerable planning was done to set up a *Train the Trainers* program in the basin. The syllabus was designed by Carol Web and then Daniel Boyce from Cranfield University. The Case study Team identified the target trainers and invited them to the workshop. Before the workshop actually commenced, meetings were held by Chris Dickens with important IWRM role-players in the Orange to discuss the needs and the prospects for the training programme. This included meeting with Dr. Steve Mitchell and Ms. Eiman Karar from the WRC, Peter Pyke from DWAF and Dr. Mark Dent from University of KwaZulu-Natal. During this consultation it arose that many stakeholders felt that the needs of IWRM training were being satisfied by a recently rejuvenated programme called FETWater. This programme had already developed a syllabus and was being integrated into local universities. This unfortunately dampened any proposals that the NeWater team had to make. The key element lacking in the FETWater programme was actually adaptive management, but there was resistance from them to adding this into the syllabus.

The Train the Trainers programme was coordinated by Dr. Daniel Boyce of Cranfield University and presented by him as well as Baart Snellen from Alterra.

List of Attendees for NeWater Training in Adaptive Resource Management

Name	Institution
Victoria Qheku	LHDA
Keneiloe Molapo-Phomane	LHDA
Pule Mokebe	LHDA
Thato Molomo	LHDA
Moliehi Shale	NeWater Team
P.N. Nthathakane	Lesotho Water Partnership
Mrs M. Mashinini/Lefothane	Lesotho Water Partnership
Mr. Bokang Makututsa	Lesotho Water Partnership
Ms. M. Phoofolo	Lesotho Water Partnership
Lil Haigh	Rhodes University
Sukh-Mani Mantel	Rhodes University
Jan Roos	University of the Free State
Victor Wepener	University of Johannesburg
Nico Smit	University of Johannesburg
Jean-marie Kileshye Onema	University of the Witwatersrand
Chris Dickens	INR
Kate Pringle	INR
Daniel Boyce	Cranfield University
Baart Snellen	Alterra

Advertising brochure



Introducing Adaptability Into Water Resource Management
Orange River 'Train the Trainer' Workshop '08

NeWater
New Approaches to Adaptive Water Management under Uncertainty



10th to 12th of March – Maseru, Lesotho (address to be confirmed)

A 3 Day "Train the Trainer" (TTT) workshop introducing the fundamental principles, methods and tools of Adaptive Management is to be held in March 2008. This workshop is aimed at individuals and organisations involved with training for Integrated Water Resource Management in the Orange River Basin.

What is Adaptive Management (AM)?

Adaptive Management is about keeping change going. Adaptive Water Resources Management builds upon the resilience and effectiveness of Integrated Water Resource Management (IWRM) practices by allowing for complexity as well as uncertainty, allowing managers to learn as the work progresses and to ensure an optimal mix of benefits for all concerned.



AM builds upon IWRM further by including:

- The understanding and working with 'uncertainty'
- The complexity of human-technology-environment interactions
- New management approaches introducing adaptability

Two documents are provided for the course:

- *Keeping Change Going: A supplementary note on Adaptive Water Resource Management (AWRM)*
- *Managing Adaptive Flexible Implementation through the use of Agile Project Management*



What does the workshop offer?

- Start a progressive "life-long" learning exercise on the use of Adaptive Management
- Learn about Adaptive Water Resources Management and work with others to explore how it can benefit you and the stakeholders that you work with
- Explore the resources available for continued learning and the tools that have been designed to help make projects integrated and adaptable

For further information and registration : Chris Dickens DickensC@ukzn.ac.za

Report of the workshop

The report of this Train the Trainers workshop has been reported on by Cranfield University in a separate part of NeWater.

Student training in the Orange Basin

Darryn Knoesen (PhD student, University of KwaZulu-Natal, South Africa)

Mr. Knoesen was supported by NeWater to carry out a PhD thesis under the direction of Prof. Roland Schulze as well as Dr. Chris Dickens of the INR. The outputs of this thesis were designed to directly feed into the Theme 1 of the Orange Case Study in that they would provide data on which a scenario of the flows in the Orange river could be speculated. A summary of his thesis is as follows:

Title: Near Real-Time to Decadal Hydrological Risk Management in the Orange River Catchment within a Context of Adaptive Water Resources Management

The Orange River Catchment's 481 quaternary catchments have been disaggregated further and configured into 1443 hydrologically interlinked sub-quaternary catchments, known as quinary catchments. Each quinary catchment has been populated with land cover information, soils and catchment characteristics, as well as 50 years of daily climate data for use with a daily time-step, physical-conceptual hydrological model. The historical, or baseline, scenarios using this information are complete.

The climate change simulations using regionally downscaled rainfall and temperature information from one General Circulation Model (GCM), namely ECHAM5, as input into the hydrological model have been completed. The GCM data, and hence the hydrological simulations, represent three periods:

- Present climate (1971 – 1990);
- Intermediate future climate (2046 – 2060); and
- Distant future climate (2081 – 2100).

The hydrological and hazard-related analyses that have been completed for the abovementioned climate scenarios include projected changes in, *inter alia*:

- mean annual rainfall and temperature;
- inter-annual variability of rainfall and temperature;
- design rainfall and design floods;
- number of days per annum exceeding predetermined rainfall and streamflow thresholds; and
- timing of the rainfall season.

There are a great number of outputs of this work, but brief predictions of interest include: It is projected that parts of the Orange River Catchment will see a 43% decrease and parts a 46% increase in the 20 year, 1-day design rainfall, with 90% of the area experiencing a change of less than 10% of the present.

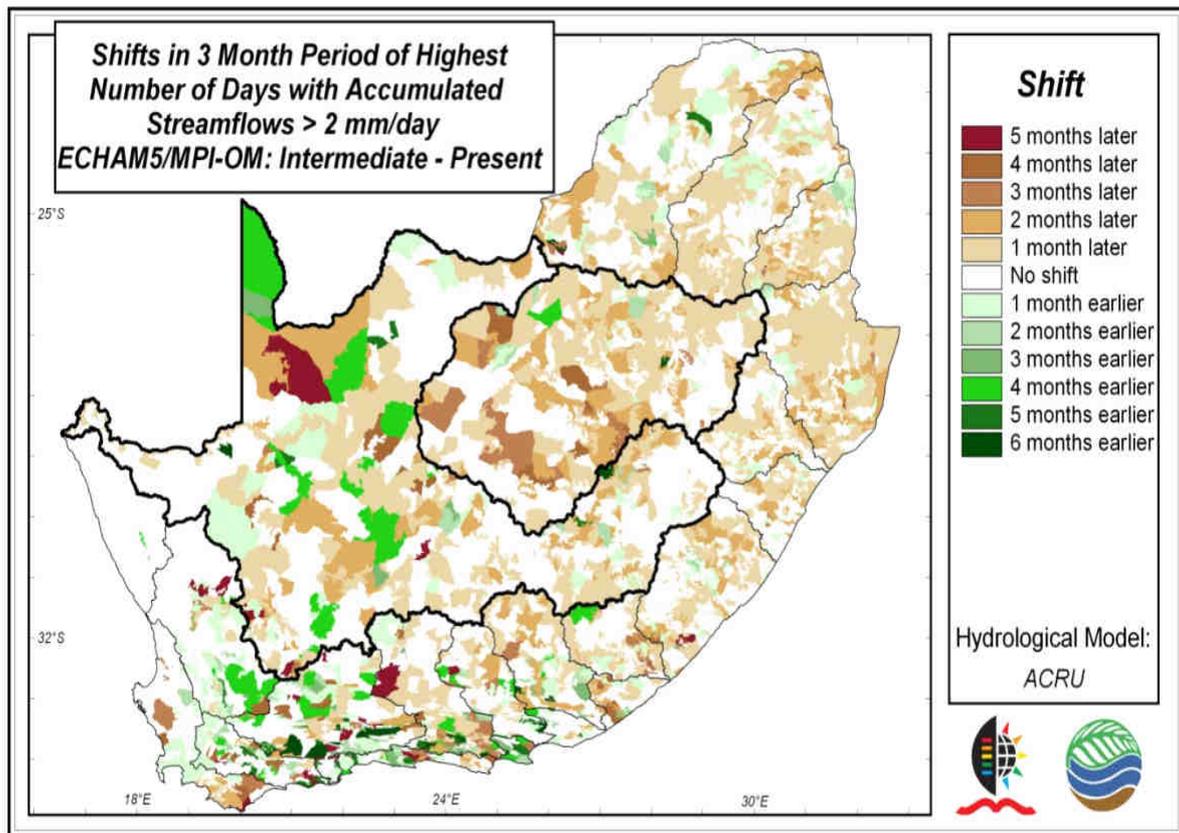


Figure showing changes to rainfall in the Orange Basin (and surrounds)

Clear spatial trends indicating that the 3 month period with the highest number of days of high streamflows is projected to shift 1 month later. This is particularly evident in the eastern regions of the Orange River Catchment and Vaal Catchment, and also reflected in the lower reaches of the Orange River itself. Since the shifts in runoff producing rainfall are insignificant, the shifts in streamflow may be owing to increases in evaporative demand.

Studies at the University of Oxford

Below are summarised two post-graduate projects that were carried out with little support from NeWater but whose contributions were useful to the overall project.

- a. An evaluation of the impact of employment by the South African “Working for Wetlands” project on people living in the area near the Seekoeivlei. A questionnaire on socioeconomic characteristics, behaviour, attitudes and beliefs was designed, containing a total of 21 direct questions with a further section of 15 open ended questions. This was administered to 64 respondents in total. This work is ongoing..
- b. An assessment of erosion in dongas in areas upstream of the Seekoeivlei wetland. Preliminary results from a survey of 12 farms covering 24,538 hectares indicate a range of erosion. The actual area covered by these donga measurements totaled 8,342 hectares. The preliminary findings indicate that the erosion ranges from 8,000 cubic meter erosion

volume and 0.3 hectares of surface up to 193,000 m³ erosion volume, and 5.1 hectares of surface loss. On the basis of this land loss, it was possible to assess the loss of value to the farmers in terms of lost income from grazing, based on the long term grazing potential for the area, and current price of livestock in the local market.

Publications of NeWater in the Orange Basin

A number of publications have been produced by NeWater that are relevant to the dissemination of NeWater products in the Orange River Basin. *Note that this excludes NeWater progress reports.* Included are:

1. Bonjean, M and C. Sullivan (2008) Economic valuation of the water quality purification function of the Klip River wetland (Gauteng, South Africa). In Sullivan and Dickens (2009)
2. Dickens, CWS (2009) Obstacles to the implementation of environmental flows. (in press).
3. Diederichs, N., O'Regan, D. Sullivan, C.A. Fry, M., Mander, M., Haines, C.J., and M. McKenzie (2005). *Key Issues and Trends in the Orange River Basin: NeWater Baseline Assessment Report* NeWater Project Report, CEH Wallingford.
4. Haase, D., Huntjens, P. Schlueter, M., Hirsch, D., Kranz, N. (2008) Enhancing stakeholder participation in river basin management using mental mapping and causality models in the Tisza, Orange and AmuDarya Basins. *Ecology and Society* (in review).
5. Huntjens, P., Pahl-Wostl, C., Rihoux, B., Schlueter, M., Flachner, Z., Neto, S., Koskova, R., Dickens, C., Nabide Kiti, I. (in press) Adaptive Water Management in a Changing Climate A formal comparative analysis of eight water management regimes in Europe, Africa, and Asia.
6. Knoesen, D., R. Schulze, M. Summerton, C. Pringle, C. Dickens, C. Sullivan & R. Kunz (2009) Water for the future: The impacts of climate change on water resources in the Orange-Senqu River Basin. D.3.8.7. Report to NeWater, a project funded under the Sixth Research Framework of the European Union. Institute of Natural Resources, Pietermaritzburg
7. King-Okumu, C and Okumu, W. (2008) *The Contribution of a Wetland Nature Reserve to Socio-economic Development in Two Small Towns: Memel and Zamani, Orange River Basin, Free State, South Africa.* A Report Prepared for the NeWater Project, Oxford, UK
8. Valentina Krysanova, Jos Timmerman, Chris Dickens, Consuelo Varela-Ortega, Maja Schlüter, Koen Roest, Patrick Huntjens, Fons Jaspers, Edinson Moreno, Hendrik Buiteveld, Romana Koskova, Marta Martinkova, Irene Blanco, Paloma Esteve, Kate Pringle, Caroline Sullivan, Claudia Pahl-Wostl and Pavel Kabat Cross-comparision of Climate Change Adaption Strategies Across Regions. Synthesis Product No. 6 of the NeWater project and also *in press*.
9. Macfarlane, D and A Teixeira-Leite (2009) Qualitative assessment of the wetland functions and benefits in the Orange/Senqu basin, In C. Sullivan and C. Dickens, Eds, Final Report of the NeWater Orange River Basin Case Study, Oxford and Pietermaritzburg, South Africa.
10. Romero, A. (2007) *Perceptions of Vulnerability of Water Supplies and Water Users in the Upper Orange Basin, South Africa.* MSc Dissertation, Oxford University Centre for the Environment. Oxford, UK

11. Sullivan, CA, Macfarlane, D, Dickens, C, Mander, M, Bonjean, M, Teixeira-Leite, A and C. Pringle (2008) Keeping the benefits flowing and growing: quantifying the benefits of wetlands in the upper Orange-Senqu basin. D.3.8.6. Report to NeWater, a project funded under the Sixth Research Framework of the European Union. Institute of Natural Resources, Pietermaritzburg, 66pp.
12. Sullivan, CA and CWS Dickens (2009) Final report of the NeWater Orange River Basin Case Study (Eds). Oxford University and Institute of Natural Resources, Oxford and Pietermaritzburg, South Africa. To be found on www.inr.org.za, <http://ocwr.ouce.ox.ac.uk/research/wmpg/> and www.newater.info
13. Sullivan, C and D. Macfarlane (2008) Subsistence values of wetland benefits in Lesotho. In Sullivan and Dickens (2009)
14. Sullivan, C and M. Mander (2009) Economic valuation of the wetlands in the upper Orange/Senqu basin. In Sullivan and Dickens (2009)
15. Caroline A Sullivan, Chris Dickens, Myles Mander, Muriel Bonjean, Doug Macfarlane, Sukaina Bharwani, Neela Matin, Kate van Nieuwerk, Nicci Diederichs, Anna Taylor, Mohali Shale Caroline King-Okumu, Nicole Kranz, Sandy Bisaro, Aiora Zabala, Adam Romero, Patrick Huntjens, and Darryn Knoesen (2008) Promoting Adaptive Water Management in The Orange Senqu River Basin: A NeWater case study. NeWater Guidebook.
16. Sullivan, C. A. Zabala, A. and King-Okumu, C.(2008) *Valuation of Wetland Benefits for Tourism and Economic Development* NeWater Technical Report, Oxford University, UK.
17. Sullivan, C.A, Deiderichs N. and Mander, M. *Assessing Water Vulnerability in the Orange River Basin in South Africa* Newater Technical Report, Oxford University UK
18. Zabala, A. (2007) *From Macro to Micro: Environmental Policy and the 'Poorest of the Poor' in Seekoeivlei*. MSc Dissertation, Oxford University Centre for the Environment. Oxford, UK
19. Sullivan, C and M. Mander (2009) Economic valuation fo the wetlands in the upper Orange/Senqu basin. In C. Sullivan and C. Dickens, Eds, Final Report of the NeWater Orange River Basin Case Study, Oxford and Pietermaritzburg, South Africa