

Environmental Flows in Ephemeral Rivers

Initiation of program for Namibia

Institute of Management Learning and Training (IMLT)

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Introduction

The workshop had two main objectives as indicated below:

- 1) Share information and enhance research cooperation
- 2) Develop a programme for Environmental Flow Requirements

The workshop was divided into two sessions; the first session was for information sharing on various projects in ephemeral rivers. This also included presentations on South Africa's experiences and processes in determining environmental flows for perennial and ephemeral systems.

The second session was set aside for brainstorming on a programme for determining Environmental Flows in Namibia, designing the programme goal, purpose and outputs.

All presentations and planning results are attached to the proceedings.

Welcoming and opening remarks

Dr. Mary Seely welcomed everybody present, particularly Mr. Abraham Nehemia, acting Under-Secretary for Department of Water Affairs, Ministry of Agriculture, Water and Rural Development and Dr. Cate Brown from Southern Waters Ecological Research and Consulting in Cape Town. She gave Dr. Steve Mitchell's apology for not making it to the workshop.

Mr Abraham Nehemia then made the official welcoming and opening remarks. He highlighted the need for determination of Environmental Flow Requirements, especially now that the environment is viewed as a water "user". He emphasized the need for sustainable utilization of river systems. He made reference to the constitution and other water and environmental legislation in the country that highlights sustainable use of natural environment coupling this with economic growth.

Scientists should take the double challenge of getting the environmental demands incorporated in water project feasibility studies and of finding adequate ways of determining these. Perceived absence of scientific tools in this assessment still results in misunderstanding and distrust.

Information sharing session

Government's perspective

In his presentation on government perspective on Environmental Flows Requirements, Mr. Nehemia acknowledged Namibia's climate and limited seasonal rains as limiting factors. He further stressed the dependency of Namibia on its ephemeral river systems and the need for dams to bridge the dry seasons. He said natural resources in river systems are not functioning in isolation but are coupled with:

- water quality
- geomorphology - channel changes
- aquifer recharge - availability of water
- in-stream/riparian vegetation - other life
- fish and other populations
- wetlands - support many activities [tourism]

He said in the past, the importance of natural environment as a water user, habitat and provider of processes and services was not recognised, focus was only on water supply for people, livestock, industry and irrigation.

Initiatives for holistic view started in 1992 with Namibia's Green Plan. In Namibia's Green Plan, ecosystems are viewed as basis for sustainable water management. This notion is supported in the country's constitution and the following policies and legislation:

- New Policies and Legislation
- WASP
- Namibia Water Corporation Act
- Environmental Management Act
- Namibia National Water Policy
- Draft Water Bill
- NDP 2

To emphasize the need of determination of Environmental Flows Requirements, Mr. Nehemia quoted relevant sections from all the above legislation. He made reference to the establishment of Basin Management Committees and Water Resource Agency and the role such institutions could play in this regard.

In conclusion, he articulated the need to harmonize human and environmental water requirements to support each other for long-term sustainable development. He said, methodologies to assess Environmental Flows Requirements are not developed and trusted that this workshop will discuss and better define many of the concepts related to environmental flows.

Experiences from South Africa

Environmental Water Requirements in non perennial systems

In the absence of Steve Mitchell from the Water Research Commission, South Africa, Klaudia Schachtschneider gave a brief overview of the process South Africa is undertaking towards determining environmental needs for ephemeral rivers.

Since the early 1980's South Africa focused on perennial systems and only initiated the process of looking at ephemeral rivers recently. The first workshop to look at non perennial systems took place in March 2003. This is followed largely by desktop studies, literature review and rapid assessments on selected systems. Communication with partners within South Africa and with neighbouring countries is identified as a necessary part of the programme.

Overview of South African Approach on Perennial Systems

Dr. Cate Brown focused on the history and methods used in determining Environmental Flows for South Africa's perennial systems. Communication amongst managers, engineers, scientists and others in water and environment sectors started in the early 1980's. This received further support from the New Water Act of 1998. Currently they are implementing environmental flows assessments in various stressed river systems.

In South Africa they use the building block methodology, which is developed through application and not research. She said it is not possible to come up with a perfect method and the only way is to use a matrix with scenarios and monitor the results and consequences as necessary. Research is however there to back up the system.

They are using the Resource Directed Measures (RDM) to balance use and protection of the river systems. The steps taken in RDM are:

- establishment of environmental flows;
- classification of the water resources;
- setting of the Resource Quality Objectives (RQOs).

They use the environmental reserve concept for assessment of the systems. There are different reserves for different catchments and ecosystems. Three methods are used to determine the reserve; these are rapid, intermediate and comprehensive, all with different levels of confidence.

Generally, she stressed the benefit of Environmental Flows Assessment in decision-making, that they lead to informed decisions. She also informed the participants that the process was not started for ecological reasons by ecologists but by water managers.

Information on current activities in Namibia

Subsurface water and riparian tree interactions in an ephemeral river

Klaudia Schachtschneider has submitted a PhD proposal looking at “Subsurface water and riparian tree interactions in an ephemeral river. Her study area is the Kuiseb River Basin and her studies will be linked the WADE project.

In her presentation she said, interaction between flood events, groundwater and woody riparian vegetation requires more research. The aim of her study is to gain understanding of these relationships. She will specifically focus on the objectives below:

- Monitor dynamics between groundwater and vadose zone in one vegetated and one unvegetated area
- Evaluate quantitatively the relation between flood events & groundwater recharge (WADE)
- Compare evapotranspiration rates & water abstraction zones of three tree species over time

Compare access to water between juvenile & mature trees of three species over time

*Regeneration process of *Faidherbia albida* and *Acacia erioloba* in western ephemeral rivers of Namibia*

Petra Moser, a PhD student at the University of Bonn, is doing her research in the Kuiseb River, looking at the regeneration processes of *Faidherbia albida* and *Acacia erioloba*. She chose the two species because they are key resources for indigenous farmers, livestock and wildlife. Both species are experiencing increasing pressure through water extraction, human use and livestock grazing. She said little recruitment is noticeable currently in the heavily used areas. Her study focuses on the following:

- Spatial and temporal distribution of regeneration events of the two species
- Role of flood-influenced landforms on the distribution of regeneration events
- Description of major processes related to seed availability for regeneration
- Influence of herbivores on regeneration process
- Socio-economic situation along the river in relation to *F. albida* and *A. erioloba*

Pod and seed production

Olavi Makuti, a B.Tech. student from the Polytechnic of Namibia, is looking at the productivity of *F. albida* and *A. erioloba* with respect to pod production and flowering. He is studying the intensity of productivity at three sites, Sarib (upstream, high groundwater level), Gobabeb and Swartbank (downstream of Gobabeb where abstraction is taking place). At each site he is

- determining the variability/pattern of seed and flower production over time,
- study seed qualities and compare that at the three sites
- establish the influence of the ground water table on the pod and flower production
- determine the relationship between tree size and productivity

Although he is doing the study for his Btech degree with Polytechnic of Namibia, he is also developing workable methods and sites for long-term monitoring of various phenological aspects. He relates his studies with socio-economic surveys along the Kuiseb River.

Floodwater Recharge of Alluvial Aquifers in Dryland Environments (WADE)

The WADE project aims to assess long-term (decades to centuries) water resources in selected semiarid to hyperarid ephemeral river basins by determining long-term transmission losses from floods and quantifying floodwater recharge into alluvial aquifers. An innovative approach will be applied based on three principal research themes. 1) Palaeoflood hydrology will be used to determine long-term flood magnitude and frequency in order to quantify the frequency of recharging flood events. 2) Surface and sub-surface hydrology will be monitored in order to quantify transmission losses through the river bed into the alluvial aquifers. The combination of these two methodologies will be able to quantify long-term aquifer recharge through flooding. 3) The final research theme focuses on the socio-economic issues related to the use of alluvial aquifer groundwater within the study catchments. The research will be undertaken in 4 research basins, twinning catchments in Spain and Israel with study catchments in Namibia (Kuiseb catchment) and South Africa. The Namibian partners are Desert Research Foundation of Namibia and Department of Water Affairs (DWA).

Water Balance for the Omaruru River Basin

The 12th Summer Desertification Programme (SDP) will focus on determining a water balance model for the Omaruru River Basin through identifying the water requirements and water use in the Basin. They will determine the water and land use by using vegetation and soil techniques (bio physical survey); socio-economic surveys; Geographical Information Systems; Remote Sensing and Modelling. The stakeholders involved are the water and land users in the Basin such as the Omaruru town, irrigation-, cattle- and communal farmers. The expected results from this study would be:

- Inventory of the dams in the Basin
- Water balance model of the Omaruru River Basin
- Training of students

SDP is coordinated by DRFN in collaboration with other partners, particularly DWA.

Monitoring and Gobabeb training and research centre

Dr Joh Henschel gave a presentation on flood and vegetation monitoring from Gobabeb. He informed those at the meeting that Gobabeb has major flood records dating from 1960's. He also highlighted the long term studies and monitoring taking place from the Gobabeb centre such as Inara distributions, studies on Welwitschia, population dynamics of riparian trees, groundwater levels (boreholes levels), groundwater recharge by floods as some of the examples.

Environmental Learning and Action in the Kuiseb River Basin

Andre Botes talked about the Interactive Learning and Action in the Kuiseb program, highlighting activities that has taken place since the inception of project 18 months ago. The process received "blessings" and acknowledgement from the Minister of Agriculture, Water and Rural Development. A Basin Management Committee has been established and the first meeting for the committee was scheduled for the 29 October 2003 in Walvis Bay. Overall, he said interest from stakeholders in the program is increasing rapidly and the project has solved a number of misconceptions in the Basin.

Water Desk at DRFN

Viviane Hoveka informed the workshop participants of the "new structuring" that took place at DRFN. DRFN projects/activities are now divided into three themes; water, energy and land. They still maintain interaction amongst the three themes. The aim of establishing the theme desks is to ensure better coordination within and outside DRFN. Viviane is heading the newly established Water Desk.

Assessment onto determination of environmental flow requirements

Maria Amakali (Chief Hydrologist, Department of Water Affairs) drafted a proposal on "Assessment into determination of environmental flow requirements for ephemeral rivers in Namibia". The aim is to quantify environmental flow requirements for ephemeral rivers with respect to the response of their ecological regimes. Such a program would:

- Use hydrological data at selected ephemeral rivers in Namibia to determine the amount of water required to maintain the river's ecosystem.
- Assess the influence of altered hydrological regime on the river's ecological regimes.
- Develop baseline information for use with other studies - methodologies.
- Recommend release strategies where applicable.

The program will specifically focus on assessment of river basin characteristics, needs identification or reasons for environmental flow requirements and concentrate at sites or basins where natural flow regimes have been altered. In the proposal she suggested initial work to start at large impoundments such as the Oanob.

Some of the methods she identified in the proposal are:

- Use existing methodologies
- Hydrology – Flow and quantity of flow-run models
- Desktop method
- Integration with other studies happening

In her presentation she stressed the need for integration of disciplines and joining efforts in determining Environmental Flow Requirements.

Development of a programme for EFR

Expectations of workshop

Mary Seely introduced the objectives of this session and possible workshop results.

Objectives

- Develop some level of joint programme to contribute to decision making and enhance research cooperation
- Formulate project/programme goal
- Formulate project/programme purpose
- Formulate possible project/programme outputs

Possible workshop results

- Plan for Decision Maker communications (presumably via DWA)
- Plan for research cooperation (particularly on the Kuiseb)
- Plan for data sharing & publication
- Plan for an Environmental Flows in Ephemeral Rivers (EFER) synthesis/ overview paper, to be reworked as information grows
- plan for development of methodology for EFER, for Namibia particularly (as SA rivers flow intermittently and are not pulsed rivers as in Namibia)
- Plan for a programme on EFR, to be lodged within the DWA, to help take all these forward

Plenary to establish a programme for Environmental Flow Requirements for Namibia.

Each participant received three cards on which he/she had to write what needs to be done to establish a programme on Environmental flow requirements for Namibia. The outcomes were put into clusters, each cluster was then given a title. The titles were seen as outputs for the program and will be reviewed by the Working Group.

The ten outputs identified are presented below in no specific order

1. Methodologies identified and tested
2. Environmental Flow Requirements established

3. Scoping study undertaken
4. Legislative support for Environmental Flows established
5. Research Network in place
6. Monitoring system in place
7. Funding secured
8. Stakeholders identified and involved
9. Information management system in place
10. Training program in place

The way forward

1. Viviane Hoveka to prepare and disseminate workshop proceedings
2. Andre Botes to disseminate general information about workshop to Kuiseb Basin Management Committee (29-31 November in Walvis Bay)
3. Interim Group formed to take process forward
Members of Interim Group: Maria Amakali, DWA; Kevin Roberts, DWA; Anna Matros, DRFN; Viviane Hoveka, DRFN and Pauline Lindeque, MET - to be approached
Review team: Dr Mary Seely and Dr Joh Henschel - DRFN; Dr Eric Tordiffe and Guido Van Langenhove- DWA
4. Interim Group writes program proposal (finalised by 17 November, including review)
 - Based on ZOPP results
 - Describe existing projects
 - Identify new projects necessary for program
 - Provide options on coordination arrangements
 - Identify process to enhance stakeholder involvement
 - Develop publicity program
5. Guido van Langenhove to take program proposal and proceedings from workshop to Mr Nehemia and Mr Heyns
6. Mr Heyns, Mr Nehemiah and Dr Seely to discuss and appoint coordinator