

Review of Namibian legislation and policies pertinent to environmental flows

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Abstract

The rationale for evaluating Namibian environmental flows is essentially that of ensuring ‘the maintenance of ecosystems, essential ecological processes and biological diversity’ and the sustainable utilisation of natural resources as promoted in clause 95 of the Namibian Constitution. Recent policy and legislative reforms have created a unique opportunity for Namibia to incorporate environmental sensitivity clauses such as those to ensure adequate environmental flows for river systems. The Second National Development Plan and the National Water Policy White Paper form the basis for the new Water Resources Management Act, promulgated in December 2004. The National Water Policy includes a basic principle headed “Ecosystem values and sustainability” that stresses that the management of water resources needs to harmonise human and environmental requirements, recognising the role of water in supporting the ecosystem. One of the strategies given to ensure environmental and economic sustainability reads: “Ensure that in-stream flows are adequate both in terms of quality and quantity to sustain the ecosystem”. Although the water policy clearly states that: “The legislation will provide for determining an environmental water reserve for freshwater sources before they can be used to supply other demands than domestic and subsistence livestock watering”, there is now no direct mention of environmental flows in the new Water Act.

This paper explores to what extent the need for the determination of environmental water needs has been incorporated into Namibian policies, legislation and development plans. It makes recommendations, pertinent to the Namibian situation, of what needs to be done to ensure that environmental water requirements are taken into account in future planning, operation and management of Namibia’s precious water resources.

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1. Introduction

Rainfall in Namibia is low and variable (Fig. 1) and can occur at any time from October to May. Namibia is the driest country in sub-Saharan Africa. The country’s mean annual rainfall varies from <50 mm at the coast to over 600 mm in the Northeast and is variable in both time and space. This inherent variability in precipitation has direct

impacts on vegetation growth, the duration and frequency of river flows and the amount of groundwater recharge. Runoff into the ephemeral rivers of the interior occurs as a direct response to heavy rainfall events and these determine the duration, volume and timing of river flow. All rivers in the interior of Namibia are ephemeral in nature. There is little or no delayed surface or subsurface runoff and definitely no surface base-flow. The main reasons for this, other than the erratic rainfall, are high riverbed losses, impermeable surfaces with little or no topsoil, scarce vegetation and hilly or mountainous terrain (Van Langehove et al., 1998). Any flow in these rivers is referred to as a ‘flood’.

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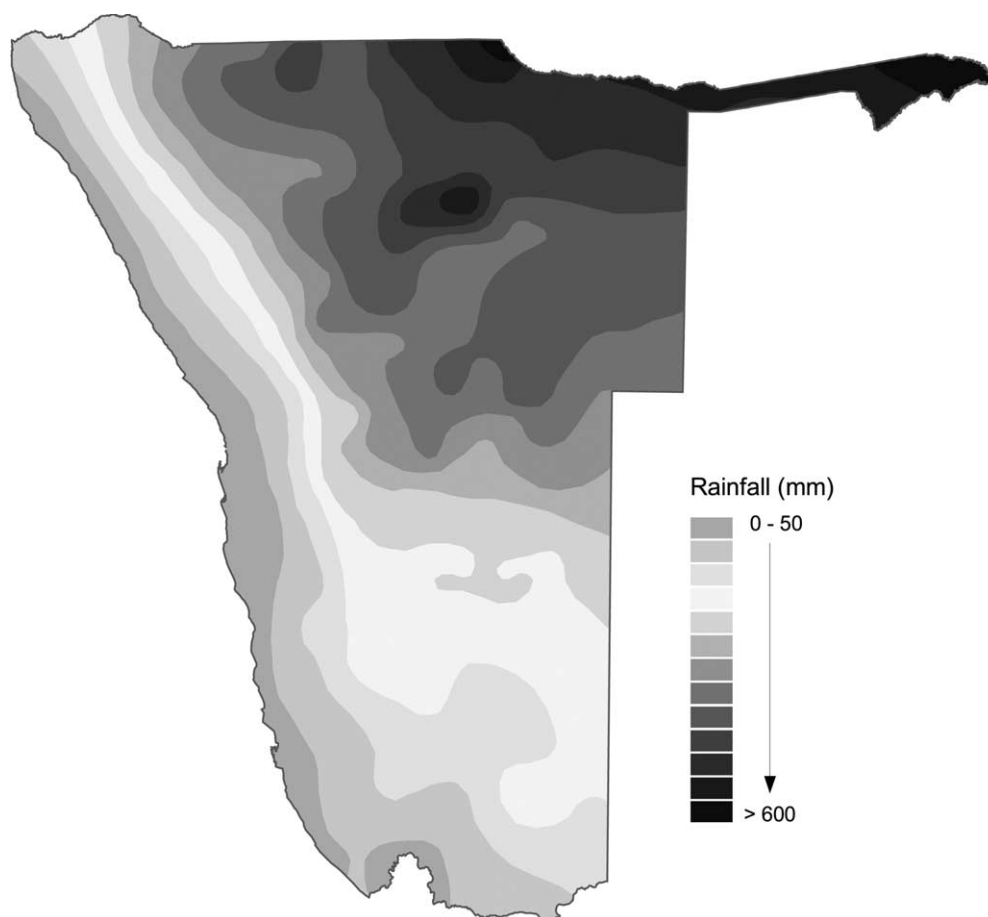


Fig. 1. Map of Namibia showing mean annual rainfall isohyets (Adapted from Atlas of Namibia 2002 by Tony Robertson).

Twelve large state dams and numerous farm dams have been built on ephemeral rivers in Namibia. These impoundments are the traditional way of storing the limited surface water flow for later use, although evaporation rates are very high. The only impoundment fed by a perennial river is Olushandja Dam, a stabilising dam near the town Ruacana. The dam receives pumped water from Calueque Dam on the Kunene River in Angola. This water is supplied to cities and towns in the North-central regions of Namibia, particularly the rapidly expanding complex of Oshikati and Ondangwa.

Evaporation far exceeds precipitation throughout Namibia and although evaporation rates vary considerably with season and in different parts of the country, the mean annual potential evaporation ranges between 2500 mm and 3800 mm which is many times the annual rainfall. Due to high temperatures and clear skies, it is estimated that 83% of the total rainfall evaporates, 14% is used by vegetation and transpired, 2% contributes to runoff and only 1% to groundwater recharge (Crerar and Bethune, 1992).

On its northern and southern borders, Namibia has access to perennial rivers that are dependent on the rainfall in neighbouring countries. These rivers show a typical pattern of one or two seasonal flood peaks and fairly steady flows

the rest of the year. The Kunene, Okavango, Zambezi and Orange rivers have river flow that is not only dependent on direct surface runoff, but also on an important delayed flow component. This is due to major water storage in bogs, swamps and floodplains in the upper parts of their catchments. Such an effect is particularly true of the Cuito River, one of the main tributaries of the Okavango River.

All Namibia's rivers and associated wetlands, both perennial and ephemeral (Fig. 2), represent vital lifelines of resources for people throughout the country. They supply water, either as surface water or indirectly from groundwater sources, which they recharge, as well as important wetland and riparian plant and animal resources and many less tangible, essential ecological services such as nutrient transfers, water purification and flood attenuation (Shaw et al., 2004). Yet in a country where drought is common and where, even in good years, water availability is limited, a responsible balance must be sought between meeting the water needs for the country's present and future development and the basic long-term water needs of the environment.

In Namibia, the broad definition of wetlands as used by the UN Convention on Wetlands of International Importance or Ramsar Convention, is used. It defines wetlands

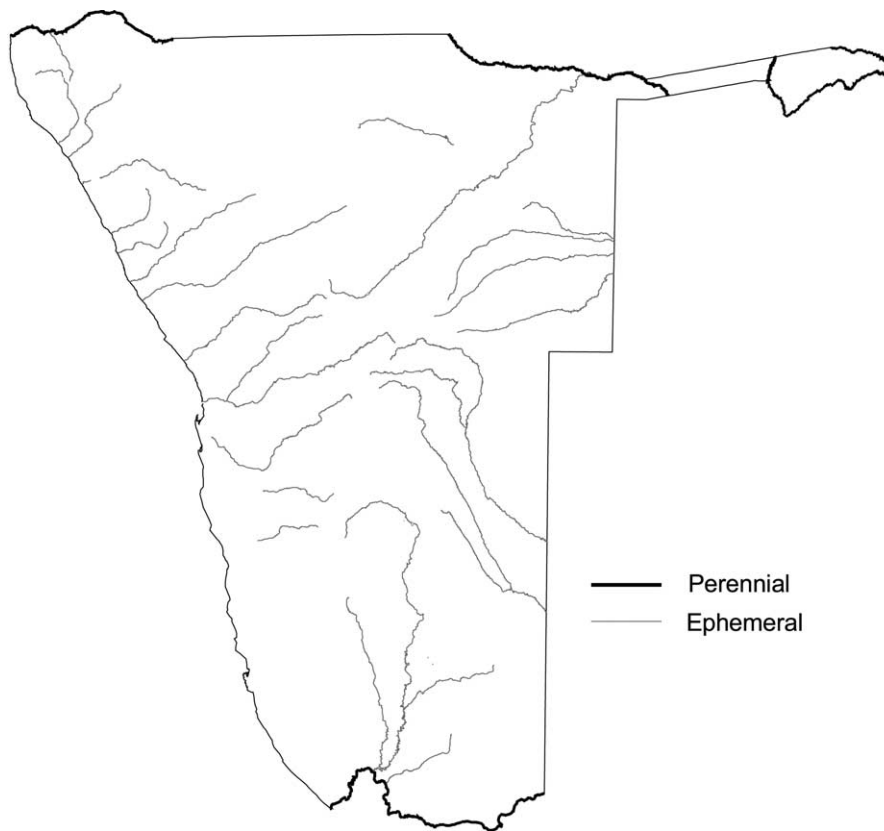


Fig. 2. Map of Namibia showing the perennial rivers on the borders of the country in bold and the main ephemeral rivers in the interior of the country in grey (Adapted from Atlas of Namibia 2002 by Tony Robertson).

as: ‘areas of marsh . . . or water, whether natural or artificial, permanent or temporary (ephemeral), with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres’ (Bethune et al., 1998; Barnard et al., 1998; Shaw et al., 2004). In an assessment of sustainable water use and good wetland conservation, Bethune (1996) points out that what is needed is a whole catchment approach, sound environmental assessments, and recognition that water is required to maintain ecosystems and their related ecological processes.

Currently, there is only basic monitoring of wetland resources. Most monitoring is concerned with only one resource—water—and then mainly in terms of quantity and quality. Other than some studies by fisheries researchers, little research has been done on wetland productivity and functioning despite the fact that their resources support many thousands of people. With Namibia’s ever-increasing water demands, such information will be needed for successful management of the country’s water and wetland resources to ensure their sustainable use.

2. Gradual recognition of environmental water needs—from Rio to the National Water Resources Management Review

The low rainfall and high evaporation typical of most of Namibia means that surface water supplies are irregular

and unreliable, as is groundwater recharge. As a result, water is often inadequately distributed. Historically, water supply priority was given to the water needs of people, livestock, industry and agriculture. Environmental water requirements were not acknowledged. Previous legislation did not recognise the natural environment either as a user of water, a habitat for aquatic plants and animals, or as a provider of essential processes and services. Nor did it stipulate the sustainable use of water resources in socio-economic and environmental terms.

The growing realisation that healthy water resources are linked to well-functioning aquatic and wetland ecosystems can be traced back to the early 1990s, particularly to the ‘environmental clause’ in the Namibian Constitution and Namibia’s presentation at the Rio summit. Maintaining the dynamics essential for ecosystem functioning and biodiversity (Brown et al., 2002) is specified in the ‘environmental clause’ or Article 95 (1) of Namibia’s Constitution. This provides for the sustainable use of all natural resources stating that: ‘the state shall actively promote and maintain the welfare of people by adopting policies aimed at . . . maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilisation of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future’.

The first mention of environmental water requirements is in Namibia’s Green Plan presented to the Rio World Summit on the Environment in 1992. The chapter dealing

with water conservation calls for the possibility and need for including compensation releases in the environmental assessment of any new project (Brown, 1992; Crerar and Bethune, 1992). The revised version of the Green Plan takes this a step further, requiring research that takes the entire river downstream of any scheme into account, not just the part immediately below the scheme. It further requires that consideration be given to controlled releases in all water and hydro-electric schemes on perennial rivers, and to the seasonal flow requirements of these rivers. An attempt to determine and supply adequate environmental water releases from Oanob Dam, in central Namibia near Rehoboth, to maintain the camelthorn, *Acacia erioloba*, woodland in the floodplain immediately below this dam (Du Plessis, 1994) was one of the first government initiatives to assess environmental water needs. Since Rio, there has been a slowly increasing recognition that the environment is a legitimate water user and that aquatic ecosystems are the basis of a healthy, sustainable water supply.

Namibian Independence created the opportunity to revise a wide range of national policies and laws (Bethune, 2003). This, together with the emphasis placed on environmental concerns at the Rio Summit in 1992, triggered widespread legislative reform particularly in terms of natural resource management. The Water Act 54 of 1956 and much of the environmental legislation were outdated and in serious need of revision. These laws needed to be brought in line with the new constitution, the ideals of community-based natural resource management, sustainable natural resource use and the development priorities and realities of post-independence Namibia.

As a first step in this process, the Water Supply and Sanitation Policy (MAWRD, 1993) stressed that communities should have the right, with due regard for the environmental needs and resources available, to determine which solutions and service levels are acceptable to them. Environmentally sustainable development of water resources and environmentally sound use of national water resources were advocated. Although this policy laid the foundations for the current community-based management of rural water supplies and for the establishment of over 200 water point committees countrywide, it did not refer directly to the need to determine and allocate environmental flows. Instead, it may be assumed that as members of their respective basin management organisations, water point committees will have a role in the future development and implementation of basin specific environmental water reserves.

The Namibia Water Corporation Act No. 12 (1997), requires NamWater, Namibia's commercially operated bulk-water supplier, to carry out its functions in an environmentally sound and sustainable way, with proper regard to the conservation and protection of water resources. There is however no specific mention of environmental water requirements. Although the studies on and monitoring of water releases for ecological purposes from the Oanob Dam became functions of NamWater when the parastatal was formed, there have not been any

substantial releases since NamWater took over this task. Another sensitive issue relevant to bulk water supply and environmental water requirements is the present unsustainable use of the Kuiseb and Koichab river aquifers that supply water to the Municipalities of Walvis Bay and Luderitz respectively.

One of the principles on which the draft Environmental Management Bill, gradually being developed by the Ministry of Environment and Tourism, is based, requires that: 'equitable access to sufficient water of ecological systems shall be fulfilled to insure the sustainability of such systems' (MET, 1998). This essentially requires that all ecosystems be provided with sufficient water to meet their ecological water requirements or that adequate environmental flows are available to sustain water dependent ecosystems. To cater for this principle, several activities that would have an impact on natural water resources and the goods and services provided by wetlands are included in the list that would by law require detailed Environmental Impact Assessments. These include:

- The abstraction of ground or surface water.
- Alteration of natural wetland systems.
- The drilling of boreholes, the construction of dams, reservoirs, levees and weirs.
- The construction of canals and channels, including the diversion of normal flow of water in a riverbed and water transfer schemes between water catchments and impoundments.

3. The National Water Resources Management Review

Recognising that national water resources should be managed sustainably, the Government of Namibia initiated the Namibia Water Resources Management Review (NWRMR) in 1998. The task of the review team was to review water resource management, develop a water policy, revise the outdated water legislation and make policy recommendations. Their aim was to enable Namibia 'to achieve equitable access to, and the sustainable development of, freshwater resources by all sections of the population especially the rural and urban poor, in order to promote long-term social and economic development'. The process yielded a new legislative framework based on some fundamental principles and a comprehensive set of recommendations, a new National Water Policy and finally in December 2004 the Water Resources Management Act.

The National Water Resources Management Review recognised that sound water resources management is essential to sustainable use of water and wetland resources. Since its establishment, the NWRMR team, aquatic scientists in the Department of Water Affairs (Hydrology Department and Ecological Research Section), the Directorate of Environmental Affairs and members of the NWRMR Steering Committee (DRFN, Desert Research Foundation of Namibia, NamWater and the Ministry of

Environment and Tourism), and the Wetlands Working Group of Namibia have worked together to include environmental water needs in the emerging policies, legislation and national plans. Together they have succeeded in including the concept that the environment needs water, as well as more specific references to environmental flow requirements, into pertinent national strategies, plans, the national water policy and emerging water legislation.

4. Environmental flows in the national water policy

Namibia increasingly recognises the importance of aquatic ecosystems, their use by people and the ecological services they provide. Several publications aimed at improving water awareness in Namibia have addressed these issues over the last decade. These are: *Namibia's Green Plan* (Brown, 1992), the DRFN publication and map on *Ephemeral Rivers and their Catchments* (Jacobson et al., 1995), *Namibia's Water: the Decision Makers' Guide* (Heyns et al., 1998), *Sharing Water in Southern Africa* (Pallett, 1997), *State of the Environment Report: Water in Namibia* (WCE, 1999), the water pollution book (Tarr, 2002), the *Groundwater in Namibia* map (Christelis and Struckmeier, 2001), and the booklet *Wetlands of Namibia* (Shaw et al., 2004).

Recently, this wealth of experience contributed to the development of the National Water Policy, which was approved by Cabinet in August 2000 (MAWRD, 2000). The policy states clearly that water is an essential resource to life and that an adequate supply of safe drinking water is a basic human need. The policy makes it clear that water concerns extend beyond human needs for health and survival, that water is essential to maintain natural ecosystems and that in a country as dry as Namibia, all social and economic activity depends on healthy aquatic ecosystems.

One of the 'Basic Principles' identified in the National Water Policy is the 'Principle of Ecosystem Values and Sustainability' which states that the 'management of water resources needs to harmonise human and environmental requirements, recognising the role of water in supporting the ecosystem'. The Environmental Water Reserve is specifically included in the 'Legislative and Regulatory Principles' that state that 'The legislation will provide for determining an environmental water reserve for freshwater sources before they can be used to supply any other demand than domestic and subsistence livestock watering'. The finally accepted legislation, the *Water Resources Management Act* (2004), provides for an environmental water reserve by granting the minister power to reserve water resources to meet domestic water needs and to 'reasonably protect aquatic and wetland ecosystems, including their biological diversity and to maintain essential ecosystem functions'.

One of the strategies in the policy to ensure both environmental and economic sustainability is to 'Ensure that in-stream flows are adequate in terms of both quality and quantity to sustain the ecosystem'. It was assumed that this and other strategies agreed to in the water policy would

form the basis of the future legislation for water resources management and that aquatic scientists would be approached to provide specialist input to the new Water Act and subsequently for the formulation of the associated regulations.

Concern about wetland ecosystems extended beyond the water sector. For example, the new *Forestry Act, No. 12 (2001)*, includes a clause for the protection of riparian vegetation, and thus legislates against soil erosion and resultant siltation. This clause, essentially taken from the old Forestry Act No. 72 of 1968 states that it is an offence to harm, injure or remove any living tree, bush or shrub within 100 m of any river, stream or watercourse (*Government Gazette of the Republic of Namibia, 2001*). This indirectly contributes to maintaining river dynamics central to the concept of environmental flows. However, in practice this legislation has never been enforced and large areas of riparian vegetation have been lost. Examples are found alongside the Okavango River and, more recently, sections of the Kunene River, where areas have been cleared for irrigation, crop planting and in some cases to improve the view from a tourist lodge.

5. Environmental flows in National Development Plan 2—NDP2

The water chapter of Namibia's second five-year, National Development Plan, (NDP2) also recognises the importance of ecosystems as legitimate water users that should receive a fair allocation of water (GRN, 2002). In comparison, the previous National Development Plan (NDP1) mentioned neither the economic and social values of the freshwater environment, nor the dependence of people on wetland resources (GRN, 1995).

Two of the major Water Sector Objectives listed in NDP2 are to:

- Utilise, conserve and protect all water resources in an environmentally sustainable manner.
- Manage and allocate the scarce water resources in an equitable and efficient manner with due consideration to the environment.

To ensure that these objectives are achieved, targets to meet these objectives in the period of 5 years include:

- Have methodology finalised to determine ecological reserves and basic needs in water management basins in Namibia.
- Conduct environmental assessments for all new projects according to the environmental assessment policy and relevant legislation.
- Have monitoring strategy plans finalised for all water management basins in Namibia.

The stated strategy to ensure equitable and efficient access to and use of water, by both people and the environ-

ment, is to put proper legislation in place. This, taken together with the objectives above, implied that the water laws then being refined should include specific mention of ecological water reserves and environmental assessments. Subsequently, paragraph 27 of the Water Resources Management Act grants the minister power to reserve water resources to protect aquatic and wetland ecosystems, their biological diversity and to maintain essential ecosystem functions; paragraph 34 requires that environmental impact analyses be taken into consideration prior to granting any licence to abstract or use water; and paragraph 13 on the functions of basin management committees, includes monitoring and data collection pertinent to the sustainable management of their water resources.

6. Environmental flows in the Water Resources Management Act 2004

If sustainable use of water and other wetland resources is the goal, then the scientific determination and assessment of their environmental flows or ecological water requirements backed by a supportive legislative framework can provide an essential tool for water resource managers.

The *Water Resources Management Act No. 24 (2004)* is based on the National Water Policy. The fundamental principle in the Act of ‘harmonisation of human needs with environmental ecosystems and the species that depend upon them, while recognising that those ecosystems must be protected to the maximum extent’ reflects both the principles stated in the National Water Policy and the environmental clause in the Namibian Constitution. The stated objective of the Act is ‘to ensure that Namibia’s water resources are managed, developed, protected, conserved and used in ways which are consistent with the fundamental principles’ including the one above.

Although clearly specified in the National Water Policy and early drafts of the bill, the section on ‘Environmental Water Reserve’ was later altered to read ‘Reservation of Water Resources’ despite written appeals from the Ministry of Environment and Tourism and the Ecological Research Section of the Department of Water Affairs through the multi-sectoral Review Steering Committee. This is in contradiction with the Legislative and Regulatory Principles of the water policy. The pertinent paragraph in the National Water Policy on the Environmental Water Reserve states that: ‘The legislation will provide for determining an environmental reserve for freshwater sources before they can be used to supply any other demand than domestic and subsistence livestock watering’. Although no longer termed the ‘Environmental Water Reserve’, the Water Act of 2004 provides for basic human and environmental water needs under the heading ‘Reservation of Water Resources’. Paragraph 27 states that: ‘The Minister, with the concurrence of the regional councils concerned, may in the prescribed manner reserve part or all of the flow of a watercourse, including any groundwater resource and water stored in a public reservoir to:

- (a) meet the domestic use of the water users concerned; and
- (b) reasonably protect aquatic and wetland ecosystems, including their biological diversity, and to maintain essential ecosystem functions.’

Regulations will need to be developed on how to determine these ‘reserved water resources’. It is assumed that this reserve will be based on the environmental flow requirements and basic human water requirements pertinent to a particular river system or basin and that aquatic scientists will be approached to assist with the determination and development of appropriate methods of assessment.

The requirement to conduct environmental impact assessments for water projects is adequately taken into account in the draft Environmental Management Act, yet to be passed, and is touched on in the new Water Resources Management Act as something to be taken into consideration when issuing licenses to abstract or use water and permits for effluent discharge or the construction of effluent treatment plants. Basin Management Committees will be responsible for implementing basin monitoring strategies pertinent to the requirements of each basin. It is assumed that this will include the determination, assessment and allocation of environmental water reserves for each river basin in close consultation with hydrologists and aquatic ecologists.

7. Responsibility for setting environmental water allocations

One of the general functions and powers of the Minister outlined in the Act is to ensure that water resource management operates in accordance with the principles of environmental sustainability. The Act provides for the establishment of a Water Resources Management Agency and Basin Management Committees. The functions of the proposed Water Resources Management Agency include:

- pursuing integrated management of water resources in Namibia,
- collecting, analysing and sharing data concerning the conservation and management of water resources in Namibia, and
- guiding, assisting and coordinating basin management committees.

Whilst those of the Basin Management Committees include:

- promoting community participation in the protection, use, development, conservation, management and control of water resources in its water management area through education and other appropriate activities,
- preparing a water resources plan for the basin,
- monitoring and reporting on the effectiveness of policies and actions in achieving sustainable management of water resources in the water management area, and

- collecting, managing and sharing such data as are necessary to properly manage the basin in coordination with the Water Resources Management Agency.

It is assumed that the Agency will be responsible for determining the environmental flow requirements to be prescribed in the Regulations under the Act. As with the other regulations, e.g. on water quality and pollution control, these should be subject to public consultation. Once agreed, the determined environmental flow requirements should be taken into consideration when licenses for water abstraction, impoundment, inter-basin transfers and effluent discharges are issued.

8. Namibia's draft wetland policy

Although the review accepted that water management for sustainable use of wetlands implies an understanding of how they function and of how much water is required to maintain these functions and the associated biodiversity, no particular emphasis was placed on wetland management during the remainder of the review process. To address this, the Wetlands Working Group of Namibia, made up of aquatic scientists from different government sectors and NGOs, developed a wetlands policy for Namibia (*Wetland Working Group, 2004*) and submitted this to the Ministry of Environment and Tourism.

Namibia's wetland policy vision is: 'Namibia shall manage national and shared wetlands wisely by protecting their vital ecological functions, life-support systems and biodiversity for current and future benefit of people's welfare, livelihoods and socio-economic development.' This policy was developed within the framework of the National Water Policy, to complement existing national policies relevant to sound natural resource management and to help meet the national commitments as signatory to the SADC Protocol on shared watercourse systems, regional water commissions, the Ramsar Convention and UN environmental conventions.

Legislative and regulatory principles include development of legislation to protect Namibia's diverse and vulnerable wetlands; recognition of the need to protect the biodiversity and ecological functioning of wetlands in all new laws and policies; and setting aside water for aquatic ecosystems (water for environmental flows).

9. The future—assessing environmental flow requirements

Although Namibia has only touched on environmental flow requirement assessments, NDP2 required that, by 2003, environmental flow requirements for each basin should be determined. This is yet to be achieved and will require detailed information on the flow characteristics, water resources, and water requirements of both people and the environment and the proposed development plans of each river basin. This requires that the river basin committees and the water resources management agency pro-

posed in the new Water Resources Management Act be in place to conduct and monitor these studies and that national funds are made available for these studies. Prior to that, the available methods need to be tested under local conditions and suitable methods applicable to ephemeral rivers and to large tropical perennial rivers need to be developed.

South African aquatic scientists have been looking into the science of in-stream flow requirements since the late 1980s and have developed appropriate local methods to reflect the realities of their water resources development (*Brown et al., 2002; King et al., 2000*). In Zimbabwe, the recently passed Water Act requires flows to be set aside for the environment and the Zimbabweans have developed and tested locally relevant methods by adapting South African methods to their own situation where there are less data and other resources. The results produced by this approach are less detailed but enable preliminary, qualitative impacts of changes in flow regime on the ecosystem and dependent rural communities to be predicted (*Steward et al., 2002*). Other Zimbabwean methods include using the monthly naturalised flow series adapted to the desktop method of Hughes and the Waflex model to operate their dams (*Symphorian et al., 2004*).

In Namibia, there is little information on the functioning of ephemeral rivers and not enough on tropical perennial rivers. Basic hydrological, ecological and social data will have to be collected on a range of ephemeral rivers as well as the larger perennial rivers, as starting points to develop an environmental water requirement assessment methodology for these rivers.

One of the strategic aims of Namibia's 10 year (2001–2010) strategic plan of action for sustainable wetland management is to 'protect and maintain essential ecological functions and the biological diversity of Namibia's wetland ecosystems' and one of the activities identified to do so it to 'integrate the principle of ecological water needs in planning and implementation' an activity that includes the estimation of 'ecological water needs of all the major perennial and ephemeral rivers and the oshanas' (*Barnard et al., Undated*).

There have been few studies concerning environmental water requirements in Namibia. Other than the Oanob Dam study and superficial focus on the environmental water needs of the Kunene and Okavango Rivers in environmental assessments of the proposed Epupa hydro-electric power scheme (*Consortium of Consulting Engineers, 1997*) and the proposed Okavango–Grootfontein pipeline (*WTC, 1997*). In this regard, the best known river in Namibia is the Kuiseb. Some of the environmental water needs for the lower Kuiseb River basin aquifers (*DRFN, 2000*), and to a lesser extent for the Khan River near Rossing Mine (*Ashton, 1996*), have been examined because water levels have recently dropped below sustainable yield levels. This lowering of the water table affected the riparian trees and the wells of people living downstream. On the Orange River there are ongoing assessments of the environmental water requirements needed to maintain the river mouth

wetlands, which are a Ramsar site shared with South Africa.

The Namibian Department of Water Affairs has not yet attempted to determine environmental water requirements. Before methods are chosen, the Namibian situation needs to be carefully analysed and, as in Zimbabwe, the available methods used elsewhere in Southern Africa should be tested, assessed and adapted to local conditions. A good review of environmental flows in Southern Africa is given by King et al. (2000) and in Hirji et al. (2002) in their recent publication on environmental sustainability in water resources management in Southern Africa.

Most environmental water requirement assessment methods have been developed for perennial rivers in South Africa and Zimbabwe. Namibia has its own challenge—ephemeral rivers. Many of these are impounded so that the available water for downstream flows is further reduced. Namibian aquatic scientists will need novel approaches and adaptations to enable them to assess the environmental water requirements of these mainly ephemeral rivers.

10. Conclusion

Ever since Namibia gained independence and throughout the water resources management review process, consultation and debates on the need to recognise the environment as a legitimate water user have taken place. The water policy now includes principles and strategies to harmonise human and environmental water requirements by recognising the role of water in supporting the ecosystem. The current National Development Plan sets targets to determine environmental flow requirements for each river basin. In the *Water Resources Management Act (2004)*, the Minister has the power to reserve water resources to meet domestic needs and to reasonably protect aquatic and wetland ecosystems. This, in keeping with the Namibian Constitution, includes providing sufficient water to the environment to maintain the biological diversity and essential ecological functions of aquatic ecosystems.

Despite the above successes, many challenges remain. The *Water Resources Management Act* was finally approved by Cabinet in December 2004, but the regulations to implement this, including those with regard to reserved water resources, have yet to be drafted. This provides one further opportunity for aquatic scientists to provide meaningful input to ensure that ecological water requirements are fully taken into account in future water resource management in Namibia.

The challenge now is to build on the present policy and legislative framework, to draft enabling regulations, to increase water awareness and to gain the political will to support sustainable wetland use. Capacity building, training and research on both ephemeral and perennial rivers are priorities that will enable Namibia to develop practical environmental water requirement methods for its rivers and other wetlands. These will need to be appropriate for Namibian conditions and the realities of a harsh climate

where environmental water is scarce, as well as being sensitive to increasing human water needs.

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