Water, Households & Rural Livelihoods

Research promoting access of the poor to sustainable water supplies for domestic and productive uses in areas of water scarcity

Water resource management for rural water supply: implementing the Basic Human Needs Reserve and licensing in the Sand River Catchment, South Africa

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WHIRL Project Working Paper 6
Preliminary results of research for discussion and comment

This project is supported by the UK Department for International Development (DFID) through the Infrastructure and Urban Development Division's Knowledge and Research programme. Project R7804 'Integrating drinking water needs in watershed projects'

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PREFACE

This working paper was prepared as a contribution to a joint Indian, South African and UK research project on Water, Households and Rural Livelihoods (WHiRL). This project is focused on research to promote better water security for rural water supply. The objectives of this paper are to:

- provide a critique of existing policies in South Africa that aim to ensure water security for the rural water sector including the Basic Human Needs Reserve (BHNR) and new licensing arrangements,
- identify gaps and key research needs and,
- briefly describe future action research planned within the Sand River Catchment.

It is targeted at policy makers and practitioners involved in trying to implement South Africa's new water legislation and policies, particularly those concerned with rural water development and management. The issues raised will also be of interest to others involved in ensuring sustainable water resources and services in semi-arid developing countries. It aims to promote discussion and dialogue between the research partners and these organisations, and to inform the follow-up research activities. Your comments would be welcomed.

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ACKNOWLEDGEMENTS

This report synthesises a range of information collected during 2001 and 2002. In particular formative ideas were developed from a workshop held at Wits Rural Facility, South Africa, 9-16 November 2001. The workshop report (Pollard *et al.*, 2001) is also available on the project website. The team that collaborated in that workshop also included: Toriso Thlou, Greg Huggins, Dirk Versfeld and Valerie Taylor. Thanks are due to earlier inputs from Alistair Wensley and Neil van Wyk.

EXECUTIVE SUMMARY

Background

In rural semi-arid areas, access to a sustainable and adequate supply of clean water is critical in the fight against poverty and for human welfare. Additionally, water is crucial to a wide range of economically important activities – from brick-making to market gardening and livestock production.

In South Africa groundbreaking new policy and legislation have been enacted (the 1997 Water Services Act (WSA) and the 1998 National Water Act (NWA)), both of which aim to tackle the need for sufficient domestic water for rural populations. The WSA provides the framework for the provision of water and sanitation services to which people are ***entitled*** (although not mentioned in the Act, this basic entitlement is widely accepted as being the 'RDP' minimum of $25lc^{-1}d^{-1}$ within 250 m of homes), and the NWA introduces the concept of the Reserve which includes the Basic Human Needs Reserve (BHNR).

However, both water resource management and water services are in a state of transition, and many aspects of these policies have yet to be implemented. Existing water rights (where these were granted) remain in place, whilst in many areas especially the former homelands (where previously no licences were required) current water use constitutes *de facto* allocations. This is about to change. Most importantly, active re-allocation through licensing and compulsory licensing is imminent, based on the principles of the NWA. A critical aspect of ***equitable*** licensing will be how to identify and allocate water for rural populations in addition to that provided for in the Reserve.

Key to licensing is the prior identification of the Reserve for catchments, and thereafter an allocation plan. In South Africa, the Reserve is a statutory requirement to ensure the protection of the water resource base as well as to secure sufficient water to meet basic human needs in a catchment (or at a specific point in a catchment) prior to any other allocation of water. The Reserve therefore has two parts: the ecological reserve (ER), currently determined as instream flow requirements (IFR) at critical points; and the BHNR. Both must be identified and protected at a catchment level. Currently the reserve is seen almost entirely in terms of surface water.

Problems with implementing a BHNR

While the determination of the surface water ER is well advanced and has a relatively strong methodological base, that of the BHNR has to date received surprisingly little attention. Current attempts to identify the BHNR have been based on overly simplistic approaches such as multiplying the population of the catchment by the 25 litres per day of the RDP standards. This approach masks a number of important methodological difficulties, including:

- **Assumption of bulk supply from surface water:** Much of the current thinking highlights the assumption that surface water is the main source for the BHNR and that bulk water supply systems enable transmission of surface water to everyone. In fact, in rural areas people access water from multiple sources, and in particular from groundwater.

Bulk water supply systems are not fully developed or are poorly designed and often do not represent the best use of either financial or water resources for water supply in many rural areas. Thus spatial and source issues must be considered both in terms of identification of the BHNR stock and in terms of interactions between ground and surface water which are likely to become increasingly important as the resource becomes more heavily exploited.

- **Assumption of no losses:** Even under optimum engineering conditions having a quantity of water available somewhere in a catchment (either in a dam, or in an assured flow) is not the same as ensuring that people will receive that allocation (e.g. 25 $lc^{-1}d^{-1}$). At the very least a realistic safety margin to cover conveyance and storage losses must be included.
- **Lack of clarity as to what the BHNR represents:** The BHNR represents a catchment level *stock* of water necessary to meet the *entitlements* to basic needs of catchment residents. To do so it is necessary to have not only the stock (BHNR) but also the means to deliver it to consumers (infrastructure and institutions). There is considerable lack of clarity as to what level of entitlement the BHNR should be designed to meet. The $25lc^{-1}d^{-1}$ of the RDP standards (roughly analogous to the 6000 litres per family per month of the Free Basic Water policy)? Or some function of the existing domestic service levels enjoyed by catchment residents? Or planned future service levels?
- **Devolution of responsibilities to an unprepared local government:** Currently one of the main actors involved in rural water supply is local government, and yet whether or not they have a statutory role in the identification and safeguarding of the BHNR, is unclear. The issue of the relationship between the BHNR and Free Basic Water, which is the responsibility of local government, further confounds this issue.
- **Problems with setting rural water supply allocations:** Current discussions around rural water supply needs tend to assume that the BHNR once implemented will be enough to meet them. This ignores both the actual and potential role of water in (small-scale) productive activities. The BHNR exists to ensure a sufficient stock to meet basic needs, and therefore *allocations* (through licensing) of additional water (and the development of infrastructure to supply it) will be essential.

Main recommendations and activities

- **The establishment of clear principles and definitions regarding the BHNR and allocations for rural water supply:** The issues of source and population distribution, as well as the broader rural water supply requirements have already been raised. In addition, we suggest that the BHNR, as an individual right must be determined for all catchment residents, based on ensuring a sufficient stock to meet delivery norms at the household. The per-capita amount maintained in the stock will vary from location to location.
- **Better linkages between water resource management and water services provision**: The calculation for the BHNR should not be implemented as a catchment level 'block' allocation. It must be disaggregated to take into account patterns of existing and planned patterns of use and development. Just as Instream Flow Requirements (IFR) are identified at critical points for the ER so then should BHNR requirements be identified at those places where water (surface or ground-) is abstracted for human use. This will be the focus of the future BHNR Whirl work using the Sand River Catchment as a case study.
- **Identification of rural water use and demand:** Ensuring that rural water users have, in addition to the BHNR, access to an equitable share of the allocable resources for the catchment is critical to addressing rural poverty. Currently mechanisms to do this are

non-existent. An initial step, currently being implemented within the WHiRL project, is to identify current water use and its impact on livelihoods, particularly those of the very poor, and thus to assess real demand for increased rural water provision.

- **Developing tools for monitoring and decision making:** The project will develop an easy-to-use, spatially-distributed, decision support system (DSS) based on a geographical information system and simple water balance model. This will allow the collation of primary and secondary sources of data to support scenario development and testing. The DSS will be based on the premise that securing rural water supply needs (both the BHNR and additional rural water needs) is intimately reliant on licensing and allocation. This will build on the work being conducted through the WHiRL project to identify both current and potential demand for water at a household level. Moreover, including some productive water use within Schedule 1 is an issue that requires clarity.
- **Awareness raising and capacity building:** The lack of knowledge regarding the BHNR and rural water allocation prevents rural communities and their representatives from engaging in meaningful discussions and decision making. Based on the activities above it is envisaged that the next stage of work will focus on working with local government to raise awareness and develop capacity to take part in catchment management processes (CMAs). This will be undertaken as action research in order to provide an assessment of what support is required.

1 INTRODUCTION

In South Africa new groundbreaking policy and legislation pertaining to water resource management and supply have been enacted. These include the 1997 Water Services Act (WSA) the 1998 National Water Act (NWA). In addition the national water policy white paper of 1997 explains intended links between the NWA and WSA in more detail than the final act (see Box 1). At their core, both of these acts aim to tackle past inequities by securing sufficient domestic water for rural populations. The WSA outlines the roles and responsibilities of those involved in providing water (including sanitation) services, while the NWA introduces the concept of the Reserve that includes the Basic Human Needs Reserve (BHNR). Not mentioned specifically in the WSA, but critical to the discussion of the BHNR are the so-called RDP norms which specify the minimum acceptable level of service as being 25 $lc^{-1}d^{-1}$ (litres per capita per day) within two hundred and fifty metres of the household. This has recently been given added weight through the free basic water policy in 2000 which makes the provision of six thousand litres of water per household per month an entitlement.

Box 1: Key policy and legislation dealing with the reserve

National Water Act: Part 3 – The Reserve
"The basic human needs reserve provides for the essential needs of individuals served by the water resource in question and includes water for drinking, for food preparation and for personal hygiene. The ecological reserve relates to the water required to protect the aquatic ecosystems of the water resource. The Reserve refers to both the quantity and quality of the water in the resource, and will vary depending on the class of the resource."

Water Services Act: Section 3 - Right of access to basic water supply and basic sanitation
(1) Everyone has a right of access to basic water supply and basic sanitation; (2) Every water services institution must take reasonable measures to realise these rights; (3) Every water services authority must, in its water services development plan, provide for measures to realise these rights; (4) The rights mentioned in this section are subject to the limitations contained in this Act."

National Water Policy: Section 5.2. Priorities – The basic needs and environmental reserve and international obligations
"One of the overriding priorities of the Government is the need to make sure that 'all people have access to sufficient water'." ….."There is as yet no definition of 'sufficient water'. The present RDP provision of 25 litres per person per day is explicitly stated as a short term target. The approach taken in the Water Services Bill is to allow for the progressive increase in the standards of basic service to be assured by local government. On this basis, it will be relatively simple to estimate the amount required for the Reserve for basic human needs using census figures, local information and technical criteria that allow for different methods of abstraction and distribution of water. The need for *reliability* in this supply of water must be taken into account in the calculations and provision be made for *population change* and *improvements in basic services* over time.

However, both water resource management and water services remain in a state of transition, and many aspects of these policies have yet to be implemented. Whilst much of the theoretical and institutional re-orientation is underway, in practice the situation still reflects this period of change. Despite the major policy changes aimed at redressing past inequities and unsustainable practices, embodied NWA and the WSA, as well as in the South African Constitution, substantial advances in implementation are currently limited to improved water supply for domestic purposes through investment in new infrastructure.

Giving real effect to the NWA, which is widely recognised for its prescience and

unprecedented principles, will only be seen with the implementation of the full cycle of water resource management. Figure 1 illustrates how this encompasses numerous policies and tools aimed at achieving equity, sustainability and efficiency. These include so-called *resource directed measures* (such as the safeguarding of a catchment-level Reserve made up of the BHNR and an Ecological Reserve (ER)), and the development of an allocation plan; and *source-directed measures*, which include the *licensing* of allocable water to different users. In cases where the Reserve is not being met due to over abstraction, *compulsory licensing* (by which existing allocations may be reduced or stopped altogether) represents the key mechanism to address the core principles, particularly in un-impounded catchments.

For the present, water use by the majority of the sectors has remained unchanged in South Africa. For example, in many areas, and in particular in the former bantustans, past and current water use represents a *de facto* allocation even though rights to water were never formally allocated. Additionally, water use and practices remain unchanged in areas where allocations did occur (such as those under the previous irrigation boards), or where users exercised riparian rights and are still abstracting what they regard as their fair share of the normal flow. The latter situation represents the case for most irrigation use in South Africa (Mr. J. Wessels, DWAF, pers. comm.). Nonetheless, most sectors are aware that, in accordance with new policies, re-allocations through licensing, or compulsory licensing, are imminent (see Section 2).

This process of reallocation has two important implications for water security for rural water supply. First, it will ensure that domestic water uses are given first priority; second, it will ensure that the Reserve (including the BHNR) is available *at all times*. As a first step in this process, all water users were required to register their water use through the regional Department of Water Affairs & Forestry (DWAF) offices in 2001.

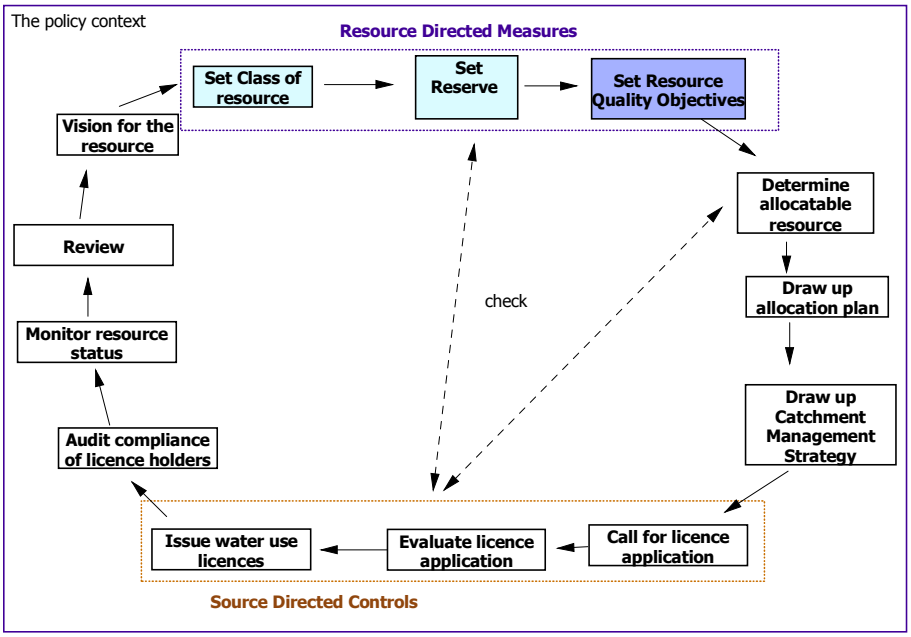

Figure 1 Schematic of the Water Resource Management process in South Africa (DWAF 2001 a).

The projected time frame for the implementation of the policies is some 20 years (MacKay 2001). Given the enormity of the task at hand, it is hardly surprising that the re-orientation of water resource management (WRM) will be a protracted process. Moreover, practice is likely to confound policy as the details of implementation surface. The Department is well aware of the challenges ahead and is actively seeking support and input from a range of stakeholders, including researchers and practitioners.

1.1 Objectives of the paper

Within the wider scope of work that still needs to be done to implement the water resource management process in South Africa, the collaborative efforts between the WHiRL and Save the Sand Projects (see Box 4) concentrate on those issues affecting rural water supply. Specifically efforts aim to identify tools and methods to allow the water requirements (particularly at the household level) of the rural poor, both current and potential, to be adequately and equitably addressed within the catchment management process. The work is based on the premise that rural water supplies will be sourced from a combination of the BHNR and allocable water. The work will therefore focus on identifying and developing the necessary tools to support this process, primarily by a) clearly identifying potential and future rural water needs and b) establishing a methodology to identify and implement the BHNR. This combined effort, which represents the sort of collaboration between researchers and practitioners sought by DWAF, will build on WhiRL's ongoing work on identifying rural household water requirements (see Pollard & Walker, 2000; Pollard *et al.*, 2001; Mokgope & Butterworth, 2001).

Within the arena of rural water supply, one set of challenges that are particularly important, but that have to date received relatively little attention are those relating to the concepts and practicalities of the BHNR. Not only are the approaches to its conceptualisation and quantification rather simplistic, but despite its importance from a rights-based perspective, the responsibility for provision is unclear. The very tier of government (local councillors) that should presumably be monitoring the infringement of this right is unaware of its statutory profile. Moreover, whilst the gains made by conferring legal status to the Reserve (see Section 2.1.1) are far-reaching, the relationship between the Reserve and a number of other issues such as free basic water, allocation and licensing, requires further exploration. In this regard, the objectives of this paper are to:

- provide a critique of existing policies in South Africa that aim to ensure water security for the rural water sector including the BHNR and new licensing arrangements,
- identify gaps and key research needs and,
- briefly describe future planned action research.

The paper starts with a brief overview of policies for rural water supply, the BHNR and licensing for rural water supply, key institutional roles and responsibilities followed by a review of progress thus far in implementing them.

2 THE POLICY CONTEXT FOR CATCHMENT LEVEL MANAGEMENT OF WATER RESOURCES: THE RESERVE, ALLOCATION AND LICENSING

In a fundamental departure from previous policies, the National Water Act represents a major re-orientation of water resource management towards *equity, sustainability and efficiency*. In particular, the principles of equity and sustainability are given effect through the concepts of the Reserve and licensing. Stakeholder involvement is achieved through setting the vision and management class for the water resource and through the participation in decisions regarding allocations. Ultimately, it is envisaged that this will be facilitated through the Catchment Management Agencies (CMAs).

2.1 The water resource management framework

2.1.1 The Reserve

The Reserve, as distinguished in South African water law, consists of two parts: the basic human needs reserve (BHNR) and the ecological reserve (ER). It is defined as "the quantity and quality of water required to:
(a) "satisfy basic human needs by securing a basic water supply, as prescribed by the Water Services Act, 1997….and to
(b) protect aquatic ecosystems in order to secure ecologically sustainable development and use of the relevant water resource" (NWA 1998; p.16).

Various references point to the fact that the BHNR is not cast in stone. The Act, for example, does not specify a quantity nor an assurance level but states that "the BHNR provides for the essential needs of individuals served by the water resource in question and includes water for drinking, food preparation and for personal hygiene". The 1997 white paper, precursor to the act, identifies the RDP, minimum service level to which people are ***entitled*** ($25 lc^{-1}d^{-1}$ within 250 m of homes) as being the starting point for BHNR determination. The South African National Water Policy explicitly states that there is no definition of what might constitute sufficient water and mentions the RDP provision as a short-term target (see later discussions).

The Reserve is intended to ensure equity, efficiency and ecologically sustainable development and utilisation; "some for all forever". Thus the provision of the Reserve prior to any other water use is a statutory requirement, and is the only allocation that enjoys statutory protection in South African law (Figure 2). The Reserve will vary depending on the class of the resource; however, whilst the ER may change depending on the management class, the BHNR will not.

While the processes of determining the quantity and quality as well as the pattern of flows required to meet the surface water ER are relatively sophisticated, there is by comparison no comprehensive methodology at present for the determination and management of the BHNR (see Section 4). The BHNR has not been defined quantitatively or qualitatively and there are no recognised implementation or monitoring processes. However, as indicated earlier, the common perception is that for water-balance assessment and scenario studies an allocation of $25\ lc^{-1}d^{-1}$ (RDP norms) would meet the BHNR. Whilst this may well meet minimum needs (see Perez de Mendiguren & Mabelane, 2001), this should not be considered to be the only water requirement for rural needs.

Although only recently being made explicit (see for example, Pollard *et al* 2001), it is important to stress that the Reserve is not intended to include, or address, water required for additional household or productive needs, subsistence crops or small-scale productive use (*i.e* garden vegetables, livestock production or micro enterprise). This is an important component of peoples livelihoods that has largely been ignored until recently (see for example, Perez de Mendiguren & Mabelane 2001; Mokgope & Butterworth, 2001). Like any other sector, the productive demands of rural users need to form part of allocation plans and must be sourced from the allocable portion of water resources by the CMA, or by the DWAF in the absence of a CMA (Figure 2). On the other hand, the Reserve allocation falls within the remit of national government functions.

A comprehensive Reserve determination requires ministerial ratification. This is predicated on a number of steps within an integrated water resource management framework (see Figure 1). This includes determining the *management class* of the water, which in turn, is contingent on the vision for the water resource in question, as defined by stakeholders. Both of these processes require public participation and the information and logistical requirements should not be underestimated. In the absence of a comprehensive Reserve determination, a preliminary determination of the Reserve may be made and later superseded by a new one (NWA, 1998). Thus, in many catchments that still await a comprehensive Reserve determination but for which there is a reasonable amount of information, undertaking a preliminary Reserve determination, by proxy, until the complete WRM loop (shown in Figure 1) is in place, is an option for starting water resource management.

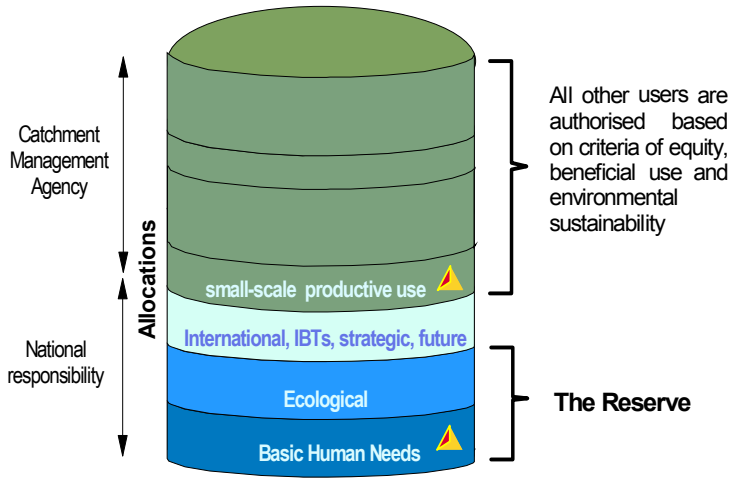

Figure 2 Schematic of the allocable portion of water resources in South Africa.
The statutory requirements of the Reserve and international (and other) priorities are prioritised nationally prior to any other allocations by the Catchment Management Agencies. Triangles indicate the focus of the WhiRL project (modified from Water Act News 1999).

Giving depth to the concept of the Reserve are the range of manuals for Resource Directed Measures, either available in draft form or under development (see for example DWAF, 1999; WRC, 2001a). These specify a range of procedures for various levels of RDMs (desktop, rapid, intermediate and comprehensive) for numerous water resources (rivers, wetlands, estuaries and groundwater); and theoretically, for the BHNR. However, the BHNR manual is not yet available.

The Reserve is to be determined at the scale of resource units. For each resource unit in a catchment, the Reserve (BHNR & ER) can include rivers, groundwater, wetlands and estuaries (Figure 3). Nonetheless, the contribution of surface water to the Reserve is better understood than is that of the **groundwater component**, although the latter is part of a focussed research initiative funded through the Water Research Commission (WRC, 2000a). The recent groundwater focus is an important advance for the BHNR since many of the assumptions that underscore the Reserve concept are dominated by a surface water focus. In particular, where there is hydraulic connection between groundwater and surface water bodies, the role of groundwater in supporting the Reserve needs to be ascertained (see points in Box 1). Current thinking suggests that where aquifers have minimal connection, the groundwater reserve would consist solely of the BHNR component (Xu *et al.* 2000; WRC 2001a), although this may change as the role of groundwater in supporting both non-surface water related aspects of ecosystems, and in contributing to (base)flows in river systems more fully understood (see Box 2).

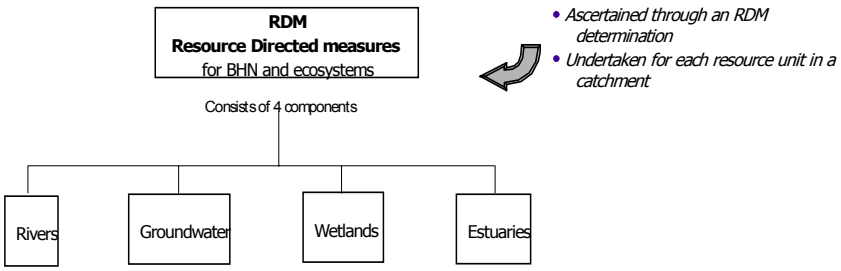

Figure 3 Components of RDMs (DWAF 1999). In the Sand River Catchment only the first three would apply.

In many rural communities it is likely that water supply, including the BHNR will be met through groundwater, and most often through stand-alone supply systems, rather than bulk supply from surface water (rivers and dams).

Box 2 The role of groundwater

In many areas of South Africa and at many times of the time groundwater will be an important component of the ER and BHNR and, arguably as stated earlier, the importance of groundwater is likely to increase in the future. Even in areas with apparently abundant surface water, river flow regimes, particularly during dry seasons, may be strongly linked to ground water levels. In these areas, the IFR will only be met if there is regulation on groundwater extraction. Hence, conceptually, the ER at a given location has two interlinked components at any location. Namely, the ground and surface water components which themselves have the important components that are illustrated in Figure 4. Likewise the BHNR at a given location has two interlinked groundwater and surface water components which are described in Figure 5. In reality the complex nature of surface and groundwater interactions and the potentially complex nature of conjunctive use of surface and groundwater will make the determination and subsequent management of ground and surface water a tough challenge. Meeting this challenge will require the methodologies that WHiRL is seeking to develop.

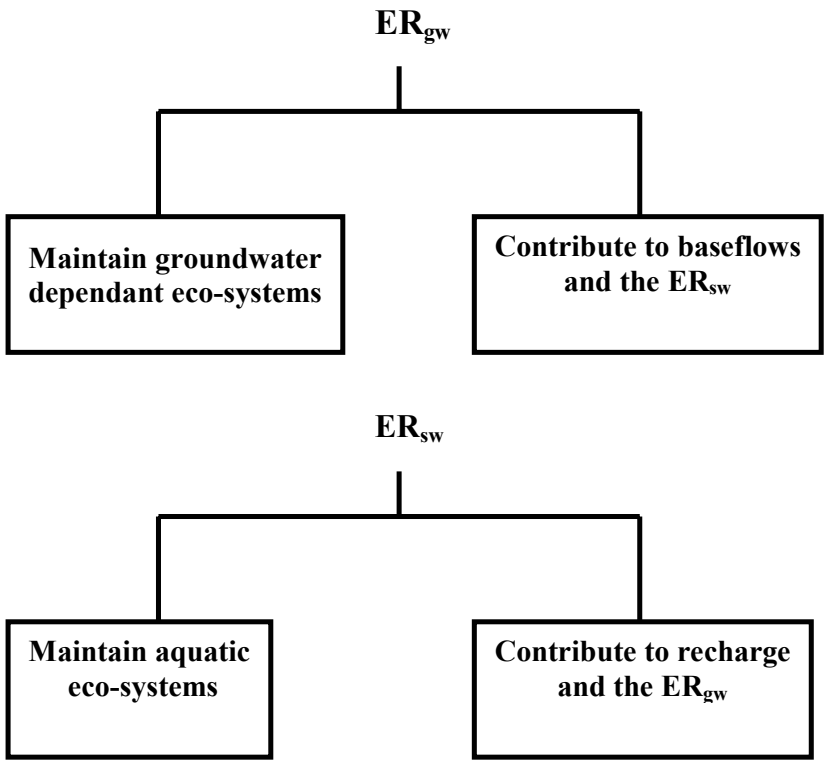

Figure 4. Main components of the ground and surface water ER

2.1.2 Reserve determination, implementation and monitoring

The NWA provides for an integrated, adaptive process of water resource management, shown in Figure 1. Within this, there are four main types of regulatory mechanisms:

- Resource Directed Measures
- Source Directed Controls
- Demand management
- Monitoring of the status of the nations water resources.

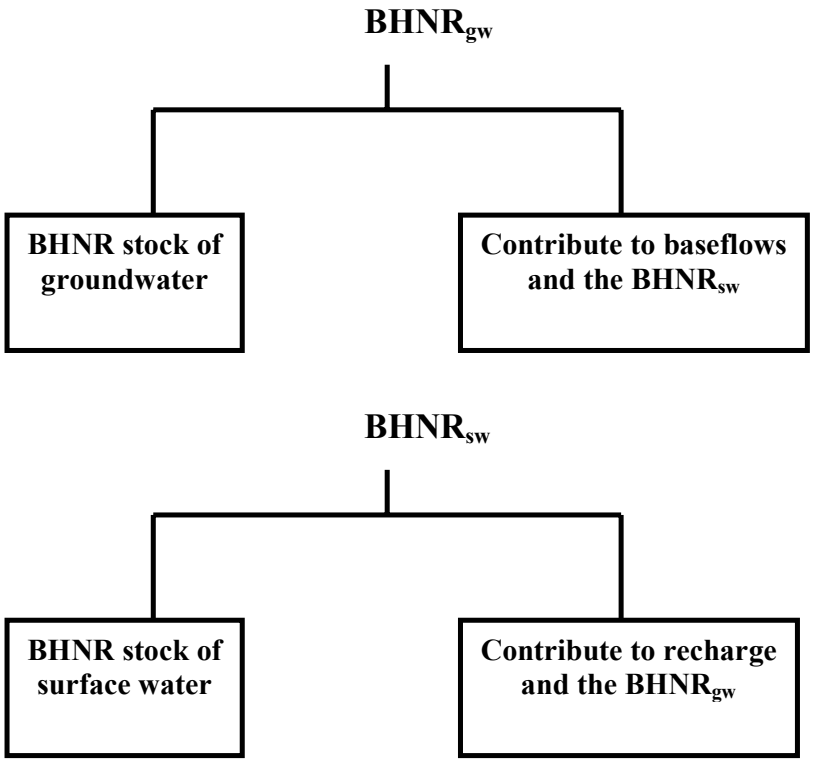

Figure 5. Main components of the ground and surface water BHNR

Resource Directed Measures (RDM) aim at ensuring the protection of all water resources and at ensuring sufficient water (quality and quantity) to meet basic human needs. A water resource is defined as an ecosystem that includes the physical or structural aquatic habitats (both instream and riparian), the water, the aquatic biota, and the physical, chemical and ecological processes which link habitats, water and biota (DWAF, 1999). The RDMs are to be developed progressively through the facilitation of an RDM project at DWAF (DWAF, 1999). They comprise three core concepts (Figure 1):

1. Water resource classification,
2. The Reserve and,
3. Resource Quality Objectives.

A management classification system: the Reserve and Resource Quality Objectives

According to the Act, the first stage of the protection process is to develop a system to *classify* the nation's water resources. The class refers to the state of the river according to a classification system which groups water resources into different classes from pristine (I) to Workhorse (III) rivers. A class is derived from a combined classification that is developed for 3 components: the BHNR, the ecological class (or category) and the utilisation class (DWAF 1999). The higher the class, the less the acceptable risk and hence the greater the protection required. Aside from assessing the *current* class, any change is stated in a future or *desired class,* which is captured in the vision (see Figure 1). It is envisaged that appropriate management activities over time will slowly improve the health of the river to achieve this.

Classifying the water resource should be undertaken in a formal process of negotiation and consensus-seeking among all stakeholders, within an integrated catchment management framework (DWAF 1999, p. 7). This involves setting *the vision* (or desired future state) for the resource which is then formally assigned through the management class (see Figure 1).

In a hierarchical fashion, the management class is then broken down into specific objectives, known as *Resource Quality Objectives* (RQO) based on the *class* and the *Reserve*. (DWAF Water Act News 1999). The RQOs constitute a formal statement of the vision for a water resource (see Figure 1) and should, theoretically, precisely define a measurable condition that can be monitored (Water Research Commission (WRC, 2001b). It seems at this stage that the best developed RQOs are for the quantity component of the ER (see for example, Rogers & Bestbier 1997). Nonetheless, the importance of RQOs for aquifer protection and for the guarantee of the BHNR has been recognised by a number of researchers (Xu & Braune 1995; Xu *et al.* 2000). Clearly, an aquifer classification system is required that is compatible with that of water courses in terms of nomenclature and current/desired classes. Particularly in areas where there is a strong linkage between ground and surface water, it would make no sense to classify an aquifer as a "workhorse" aquifer if it an important source of base flow in pristine water course.

2.1.3 Allocation, licensing and compulsory licensing

Under the terms of the NWA (1998), water cannot be allocated to other users until the Reserve and international obligations have been met.

All water users beyond 'Schedule 1' users[1], (i.e. for domestic and subsistence) require a water use license. Rights to use water can be provided through registration (existing users) and licensing (new users). Even supply systems to communities should be registered and/or licensed – although the individual users do not need to be licensed. This is to provide water resource managers with the knowledge of who is using what, and with the ability to control such use where this is justified (Mr. D. Versveld, DWAF, pers. comm).

In water-stressed catchments, either because of current over-allocations[2], or to meet the needs of new users (and particularly where there is a need to address inequities in past allocations), the process of ***compulsory licensing*** may be invoked (see Pollard *et al.* 2001). This is a complex process aimed at reallocating existing scarce water resources over a wider spectrum of users and future users. Essentially it means the reduction of allocations to some (or all) existing users so that new users can be provided for, or to deal with naturally occurring stresses and shocks such as drought.

Legislation for registration and licensing applies to all forms of water use – both surface and groundwater. This means that every existing borehole must be registered and all new boreholes (other than private boreholes for schedule one uses) will need to be licensed. New borehole licenses may either be refused or restricted in terms of the volume requested The first responsibility in the licensing process will be to ensure that the needs of the Reserve (with priority being the BHNR) are met.

[1] Schedule 1: All users are authorised, without registration or payment, to take water for "reasonable domestic use, watering gardens and stock watering" but not for commercial purposes

[2] A catchment can become water stressed only through human use. The ER explicitly recognizes naturally occurring hydrological variability and allows for wetter and drier periods. On the other hand the BHNR remains fixed.

2.1.4 Auditing and monitoring

It is clear from the water resource management process (Figure 1) that auditing (compliance) and monitoring (of the Resource Quality Objectives) are an integral part of the process. Nonetheless, given that no Reserve determinations have been implemented, nor has compulsory licensing been evoked in any catchment, neither of these steps have been put to the test. Not only do there appear to be no substantive frameworks for auditing or monitoring but the issue presently receives inadequate attention (but see DWAF, 2001a).

To our knowledge, only a few initiatives have emerged in this regard. The first is a protocol for monitoring of Instream Flow Requirements[3] (IFRs), which was introduced at a Water Research Commission workshop late last year (WRC, 2001b). This pertains specifically to the ER. The second is an attempt to develop a monitoring framework for the Sand River through the Save the Sand Project (Section 3) which is still in its early stages.

2.2 Institutional roles and responsibilities

2.2.1 Catchment Management Agencies

In order to give effect to one of the major policy advances of managing water resources on a catchment basis, DWAF has divided the country into 19 Water Management Areas (or mega-catchments). Ultimately, responsibility for water resources management for each Water Management Area will fall under a Catchment Management Agency or CMA (Box 2). The CMA has to be finally proclaimed by the Minister on acceptance of the proposal for establishment of the CMA. Until CMAs are established or are deemed competent in terms of their designated functions, the responsibilities of the nascent CMA will be undertaken by the regional DWAF office under ministerial delegation.

The DANCED IWRM Project has focussed on the roles and responsibilities of institutions (notably CMAs) in three Water Management Areas: the Crocodile West- Marico, the Umvoti-Umzhumkhulu and the Olifants-Doring catchment. The project is due for completion at the end of 2003.

Box 2. Responsibilities of CMAs

CMAs will be developmental in nature, and serve the interests of equity, corrective action and optimum use of water. The governance structure of CMAs will balance the requirement to reflect the interests of various stakeholders with the need to ensure the effective management of the catchment area.

The NWA (1998) states that the main functions of a catchment management agency are:

- to investigate and advise on the protection, use, development, conservation, management and control of water resources in its water management area
- to development a catchment management strategy; and
- to co-ordinate the related activities of the water management institutions within its water management area.

[3] IFRs are generally calculated to mitigate anthropogenic changes to the ecological integrity of rivers, usually through impoundments. These IFRs are quantified in terms of their magnitude, duration, timing and frequency. South Africa is regarded as one of the leaders in the development of comprehensive IFR methodologies and currently uses the Building Block Method to identify important blocks of flow (through specialists) which are ultimately represented in a flow regime (see King et al. 2002). These are then used to negotiate management actions (such as dam releases) to deliver the IFRs. Currently, IFRs are synonymous with the ER.

The main tool proposed to facilitate WR management at regional or catchment level is the use of a catchment management strategy (Box 3). This is drafted within a nationally determined framework, either by the catchment management agency or in consultation with all role players where a catchment management agency does not exist. Theoretically, there will be generic CMS guidelines although clearly, these will have to be adapted for each catchment under consideration. The Department has developed a generic framework for a CMS (DWAF 2001a) and is currently preparing for tender for the Inkomati CMS. The CMS will need to complement the national water management strategy[4] approved by DWAF.

Box 3. The purpose of the CMS

The CMS will contain details of:

- water allocations
- the requirements of the environment and international obligations
- the main issues affecting water quality and quantity which require intervention
- management goals for addressing the critical issues
- potential management strategies and responsibilities for action to achieve these objectives
- financial arrangements.

3 PROGRESS ON IMPLEMENTING POLICY: CHALLENGES TO INTEGRATING RURAL WATER SUPPLY AND WATER RESOURCE MANAGEMENT

In the absence of formal institutional and strategic procedures, a number of integrated catchment management initiatives have been initiated in the past four years in South Africa. These have been catalysed by local stakeholders in response to water resource problems and have, largely, been supported by DWAF. One such initiative is the Save the Sand Project (SSP; Box 4).

Box 4 The Save the Sand Project

The SSP is a national pilot project for Integrated Catchment Management. As its main aim it seeks to secure the long-term potential of the natural resources of the catchment, and in particular of the water resources, through sustainable, equitable and integrated approaches. The SSP was instigated following the 1992 drought and the serious impacts this had on flows in the Sand – particularly in the commercial game farming areas in the lower catchment. It has been ongoing since 1999 based on the outcomes of a feasibility study (Pollard *et al.* 1998). Amongst other aims, the SSP is now initiating the implementation of the WRM framework of DWAF (Figure 1), with the following objectives:

1. To support the initiation of a prototype of the water resource management loop for the Sand River Catchment, with a focus on the BHNR from implementation through to monitoring and compliance (and how in combination with licensing the BHNR will meet RWS needs).
2. To provide a framework for this that can be adopted within a catchment management strategy.

The Sand River Catchment falls into the Inkomati WMA and includes the Sabie, Crocodile

[4] The National Water Resources Management Strategy is in the final stages of internal comment (DWAF). Thereafter public comment will be invited. The Strategy deals with various strategies for WRM (protection, use, conservation and demand, institutions, pricing, integrated planning, monitoring and information systems, public safety, implementation activities), complementary strategies and co-operative governance.

and Komati sub-catchments. Currently, the Inkomati falls under the responsibility of the Nelspruit regional office. The proposal for the establishment of the Inkomati CMA was submitted to DWAF in 2001 and is still under consideration (DWAF 2001d). The Inkomati CMA is likely to be the first CMA established in the country and it is envisaged that the implementation phase will probably start in mid-to-late 2003. As stated, generic CMS guidelines exist (DWAF 2001a) and tenders for their development are currently being prepared (Ms. M. Ligthelm, DWAF, pers. comm.).

3.1 Implementing the water resource management framework

3.1.1 The Reserve and Instream Flow requirements

The precursor to Reserve determinations in South Africa was the quantification of Instream Flow Requirements (IFRs) for rivers. As mentioned earlier this is effectively synonymous with determination of the ecological component of the Reserve. However, there are a number of important advances in Reserve determinations.

- Firstly, the ER is predicated on the management class of the river in question (see Section 2.1). In other words, the team provides a number of ER scenarios that are pegged to each management class. Previously, the IFR team set a recommended flow regime (quantity and quality) for the river in question and specified this as drought and normal IFRs.
- Thus, a comprehensive Reserve determination requires a public participation process (setting the vision) in order to determine the current and future management class for sections of the river.
- Secondly, the Reserve determination includes the additional component of the basic human needs, the BHNR. With some exceptions (see below), methods for the BHNR are generally limited to multiplying the population of the catchment by 25 $lc^{-1}d^{-1}$. This approach is methodologically flawed for a number of reasons (discussed in Section 4).
- Thirdly, before granting any new licences for water use, DWAF is required to undertake a comprehensive Reserve determination. Since the Department is currently under enormous pressure to undertake Reserve determinations, which are costly and labour-intensive exercises, delays are to be anticipated.

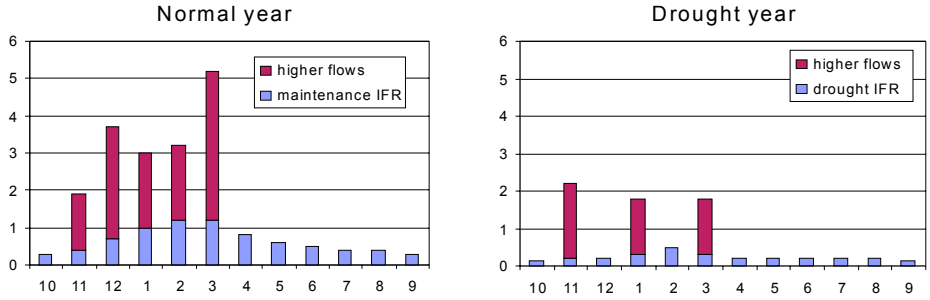

Figure 4 Example of the IFR output: IFR 6 on the Mutlumuvi River in the Sand River Catchment.

In South Africa, a number of IFR studies have been conducted country-wide, including that of the Sabie-Sand Catchment which was undertaken in 1996 (DWAF 1996; 1997). The Sand River has, for example, identified three IFR sites with specified daily flows at each site (Figure 4). To date, these IFRs have not been implemented. More recently, a substantial number of desktop Reserve determinations have also been undertaken and comprehensive determinations in the Olifants Catchment (Limpopo Province) and the Mhlatuze (although they have not yet been approved by the Minister). The BHNR determinations are still based on RDP values multiplied by the population.

Nonetheless, although the policies regarding the Reserve have evolved from that of IFR determinations to Reserve studies, without the important step of visioning and setting of the management class most Reserve determinations are, in reality, IFR determinations. At a catchment scale this is important to note, because in the Sand for example, the IFRs specifications do not include the BHNR and they are not linked to any management class. They are also clearly related only to surface water. If the above constraints are acknowledged, they do, however, offer an important interim proxy for Reserve specifications in the absence of a comprehensive study. It would also appear that few Resource Quality Objectives have been set and frameworks for monitoring are now in their early stages (Mr. van Wyk, DWAF, *pers. comm*.).

3.1.2 Quantifying the BHNR: experiences from the Sand and Thukela River

As stated, there is no national protocol for determining the BHNR for a catchment. The general understanding is that it is simply the population multiplied by 25 $lc^{-1}d^{-1}$, as is illustrated in the case of the Sand River, given below. The second example provides a prototype that is being piloted in the Thukela Catchment. Nonetheless, both these approaches merit further attention due to a number of considerations discussed in Section 5.

Sand River Catchment

At the time of undertaking the Sand River Feasibility study (Pollard *et al.* 1998), the BHNR concept was still evolving and in fact, the NWA had not been promulgated. However, the RDP minimum was a widely used concept in basic water service provision in South Africa. As an absolute minimum the RDP standard was set at 25 lc^{-1} d^{-1} . Thus the BHNR was limited to a total volume of water calculated as the population multiplied by 25 l c^{-1} d^{-1}. This led to two estimates, current and projected (Table 1).

Table 1 - Estimates of the Reserve (water required to meet basic human needs) based on two levels of service- the RDP minimum and RDP medium-term figures.

	YEAR			
	1998		2010	
Population	382,864		508,922	
Level of service ($lc^{-1}d^{-1}$)	25	60	25	60
Domestic Reserve Mm^3a^{-1}	3.49	8.38	4.64	11.15

Thukela Catchment

A pioneer case study for the determination of the BHNR has been undertaken for the Thukela Catchment in KwaZulu-Natal (see Pollard *et al.* 2001). Water resources within the Thukela

are not over-allocated and the catchment is not water stressed. In order to move from the simplistic RDP norm of 25 $lc^{-1}d^{-1}$, and to address different consumption and distribution patterns within the catchment, a more sophisticated approach has been piloted. This is based on the principle that living conditions and living standards affect the volume of water that should be allocated to Basic Human Needs. This volume is therefore no longer one based on the principle of 'sufficiency for survival' but rather on the amount of water which any individual living under certain conditions could be considered to require as a basic minimum. Thus the main parameters used in this study were settlement types, consumption and growth rates for each. The allocations used in the Thukela study are provided in
Table **2**.

Table 2 The demographic standards used to calculate the BHNR in the Thukela study

Settlement	Indicator	consumption ($l\ c^{-1}d^{-1}$)	Growth rate (%)
Urban	Water use	200	2
Peri-urban	Growth rate + shift towards "urban water use"	100	2
Rural settlements	Expectations of water supply	50	1.5 – 1
Scattered households	Accessibility problems; carrying load	25	0 – 1

Only people living within *5 km corridor* of the main Thukela system were considered in the BHNR determination. This comprised 45.6% of the population. However, some spatial characteristics were included in that larger settlements that are part of the water supply scheme were considered. The Thukela BHNR model has all off-takes in the database.

In the Thukela case study the BHNR was calculated as a flow in the river of 2 m^3s^{-1}. The BHNR was calculated as an additional Reserve over and above the ER, because it is consumptive compared to the largely non-consumptive use by the ecology. However it remains questionable whether the IFR volumes specified at IFR sites could include the BHNR for downstream allocation. The determination of the BHNR has been linked to the ER process in that evaluations have been made to coincide with the IFR sites. Therefore, all Reserve determinations have been performed for mainstream flows.

As such the determination of the BHNR has been performed assuming surface water as the sole source for this water use. While this is not critical to the determination of the BHNR of the Thukela catchment because of the precautionary principles used in the determination, it is unlikely that in water- stressed catchments the BHNR will be met from surface water sources alone, or indeed that it will be sourced from un-impounded stream flow (as opposed to dam impoundment).

The Thukela study is undertaking scoping work on the groundwater component in order to understand the interaction between groundwater and surface water, particularly in terms of base flow. Where groundwater is required in conjunction with surface water, the methodology of determining the BHNR as well as the processes required for implementation and monitoring will be more complex than in the instance of the Thukela Case study. This raises concerns around calls for the BHNR process to be less complex than the ER process. In addition, the Thukela BHNR does not take account of either the water quality or the assurance of supply required to make abstractions possible.

Inter basin transfers (IBT) were excluded from the Thukela case study methodology although in water-stressed catchments like the Sand, the ITB from the Marite (Sabie sub-catchment) may be required to augment flows in the Sand River to meet present water allocations in the Sand catchment and to provide sufficient flow to meet requirements further downstream.

3.1.3 Allocations and licensing

The issues of allocations and licensing are still being debated within DWAF. DFID (SA) is currently undertaking a Water Resource and Service Programme, which has compulsory licensing and allocations as its core. Using the Komati Basin as a pilot, this programme will focus on the development of generic allocation procedures, with a particular emphasis on allocations for the poor.

As discussed earlier, in the absence of Reserve determinations no licensing or compulsory licensing has been carried out. However it is through a combination of licensing and the BHNR that rural water supplies will be met. The option of including some productive water use within Schedule 1 has already been raised and requires further discussion.

3.1.4 Auditing and monitoring

To our knowledge, only a few initiatives have emerged that focus on auditing and monitoring. Given that licensing has not been evoked, auditing compliance is not possible. Nonetheless, a framework for this is required.

The first initiative is a protocol for monitoring of IFRs, which was introduced at a Water Research Commission workshop late last year (WRC, 2001b). This pertains specifically to the ER. The second is an attempt to develop a monitoring framework for the Sand River through the Save the Sand Project which is still in its early stages.

4 ENSURING ADEQUATE WATER SUPPLY FOR RURAL HOUSEHOLDS: IMPLICATIONS FOR RESEARCH AND IMPLEMENTATION

The above discussions indicate a number of gaps regarding both the BHNR and in wider rural water supply. These are elaborated in detail in this section, but can be summarised as embracing both conceptual and methodological issues:

Conceptual issues:

- the need for a clear definition of the BHNR and its relationship to other quantities set for household supplies (RDP; Free Basic Water)
- the need to clarify roles and responsibilities for delivery of the BHNR (national; local)
- the adequacy of the BHNR in meeting household water supply needs
- identification of other approaches to securing water for household requirements

Methodological issues:

- calculating the BHNR (ground and surface)
- integrating water supply plans and water resource management
- ensuring representation of rural household level users in resource management fora (CMAs) and in allocation and licensing decisions.

- ensuring that practical problems do not arise from using domestic water supply systems as means of supplying productive water

These issues are captured in the following discussions.

4.1 Determining the BHNR and its role in meeting household water requirements

4.1.1 What is the BHNR?

Before looking at how to implement the BHNR in practice, it is worth briefly clarifying the issue of *what* the BHNR is. Figure 5 shows how the Basic Water *entitlement* of a reliable minimum of $25lc^{-1}d^{-1}$ within 250 metres of a person's residence relies on both a sufficient *stock* of water, and the *mechanisms* (infrastructural and institutional) to deliver it. In terms of ensuring that the entitlement is met a stock without delivery mechanism is as useless as a delivery mechanism without sufficient water resources to draw upon. The BHNR is therefore a stock. It must be sufficient in the right quantity at the right time in the right place to ensure that whatever delivery mechanism has been developed can bring it to peoples dwelling places.

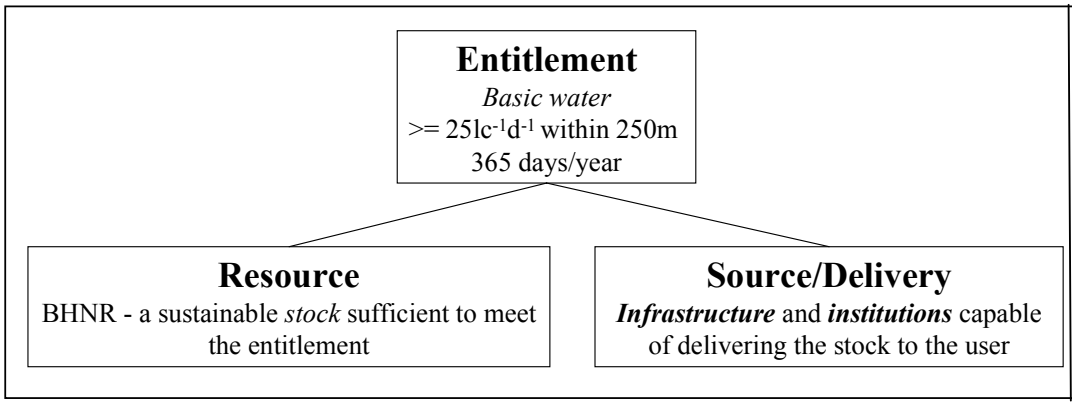

Figure 5 Relationship between the BHNR and delivery mechanisms in ensuring the basic water entitlement

Both of the case studies presented in the previous section (Sand and Thukela) point to the notion of the BHNR as a variable amount. In the case of the Sand the increase in the BHNR was considered for the entire population. In the case of the Thukela, the BHNR was contingent on present living standards. In the light of the aspirations of the original national water policy (Box 1) it would seem that the Thukela approach is more in line with original thoughts on how the reserve should be developed. Nonetheless, basing calculations on different levels of "basic needs" for different sections of the community within a single catchment risks confounding the principle of equity in that it may simply further perpetuate the divide between "haves and have-nots" i.e. if you already have access to better services then you "acquire" a right to a larger BHNR. Taking this risk into account a modification of this approach would be to base initial BHNR calculations on a function[5] of the highest level

[5] For example the mean of the service level enjoyed by the upper quartile of the population, or the design service level of the best served town in the catchment

of service already enjoyed in the catchment.

The alternative to this is an approach to calculating the BHNR based on the RDP minimum standard. This in raises two important questions. Firstly whether 25 $lc^{-1}d^{-1}$ is sufficient to meet *minimum needs*. And secondly how to deal with the rights of communities who already receive service levels greater than RDP. Importantly, the figure of 25$lc^{-1}d^{-1}$ is not cast in stone but is rather a commonly used figure for an absolute minimum entitlement, it is also clearly identified as a *starting point* and not a final aspiration. It could be argued that this amount should be increased (to for example the WHO minimum of 40 l $c^{-1}d^{-1}$).

In either case, and regardless of the initial calculation of the BHNR it is clear that future projections of the BHNR should then be made on the basis of both demographic growth and rising norms for service delivery.

Following on this theme, and given the fact that the BHNR is an individual right, it is argued that the following imperatives should prevail for the determination of the BHNR

1. It should be determined for *all residents* of a catchment (and not be restricted to those people neighbouring a stream, for example), and on the basis of a fully reliable 365 day per year supply based on some agreed level of (drought) risk.
2. it should be an *equal amount* for all catchment residents
3. since it represents a stock used to meet an entitlement it should not be driven by economic imperatives (e.g. affordability). This point is supported by the recent announcement of Free Basic Water which entitles are households to 6000 l of free water per household per month.
4. changes to the BHNR should be planned over time to deal with population dynamics and increases in delivery level (Figure 6)

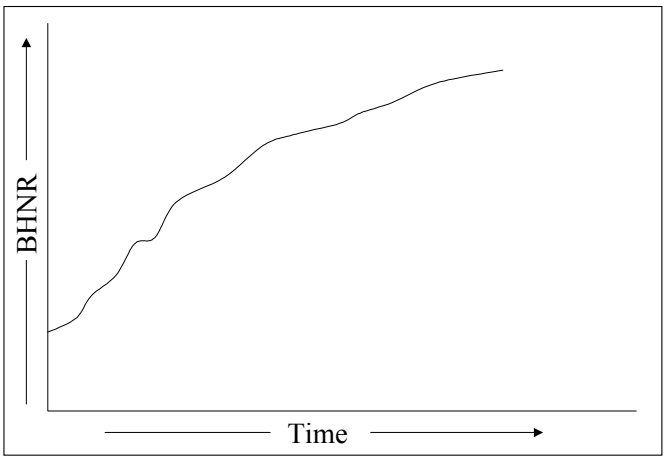

Figure 6 Changes in population (births, deaths, migration etc.) and service level will lead to a constantly evolving BHNR

An equally important issue pertaining to discussions of the BHNR is that of how and where to assess it. It is clear that the BHNR cannot be a fixed amount because it is not in itself an entitlement but rather the stock needed to meet an entitlement. In other words, providing 25

$lc^{-1}d^{-1}$ in a river, dam, or aquifer does not ensure that this is what the end user will receive because the water has to be transported from source to user and storage and conveyance losses will lead to important quantitative reductions. This does not mean that the BHNR value should necessarily vary widely but it does suggest that some factor of safety needs to be applied depending on the source and the infrastructure in question.

Equally, because the entitlement will be met using different sources in different parts of the catchment (ground or surface within the catchment, or bulk supply from outside the catchment) it will be necessary to disaggregate the BHNR to ensure that it is met at each source (abstraction) location.

Finally, the need to ensure a reliable 365 day per year supply means that (in contrast to the Ecological Reserve) the BHNR does not vary over time. For an unimpounded river this means the inclusion of the BHNR within the IFR calculations, ensuring that daily BHNR and ER combined do not exceed the expected minimum yearly low flow for a given time period (i.e. based on a 50 year drought). For impounded or stressed systems surface water systems as well as for groundwater, it means ensuring an adequate level of buffering or storage to deal with periods of water stress or drought (WRC 2001a). Both dams and groundwater must therefore be dealt with in terms of ability to provide storage to meet the BHNR over some pre-determined period - (for example, a minimum safe requirement might be two years capacity from being completely full – thus allowing for one fully missed rainy period.).

In summary it is suggested that the objective of assuring a sufficient stock to meet supply entitlements should form the basis of the BHNR. From this the quantity of water necessary to meet it should be calculated with the inclusion of a reasonable factor of safety. Identifying what such a factor should be will form part of the work of the WHiRL project.

4.1.2 Assessing the relationship between the BHNR and Free Basic Water

It is clear the locus of responsibility for *allocating* the BHNR rests with National DWAF (Figure 2). However, the provision of water and sanitation services in general, and Free Basic Water (6000 l per household per month) in particular rests with Local Government. Two questions therefore require clarification.

- Firstly, what is the relationship between the BHNR and domestic water services – is it indeed correct that any reasonable level of domestic water supply is covered by the BHNR or rather that this should be restricted to sufficient water to meet only the 25 $lc^{-1}d^{-1}$ (RDP) or 6000 l per family per month (Free Basic Water) norms.
- What is the role/responsibility of local government in the *identification and safeguarding* of the BHNR?

These issues are particularly relevant in any awareness raising/ training initiative, particularly when they involve local stakeholders. In the case of local and district municipalities (the institutions directly responsible for transferring much policy into practice) and understanding both concepts is critical to being able to take responsibility for them.

4.2 Addressing rural water needs above the BHNR

In addition to the problems of establishing the BHNR, insufficient thought has been given to the mechanisms by which allocation of water for use by rural communities above and beyond the BHNR will be implemented (see for example, Schreiner & van Koppen, 2000; Perez de Mendiguren & Mabelane, 2001). Two options exist: Schedule 1; and allocation and

licensing. The "reasonable use.." recognised under schedule 1 is open to interpretation and may well accommodate some productive uses, but how much? With licensing as a more concrete option at this point, the issue will be to assess how the voice of rural communities can be brought to the licensing table.

Rural communities use water for a wide range of productive and domestic uses, *all* of which are important to their livelihoods. There is strong evidence that where service levels are increased this has a direct impact on poverty reduction. Work in the Sand River Catchment has already made clear that rural people have the capacity to make effective use of quantities of water far above those provided for in the BHNR (Perez de Mendiguren & Mabelane, 2001). Identifying mechanisms to ensure that rural users have a strong voice in allocation and licensing will be critical in using water resources to tackle poverty. One possible mechanism for addressing rural water supply needs, certainly at the household level, would be by including an expanded allocation of household water within Schedule 1, thus ensuring that household water use above the Reserve minimum would have statutory first call on allocable water resources. Nonetheless, this issue is still be debated by the Department (Mr. Versveld, DWAF, pers. comm.; see also Schreiner & van Koppen, 2000). Additionally, research that provides clear frameworks for water demand by rural communities would expedite this issue.

Finally it is important to note that currently water services and water resource management appear to operate in a vacuum or 'despite each other'. District municipalities, on the one hand, have developed various planning documents (Water Service Development Plans, Integrated Development plans) on a district basis. Water resource management, embraced in a catchment management plan, on the other hand, subscribes to catchment boundaries. District boundaries often transect multiple catchments. The Bohlabela District for example, into which the Sand River Catchment falls, traverses the Sabie, Sand and Olifants catchments and the water supply plans utilise water from all three catchment. How can integrated water resource management really be achieved for each catchment if water resource managers and suppliers do not integrate their planning initiatives?

5 THE WAY FORWARD: TOWARDS A REALISTIC ESTIMATION OF RURAL WATER REQUIREMENTS

The paucity of existing approaches, specifically for the BHNR, and for ensuring rural water supplies over the BHNR have been raised. The collaborative efforts of the WHiRL project and the Save the Sand offer, respectively, a vehicle for providing information regarding household water demand within the Sand and for implementation. The persistent water shortages experienced by rural communities in the Sand Catchment make this need even more pressing. Given this, future research will focus on a number of key issues within the Sand River Catchment. These will include:

- Further clarification of the concept of the BHNR (quantity, source or supply)
- Further clarification of the concept of the ER (and interactions between the ER surface water and ER groundwater)
- The importance of groundwater contributions to BHNR
- The role of groundwater/ surface water interactions
- The relationship of ER and BHNR
- Methods for the determination of the BHNR
- Methods for ensuring that both BHNR, Schedule 1 and licensing are used to ensure an equitable share of water resources for poor rural inhabitants of the Sand

Given the fact that the BHNR is dependent not only on the population in question but also on both the source(s) used and supply, the *spatial issue* (be it of source or supply or both) is a key consideration. Although the linking of the BHNR to the surface water ER is an important component, the focus on surface water alone is not a useful point of departure if the BHNR is considered to be an entitlement for all catchment residents. To reiterate, this is because the BHNR for rural communities is likely to be served through groundwater as well as through surface water. In the Sand River Catchment, for example, it is estimated that some 60 - 70% of the population is currently served by boreholes and springs. Thus, in order to move from the very simplistic RDP norm of 25 $lc^{-1}d^{-1}$, and to address the spatial issues of source and population settlement patterns within the catchment, a new approach is required.

Linked to this is the concern that in the rural parts of South Africa where AWARD work, a further barrier to implementing proper catchment management, and by extension rural water provision, is the lack of reliable information regarding current *water use or demand* by rural people. Although water use has been the subject of a number of investigations the methodologies are often questionable. In addition they address neither the issue of water resource availability, nor do they provide a comprehensive analysis as to why current extensive (and costly) bulk infrastructure fails to deliver even the minimum water requirements is sorely absent.

With regard to the issue of water demand, an initial step for the project will be to develop a linked geographical information system and simple water balance model which will collates primary and secondary sources of data to support initial reserve determination. This system will be developed within the framework of a decision support system, with the intention that it will be further developed later in the project as part of a support package for catchment stakeholders. It will draw on both Save the Sand work to identify large scale current water use within the catchment, and work being conducted through the WHiRL project to identify both current and potential demand for water at a household level. The DSS will be based on the premise that securing rural water supply needs (both the BHNR and additional rural water needs) is intimately linked to the process of allocation and licensing, and to Reserve determination. Box 6 is a simplified version of the steps that should be taken for identifying the ER and BHNR for the Sand Catchment. However it is planned that a simpler three-step procedure will be followed during the next 6 months. The steps are to:

(a) develop preliminary estimates of both the BHNR and of likely demand by rural users
(b) identify additional data and information needs
(c) identify other priority activities including the development of information products necessary to support local and municipal level stakeholders in participating in rural water allocation decision making.

The results of both initial reserve determination and discussions with local stakeholders will be reported in an update of this working paper later this year. Following this, and starting in late 2002, a number of additional issues will be addressed These are likely to include the following:

Box 6 Steps for identifying the ER and BHNR for the Sand Catchment

Main Steps	Main Outputs
1. **Secondary data consolidation**	• GIS database containing relevant secondary information.
2. **Fieldwork and primary data collection**	• IFR sites located and aquifer response units delineated. • Updated GIS database containing sufficient information to set and disaggregated BHNR, ER(surface) and ER(groundwater) for each IFR and groundwater response unit.
3. **Data processing and analysis**	• Spatially and seasonally distributed information on the current status of water resources and trends in use, demand and availability along with additional information needed to set the reserve.
4. **Set current and desired classes for groundwater response units, geo-ecological zones and rivers**	• Parameters that set the limits of surface and groundwater extraction between IFR sites and for each groundwater response unit.
5. **Develop scenarios and model potential benefits, impacts and tradeoffs associated with each scenario**	• A set of "acceptable" scenarios along with explicit information on potential impacts on net productivity, poverty, ecology etc and the relative tradeoffs associated with each scenario.
6. **Share consolidated information, scenarios & modelling inputs**	• A set of "acceptable" scenarios that have the approval of stakeholder groups.
7. **Decision making process**	• A scenario is selected that: o Sets the current and desired class for each resource unit and groundwater zone; o Sets ERsw for each resource unit and ERgw for each groundwater zone; o Identifies the groundwater and surface water reserves to meet BHNR in real time; o Identifies the storage components of the surface and groundwater reserves to meet BHNR during dry seasons and periods of drought; o Lists management responses when surface and groundwater limits of acceptable change have been reached; o Disaggregated and seasonal volumes of water that can be allocated for productive and other non-essential uses.

- Firstly, as stated earlier the role of local government in terms of the *identification and safeguarding* of the BHNR is unclear. Presently they are faced with the challenges of delivering water and sanitation services and most critically Free Basic Water (which may, in effect, represent the entitlement side of the BHNR). Prior to identifying the role of local government in setting the BHNR the relationship between basic water *services* and the BHNR must be clarified. Moreover, local councillors who would represent peoples' rights particularly in cases where the BHNR is not being met, have limited knowledge regarding the concept of the Reserve. Local government therefore represents a key target for future awareness raising regarding the implementation of BHNR and licensing work.
- Secondly, there are a range of management issues that require addressing to ensure the

proper linking of water service delivery infrastructure and the BHNR as the stock that supplies them. For example, the identification of river abstraction points and the calculation of a local BHNR to ensure their supply, or the management of groundwater through zoning, may become an important management consideration, particularly for local-level water supply institutions such as water committees.

- Thirdly, within the broader context, the protocol for the BHNR determination needs to be integrated into an overall Reserve Determination approach and into the Catchment Management Strategy. How links between stakeholders in rural water supply (particularly between local government) and the emerging CMS for the Inkomati can be formulated requires further examination.

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