SUMMARY OF

Catchments, Sustainability & The Reserve

WWF *for a living planet*®

Preface and Acknowledgements

This booklet is part of a series to support a capacity-building initiative for Catchment Forums and Water Users Associations in the Olifants-Doring Water Management Area of the Western Cape. This initiative is a pilot, for possible implementation elsewhere in South Africa. The booklet is therefore designed to be used throughout the country.

Compiled by Lawrence Sisitka
heilaw@imaginet.co.za

Artwork: David Jackson (cover illustration) and Tammy Griffin

For more information on the materials and the capacity-building initiative, contact Rodney February rfebruary@wwf.org.za.

NASPERS FETWATER water & forestry Department Water Affairs and Forestry REPUBLIC OF SOUTH AFRICA TLF

CONTENTS

Introduction

This booklet explains the new approach to water resources and their management, which was introduced by the National Water Act, Act No. 36 of 1998. We look at why it is so important to manage our water resources better, and at the principles and procedures which DWAF, the Department of Water Affairs and Forestry, has introduced to guide and support this process.

We introduce complex ideas like Sustainability, Integrated Water Resource Management, Resource Directed and Source Directed Measures, the Classification of water resources, Catchment Management Strategies and the Ecological Reserve. We do so in as straight-forward a manner as possible. At the end of the day, all water users should be able to work with these ideas at some level.

The booklet will therefore explain why:

- We no longer look at water as separate from the rivers, wetlands and underground aquifers which are the sources of our water.
- We recognise that water resources (aquifers, rivers, wetlands and estuaries) are connected, in *catchments*, where they are also intimately connected to the land itself, and to our livelihoods and economic activities.
- We need a new way of looking at conservation and development, not as forces pulling in opposite directions, but as two sides of the same coin, supporting each other. The idea that captures this connectedness, is *sustainability*.
- We are forced to work towards sustainability, as we live in a country with high pressures on scarce water.
- Government has introduced the idea of a Reserve, to meet basic human needs and address the long-term sustainability of our water resources.

Each resident of a catchment can contribute to the more sustainable use and management of the water resources in that catchment. In order to do so, however, one needs a basic understanding of the key concepts, and how they play out in practice. While this book provides an overview, others have more detail, especially on the practicalities. Use this booklet therefore

with other resources, including the other booklets in this series, and the accompanying CD of source documents.

This overview is complemented by the overviews of laws and policies, water management institutions, and the classification system - tools for managing our catchments and water resources more sustainably. In addition, four booklets on our water resources provide more detail about their ecological functioning, and the practical actions we can take to manage them better. See *To Find Out More*, on page 39, for their details.

Managing Catchments – A New Way To Manage Water

Catchments – All About Connections

Water resources include groundwater and surface ecosystems like rivers, estuaries and wetlands. Wetlands can include rivers and estuaries, but the term is more commonly used to refer to water resources like vleis, lakes, pans and seeps. The term water resource refers to the water and the ecosystem in which it occurs.

It may take a bird's eye view to see water resources as connected to each other. For children playing on the banks of a river, 'their' river may actually seem like the whole world! It is only as we grow older, travel or go to school, that we may come to see the connections between, say, a river and the sea, or the river and a distant mountain spring, or between the river and the ploughing of fields, the clearing of trees, or the town's sewage works.

The idea of a 'catchment' gives us the bird's eye view on the many connections of our water resources. If we were to fly high over the area of land from where water drains into a particular river system, we would be looking at that river's *catchment*. This land 'catches' rain water (and other forms of precipitation like snow) and feeds some of it into the river.

Catchment – the area of land which contributes water (as well as sediment and other surface-derived materials) to a river. The boundaries between two adjacent catchments are the highest points between them. From these ridges, water either flows in one direction to eventually drain into one river system, or in a different direction, to drain into another river system.

When rain falls, much of it is taken up by plants, and 'breathed out' again into the air (transpiration), as part of the water cycle. Water also evaporates directly into the air, especially from large open surfaces. The rainwater which is not lost to evapotranspiration either drains under ground, or drains over land towards lower levels (surface run-off). Both groundwater and surface run-off feed into rivers. Some groundwater can seep into rivers from other catchments. But most of the river's water comes from its catchment. The chemistry and quality of the water in the river is therefore strongly influenced by the nature of the land through which it comes.

Bigger rivers are formed and fed by tributaries. Each tributary can be said to have its own, smaller catchment. That tributary may even have smaller tributaries contributing to it. So a river catchment is made up of many smaller catchments: primary, secondary, tertiary and quaternary catchments.

Catchment Connections – Water Resources are Connected

From our bird's eye view it is easy to see how one river is connected to other contributing rivers. We can also see how the upper reaches of the river connect to the middle and lower reaches and eventually, the sea. In fact, we don't have to be up in the sky to see this. People who live downstream of a dye factory can see the effluent from that factory flow past, and may feel the effects on their skins when they use the water. Farmers who farm along the main stem of a river, downstream of an area with many dams along the tributaries, know that if their upstream neighbours extract or dam more water, there is less for them.

It is not just the parts of a river that are connected to each other; different water resources in a catchment can also be connected to each other. Sometimes the connection is obvious, for example a river which starts in a wetland. Often, however, the connections are hidden, even to the bird's eye viewer, because they may be underground. Groundwater can connect a distant wetland and a river, for example. Groundwater systems themselves are connected, and when a borehole dries up, or the water table in a wetland drops, it may be because much water is being extracted elsewhere in the catchment – from other boreholes, or from a river which may have been feeding the underground source.

The following diagram illustrates the multiple connections that are possible between water resources in a catchment:

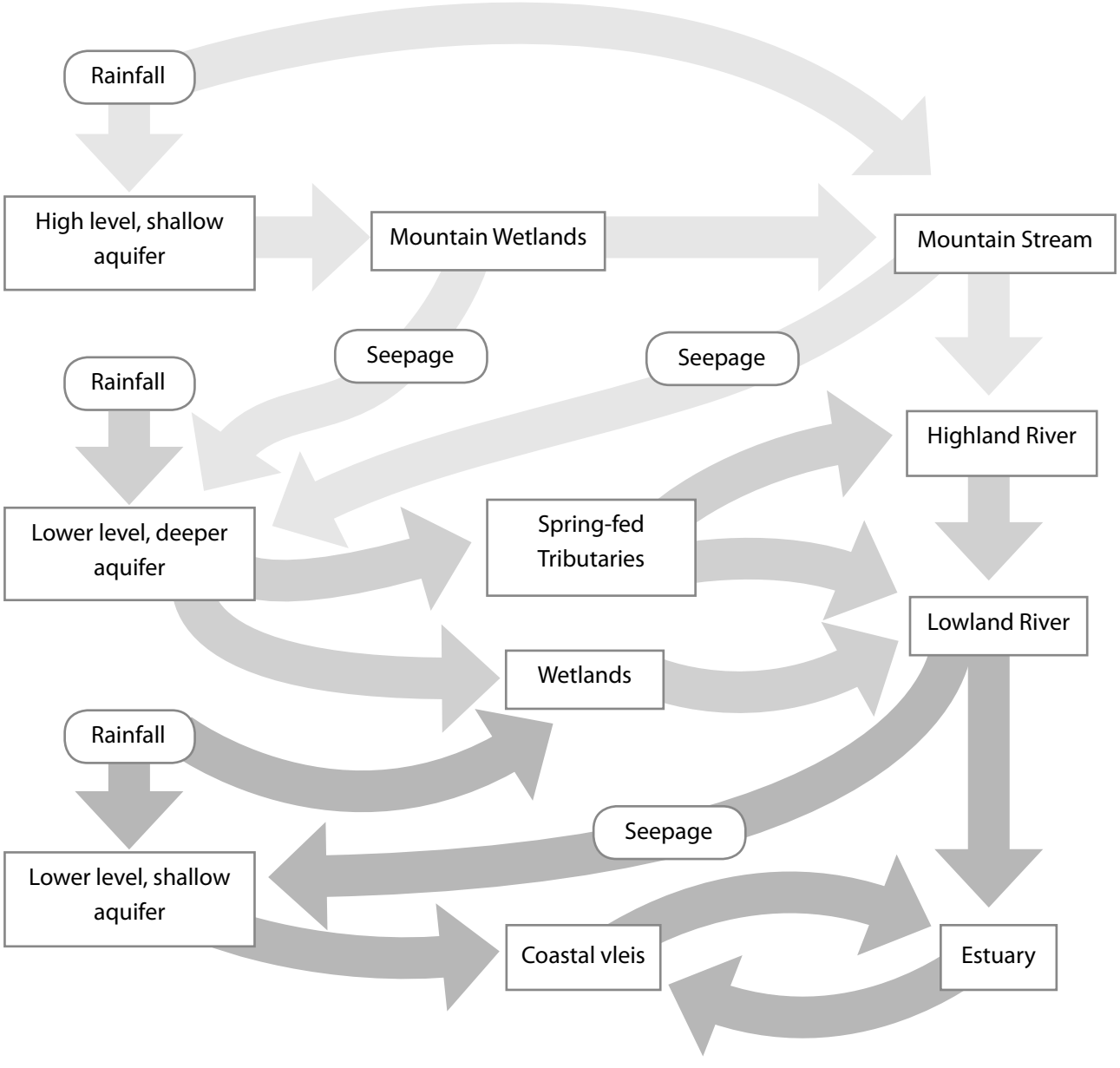


Figure 1: Water Exchange between Catchment Components (From *Taking Care of Groundwater*, compiled by Lawrence Sisitka)

Catchment Connections – Water Resources are Connected to People

To remind ourselves that water resources are also connected to people, we can take another flight – this time over the whole country. If you have never taken a plane ride, pretend you can take a train from Bitterfontein in the Northern Cape, via Pofadder, Upington and Johannesburg, to Durban.

Compare Pofadder to Upington: both towns are in a very dry part of the country, but Upington is on the banks of a large, permanent river (the Orange River), while Pofadder has no water in sight. This clearly makes a big difference to the people who live in these towns, including the kinds of economic and livelihood activities they can undertake.

Now compare the dry west and north-west of the country to the wetter eastern parts. Note again the different kinds and levels of activities, especially economic activities. To a large extent, it is the availability of water that makes the difference! It is water, to a large extent, which determines whether you can farm with cattle or with goats; the available water supports either sparse scrub or lush grass, small ephemeral rivers, or strong-flowing permanent rivers.

When you stop over in Gauteng, you may well wonder where the water comes from that supports this economic heartland. Here, wealth was originally built on mining, but in order to achieve and sustain the level of growth we witness today, water had to be brought, at great expense, from the Tugela River in KwaZulu-Natal, across the Drakensberg mountains, into the upper catchment of the Vaal River, to urban and industrial Gauteng. A second, even more elaborate scheme was necessary; the Lesotho Highlands Scheme sees South Africa buying water from a neighbouring country, channelling it from the upper reaches of the Orange River in Lesotho (Senqu River) to the Vaal River.

Just as the distribution of water resources influences people and their activities, our activities influence our water resources. Some examples are:

- Planting forests in upper reaches, reduce surface run-off that feeds rivers and wetlands.
- Clearing alien trees can increase run-off to feed rivers and wetlands.
- Ploughing close to river banks remove the vegetation which acts as a buffer that protects the river to some extent from polluted run-off and soil erosion.
- Fertilizer in the run-off from golf courses and other areas turn fresh water green – with slimy overgrowth of algae and water weeds, which suffocate water life and contaminate drinking water.

- Draining wetlands or otherwise damaging them affects their buffering and purifying functions, so that other water resource receive more polluted water from them, floods are worse, and low-flow during the dry season, is reduced.
- Pollution from landfill sites and informal settlements can seep into groundwater from where it can eventually contaminate other water sources.
- Polluting rivers lead to pollution in estuaries and the sea.
- Increasing water extraction from rivers reduce the amount of fresh water in estuaries, hence changing the communities of plants and animals that can live there, and can eventually cause the mouth of the estuary to close up; this has effects on the marine ecosystems and fishing industry, since many sea fish use estuaries as shelter during part of their life cycle.

Catchment as Management Tool

To repeat then, the idea of a catchment is a way of looking at water as connected – to ecosystems, to the land, to other water bodies, and to people and their activities. The examples above may give the impression that the idea of a catchment is meant to make use feel bad about being here on earth, but that is not the case! Ultimately, the idea of a catchment helps us to come up with better ways of managing our water resources. The proposed way forward, to do just that, is through what is known as Integrated Water Resource Management.

Integrated Water Resource Management

Integrated Water Resource Management (IWRM) is a new way of looking at managing water. All the processes described in this book make up IWRM.

Why the term 'integrated'? What is this new way all about?

- Water allocations are considered in relation to all stakeholder needs: domestic water users, urban and industrial users, and so on.
- Water allocations are also considered in relation to future needs or uses and future users – the sustainability of the resource.
- Water is managed not only in terms of allocations of the available supply, but as part of an ecosystem or water resource. So, rather than just managing the water (e.g. just sharing out or licensing water), authorities are meant to manage the river (the water resource). This means managing an ecosystem (water flow and quantity, water quality, river bed and banks (riparian area), plant and animal life in the water and along the banks) as a whole (integrated).

- Water resources (for example surface water and groundwater) should be managed in relation to each other, and to the rest of the catchment.

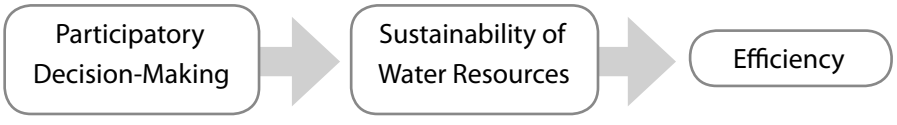
This kind of 'integrated' management is a challenge. It requires cooperation between different authorities, and different communities living in the catchment. For example, the Department of Water Affairs and Forestry needs to work with the Departments of Agriculture, Environmental Affairs and Land Affairs, as well as municipalities and nature conservation. Communities who have previously had little interaction with each other, from across cultural and socio-economic divides, need to sit down together to discuss their separate and common concerns in their catchment. These sorts of discussions are not always easy, and putting them into practical management plans can be even harder. A proposed ways in which to achieve this, is through the development of a Catchment Management Strategy.

The Catchment Management Strategy will include goals for achieving a certain quality and use value from the water resources in that catchment, and action plans and timeframes for achieving the goals. The goals will be based on a number of measures which the National Water Act (Act No. 36 of 1998) has introduced. Let us therefore examine this, our new Water Law, next.

Directions From The New Water Law

Key Features of a Historical Shift

The new Water Law is based on three principles:



South Africa's previous water law was based on a rights-based approach to water. Water was tied to property or land. Those who owned land, had the right to the water associated with that land. In combination with other laws (such as those preventing Black South Africans from owning land) this led to the political unevenness in access to water which we still have today. This is over and above the fact that water distribution is also naturally uneven, due to climate differences across the country.

The new Water Law (The National Water Act of 1998) takes a different approach. It emphasises:

- the need to share water fairly
- the need for efficiency (using water productively and with no waste), and
- the need to use water sustainably.

The Act is informed by a carefully researched understanding of where our water comes from (the water cycle and water resources in catchments) and how best we can maintain the supply. Hence, *the new Water Law defines the river (the entire river ecosystem), and not just the water that can be abstracted from the river, as the resource to protect*. It also defines groundwater, rivers, riparian areas and wetlands as water resources to protect. Finally, as we saw above, it promotes *integrated* water resource management, on a catchment-wide basis.

Another of the key features of the National Water Act of 1998 (NWA) is that it introduces shared responsibility for the management of water resources.

While the Minister of Water Affairs and Forestry remains the custodian of the national water resource, the Act makes the management of water resources a partnership between local water users, regional catchment managers and DWAF.

Although the new NWA places an emphasis on ecological sustainability, it is in fact an anthropocentric or people-centred law. This is reflected, for example, in the following statement from the *White Paper on a National Water Policy for South Africa*:

> ***"The objective of managing the quantity, quality and reliability of the nation's water … is to achieve optimum, long term, environmentally sustainable social and economic benefit for society from their use." (DWAF, 1997)***

Even one of its key concepts, the Ecological Reserve, has benefits for people in mind, as we will see below.

The Practicalities – Measures and Strategies to Give Life to the Principles

The principles of the National Water Act need to be put into practice. To this end, the Act has two broad sections. One deals with Source Directed Measures, and the other with Resource Directed Measures. These Measures involve concepts which are eventually translated into measurable objectives for managing water resources. They are brought together in management plans in what is known as Catchment Management Strategies. We will briefly examine these processes, which will become clearer as later sections provide more detail on how they work.

Source Directed Measures

These measures are used to manage and control land-based activities in the catchment which have an impact on water quality, especially sources of water pollution. Source Directed Controls include:

- Standards for controlling the quality of waste discharge.
- Requirements for the prevention, mitigation and cleaning up of pollution.
- A system which authorises water use and issues licenses.
- Requirements for environmental impact assessments as part of the process of evaluation of water use licence applications.
- Best management practices for construction of dams and weirs, disposal of solid waste, application of pesticides, or construction of roads in or near the riparian zone.

Source Directed Measures can be enforced, if necessary, by prosecution. They work hand in hand with economic incentives for managing water quality and quantity. The economic instruments for which the NWA makes provision includes:

- water pricing,
- waste discharge charges,
- rebates for the return of treated wastewater, and
- penalties for non-compliance and pollution, whether deliberate or accidental.

Source Directed Measures Complement Resource Directed Measures

Resource Directed Measures

These set targets for the quality of the water resource itself, and relate to (1) volume of water, (2) quality of water, (3) habitats for wildlife and (4) biota (communities of plants and animals).

The Resource Directed Measures (RDM) form the basis for much of the discussion in this booklet. They consist of three broad tools:

- Determining the Resource Class (Water Resource Classification)
- Determining a Reserve for the Resource
- Setting Resource Quality Objectives

Determining the Resource Class is discussed briefly below, and more detail is given in a separate booklet, *Guide to Water Resource Classification*. The Reserve is discussed in some detail later in this booklet, and Resource Quality Objectives will be introduced in relation to the implementation of the Reserve.

Catchment Management Strategies

A Catchment Management Strategy brings together the RDM processes: It incorporates the chosen Resource Class and the Reserve which has been determined, and the Resource Quality Objectives which have been set for each significant water resource in the catchment. As such the Catchment Management Strategy is at the heart of Integrated Water Resource Management.

Developing and implementing a Catchment Management Strategy is a way of considering all the different water users and their needs among the communities of a catchment, as well as future needs and uses, and to plan accordingly. It must be developed by a Catchment Management Agency (CMA, see below) which represents relevant specialists and stakeholders, and which is assisted by the regional and national offices of DWAF.

The *National Water Strategy* (see www.dwaf.gov.za) provides guidelines for drawing up a Catchment Management Strategy, which must be aligned with the National Strategy. These guidelines are also are summarised and explained in an easy-to-follow guide, *Guidelines for Developing Catchment Management in South Africa* (DWAF, 2007a).

A Catchment Management Strategy actually consists of a number of sub-strategies. Some of these are **facilitatory sub-strategies**, which help the CMA to do its job. They include strategies for consultation with the stakeholders, communications and finances.

Central to how water resources and the catchment would be managed, are the **resource management sub-strategies**. There are two sets of them, which must work together. The RDM sub-strategies are strategies for the achievement and maintenance of Resource Quality Objectives which would have been set in relation to the chosen Management Class for the resource unit, and the Reserve. The other set involves the sub-strategies for Source Directed Controls.

To put all this together, and to ensure coordination and collaboration between the different users and authorities responsible for both water use and related land-use in the catchment, one also needs an **integration strategy**.

But why should ordinary water users know all this detail? Is this not simply a government responsibility, that should be communicated to us? The answer is no: the NWA requires water users to become actively involved in water management and related decisions. Provision have been made for this, through various water management institutions.

Water Management Institutions – CMAs, WUAs and Catchment Forums

A vital component of Integrated Water Resource Management, as introduced by the National Water Act (Act of 1998), is the gradual sharing of responsibility and authority of water resources. Key among the water management institutions with whom responsibility will be shared, is the Catchment Management Agency (CMAs). The NWA divides the country into 19 Water Management Areas. Each of these Areas will eventually have a Catchment Management Agency.

The CMA is a statutory body which must be approved by the Minister of Water Affairs and Forestry. As such it has various roles and responsibilities, which are described in the booklet *Summary of Key Water Management Institutions*, in this series.

Earlier we saw that the CMA has responsibility for developing a Catchment Management Strategy. The CMA also has responsibility for implementing and monitoring the Strategy. In addition, the CMA must consult with stakeholders in the catchment, that is, people whose actions (such as water use, discharges, and land use practices) will affect or be affected by the Integrated Water Resource Management process. In all these processes,

CMAs can receive inputs from Catchment Forums, and Water Users Associations (WUAs, see *Summary of Key Water Management Institutions)*.

Catchment Forums are the main platforms for consulting the broad range of communities and interest groups in a catchment. WUAs represent their own interests as registered water users. Members of Catchment Forums, Reference Groups and WUAs will be consulted on matters related to the management, protection, conservation and sustainable use of the water resources in their catchments. As such, it is important that everyone has a good basic understanding on the principles which underpin the National Water Act, and how they play out in practice. These key principles are Equity, Efficiency and Ecological Sustainability.

Many water users, particularly those who have lived and worked in a catchment for years, have a good understanding of those aspects of water resources which affect them directly. It is generally harder to develop a long-term view on water resources, in relation to each other across a catchment, and in relation to future needs and ecological sustainability. We give some attention to these matters in the next section.

Sustainability

A New Look At Development & Conservation

Why this new buzz word, *sustainability*? Although the word might not always achieve what we would like it to, there was good reason for coining the term. The idea was to come up with a term that would show that conservation and development are not opposing forces which pull apart from each other. We could in fact look at conservation and development as two forces which mutually support each other, like two sides of the same coin.

For this to be truly the case, however, we need to look at both conservation and development in a special – new way. We cannot continue with 'business as usual'!

Conservation takes place not only in game parks and nature reserves, but everywhere where there are natural resources. Farmers practice conservation on their farms when they protect the indigenous vegetation in the buffer zones along rivers, for example.

On the one hand we, and our conservation agencies, need to recognise that *conservation* is not about keeping people away from nature. It is about looking after nature in such a way that people benefit, now and in the long run. For example, protecting marine areas replenishes nearby fishing stocks. Managing National Parks so that visitors can enjoy the wildlife, and locals can be employed, is a form of development which brings millions of rands to South Africa each year.

Sustainable development should be about ***a new approach to development***, which considers ***economic justice*** or fairness, as well as the ***ecological aspects*** of the resources on which development ultimately depends.

On the other hand, we also need to recognise that *development* cannot continue in the same vein as before, when little attention was given to whether poor people really benefited from a particular development, and to how nature has been affected in the process. Some forms of development actually cut jobs, or reduce people's livelihood options. Forms of development which do not calculate losses to natural capital, are unsustainable in the long run.

Sustainability is about being able to sustain a good quality of life, now and into the future. It is not about growing and growing until the earth collapses under our weight! It is about making wise decisions so that the earth can sustain or carry us, and the generations after us. This applies on the scale of

the earth itself, but also on the scale of a country, or a single catchment, or farm.

We all know of places, farms, or parts of the country which have been managed badly, or forced to carry too many people, and can now no longer sustain those people and a good quality of life.

We also know that while development as we know it has benefited many people, many more have been systematically excluded from its benefits. Apartheid policies systematically prevented Black South Africans from owning land and property (the basis of development), subjected them to a form of education which ensured a labour force with limited skills, and discriminated against them in the economy, even though they contributed fundamentally to its growth.

To undo the damage of these years of exclusion requires a long road of recovery, in which equity and ecological sustainability must be uppermost in our decision-making. It is for this reason that the National Water Act gives such emphasis to these principles. It is particularly fitting, because water is so central to development and to equity. Water is also central to South Africa's future – whether we can continue to develop and meet the expanding social needs, or whether we face the collapse of ecosystems and the closing down, rather than opening up, or development opportunities.

South Africa's Scarce Resource

Almost all of Southern Africa is classed as a dryland by world standards – drylands being semi-arid regions which receive 200–500 mm rain per year. Our mean annual rainfall is 475 mm per year. Only a narrow band to the east, which receives more than 500 mm per year, is classified as humid.

To make matters worse, as much as 90% of the rainfall in a particular area can be lost to evapo-transpiration. In Gauteng, the amount of water lost to

evaporation is twice the amount of rainfall. In the lower Orange River valley, evaporation is 10 times as much as the rainfall (Davies and Day, 1998, pages 30 and 39). What this means, is that there is no water surplus in South Africa – the country as a whole has a massive water deficit.

The high rate of transpiration is partly due to high temperatures in summer, when the bulk of the country's rain falls. It is also due to our topography, the shape of the land. Unlike East and Central Africa, Europe and North America, we have few natural lakes in which water can accumulate. Our land is an old one, and erosion has had time to flatten the earth and fill in most depressions where water could have collected. And because Southern Africa has escaped the major Ice Ages, we do not have deep glacial valleys, either.

Further to this, our rainfall is highly seasonal, which means that there is always a dry season (either winter or summer). And the rainfall is erratic, meaning that from year to year, we cannot be sure how much rain we'll get. Both droughts and floods are common.

Scientists predict that global warming will cause even greater extremes in our weather patterns: that over time, the periods between rainfall events will become longer, and that when rain falls, it will fall harder and faster. This means that both droughts and floods are likely to increase, if the climate changes as predicted.

It is clear that we need to think about water in terms of sustainability. Development requires water. Agriculture, industry, tourism and people's livelihoods and quality of life, are all dependent on the availability of water. Our simple examples of Pofadder and Upington illustrated this.

- South Africa has close to the lowest conversion of rainfall to usable runoff from rivers of all countries in the world (SA: 8,6%, compared to Australia: 9,8% and Canada: 66%).
- South Africa has a surface area of about 1 220 000 square kilometres, of which about sixth (roughly the area of the United Kingdom) has no significant run-off. The only water available here is brackish groundwater.
- About half of the rain that does fall is caught and stored in dams; 8% runs through rivers, the rest drains into the soil or is lost to evapotranspiration.
- South Africa's population increases by about a million people each year.
- In search of work in an economy, millions of South Africans stream to the cities, reflecting that the resources in rural areas can increasingly not sustain the population, or provide reasonable livelihoods. This puts disproportionate pressures on water resources feeding urban areas, many of which are already stretched to the limit.
- The demand for water increases exponentially. To keep up with the demand, more dams were built between 1971 and 2000 than had been built between 1952 and 1970. About half of South Africa's rainfall is already dammed.

- If total surface water resources were to be combined with the lowest rate of population growth and the total exploitation of the amount of groundwater we think we have, permanent drought can be held off until about 2040 at best. In reality several factors might bring this date forward.
- Because both demand and supply are distributed unevenly across the country, some areas will experience permanent drought and water shortages before this date.

Adapted from Davies & Day, 1998, pages 315–316.

For how long can we sustain development in South Africa, given our water shortages? How best can we use the available water, in order to not only maintain development, but make sure that development is extended to those South Africans who have been excluded from economic benefits?

Pollution and Water Quality

When we consider water and sustainability, it is not only water scarcity which is an issue. Water quality is also a critical factor. When the little water that is available in dry areas becomes polluted, by sewage, mining effluent or fertilizer excess, for example, this compounds the problem. Even where water is not necessarily scarce, as in the wetter eastern regions of South Africa, water quality, reduced by pollution, can be a critical sustainability issue. Poor sanitation pollutes the water which kills thousands of South African children each year. Pollution from various sources also pushes up the costs of purifying water to make it suitable for domestic and other uses – placing an additional burden on municipalities which are struggling to meet development needs.

Water borne sewage is available to only about one third of Black South Africans, and Black South Africans suffer the highest levels of child mortality and water-borne diseases in all Africa, in relation to per capita GDP. (Bond, 2002, page 36)

Some industries have already experienced the fact that polluting water is convenient in the short term, but not in the interest of sustainability. South African companies have been sued, in high profile court cases, for example for polluting ground water with heavy metals, which have been linked to various diseases among the people who have been drinking it, and their livestock.

Water pollution is not always about the direct dumping of effluent or solid waste in water. Often the pollution is indirect. For example, chemicals may leach from landfill sites, leaking containers and storage dams into underground water courses, and eventually arrive in surface water through routes illustrated in Figure 1 on page 8.

Pollution has an even greater impact on sustainability when water resources have been degraded or destroyed in other ways. For example, wetlands help to purify water (see *Taking Care of Wetlands*, to find out how). Where wetlands have been destroyed, water quality drops as a natural purification

works have been removed from the system. This places great strain on municipal water purification works, and increases the cost of clean water. It has been shown that it costs much more to build extra artificial wetlands or purification works, and even to rehabilitate existing wetlands, than what it would have cost to maintain the natural wetlands in the first place.

Clearly, sustainability is also an issue of rands and cents. In the long run, decisions based on ecological sustainability, save money.

The Reserve – Some For All, Forever

A Touchy Subject

The Reserve is perhaps the key tool in the NWA for making our water resources last. It is also controversial! These are some of the things that people have said about the Reserve:

The Reserve is water for bugs.

More water for the Reserve means less water in your stomach.

How can you tell people they can't have water because the fish need it?

The Reserve is just there to give consultants jobs.

If 10% of the money already spent on Reserve determinations had been spent on supplying water to rural areas, we'd have done more good.

All we really need is sustainability. Why don't we just maintain all rivers at the lowest protection level then we can get maximal use out of them while still ensuring a sustainable resource?

How did ecologists in South Africa manage to negotiate so much power for protecting nature in the new water policy?

The Reserve is there to maintain the resource, which provides goods and services to people.

The Reserve is about Some for All, Forever.

Adapted from Sherwill et al, 2003, by Van Wyk et al., 2006

As you work through the following sections, you will hopefully be able to see that most of these statements present a mis-interpretation of what the Reserve is about.

What Exactly Is The Reserve?

The Reserve actually has two components, as follows:

A Reserve consists of

- A Basic Human Needs Reserve
- An Ecological Reserve

The Basic Human Needs (BHN) Reserve is the "SOME FOR ALL" part of the Reserve. It is the quality and quantity of water which must be in the water resource in order to meet the *basic* water needs of *all* the people who depend on that particular resource. This is calculated based on a lifeline amount of 25 litres of wholesome water per person per day, for basic needs like drinking, cooking and washing, within 200 metres of the home. It is therefore not accurate to say that the Reserve puts ecosystems before people.

The Ecological Reserve is the "FOREVER" part of the Reserve. It is the quantity and quality of water which would be required to sustain the particular ecosystem (say a river or underground aquifer), so that the water resource can in turn sustain people and development. Again, people's basic needs are fundamental to this component of the Reserve. The Law defines it as: "the quantity and quality of water required … to protect aquatic ecosystems *in order to secure ecologically sustainable development and use* of the relevant water resource" (Republic of South Africa, 1998).

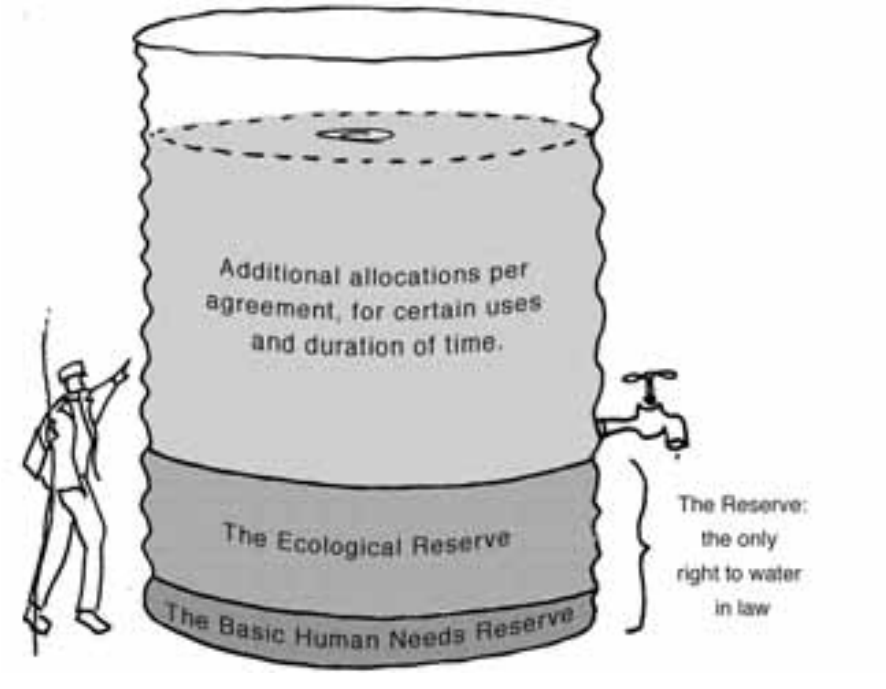


Figure 2: The Reserve and Additional Allocations

Together, these two provisions are based on the South African Constitution which guarantees every citizen the right to have their basic needs met, and the right to a safe and healthy environment. The Reserve (the BHN Reserve together with the Ecological Reserve) is the only right to water provided for by the new Water Law. All other water allocations are made through a system of authorisations, given to water users for a specific duration and purposes.

The Reserve has the highest priority when water is being allocated. No licenses for using the water in a water resource may be issued, until the Reserve has been determined and water set aside to meet the Reserve requirements, for basic human needs and keeping ecosystems functioning.

How does one determine the Basic Human Needs Reserve? Regulations under the Water Services Act of 1997 guide the process. This is how the BHN Reserve was calculated for a portion of a catchment in which an estimated 9100 people live, and where the cumulative Virgin Mean Annual Runoff (VMAR) is 519 million cubic metres (MCM):

Tertiary Drainage Region	**Population (Current requirement)**	**Per capita need (litres per day)**	**Basic Human Needs Reserve Required**	
E10	9100	25	MCM/annum	% VMAR
			0.083	0.00016

So, this portion of the catchment needs to supply a minimum of 0.083 million cubic metres of water per day, or 0.00016 per cent of the average annual runoff, for its residents. This is the current requirement, based on the current population; if the population of the catchment increases, the Reserve would have to increase, too.

More About The Ecological Reserve – Is It About Fish and Bugs?

The Ecological Reserve consists of the following:

- a certain volume and flow of water that must be maintained for a certain duration (this may vary from season to season, if the water resource is a seasonal one, for example rivers which only flow in summer, or flow stronger in summer)
- a certain quality of water that must be maintained, that is, the levels of (for example) nitrates, phosphates, ammonium, trace elements, heavy metals and suspended soil which must not be exceeded.

The Law defines the Ecological Reserve as: "the quantity and quality of water required … to protect aquatic ecosystems in order to secure ecologically sustainable development and use of the relevant water resource" (Republic of South Africa, 1998).

In essence it is about a simple set of ideas: we need to make sure that there is some water in our rivers (and wetlands, and underground sources) so that the river can carry on being a river. If the river carries on being a river, it can keep us alive indefinitely. If it stops being a river, our supply dries up, various goods and services are no longer available, and we are in trouble.

But how does the protection of aquatic ecosystems secure sustainable development and use of the water resource?

At the heart of the Reserve is the idea of sustainability. Saying that it is important to set aside some water to keep ecosystems going, is similar to saying: When a farmer has a bag of mealies, the family can eat some of them, but they must also keep some for seed, to sow, so that they can have another bag of mealies with the next harvest, to sustain themselves. Or, when a breadwinner comes home on the bus with her wages, she can spend the money, but she must keep some to pay for another bus fare, so that she can go back to work, to sustain her income. Similarly, when we have a river flowing past, we can use some of this water (for irrigation, power stations, hotel swimming pools) but we also need to make sure everyone's basic needs have been seen to (the BHN Reserve) *and* we need to leave some water in the river (or other water resource) so that that river, wetland or estuary can continue to function as an ecosystem.

South Africa's Water Law acknowledges the entire ecosystem (and not only water) as a life support system. The 'resource' is defined to include a watercourse, surface water, estuary or underground aquifer, where the watercourse includes rivers and springs, the channels in which water flows regularly or intermittently, wetlands, lakes and dams into or from which water flows, and where relevant the bed and banks of the system. The quality of the resource is also defined broadly to include fluxes in flow: physical, chemical and biological characteristics of the water; the character and condition of the in-stream and riparian habitat; and composition, condition and distribution of the aquatic biota (types of water life). The drafters of the law thus saw the resource in a holistic sense: the water, the ecosystem of which it is a part and through which it flows and which influences the quality and quantity of water, and the ecological processes that make up the resource. The Ecological Reserve was introduced to achieve a dynamic ecological state of the resource that provides a range of goods and services to society.

(Adapted from Van Wyk et al., 2006, p.406)

Only as functioning ecosystems can rivers provide their goods and services like a reliable supply of water, a cleansing service, and a host of goods from the river banks, including building materials, medicinal plants and environments for recreation and tourism. Only as functioning ecosystems can wetlands provide their goods and services, which may include flood attenuation, a steady flow of water in the dry season, food and craft materials and water purification. Only as functioning ecosystems can estuaries provide their goods and services, ranging from recreation and tourism to sustaining fishing industries. And these surface water sources are inter-dependent with the quality and quantity of water available from groundwater sources. These benefits (and more) cannot be sustained without the watery ecosystems which keep the water resources 'alive' and functioning.

Rivers are not water ***users***. They are ***providers*** of water and water-related goods and services. They ***require*** water (of adequate quality and quantity) to maintain themselves and keep providing those benefits to society.

Sometimes the role of aquatic ecosystems (plants, animals, micro-organisms and the physical factors they interact with, like water, soil, air, nutrients) is quite a direct one. For example, wetland plants as well as the micro-organisms in these watery environments play a direct role in purifying the water. When they are lost (such as when a river bed is lined with concrete to form a canal, or when a wetland is drained) the purification function is lost. At other times the role of plants and animals is more indirect; for example when we lose the natural vegetation along river banks, the river is more exposed to pollution and soil erosion and over time, may lose its ability to cleanse water, with water life gradually dying off, and goods and services diminishing.

The Ecological Reserve is "an ecological means to a socio-economic end". (Van Wyk ***et al***., 2006)

Water life, especially invertebrates like crabs and insects, are good indicators of the overall health of an aquatic ecosystem. When the pollution sensitive species start to die, it is an indication that the water is becoming polluted. As more and more pollution-sensitive species disappear from the river, we can conclude that the river is becoming more polluted. There are also other indicators, such as plant life, the presence of indigenous or alien species, which reflect ecosystem health. We can use these indicators to get a sense of the health of the system (sometimes called the Present Ecological Status). We can then use this information to consider how long this river, wetland or estuary would be able to keep functioning as a water resource, and provide its goods and services to people. Together with the authorities and specialists, the residents of a catchment can then decide what level of water-associated goods and services they would like to achieve and sustain in this water resource (setting the Management Class for the resource). An important part of this process is to decide on the Ecological Reserve that must be maintained in the resource, in order to maintain that particular ecological status, with the associated eco-services.

Rivers (and other water resources, such as the groundwater aquifers which feed them, as well as wetlands and estuaries) offer a wide range of goods

and services to human society. They provide water for domestic use, irrigation farming, livestock, power generation, industries. Rivers dilute and process waste from sewage works, and industrial effluent. River ecosystems and wetlands in particular process waste materials, including nutrients from sewage and agricultural runoff. River channels and banks provide spaces and resources for recreation and tourism, traditional healing and ceremonies. They are also the homes of many species of plants and animals which in turn contribute to the above functions! In rural areas in particular, many families rely directly on water resources for their livelihoods – for fish, reeds, medicinal plants, fodder for livestock and building materials.

There is conflict between these needs. If farmers in one part of the catchment use up too much groundwater for livestock or irrigation, a wetland may eventually dry up, and people who fished there, would be affected. If one community uses a river to wash away their sewage, a downstream eco-tourism resort might find its clients becoming ill from swimming in the river. Others would have to pay more to clean the water for drinking purposes.

A single system cannot provide for all of these needs, all of the time. We need to make choices. The choices are partly about whose needs will be met, or what kinds of needs will be met, in the allocation of water. The choices also require us to think of the future. If we choose to simply meet our present needs, to the maximum that the water resource can provide, we are not investing in the future of the resource. This means that in the future, we won't be able to meet those needs: water resources will collapse under the weight of pollution and other forms of degradation, and/or will simply dry up.

It is to ensure that we will be able to continue meeting needs in the future, that the Ecological Reserve has been introduced.

Reserve Determination

The Water Law determines that an Ecological Reserve must be determined for every significant water resource in a catchment. That means every significant wetland, river, estuary and groundwater system, must have a Reserve Determination. Significance is based largely on geographical extent.

As we noted before, the Reserve is determined as part of an integrated process of Resource Directed Measures (RDM), consisting of the following:

- Choosing a *Resource Class*
- Determining the *Reserve*
- Setting *Resource Quality Objectives*
- Developing *A Catchment Management Strategy*.

How this happens in a catchment, or portion of a catchment, is summarised in Figure 3. The process is led by DWAF or agencies which they appoint for this purpose. It involves specialists in various areas, and the stakeholders in the catchment are also given an opportunity to participate in various steps along the way.

Notes to Figure 3 – Determining Resource Directed Measures Including The Reserve

Notes to Step 1 (Refer to Figure 3 on page 30)

Reserve Determination can be done with varying levels of certainty. Sometimes it may be necessary and possible to do a Comprehensive Reserve Determination, which can take up to 18 months and involve big specialist teams. At other times a quick Determination may be all that is required or possible, in which case a desk top study will be done, with about two days of observations in the catchment itself.

Notes to Step 2:

The selection of sites for specialist surveys is closely related to the various eco-regional types which may be represented in the study area, but also depends on factors such as representivity, suitability for hydraulic calibration and accessibility. The confidence in the determination of the Reserve, especially, is very much dependent on the selection of suitable study sites, so this step is one of the most important in the whole RDM determination.

Step 1: The RDM study is initiated: Geographical boundaries are drawn; the RDM level & components are selected, and a study team put together. This will consists of various specialists, social scientists, freshwater ecologists, hydrologists, economists, etc.

Step 2: Specialists determine the eco-regional types in the study area, delineate resource units (e.g. particular river reaches and individual wetlands), and select sites for making observations and taking measurements.

Step 3: The resource quality reference conditions are determined: what would the state of the resource have been, if it were completely natural and un-used?

Step 4a: The present status of resource units is determined in terms of: Present Ecological Status (PES) and resource quality (for example PES can be Natural, Good, Fair or Poor); and water uses, land uses, and socio-economic conditions in (this part of) the catchment.

Step 4b: The importance of resource units is determined, in terms of: Their ecological importance and sensitivity; their social importance; and their economic importance.

S**tep 5b:** Now management Classes for the various resource units are set. This is known as classification, or preliminary classification. The proposed classes to choose from are: Minimally Used (Class I), Moderately Used (Class II) and Heavily Used (Class III).

Step 5a: The desired management classes for the resource units are determined, based on: their importance; their sensitivity; and achievability (is it possible to achieve this Class).

Step 6a: The Reserve is determined for each resource unit. This involves determining water quantity and quality, integrating water quantity and quality, and integrating the river/wetland/groundwater/estuary components.

Step 6b: Now the Resource Quality Objectives (RQOs) are set for each resource unit, using rules for the selected classes. This is done in terms of habitat, biota, water uses and land-based activities.

Step 7: A resource monitoring programme is designed.

Step 8: A notice of the RDM determination is published, and comment can be received.

Step 9: This step gives effect to the RDM determination: A strategy is developed for achieving the Resource Class, Reserve and RQOs; and a Catchment Management Strategy is drawn up and implemented.

Step 10: The status of the water resource, and its response to RDM implementation, is monitored. The process is iterative, and can be repeated.

Figure 3: How Resource Directed Measures (RDM) Are Determined In A Catchment

These steps are simplified. The detail which is left out can be obtained from specialists, or documents such as the following source for this figure: MacKay, H. *et al*. 1999. Resource Directed Measures For Protection Of Water Resources: Generic Section "A" For Specialist Manuals, Version 1.0. DWAF, www.dwaf.gov.za/rdm

How much water does a river need? It seems that for most rivers, between 20% and 40% of unaltered runoff is required to maintain close-to-normal habitats and processes in the river ecosystem. Scientists believe that each water resource, like a river, is unique, and has specific water requirements depending on its geographical position, its seasonal flow pattern, its plant and animal communities and its conservation importance. Ideally, the Reserve should therefore be determined based on intensive knowledge of the specific water resource.

Knowing the eco-regional type of a resource (Step 2 in Figure 3) allows one to make some predictions about what kind of ecosystem could be expected to occur in that unit under natural conditions. Eco-regions are areas with similar climate, geology and vegetation, which influences the distribution of various plants and animals. Rivers in one eco-region are more similar to one another than to rivers in other eco-regions.

Examples of eco-regions in the Olifants Doring catchment in the Western and Northern Cape are: Nama Karoo, Namaqua Highlands, Greater Karoo, Western Folded Mountains, Southern Folded Mountains, Western Coastal Belt and South Western Coastal Belt.

Knowledge about these eco-regions is then used to guide expert judgement regarding what the appropriate numerical water quantity and quality requirements might be for achieving different levels of protection of that particular water resource. Eco-regional typing is also a way of transferring understanding from water resources for which a fair amount of data is available to those of the same eco-regional type for which little data may be available.

It is important to bear in mind that:

- Rivers may feed (or be fed by) wetlands and underground aquifers. These systems will have a required Ecological Reserve, too.
- The river runs into an estuary. As a significant water resource, the estuary itself will need a certain volume and quality of water, in order to be sustained at the required management Class which has been chosen for it.
- The different reaches of the river (upper, middle, lower) and the different tributaries to a river system, will all have different water and flow requirements. For example, in the upper reaches of a river the ecosystem is adapted to high flow and a very high water quality and many organisms are very sensitive to pollution. In lower reaches, many organisms are hardier and more tolerant of pollution.

One can therefore also determine the Ecological Reserve for different sections of rivers, for different rivers in the same river system, and for

different water resource components, such as wetlands, estuaries and groundwater. These are referred to as **Integrated Units of Analysis**, to indicate that the Reserve will be calculated separately for this particular river reach or water body, on the one hand (Step 2 in Figure 3), but also that the calculations and interpretation will take into account the other Units to which it relates (for example, in Step 6a).

The breakdown of a catchment into water resource units for the purpose of determining the Reserve is done primarily on a biophysical basis, according to the occurrence of different ecological regions (eco-regions) within the catchment. The idea is to break down the catchment into units which are relatively homogenous on an ecological basis, to ensure that the Ecological Reserve is set in appropriate terms. For **groundwater**, the principle is the same, and water resource units are initially defined on the basis of geo-hydrological response units. The breakdown into resource units via eco-regions and/or geo-hydrological response units could be continued into even smaller resource units based on management requirements. An example might be where very different land uses (such as agricultural and urban) occur along a reach of river which is contained within one eco-region. Then a further breakdown of the eco-region could be on the basis of the major land uses.

Step 3 – Determining the reference conditions for each resource unit – is an important one in the process, as all the next steps depend on it. The assessment of present status (step 4), the selection of the future management class (step 5) and the quantification of the Reserve and Resource Quality Objectives (step 6), are all carried out relative to the reference conditions for that resource. The reference conditions thus represent a baseline which is relevant to a particular resource. If the baseline is not stable, then the grounds on which management decisions are made will always be shifting. This opens the door for de facto authorization of cumulative impacts in the water use licensing process, which is not consistent with the protection policy. Hence the reference conditions are set on the basis of **natural unimpacted conditions**, since that is the most stable baseline available. Different procedures are used for determining groundwater conditions, and surface water conditions. How does one know what the natural, unimpacted conditions would have been? This depends a lot on scientists' knowledge of eco-regions. For example, if the eco-regional type of the resource indicated that a high-altitude, cold-water ecosystem could be expected to be present, then the reference conditions for water temperature and dissolved oxygen would specify, as quantitatively as possible, the expected diurnal, seasonal and inter-annual (if relevant) patterns.

There may be situations where the water resource has been modified to such an extent that the ecosystem has been irreversibly changed. Usually

this is the result of permanent man-made changes or a catastrophic natural "reset" such as a very large flood. The ecosystem can still be protected in its modified state, although it may bear little resemblance to the original ecosystem. An example is the Blesbokspruit near Springs in Gauteng. This used to be a typical seasonal highveld stream, but with urban development and increasing wastewater discharges, extensive wetlands have developed in the stream bed. These wetlands now provide a valuable habitat for water birds, to the extent that it has been declared a Ramsar site. If there is no practical way of restoring the original ecological characteristics of a water resource, then there may be justification for resetting the reference conditions to more accurately reflect the new ecological characteristics.

Step 4a – The present status of water resources is assessed in relation to the:

- ecological status of the resource,
- status of the resource for basic human needs and
- status of the resource for water users.

Tools for addressing basic human needs and water uses are the South African Water Quality Guidelines (DWAF, 1996) and the Domestic Water Quality Assessment Guide (DWAF, DOH & WRC, 1998, quoted in MacKay, 1999; see also www.dwaf.gov.za).

Step 4b – Assess the importance and sensitivity of the water resource – The importance and sensitivity of a water resource, in ecological, social or economic terms, is used to guide the decision on the level of protection required, which in turn determines the management class which should be assigned. For example, if the present status of a water resource is very degraded but the importance and sensitivity are high, then a higher management class than the present status should be set as a management goal which will lead to improvement in resource quality.

Ecological importance of a river is an expression of its importance to the maintenance of ecological diversity and functioning, both locally and more widely. Ecological sensitivity refers to the system's ability to tolerate disturbance and its capacity to recover from disturbance once it has occurred (resilience).

In determination of RDM, the following are used to estimate ecological importance and sensitivity:

- The presence of rare and endangered species, unique species (i.e. endemic or isolated populations) and communities, intolerant species and species diversity.
- Habitat diversity, including specific habitat types such as reaches with a high diversity of habitat types, i.e. pools, riffles, runs, rapids, waterfalls, riparian forests, etc.

- The importance of the particular resource unit (e.g. river or reach of river) in providing connectivity between different sections of the whole water resource, i.e. whether it provides a migration route or corridor for species.
- The presence of conservation areas or relatively natural areas.
- The fragility of the system and its resilience, i.e. its ability to recover following disturbance. Both living and non-living components are considered here.

Social Importance – Aspects to be included in the assessment of economic and socio/cultural importance are:

- The extent to which people are dependent on the natural ecological functions of the water resource for water for basic human needs (sole source of supply).
- Dependence on the natural ecological functions of water resource for subsistence agriculture or aquaculture.
- Use of the water resource for recreation.
- The historical and archaeological value of the water resource.
- Its importance in rituals and rites of passage.
- Sacred or special places in the river.
- The use of riparian plants (for building or traditional medicine).
- The intrinsic and aesthetic value of the water resource for those who live in the catchment, or who visit it.

Economic importance – The economic value of a water resource is traditionally assessed in terms of the amount of water which can be abstracted for off-stream use. Typical indicators include the number and value of jobs generated by the use of the water, or the amount of revenue generated.

Water resources also provide other services which are often not included in economic valuation, and in particular this applies to the services and benefits provided by aquatic ecosystems. These can include, amongst others:

- Transport and/or purification of biodegradable wastes.
- Recreation and aesthetic opportunities.
- Food production.
- Flood attenuation and regulation.
- Water-based transport.

The development of tools for quantitative valuation of ecosystem services and benefits is still in an early stage. However, it is necessary to at least identify all the potential economic values of a water resource, and to apply the new resource economics tools as they become available.

Step 5 entails the selection of an appropriate management class as the target for long term protection and management of the resource unit. The NWA requires that each significant river or river section be classified according to a management Class. The management Class of the river describes the level to which the ecosystem of a river is protected, in relation to the other demands being made on the river.

The Class selected could be the same as the present status category, or it could be set higher if improvement of resource quality is required. It cannot be lower. Sometimes structural modifications to the resource (such as dams or urban development) may be such that a higher class than the present one can not be practically achieved in the short to medium term.

Each Class is associated with it rules for coming up with measurable objectives for the Reserve and resource quality, and for the Source Directed Controls which may be applicable within the catchment.

The implications of selecting a particular management Class can be established and various scenarios tested before the final Class is set. It is likely that there will be some iteration around the selection of a possible management Class and the evaluation of the implications for the Reserve and for Source Control Measures, until a management Class is selected which represents the optimal balance between protection and utilization.

Water resource management is about making choices – choosing between different kinds of benefits, benefits in time and space (who benefits most, where, when). It is NOT about choosing to benefit people or choosing to benefit the river.

For intermediate and comprehensive RDM determinations, the process of assigning a management Class to a specific water resource will be a consultative one, involving relevant stakeholders in deciding on the level of protection that is desirable for the resource. This consultative process must address both ecological and social issues, for the short-term and the long-term.

Because classification is a detailed process, in which water users and other catchment stakeholders can make an input, it is described in more detail in a separate booklet in this series, called *Water Resource Classification – A Brief Guide*.

Step 6a – Quantify the Reserve for each Resource Unit

The classification system provides rules for setting the Reserve and Resource Quality Objectives. These rules are not a set of numbers valid for all water resources: in most cases, the rules are rigorous procedures for deriving site-specific, measurable objectives which are appropriate for the reference conditions of that resource.

For example, the classification system might set out procedures for deriving instream dissolved copper (Cu) concentrations for various management Classes. The procedure for Cu in one Class of rivers might yield different in-stream concentrations required to achieve the same level of protection for a river with naturally hard water as for a river with naturally soft water, because the bio-availability and hence the toxicity of Cu depends on water hardness.

Explicit rules have been proposed for setting of the water quality component of the Ecological Reserve, linked to the management Classes. The determination of the water quantity component of the Reserve relies heavily on expert judgement and the application of site-specific knowledge, reflected in so-called "rule curves".

The RDM requirements of each resource unit must be matched with those for the adjacent resource units. For example, the Reserve determination for an estuary must be matched to the Reserve determination for the river reach immediately upstream, not only in terms of the amount and quality of the river flow, but also in terms of the timestep and units in which the Reserve requirements are presented.

Step 6b – Set Resource Quality Objectives for Each Resource Unit

Resource Quality Objectives describe, in both words and numbers, how all aspects of a water resource must be managed so that the water resource is adequately protected.

To maintain aquatic ecosystems and therefore water resources, it is necessary to:

- provide enough water,
- at the right time,
- distributed in the right flow pattern, and
- of adequate quality.

Resource Quality Objectives therefore include the pattern, flow, timing and level of water and the physical, chemical and biological characteristics of the water. They also include the character and condition of the in-stream and riparian habitats; and the character, condition and distribution of the aquatic biota (communities of plants and animals including micro-organisms). RQOs also address land-based activities such as the discharge of waste that might be poisonous to water life, or the removal of vegetation from the riparian zone.

Source Directed Measures

These complement the Resource Quality Objectives. These are tools (from the National Water Act) which help us to manage and control the impact

of land-based activities on water resources (discussed above). Source Directed Measures are tailored to match the Class of the water resource. So, for example, certain kinds of waste discharges may be allowed in a river or estuary that has been classified as *Fair*, but would not be allowed in a river or estuary classed as *Natural*.

Step 7 – Monitoring

This is an important and ongoing step which serves a number of purposes:

- To collect data to improve the confidence of a future RDM determination at the next level (e.g. to prepare for a future comprehensive determination if the present determination was at intermediate level).
- To monitor the response of the aquatic ecosystem, to check that the Reserve and RQO which were set, do provide the level of protection required by the selected management Class.
- To monitor whether management actions are adequate to achieve compliance with the requirements of the Reserve and RQOs.

Step 8 is another opportunity for stakeholder input.

Step 9 involves making sure that all the above measures and goals are actually implemented!

Back to The Catchment – Catchment Management Strategies

All catchments must have management plans. The Catchment Management Strategy (CMS) is the mechanism for bringing together all the measures and goals, from the RDC and Source Control processes, and making sure that they are implemented and enforced. A CMS must contain measurable goals, agreed timeframes for achieving these goals, and programmes for moving towards the goals, with interim targets along the way.

Once the RDM, the timeframes for achieving them, and the plan of action are agree upon, they are written into the Catchment Management Strategy. The Catchment Management Strategy must also be in agreement with all Source Directed Controls, for example laws controlling levels of discharge. The catchment management plan is then legally binding and enforceable by the Catchment Management Agency.

It is vital that stakeholders and water users in the catchment agree on the strategy and implementation plans. They are the ones who will have to change their ways of using water and land, especially if the water resource is degraded and in a lower Class than desired. Some people will have to use less water. Some may have to treat their waste to higher standards or find alternative ways of disposing of it. Some may have to restore riparian land, or change their land use practices. For example, they might have to change

from one crop to another. All of these changes are to be included in an agreed strategy.

This is a dramatic departure from how we have done things before! This may be what it takes to manage our water resources in an integrated manner, towards greater sustainability of this, one of our most precious and pressured resources.

For More on Catchments

If we are to participate usefully in catchment management, and make, support and implement decisions which lead towards sustainability, we must have a basic understanding of how water resources work.

It is not always easy to see how it is in our interest to protect these ecosystems, because it may require sacrifices, and the benefits are not always obvious, especially when the resource is far from us. Understanding how ecosystems work, and how good management benefits us, may therefore take a little learning. This booklet is accompanied by four others which provide an introduction on the ecological functioning and benefits of water resources in our catchments, and what we can practically do to use them sustainably and achieve the desirable Resource Quality Objectives. These booklets are called:

- *Taking Care of Groundwater – Why and How*
- *Taking Care of Rivers – Why and How*
- *Taking Care of Wetlands – Why and How*
- *Taking Care of Estuaries – Why and How*.

Anyone can use these booklets to apply the ideas of sustainability and water resource management in their own context, be it a farm, an urban wetland, a rural village or any other community living and making a living in a catchment.

It can also be very useful to know more about Catchment Management Agencies, Forums, and Water Users Associations, and the tools which the National Water Act of 1998, as well as other legislation and policies, provide for the management of water resources. The booklets in this series which have information on these topics are:

- *Summary of Key Water Management Institutions*
- *Summary of Key Legislation Concerning Water/Catchment Protection and Management*
- *Water Resource Classification – A Guide*.

Further Reading and References

Bond, P. 2002. *Unsustainable South Africa. Environment, Development and Social Protest*. University of Natal Press, Pietermaritzburg.

Davies, B. & Day, J. 1998. *Vanishing Waters*. UCT Press, Cape Town.

De Villiers, C.C. et al. 2005. *Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape*. Botanical Society of South Africa, Conservation Unit, Cape Town.

DWAF (Department of Water Affairs & Forestry). 1997. *White Paper on a National Water Policy for South Africa*. Pretoria, South Africa.

DWAF (Department of Water Affairs and Forestry). 2007a. *Guidelines for the Development of Catchment Management Strategies: Towards equity, efficiency and sustainability in water resources management*. By S.R. Pollard, D. du Toit, Y. Reddy and T. Tlou. DWAF, Pretoria.

DWAF (Department of Water Affairs & Forestry). 2007b. *Preliminary Determination of the Reserve and Resource Class: Olifants River (Western Cape) – Quaternary Catchment Areas E10K, and Appendices*. DWAF, Cape Town.

DWAF (Department of Water Affairs & Forestry). 2007c. *Preliminary Determination of the Reserve for the Groundwater Component in Tertiary Catchment E10, and Appendices.* DWAF, Cape Town.

Institute for Water Research. 2002. *Some For All, Forever. Water Ecosystems and People*. Water Research Commission Report No.TT 176/02.

MacKay, H. *et al*. 1999. *Resource Directed Measures For Protection Of Water Resources: Generic Section "A" For Specialist Manuals, Version 1.0*. DWAF, www.dwaf.gov.za/rdm

Republic of South Africa. 1998. *National Water Act. Act No.36 of 1998*. Pretoria, South Africa.

Rowntree, K. 2003. *Guidelines for Participation in Integrated Water Resource Management (IWRM) in South Africa: Environmental Guidelines*. Water Research Commission (WRC), Report No.1233/2/03.

Van Wyk, E, Breen, CM, Roux, DJ, Rogers, KH, Sherwill, T, Van Wilgen, BW. 2006. *The Ecological Reserve: Towards a common understanding for river management in South Africa. Water SA*, 32(3) and http://www.wrc.org.za

Notes

Notes