Assessing policy influences on people's relationship to water ecosystem services: The South African experience

Gavin Quibell

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Executive Summary

Water resources policy in South Africa is at the forefront of international policies toward the protection of water ecosystem services[1]. However, in spite of many innovative approaches, 10 years after these approaches were included into policy[2], many of these ideas have yet to operationalised. This Policy and Practice paper tries to unpack some of the underlying reasons for this. It is hoped, that this will provide useful pointers for the International Institute for Environment and Development's (IIED) assignment to scope a possible DFID Research Programme on Freshwater Ecosystem Services and Poverty Reduction.

In South Africa, policy at the highest level provides a framework for environmental protection and redress. The Bill of Rights in the Constitution, explicitly requires that the state to take proactive action to bring about equitable access to all of South Africa's natural resources, recognising the need for "*ecologically sustainable development and use of natural resources while promoting justifiable economic and social development".* A number of fundamental rights outlined in the Bill of Rights could be associated with water ecosystem services. However, the Constitution requires government to take reasonable legislative measures to achieve the progressive realisation of these rights. Many government agencies therefore do not rely on the vagaries of water ecosystem services to provide for these rights, and take proactive actions themselves.

Water policy in South Africa, however, explicitly recognises the value of water ecosystem services. Water resource protection is focused on the maintenance of vital ecological functions, and the "*silent services*" these functions provide. Moreover, the National Water Policy (NWP), and the National Water Act (NWA) also provide the basis for South Africa's water allocation reform process by allowing for the re-allocation of water, through a process of compulsory licensing, to give effect to the ideals of equity, economic growth, and protection of water ecosystem services. Moreover, the NWP and the NWA provide for the introduction of a Classification System, which explicitly recognises the need to balance the protection of water ecosystem services with the use of the water for productive purposes (irrigation, industrial and mining uses). This is done by classifying "significant water resources" into one of three Classes.

South Africa, therefore, has a range of innovative policies, which explicitly recognise the value of water ecosystem services, and the use of water to promote equity and address poverty. However, nearly 10 years after promulgation - three of the main pillars of NWA, the Classification System, the establishment of Catchment Management Agencies, and compulsory licensing are still in their infancy. South Africa therefore moved relatively rapidly (from April 1994 to September 1998) to develop the NWP and NWA, but achingly slowly to put these policies into practice. Much of this may be related to a *paralysis by analysis* syndrome, where water resources managers attempt to fully understand the integrated nature of water resources, and the possible response of water ecosystem services before making decisions.

To complicate matters, the commitment to fair and reasonable approaches to redress, allowing the affected parties to approach the courts is highly likely to slow progress with compulsory licensing. The integration of compulsory licensing, the Classification System, and the development of Catchment Management Strategies within a joint IWRM process may therefore make it difficult to realise the core objectives of equity, sustainability and efficiency included in the policy. In the light

[1] Water Ecosystem Services is used in the same context as outlined in the Millenium Ecosystem Assessement (MAR7, 2005)

[2] The term 'Policy' is used as shorthand in this document to mean the range of signals that stem from laws, regulations, policies, subsidies, incentives, institutional arrangements and major programmes and initiatives – primarily steered by government.

of this radicalisation of policies to speed up reform may compromise the country's ability to effectively manage water ecosystem services.

Be this as it may, water allocation reform is occurring through the land reform process, and in many areas existing water allocations to the poor have been made through other mechanisms. However, the majority of land reform projects are failing, and in many cases water set aside for uptake by the poor has never been successfully taken up. Much of this appears to be due to the lack of sustained financial support. This is not only affecting the establishment of emerging black farmers, but is shifting the entire agricultural sector towards fewer larger commercial firms. While it may be argued that in the longer term this provides for more sustainable inroads into addressing poverty and protecting the environment, in the shorter term it makes the poor even more vulnerable to the loss of water ecosystem services.

To complicate matters, many water ecosystem services may be vulnerable to climate change. A small reduction in rainfall, or even more variable rainfall, can result in large changes in runoff, and hence water availability. South Africa's National Climate Change Response Strategy recognises that mitigation of these impacts requires coordinated action across a number of government Departments. Much of the response in the water sector is likely to be related to shifting water use away from agriculture towards industrial and mining uses, which produce more jobs and income per drop. Ironically, this could increase South Africa's carbon footprint, and is vulnerable to global responses to climate change. Climate change may also, at least in the short term, see increased demands for irrigation water, as increased evapo-transpiration increases crop watering requirements, and as the economy struggles to shift toward a greater industrial base.

Generally little is known about how both the reduced availability of water, as well as the shift towards industrial and mining water uses will impact water ecosystem services, particularly in South Africa where water ecosystems are adapted to extreme variability in runoff. However, it is possible that a sustained change may affect the provision of critical ecosystem goods and services. Increased temperatures, and a widening of the winter and summer shoulder seasons may shift biological triggers earlier or later affecting the functioning of these systems. A lack of knowledge on threshold responses for these services also makes it difficult to predict how ecosystem services would respond to changes in climate. At this stage there are no policy provisions on how these shifts could be accommodated in the Classification System.

What is, however, clear is that the state, and in particular the Department of Water Affairs and Forestry (DWAF) and the Catchment Management Agencies (CMA) will primarily be responsible for managing the responses to these changes. The DWAF remains ultimately responsible for the establishment of the Water Resource Class, while the CMA will have to adapt to climate change by progressive reviews of water use licences. However, while the South African public scored relatively high in an international poll on awareness of climate change, the dominant political and social discourse in the country is still on redress. Within this environment the adage;

> *"Goods and services provided by government will always count more than goods and services offered by ecosystems."*

will certainly hold. It is, however, unfair to suggest that the South African politicians and the public at large has little interest in maintaining water ecosystem services, as the inclusion of these concepts into water policy bears out.

However, ultimately the implementation of what is a highly complex set of policies and practices will be limited by both human and financial resources. As indicated earlier, this is largely related to the commitment to larger and more sustained financial support to emerging water users, and the management of these resources. The South African government consequently has to walk a difficult tightrope between an economic growth-friendly budget and taxation system, which may not provide the social resources necessary, and a socially-friendly budget and taxation system, which may slow economic growth. Civil society has certainly actively, and sometimes violently, entered this debate. But once again this has largely focused on equity and sustainable municipal services,

and not on water ecosystem services *per se*. A notable exception to this is the Working for Water campaign, which is relatively widely known.

The future evolution of these issues is therefore largely tied up in the country's wider response to eradicating poverty. While the Mandela Presidency focused mostly on reconciliation, the Mbeki Presidency has focused on providing basic services while promoting economic growth as the primarily mechanism to sustainably address poverty. This approach has, however, increasingly come under criticism by social activitists, who argue (not without some evidence) that this approach has widened the gap between rich and poor, and has benefited only a few. The next Presidency, due in 2009, may see a shift in these approaches, promoting more socially friendly practices, and a re-slicing of the economic pie. Forecasting the impacts of this on water ecosystem services at this stage is largely speculative, but some policy shifts affecting the protection and management of water ecosystem services are likely .

The following potential research priorities for DFID's Research Programme on Freshwater Ecosystem Services and Poverty Reduction, have been distilled.

1. How to value water ecosystem services?
2. How much integration is appropriate for IWRM?
3. What are the threshold and amplification effects of climate change?
4. Variability vulnerability and small businesses/producers.
5. How can pricing and incentive mechanisms shift water use?
6. How do we move water ecosystem services up the political agenda?

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However, this kind of policy and practice analysis does not occur overnight, and is usually the product of many heated and beer fuelled discussions over a protracted span of time. Much of the ideas and experience included in the above paragraphs have evolved during a DFID funded programme on Water Resources Management in South Africa. Many, many people have contributed to this wider programme, and hence to the ideas expressed above. You know who you are, consider yourselves collectively thanked!

CONTENTS

1. Background

We have known for many years that water is fundamental to life. However, it is only relatively recently that water resource management policies have started recognising that water is not only important to sustain life, but also that water ecosystems also provide a range of services vital for our well-being. Our understanding of the scope of these services has grown over the last two decades, and the Millennium Ecosystem Assessment (MAR7, 2005) now recognises a range of these 'ecosystem services', grouped into the following four areas:

- *Provisioning* services like food, fresh water and fibre,
- *Regulating* services like climate and flood regulation,
- *Supporting* services like soil formation and nutrient cycling, and
- *Cultural* services like spirituality, aesthetics, education and recreation

South Africa's relatively recent political transition, coming at a time when these ideas are actively evolving, provides both the opportunity and drive to radically review a wide range of policies and practices affecting these water ecosystem services. A long history of water resources management and interaction with leading figures in Integrated Water Resources Management (IWRM), placed the country in a position to develop policy which not only addresses the legacies of apartheid, but which is also in line with the most up to date thinking on the protection and management of these water ecosystem services. This impetus is being further entrenched by the growing recognition that the poor will be hardest hit by the loss of these services – effectively linking these services to the South African government's core redress initiatives.

However, the way in which the South African government has shaped these policies and practices, particularly around environmental and poverty issues, is also influenced by its desire to play a prominent role on the world stage, particularly as one of the driving forces behind NEPAD and the "African Renaissance". This is a vision of South Africa spearheading Africa's move towards much greater global responsibility, focussing not only on good governance but also on more environmentally sustainable approaches to development and poverty elimination[3]. This too has provided major impetus for inclusion of innovative and sweeping policy provisions for environmental protection.

Environmental policy in South Africa therefore tends to be up at the forefront of international thinking, and this is certainly the case for the country's approaches to maintaining water ecosystem services – as the following sections will bear out. But in many other respects, 13 years after the onset of democracy, the country still faces enormous equity challenges. The GINI coefficient is one of the highest in the world, and indications are that the gap between rich and poor is growing. Despite innovative approaches to water resources management and to ensure the sustainability of aquatic ecosystems, nearly 10 years after the promulgation of the National Water Act these approaches have yet to concertedly operationalised, and both land and water allocation reform are moving at a snail's pace.

South Africa's ability to write policy and legislation thus seems to far outstrip its ability to put it into practice. Because of this, while South Africa's political and bureaucratic commitment to maintaining water ecosystem services may not be typical of most low income countries, the challenges to making them work for the poor are perhaps typical of many other African nations. This analysis therefore places emphasis on the implementation challenge.

[3] The political drive in South Africa is to use the term "eradication", rather than the more widely used terms "reduction" or "alleviation", to signal a sustained effort to eliminate the legacy of apartheid.

2. Mapping policy[4] and its implications for water ecosystem services

2.1 The Constitution

The Constitution of the Republic of South Africa (Act 108 of 1996) provides the first indications of the Government's commitment to both environmental protection and redress. This is coded into the Bill of Rights, and is given specific substance in a number of places in the Constitution. Importantly, for the purposes of this analysis, many of these rights can be linked to water ecosystem services.

Section 9(2) of the Constitution (Republic of South Africa, 1996) requires government to develop legislative and other measures to promote equality. This includes reforms to bring about equitable access to all of South Africa's natural resources **[S25(4)*a*]**. **Section 25(8)** also indicates that provisions of the Constitution should not impede the State from undertaking land, water and related reform. This gives government the powers to actively intervene to effect redress, even where this may impinge on established or pre-existing rights.

The Bill of Rights also guarantees the right to an environment that is not harmful to health or well-being **[S24 *a*]**, and importantly, the right to have the environment protected through reasonable legislative and other measures **[S24 *b*]**. There is specific reference to "*ecologically sustainable development and use of natural resources while promoting justifiable economic and social development"* **[S24 (*b*)(iii)].** In addition, the Bill of Rights provides the right to a number of other basic human needs, which could be provided by water ecosystem services. **Section 26 (1)** gives everyone the right to adequate housing, and **Section 27 (1**) the right to sufficient food and water, and health care services.

However, as the Constitution requires that the state must take reasonable legislative measures to achieve the progressive realisation of these rights, government agencies generally do not rely on water ecosystem services to provide for these rights. Water ecosystem services (outside of the sustainable development provisions), have therefore not been widely profiled in mechanisms to realise the goals of the Bill of Rights.

> **Macro policy and ecosystem services (See also Appendix A)**
> In South Africa policy, at the highest possible level, explicitly recognises the right to redress, sustainable development, protection of the environment, and certain other basic human rights. Implicitly, it may be argued that many of these rights could be provided by water ecosystem services, and that these services should be recognised as part of the country's natural resource base. This would place an obligation on the State to provide equitable access to these services.
>
> More practically, however, the Bill of Rights places an obligation on government to take legislative and other steps to progressively realise these rights. Faced with these obligations, in practice most government agencies are hesitant to rely on water ecosystem services, and prefer to take proactive actions themselves.

2.2 The National Water Policy (NWP)

One of the first actions by the first democratic Minister of Water Affairs and Forestry was to initiate the Water Law Review process. One of the initial outcomes of this process was the production of the "Fundamental Principles and Objectives for a New Water Law in South Africa." (DWAF 1997). A number of these principles set the scene for recognising the value of water ecosystem services. Specifically, *Principle 5* indicates that; *[…], it is necessary to recognise the unity of the water cycle and the interdependence of [all] its elements*…, and *Principle 9 "The quantity, quality and reliability of water required to maintain the ecological functions on which humans depend shall be reserved…."* (DWAF 1997).

[4] The policies are mapped against ecosystem services in Appendix A.

The evolving water policy in South Africa, in the immediate post 1994 elections phase, therefore, explicitly recognised the value of water ecosystem goods and services. The White Paper on "A National Water Policy for South Africa" (which followed on from the *Principles*) further elaborated this concept;

> "*The water and water-related services which people use are not dependent only on the physical and chemical characteristics of the water itself, but on the healthy functioning of whole ecosystems."*
>
> (DWAF, 1997).

Water resource protection was therefore focussed on the maintenance of vital ecological functions, and the "*silent services*" these functions provide. The NWP, however, also recognised that in some cases the benefits of using water in industrial and agricultural processes (and the associated reductions in water quality) justified a higher risk of losing some ecosystem services. But in other systems the value of water ecosystem services both in economic and social terms would demand a higher level of protection. This forms the basis of the Water Resource Classification System discussed in a later section.

However, the NWP was not the first recognition of the need to secure environmental flows and hence the protection of water ecosystem services. For at least for the decade preceding the NWP's publication, environmental water needs were based on the flows needed to provide for certain ecological. In practice, this meant that the water ecosystem services were seen as a competing water user, and not as part of the water resource itself. Nevertheless, this simpler approach did provide for ecological flows, and may have proved a more effective means of supporting ecologically sustainable development (see Section 2.4).

The NWP also provides the basis for South Africa's water allocation reform (or WAR) process by indicating that water use will only be recognised if it is "*beneficial in the public interest*", and that this means the optimal balance between social, economic and environmental water use. In order to achieve this the NWP indicated that a new system of allocation would be implemented, which allowed for the re-allocation of water on a catchment basis to give effect to the ideals of equity, economic growth, and protection of water ecosystem services. However, the NWP also specified that water use infrastructure investments made would be recognised, indicating that certain norms, rules and rights should underlie the re-allocation process. This is discussed in the Water Allocation Reform section below.

2.3 The National Water Act

South Africa's National Water Act (Act No. 36 of 1998)[5] is widely regarded as one of the most progressive examples of water resource legislation in the world (Stein, 2002). Firstly, the Act, being founded in the public trust doctrine, provides for maintaining ecological goods and services that are necessary to ensure sustainable use of the resource, as well as those services which contribute to improved livelihoods for the poor. Secondly, the NWA specifically provides a number of mechanisms for promoting redress, and the equitable use of water resources for productive purposes. These are briefly outlined below. Quibell and Stein (2005) provide a more comprehensive assessment of these provisions in the context of markets for catchment environmental services.

2.3.1 Resource Directed Measures (RDM)

The RDM are a series of measures that provide for the protection of water resources by outlining an appropriate balance for the protection, development and utilisation of different water resources (DWAF, 1997). The RDM are made up of the following:

- **The Reserve** [**S16**]: - This is the water quantity and quality required to meet basic human needs and to maintain aquatic ecosystem functioning. The Reserve is a non-

[5] The National Water Act is available online at www.dwaf.gov.za/Docs

competing water use and receives a priority allocation. The Reserve is set according to the Class.

- **The Resource Class, and Classification system** [**S12**]: These outline the appropriate balance between the utilisation and protection for any significant water resource.
- **The Resource Quality Objectives** [**S13**]: These are a set of narrative and numerical management objectives, defined for any particular resource, and are associated with the Resource Class of that resource.

These provisions not only aim to manage water quantity and quality, but also the instream and riparian habitat, the aquatic biota, land-based activities which may affect the resource, and "any other characteristic" of the water resource [**NWA**, **S13 (3)**]. **Sections 15 and 18** of the NWA also require that any water resource management actions give effect to the Resource Directed Measures. This means that water ecosystem services can be defined as Resource Quality Objectives and management of the resource must then provide protection for these services. This concept has been further elaborated in the Classification System described in Section 2.4. Importantly, the establishment of the Reserve and Class for any resource is subject to public participation. This means that the voice of the poor must be heard, particularly with respect to their needs for certain water ecosystem services. However, as the system has yet to be implemented, we do not know how well the poor will articulate these needs.

2.3.2 Water use in the NWA

Section 21 of the NWA recognises 11 "uses" of water[6], including not only consumptive uses, but also any land-based activity that can affect either the quality or quantity of water. This means that water use is non-exhaustively defined, and any activity that potentially affects the quality or quantity of water could be defined as a water use. Any activity that affects water ecosystem services could, therefore, be defined as a water use and would consequently be subject to authorisation. This can further entrench the protection of these services.

2.3.3 Water Use Charges

Chapter 5 of the NWA includes provisions for establishing a pricing strategy for water use charges, and for the application of this strategy. This Pricing Strategy (DWAF, 1999) indicates that any water use is potentially subject to water use charges. However, to date water use charges have only been established for abstraction, storage, and stream flow reduction activities. They may soon be established for recreational use of water on State-owned water bodies, and waste discharge charges are under development (DWAF, 1999). Importantly, these charges must be used to manage the water resource, and may not constitute a general tax or levy. These charges can therefore be used to both provide incentives for the protection of ecosystem services, but also to support maintaining these services.

2.3.4 Compulsory licensing

Compulsory licensing [**NWA, Sections 43-48**] is a mechanism to reconsider all the water use authorisations in an area to achieve a fairer allocation of water, to promote beneficial use of water in the public interest, to facilitate management of the resource, or to protect water resource quality. However, its proactive nature also means that the process is often seen as the end point of the IWRM process (see Section 2.6), allowing for the most economically, environmentally and socially efficient use of water. While any of the water uses defined in **Section 21** of the Act can be subject to compulsory licensing – to date the process has only focussed on consumptive uses of water, i.e. abstraction and stream flow reduction activities. The process therefore allows water resource managers to proactively reallocate water to achieve equity, while at the same time meeting the requirements for the RDM, and ensuring that certain water ecosystem services are provided.

[6] These 11 uses include; 1) abstraction of water for use; 2) storing water; 3) impeding or diverting the flow of water; 4) reducing the flow in the river by a land based activity (a Stream Flow Reduction Activity); 5) activities on land that may affect the quality of water; 6) discharging waste or waste water; 7) discharging of waste on land in a way that might affect the water resource; 8) disposing of heated water; 9) altering the bed, banks of characteristics of the resource; 10) discharging of underground (mining) water; 11) using water for recreation

2.3.5 Institutional Arrangements

One of the pillars of the NWP (DWAF, 1997) is that water resources management will be delegated to the lowest appropriate level. The NWA therefore makes provision for the establishment of Catchment Management Agencies (CMAs) that would manage the water resources in South Africa's 19 Water Management Areas. These CMAs will be funded out of the charges levied on water use. To date, however, proposals to establish CMAs indicate that most are only marginally viable with the water use and waste discharge levies that will be imposed. The CMAs may, however, also be supported by money appropriated by Parliament or money appropriated from any other lawful source (**NWA -** [**S84 (2a&c)]**). These CMAs will have to, through the establishment of Catchment Management Strategies, provide for the protection of water ecosystem functions. At a lower level Water User Associations (WUAs) will be responsible for managing water resources locally, and are likely to be responsible for the grassroots management of water ecosystem services. Moreover, given the inclusive nature of the establishment of these WUAs, they are likely to include both the impactors and beneficiaries of these ecosystem services.

Policies affecting demand for ecosystem services (See also Appendix A)
The RDM are explicitly based on the maintenance of water ecosystem services. This lies at the heart of the ecological Reserve and Resource Class, and legislation places an obligation on the State to give effect to the RDM. In effect, therefore, the primary demand for these services comes from policy itself, and the requirements for public participation inherent in setting the Reserve and Class. This should provide a powerful impetus for implementing practices that make these services work for the poor. However, by placing the responsibility of giving effect to the Reserve and Class on the State, the efficacy of these measures is limited by the implementation capacity of the State, and the capacity of the poor to recognise and demand these services.

2.3.6 The Working for Water and Working for Wetlands campaigns

The Working for Water and Working for Wetlands campaigns deserve special mention as they represent functioning markets for ecosystem services. The Working for Water campaign, which focuses on the removal of alien vegetation to improve river flows, provides temporary employment for indigent communities, and the Working for Wetlands campaign aims for similar benefits by promoting access to wetlands for the poor for curios, building materials and medicinal plants (i.e. water ecosystem services). However, whilst the campaigns have largely been hailed as a success, the jobs created are not always sustainable and the campaigns may not always be financially self sustainable. Moreover, while downstream users may benefit from improved river flows and water availability, in few cases do these downstream users pay for the removal of alien vegetation. Nevertheless, they do provide concrete examples of the value of water ecosystem goods and services to improve the livelihoods of the poor, and hence give impetus to the social and political processes supporting the protection of these services.

2.4 The Water Resources Classification System

In order to give effect to its obligations under the NWA, the Department of Water Affairs and Forestry has developed a draft National Water Resource Classification System (DWAF, 2006a). This, drawing on the initial proposals in the NWP, proposes that the benefits offered by water ecosystem goods and services be weighed against the benefits that would accrue from water uses[7] that may compromise these services. This, it is proposed, should be done in a "hybrid" Cost-Benefit Analysis supported by a Multi-Criteria Decision Analysis tool. In cases where the benefits offered by water ecosystem services outweigh the benefits of water uses that may compromise

[7] Remember here that water use is defined broadly and non-exhaustively as anything that could affect the quality and quantity of water or aquatic ecosystems.

these services, the water resource would be given a high level of protection. Conversely, lower levels of protection would be afforded where there is a higher value to water use. Clearly, therefore resource classification cannot be separated from the broader IWRM process, and will ideally be paralleled with compulsory licensing and water use efficiency programmes. The system also demands a high level of public participation in an attempt to achieve consensus to the final resource Class, and requires significant technical skills and coordination expertise.

Policies affecting access to ecosystem services (See also Appendix A)
The Classification system is the primary tool for ensuring access to aquatic ecosystem services in South Africa. Stakeholder participation and an analysis of benefits of water ecosystem goods and services, compared to the value of productive water use underlie the classification process. However, therein lies the rub. Knowledge of what goods and services may be lost or gained at different flow regimes is tenuous, quantification of the benefits of these services is complicated, and the coordination needed to integrate classification into the broader IWRM process may prove elusive. The system as it currently stands therefore demands significant technical and social skills and resources. Be this as it may, the system has been successfully piloted, albeit outside of the broader IWRM process. (See Section 2.6)

2.5 The water allocation reform programme

Recognising that water in South Africa is still predominantly in white hands, and given the mandate in the NWA, the Department of Water Affairs and Forestry initiated its Water Allocation Reform or WAR programme in 2003. The WAR programme not only addresses the implementation of compulsory licensing (although this is a major focus of the process), but also on methods to encourage and identify potential black uses to come forward and to speed up authorisations to these users. The programme is founded firmly in the public trust doctrine, and aims to promote the long-term sustainable (re)allocation of water to realise the equity objectives of the NWA (DWAF, 2006b), while maintaining economic growth, and while minimising the impacts on existing lawful water users. The process, consequently, recognises that it is not only how much each user gets that is important, but also the way in which re-allocations are done that affects the sustainable economically beneficial use of water.

The WAR programme has, however, been fraught with legal, technical, social and political problems. There is a significant and growing threat of legal action by existing users who may be deprived of water rights without compensation. Many protagonists also see the compulsory licensing process as the panacea for all water resource problems, and as the end point in the IWRM process. There is consequently a tendency to over-elaborate the process, and to be very risk adverse. There is, nevertheless growing social and political pressure to speed up the process of redress, and suggestions that the compulsory licensing process takes too long. Senior management in DWAF is consequently seeking ways to speed up re-allocations outside of the Compulsory Licensing process.

2.6 The IWRM process

South Africa's NWA recognises in several places the need for integrated management of the country's water resources. The National Water Resource Strategy (NWRS, DWAF, 2006c) – which is presented as the country's blueprint for sustainable water resources management, further elaborates this; specifically committing the DWAF to a process of Integrated Water Resources Management (IWRM). The NWRS adopts the Global Water Partnership's definition of IWRM as;

> "An IWRM approach promotes the coordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems."

The DWAF has conceptualised IWRM and the processes that contribute to it as outlined in Figure 1 below.

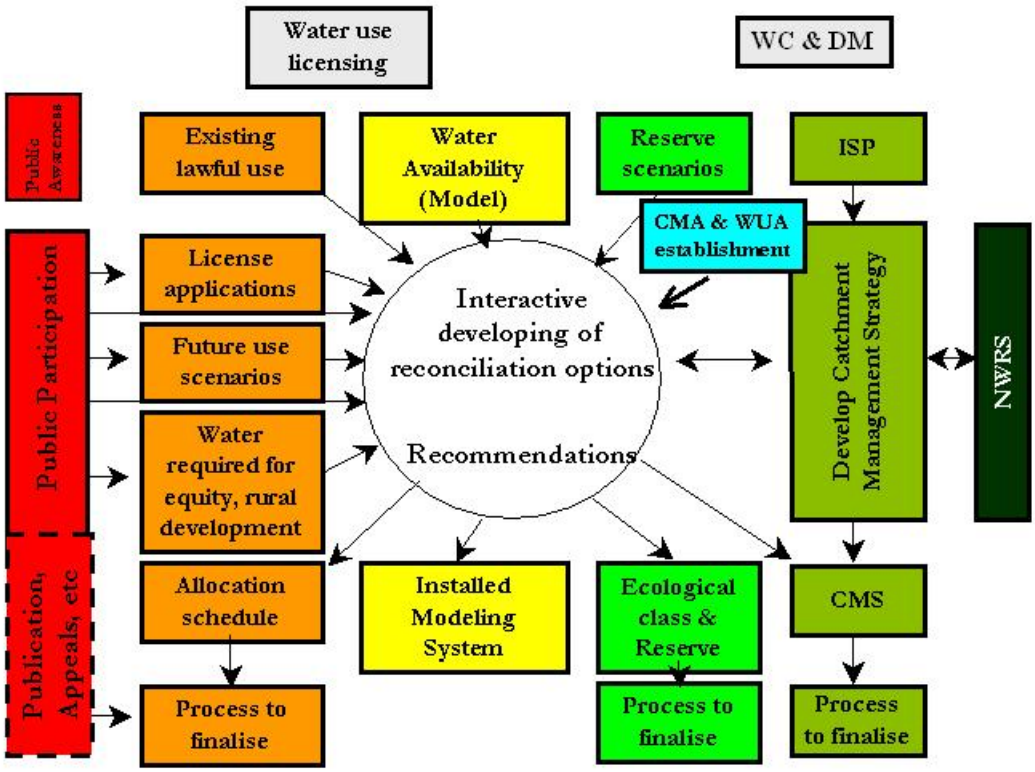

Figure 1. *The conceptual implementation of the IWRM principle as promoted by South Africa's Department of Water Affairs and Forestry (van Rooyen, 2004 pers comm.)[8] (WC&DM = water conservation and demand management, ISPs highlight known water availability and demands in 19 "water management areas").*

Ideologically, a number of activities, spread across several of the DWAF's directorates, would come together into an interactive development of options to reconcile demands for water with water availability and ecosystem needs. This process would result in a water allocation schedule, an installed water availability modelling system, and the final Water Resource Class and Reserve needs. Conceptually this process is the only way to carefully balance demands for water with the protection of water ecosystem services, while maintaining economic growth.

However, this approach places an enormous coordination burden on the DWAF, as a wide range of directorates need to reach the starting line at the same time. This inevitably delays implementation, and is often inconsistent with social and political demands for action both for redress as well as for environmental needs. Clearly, some areas may wish to move faster on the determination of the Resource Class, while others may need to focus initially on equity issues. Moreover, as each of these processes are tied to their own set of legal requirements, finalisation of these within the ambit of the NWA becomes difficult.

2.7 Local planning and water ecosystem services

South Africa has, over the last 10 years, put in place a plethora of policies all focussing on giving effect to the Constitutional principles outlined Section 2.1 above, and all subject to much the same co-ordination problems plaguing implementation of the NWA. Much of the recent effort in South Africa has gone into the establishment of viable local government, and ensuring the effective functioning of municipalities.

[8] Johan van Rooyen, Director: National Water Resources Planning - DWAF

This is largely governed by the Municipal Systems Act, and the Integrated Development Plans (IDPs). These IDPs require local government to plan, coordinate and implement opportunities to address equity and poverty within the municipal boundaries. But are also tied to environmentally sustainable use, and IDPs therefore include sections on "the environment". As the municipal boundaries now cover the whole of the country, effectively all projects (even those in the rural areas), should be included in the IDP.

These IDPs have however been criticised for being "pie-in-the-sky" and often unrealistically ambitious given the limited resources in local government. Nevertheless, the increased political focus on sustainable local government means that IDPs appear to be improving, and are increasingly being promoted as the tool to ensure the co-operative governance required to integrate poverty eradication efforts across a range of institutions. There are, however, enormous challenges to this kind of cross-sectoral integration. Time and resources available to this policy and practice analysis do not however allow for a complete analysis of these broader policies and the reader is referred to Ashton and MacKay (2004), and Mazibuko and Pegram (2006).

The water allocation reform programme has, nevertheless, recognised the importance of subsidiarity and that efforts to reallocate water to emerging black owned enterprises will be more sustainable if local government is directly involved. Opportunities already identified in the IDPs are therefore identified and explored within the compulsory licensing process, while other viable opportunities identified during compulsory licensing are built into the IDPs.

2.8 Land Reform and water ecosystem services

Land reform is effected by a raft of legislation described in more detail in Quibell and Stein (2005). Importantly, however, Land Reform enjoys a much higher social and political profile than does water allocation reform. Land Reform was initiated prior to the 1994 elections, with the White Paper on Land Reform being published in 1991, and the Restitution of Land Rights Act (Act No.22 of 1994), being promulgated in 1994. Broadly, the Land Reform Programme includes three components:

- *Land redistribution*, where land is found to establish poor communities – which often includes the expropriation of irrigated land.
- *Land Tenure*, where communities living on the land for decades are given formal tenure – sometimes on irrigation farms; and
- *Land restitution,* where land is restored to communities who were deprived of their land under the apartheid system.

The underlying drive for land reform was to transfer some 30% of viable agricultural land into black hands by 2014 – 20 years after the first democratic elections. However, more than 10 years after 1994, progress has been very slow, and in 2004 the Land Summit highlighted that government will have to transfer the same amount of land per year for the following 10 years, as it had in the first 10 years of democracy to meet the targets. The South African government is therefore adopting more aggressive expropriation policies in order to meet these targets. In spite of this the Department of Land Affairs is still struggling to spend its budget.

The links between land reform and water allocation reform have also become clearer as the Department of Water Affairs and Forestry initiates its compulsory licensing programme. In some areas up to 50% of the water available for allocation may be tied up in land reform. Clearly, therefore water allocation reform targets may be realised by transferring water entitlements together with the land. However, the recent focus on land reform has also highlighted that some 95% of land reform projects have failed once transfer has taken place[9]. This has prompted the development of the Area Based Planning approach – where land reform projects are integrated into the IDPs.

[9] Pers Comm Siyabu Monana (2007), Consultant involved with the analysis of the Land Reform process.

2.9 Putting policy into practice

Writing the "policy" part of this Policy and practice analysis has been relatively easy. It is clearly evident that South Africa has a range of policies, some of them innovative and many informed by the most up-to-date international thinking, which explicitly recognise the value of sustainable water ecosystem services, and the use of water to promote equity and address poverty. The development of the Classification System has started to outline how these policies could be put into practice, and the WAR programme has analysed the concepts of beneficial use in the public interest, as well as the promotion of both economic growth and poverty eradication (Quibell, *et al*, 2007). However, the picture of actual implementation practices is much harder to paint.

South Africa has long recognised the importance of environmental flows, and the value of ecological services that these flows secure. While this has only recently been explicitly recognised in law, and given priority in allocation, approaches in the 1980's and early 1990's allowed the development of instream flow requirements based on the flows needed to secure critical ecosystem functions. These water demands were, under the old system, seen to be legitimate competing uses, and in most cases other water users accepted the impacts this had on water availability. Importantly, however, this system did not strive for an ideal optimum or to seek consensus with stakeholders, and was in many respects easier to implement.

There are also certainly working examples of making ecosystem or catchment services benefit the poor in the Working for Water, and Working for Wetlands programmes. Similarly, Quibell and Stein (2005) show that the legislative environment is conducive to promoting and protecting water ecosystem services. However, nearly 10 years after promulgation - three of the main pillars of NWA, the Classification System, the establishment of CMAs, and compulsory licensing are still in their infancy. The Classification System still needs to be coded into draft Regulations, which need to go through a public participation process and be promulgated before it can be implemented, the first CMA has only just been established, and compulsory licensing is yet to be implemented fully. South Africa therefore moved relatively rapidly (from April 1994 to September 1998) to develop the NWP and NWA, but achingly slowly to put these policies into practice.

While limited human and financial resources could be (and have been) blamed for some of the lack of progress, there has certainly been a tendency to work towards an elusive optimum, apparently promoted by the policy. A syndrome of *paralysis by analysis* seems to have pervaded both the development and implementation of strategies, where water resources managers attempt to fully understand the integrated nature of water resources, and particularly the possible response of water ecosystem services before making decisions. Some of this could perhaps be blamed on the "overly clever" policies, but there has been a predisposition to overcomplicate implementation. Overlay on this the growing political and social pressures for redress, and you have the potential for perverse outcomes to occur (see Appendix C).

To complicate matters, the commitment to fair and reasonable approaches to redress, allowing the affected parties to approach the courts has certainly slowed progress in land reform, and is highly likely to have the same effect on water allocation reform. The slow pace of implementation has influenced the scoring in Appendix A, where overarching policies and legislation establishing ecosystem services and affecting the demand for these services have scored high, but where scores for policies affecting the development of and access to ecosystem services have a lower projected scoring.

Perhaps of more concern is the fact that many land reform projects are failing, and in many cases water set aside for uptake by the rural poor has never been successfully taken up, or established schemes have failed. In some cases, schemes have not been able to re-secure finance when floods have destroyed irrigation infrastructure. Preliminary analysis of these schemes has suggested that a much bigger and more sustained financial commitment is necessary to successfully establish small growers in a largely westernised marketing system. South Africa now has one of the least regulated agricultural sectors in the world, and the protection mechanisms and

finance used to establish the existing white farmers is not available to emerging black farmers. This has not only impacted on redress initiatives, but has promoted shifts towards fewer large producers within the white farming sector.

Clearly, therefore, successful implementation of the water allocation reform programme requires much more than a commitment by the Department of Water Affairs and Forestry, but by government as a whole. Failing land and water reform projects increase the poor's vulnerability to the loss of water ecosystem services, and in many cases may directly contribute to the loss of these services. The Southern African Millennium Assessment (Sa*f*MA 2005) also highlights that at least 4 of the 8 MDGs will not be realised without an integrated approach, cutting across several sectors. Balancing integration with a tendency to overcomplicate implementation practices, and more importantly the need to secure all the links in the chain, therefore, appears to be the one of the greatest challenges lying ahead. The SA*f*MA (2005) suggests a greater commitment to adaptive management in the face of these challenges. However, without a significantly greater financial commitment to sustaining land and water reform projects, linking water ecosystem services to core redress initiatives in an idealised integrated approach may compromise the country's ability to achieve both.

3. Climate change and water ecosystem services

3.1 Background

South Africa's response to climate change (see below for discussion of its potential impacts) is to some extent also dictated by where the country sees itself on the world stage, and particularly its role in Africa. This is nevertheless tempered by the recognition that the economy is still developing and is vulnerable to global response mechanisms. South Africa ratified the UN Framework Convention on Climate Change in August 1997, and acceded to the Kyoto Protocol in July 2002. However, as a non-annex 1 country, South Africa is not required to reduce greenhouse gasses. The country is, however, still committed to incorporating mechanisms to reduce emissions into policies and practice and to reducing emissions by accessing investment through the Protocol's Cleaner Development Mechanism. But, recognising the vulnerability of the economy, the country also recognises the need to access donor funding to support both adaptation and response measures.

As part of its obligations under the Protocol, South Africa has produced a National Climate Change Response Strategy[10] in 2004. This Strategy highlights a number of particularly vulnerable sectors, including the health sector, maize production, plant and animal biodiversity, water resources, and rangelands. The Strategy recognises that mitigation of impacts in these sectors requires coordinated action across a number of government Departments. The Department of Water Affairs and Forestry has responded to this by recently initiating the development of a Water Sector Response Strategy. The National Water Policy of 1997, nonetheless, recognised the need to "adapt water resource management to human induced changes in climate", and the recognises that mitigation of impacts in these sectors requires coordinated action across a number of government Departments. The Department of Water Affairs and Forestry has responded to this by recently initiating the development of a Water Sector Response Strategy. The Water Sector Response Strategy will presumably further detail what this actually means for water resource managers.

South Africa's Water Research Commission has also responded to the climate change threat, and has funded research into "Climate Change and Water Resources in Southern Africa" (Schulze, 2005). This extensive work addresses not only the plausible climate changes, and the possible impacts on runoff and agriculture, but also assesses the vulnerabilities of sensitive communities and measures to adapt to and mitigate these impacts. This is being followed up by a further research project, which will address *inter alia* the possible impacts of climate change on aquatic

[10] Available online at www.deat.gov.za

ecosystem goods and services. The following sections are drawn largely from the findings of these research projects, and are summarised in Appendix B.

3.2 Impacts on water availability and water allocation

The effects of reduced and more variable rainfall, and higher temperatures and [$C0_2$] are amplified in greater reductions in runoff. Higher temperatures increase evaporation and evapo-transpiration, promote the growth of woody plants including invasive aliens[11], and dry out soils. A small reduction in rainfall, or even more variable rainfall, can therefore result in large changes in runoff, and hence water availability. Models show that streamflows could be reduced by up to 10% in the Western Cape by 2015, and that the reduction in runoff will progress from west to east, reaching the east coast by 2060[12].

South Africa's NWRS therefore recognises that climate change will have an impact on water availability. Water availability assessments in the NWRS – and hence water allocations - are still, however, based on historical runoff sequences. The five yearly revisions of the NWRS may address this, based on the WRC research, and a possible impetus provided by the Water Sector Strategy. The broad response of the NWRS to increasing water stress (from both increased demands and climate change) is nevertheless to promote a gradual shift in water use patterns away from agriculture towards industrial and mining uses, which produce more jobs and income per drop. Ironically, this could increase South Africa's carbon footprint, and is very vulnerable to global responses to climate change (for example by affecting the sale of coal to China or global energy prices – which could slow the economy). The WAR programme has also indicated that the economy would drive water allocations, and not the other way around. Shifts in water use patterns in response to climate change therefore depend on wider economic growth. Our understanding of how incentive mechanisms like water pricing could and should influence these shifts in water use patterns is very poor.

Climate change may also, at least in the short term, see increased demands for irrigation water, as increased evapo-transpiration increases crop watering requirements, and as the economy struggles to shift toward a greater industrial base. The NWRS also suggests that increased variability in runoff would increase the unit costs of water from storage. Smaller scale farmers established under the WAR programme will also be very vulnerable to climate variability. This could change the way in which water is allocated, as well as farming practices – influencing a shift away from smaller farms, to larger commercial enterprises (see Quibell *et al*, 2007). Over the last 6 years the number of dairy farmers has halved, while those who have stayed in business have more than doubled their production, and a single producer produces some 40% of the country's tomatoes. This loss of small scale use, on top of increased globalisation and competition for markets and the loss of internal support mechanisms (like the various marketing boards) may seriously compromise efforts to achieve equity in access to water for productive purposes. Livelihood support programmes based on dryland farming or rainfall harvesting may also be compromised, and the boundaries for viable programmes may also move gradually eastwards.

The effects on groundwater availability are less easy to predict, but could be even more significant. Preston[13] (*pers com*) has suggested that an increase in alien invasive plants in the western Cape could virtually wipe out the availability of groundwater, having a major impact on communities dependent on this as the sole source of water.

[11] South Africa has lead the world in recognising that alien vegetation and commercial afforestation actually reduces river flows, and hence impacts on water availability.
[12] From the National Water Resources Strategy, available online at www.dwaf.gov.za/Docs
[13] Guy Preston manages the Working for Water campaign

3.3 Impacts on water quality and health

The National Climate Change Response Strategy specifically recognises the vulnerability of the human health sector to increased temperatures and extreme events. This may be through promoting the spread of water borne pathogens like cholera (cholera risk areas are likely to spread from the warmer low lying areas in the east), as well as infrastructure failure associated with extreme weather events.

Warmer climates may also promote algal growth, exacerbating the impacts of eutrophication, both by higher water temperatures but also greater thermal stability in lakes and impoundments. Shifts towards a greater industrial and mining use of water may also threaten water quality. More intense rainfall, and poor vegetation cover may also increase erosion and increase sediment yields.

3.4 Impacts on ecosystem services

Generally little is known about the higher order impacts of climate change on water ecosystem services, particularly in South Africa where aquatic ecosystems are adapted to extreme variability in runoff. However, it is possible that a sustained change may affect the provision of critical ecosystem goods and services. Increased temperatures, and a widening of the winter and summer shoulder seasons may shift biological triggers earlier or later affecting the functioning of these systems. A lack of knowledge on threshold responses for these services also makes it difficult to predict how ecosystem services would respond to changes in climate.

Perhaps more importantly, the policy and practice response to these changes still needs to be clarified. Once a Reserve and Class has been determined, water resource management must give effect to those requirements. This could mean maintaining downstream flow regimes from storage, even in the face of overall reductions in runoff as a result of climate change. This could place an additional burden on water availability for productive purposes, and ultimately the economy.

3.5 Impacts on ecosystem resilience

As with the previous section, little seems to be known about how ecosystem resilience may respond to climate change. Ecosystems in South Africa have always coped with and recovered from periodic droughts and floods. It is, however, possible than an increase in the frequency of these events would affect the ability of the systems to recover, and would cause long-term changes in ecosystem functioning. For example, floods in the Sabie Sand River system are known to change the fish assemblages (Kleinhans, *pers. comm*.), and the system can take some four years to recover from these impacts. More frequent flooding could cause permanent changes.

4. The role of the state in maintaining water ecosystem services

4.1 What is the role and interests of the state in water ecosystem services?

One of the outcomes of the water law review process in South Africa has been to inculcate the protection of water ecosystem services directly into policy and indirectly into legislation. The National Water Resource Classification System is based on securing ecosystem goods and services that contribute either to; improved livelihoods, improved water quality, or which mitigate against flooding, and protect critical baseflows. The classification of the resource and the establishment of the Reserve, unlike many of other functions in the NWA, cannot be delegated to Catchment Management Agencies. National government, in its role as the custodian of the water resource is therefore primarily responsible for establishing the protection of these services.

This is not, however, done in isolation, and the establishment of the Resource Class is done in consultation with stakeholders, and is ideally integrated with the compulsory licensing and the

development of catchment management strategies. The classification process will also strive towards consensus[14], while maintaining the public trust doctrine. As such, after hearing representations, the final determination of the Class remains with the Minister: Water Affairs and Forestry. A present this is delegated to the Director-General[15] of the Department, and will be done on the advice of the RDM Chief Directorate. This signals the intention to retain the determination of the appropriate balance between protection and use in any resource as a political decision.

Protection of water ecosystem services therefore ultimately rests, firstly, on them being identified in the classification process and, secondly, on creating sufficient social impetus to sway the political decision in favour of protection. While there is certainly a body of NGOs that recognise the value of these services for rural livelihoods, it is still too early to tell if this would create sufficient momentum to alter decisions. Similarly, until such time as the classification process has seen widespread implementation, it is unknown whether the immediate attractions of job creation and economic growth opportunities would dominate stakeholder discourse. Certainly there is a risk that the pressure to address significant disparities between the "haves" and "have nots" (and the social instability this can cause) may drive processes to identify quick equity wins. The implications of the current political discourse on this process are outlined in the following section.

Once established, all organs of State or water management institutions must give effect to the Reserve. The capacity to actually make water ecosystem services work for the poor, therefore, rests not with national government and the ability to establish the level of protection, but rather the capacity of Catchment Management Agencies and Water User Associations to manage the resource accordingly. This is addressed in Section 3.3 below.

4.2 What are the interests of politicians and leaders in water ecosystem issues?

The predominant political discourse in South Africa at present is: addressing poverty and ensuring equity. The debate is exactly how to achieve this. To understand how this affects interests in water ecosystem services we need to understand where the country comes from and where it sees itself within the developing world.

The need to break away from the dependencies of poverty is particularly true for South Africa, where the promise of democracy is equated with the need for all South Africans to enjoy the lifestyle of the whites. The poor have aspirations which they feel must be met by government. Social pressures are therefore often to provide the highest levels of services, and by implication to reduce the dependency on ecosystem services. In this light, the adage;

> *"Goods and services provided by government will always count more than goods and services offered by ecosystems."*

will certainly hold. For example, providing safe potable and chlorinated water will always be preferable to maintaining wetland-filtering functions, particularly as much of the microbial contamination will occur at the site the water is collected or after the water is collected. Politicians and NGOs in post-Apartheid South Africa would therefore always tend towards engineering solutions to a lack of service delivery.

The political value of ecosystem services is also tied to some extent to the approach government takes to address poverty. Ideologically, poverty can be addressed by either re-slicing the pie more equitably, then letting the benefits grow, or by growing the pie, and ensuring the additional slices are better shared. A detailed examination of these ideologies is beyond the scope of this analysis, and a more detailed account of the impact of these on water allocations is provided in Quibell, *et al* (2007). The possible impact of these approaches on policies towards water ecosystem services is discussed in Section 5.

[14] It is nevertheless recognised that consensus may not be achievable.
[15] The Director-General is a political appointment, and serves as the link between the bureaucracy and the political processes.

It is, however, unfair to suggest that politicians in South Africa have no interest in protection of the environment and in water ecosystem services. The inclusion of the RDM measures in the NWA, and the promulgation of the National Environmental Management Act in 1998 (DEAT, 1998), which requires EIA authorisations for developments, is proof of this commitment. Practitioners have nevertheless consistently source to ground environmental protection in the more popularist movements for poverty eradication and sustainable growth.

4.3 What are state capacities to handle water ecosystem issues?

South Africa's National Water Act is widely hailed as one of the most progressive pieces of water legislation in the world. It's foundation in IWRM principles, and the innovative methods to ensure protection of aquatic ecosystems, together with processes like compulsory licensing give the State the power to realise the ideals of optimum social, economic and environmental use of water. However, this has come at a price. The strategies to implement these policies are often highly technical, and fraught with legal pitfalls. As a result, implementation processes have often been slow and are increasingly being hampered by a lack of human resources. There is also increasing evidence that government will not be able to realise its WAR objectives, and importantly to establish viable and sustainable post reallocation water using businesses for emerging users, without a significant sustained financial commitment. Similar post settlement support problems have plagued the land reform programme.

Clearly, therefore in spite of an experienced and well-qualified core of water resource managers, and aquatic ecologists, South Africa suffers from significant skills shortages, and financial and human resource capacity problems. These problems are likely to be even more pronounced in the Catchment Management Agencies. This can conceptually be resolved in two ways: firstly, by increasing the resources by appointing more people, training more graduates and increasing budgets; or, secondly, by reducing the work load by developing simpler implementation strategies and/or narrowing the scope of the work[16]. Neither of these options appears to be feasible or attractive in the short term, and it is likely that a combination of both would have to be developed.

Ultimately, however, realising the ideals of the classification and water allocation reform processes will require a significant cash injection. Finding this within the national fiscus depends largely on government's overarching approaches to addressing poverty as described in Section 3.2. An economic growth-friendly budget and taxation system may not provide the social resources necessary, while a socially-friendly budget and taxation system may slow economic growth and long-term sustainability.

While an argument could be made for donor support in this respect, the tendency at the moment is for donors to withdraw from South Africa, focussing their attentions rather on the country's poorer neighbours and Africa as a whole. Moreover, the donor support needed at this stage appears to be more operational and less developmental. Ironically, in the face of pressing needs back home, South Africa is considering becoming a donor in its own right, something that would absorb some R 6-9 billion of the tax base. This aid will be conditional[17], and focussed on Africa, reflecting the need to be seen to be active in NEPAD and the African Renaissance.

5. The role and effectiveness of other parties

5.1 How are civil society and the private sector organised to respond to or shape policy issues associated with water ecosystem services, and through what mechanisms?

South Africa's policies towards protection of aquatic ecosystems, and in particular the recognition of ecosystem services as the basis for that policy, was originally largely driven from an academic

[16] This inherently means accepting the risk that the integrated nature of water resources management is not fully understood or accommodated in management.
[17] Again with some irony, South Africa has fought against conditional Aid since 1994.

perspective, spurred on by development of methodologies for instream flow determinations during the 1980's and early 1990's. Certainly, it's inclusion in the NWA in the way it was (see Section 2) was made possible by the Constitutional provisions for sustainable development, but such radical shifts in thinking around protecting aquatic ecosystems would not have been possible outside of the political drive to redress the inequities left by the apartheid system, and the academic basis for instream flow determinations.

Many of these academics have subsequently left South Africa, but a core of similarly minded people are continuing with the ongoing development of the Classification System. Critically, therefore, the development of policy around ecosystems services was not driven by a groundswell of support from the wider population, and its inclusion in the legislation was mostly in recognition of the public trust doctrine in the NWA. It is, however, perhaps unfair to intimate that there is limited support for the Reserve and classification process. Several NGO's are advocates for the process and have, in some cases, approached the courts to stop developments using this legislation as a basis. This kind of advocacy is also evident within the Department of Water Affairs and Forestry bureaucracy, and in some cases the Resource Directed Measures directorate has been accused of slowing down the development and use of water resources.

Importantly, this advocacy has not spread to the majority of the population, nor is there any evidence for widespread political support for ecosystem services as one of the tools in the arsenal against poverty. There has, nevertheless, been increasing activism and mass action for the provision of sanitation, housing and water services. Scenes reminiscent of the struggle against apartheid are quite common. These sometimes violent protests give the poor access to the media, but these actions are often portrayed as irresponsible and hence in a poor light. Similar threats of "Zimbabwe Style" reallocations of land and water are sometimes used to peak the media's interest. However, in all of these cases problems are seen to be a result of a failure of government to deliver, and not against a backdrop of water or land availability, or a failure to secure other ecosystem services.

Clearly, there is little widespread knowledge of ecosystem services, and the role these play in sustainable development. A notable exception to this has perhaps been the Working for Water campaign, which has Nelson Mandela as a patron, and is relatively widely known. However, civil society may become more actively involved in engaging and demanding water ecosystem Services as the DWAF moves to promulgate and implement the Classification System.

However, in response to the Water Allocation Reform process, many existing water users are definitely gearing up for battle. In most cases farmers are arguing that government should build more dams to support the new demands of black users. Similarly, there have been demands that compensation be considered for all deprivations of existing water entitlements. The business sector is also arguing for an economic growth model to guide the reallocation of water. It is therefore highly likely that the water allocation reform process will end up in the courts in the next few years. The outcomes of these cases, and government's response to them, will largely chart the course of the ongoing WAR process.

5.2 How are external actors organised to respond to or shape policy issues affecting water ecosystem services?

South Africa is seen by many to be at the forefront of global thinking on water resource protection. While the approaches used in other countries certainly helped shape South Africa's NWP, donor support or external agencies have not strongly influenced overarching policies since the promulgation of the NWA. However, some donor-supported projects have helped develop implementation strategies for this policy, the water allocation reform programme being a case in point. The value of this support is, however, not perceived to be the expertise or even financial resources provided by external actors – but rather the focus donor supported projects provide to addressing specific implementation problems.

6. Forecast other changes

6.1 How will changes in the above political roles and interests affect the policy 'map'?

Preceding sections have alluded to some of the likely future trends. The predominant force shaping policies and implementation in South Africa will remain efforts to ensure equity and the provision of services like housing, water and sanitation. However, the way this is achieved may change.

One of the more topical media subjects over the last year in South Africa has been the Presidential succession debate. The Mandela Presidency appeared to focus on reconciliation and the immediate post apartheid euphoria of the new South Africa. The Reconstruction and Development Programme aimed to rebuild South Africa. The Mbeki Presidency has aimed at two areas: the provision of basic services; and promoting economic growth to make those services sustainable. This has often meant walking a difficult tightrope between socially or economically responsible policies. This seems to be coupled to a greater international and environmentally responsible approach to sustainable development.

While this has ostensibly worked in some respects, given the apparent progress towards meeting the MDGs and economic growth figures, there is mounting criticism. There is evidence that the services provided are not sustainable and "quick wins have lead to rapid failures[18]". Similarly, many argue that the country is experiencing jobless growth. The gap between rich and poor is growing, and progress on land and water reform has been slow.

Recently, therefore, and increasingly with the Presidential succession debate, this approach has come under fire. Trades Union movements, and political parties to the left of government (which are part of the ANC/Cosatu/SACP alliance) have suggested that social equity is a surer path to sustained economic growth and job creation. This may see a speeding up of spending on government delivered services, and perhaps more risk-averse promotion of developments. This may also mean that South Africa's role on the international stage would be downplayed in favour of spending at home. While it is too early to tell if this will impact on the political perceptions of water ecosystem services, it is possible that a greater focus on redress and service delivery will divert attention from environmental issues.

6.2 What are the drivers of socio-economic change that affect water ecosystem services and their links to poor people?

Direct dependence on ecosystem services for livelihood support is largely a rural poor phenomenon. Urbanisation, economic growth and the provision of services will dilute this immediately obvious link. However, the less direct links between these services, and sustainable provision of services and sustained economic growth (for example in lowering water treatment costs) may in fact be much more important, particularly in the light of growing impacts on the water resource.

Unfortunately, these less direct links are also less understood, and hence less likely to drive policy and practice towards water ecosystem services. It is, nevertheless, likely that economic growth, and a gradual reduction in poverty may (at least in the shorter term) see less attention being paid to water ecosystem services.

7. Suggestions for research priorities

1. **Values of water ecosystem services**. While the links between rural livelihoods and water ecosystem services have received some attention, the link between these services

[18] Kathy Eales, City of Johannesburg, Water Services (personal communication)

and economic growth and the sustainable provision of services is very poorly understood. These links remain largely anecdotal and un-quantified. The value of these ecosystem services to developing countries longer term visions needs to be highlighted and recommendations made as to how this should be recognised in policy and law.

2. **What is an appropriate level of integration for IWRM**. Developing countries are likely to struggle to manage and coordinate all the factors that contribute to IWRM, and especially to "optimise" social, economic and environmental use of water. Mechanisms need to be developed which allow policy and practice to recognise the integrated nature of water resource management, without becoming bogged down in an academic and technical ideal. Less risk adverse, but still responsible approaches – based on an understanding of water ecosystem services – need to be developed, which recognise emerging economy needs. A new focus on ***Outcomes-Based Water Resources Management*** – focusing on the integration needed to realise specific outcomes should receive additional focus.
3. **Threshold and amplification effects of climate change**. The impacts of climate change on water flows, and more recently on ecosystem goods and services, is receiving some attention in South Africa through the Water Research Commission. However, attention may need to be paid to possible threshold or amplification effects. Groundwater may need to be a particular focus, as may changes in water borne pathogens, infrastructure failure associated with extreme weather events, algal growth, water quality impacts of shifts towards greater industrial and mining use of water, and increased erosion and sediment yields.
4. **Variability vulnerability and small businesses/producers**. The impacts of more variable flows and rainfall on the establishment of viable small water using businesses needs to be better understood. This needs to be contextualised within the broader development goals of poorer nations, and in particular the need to ensure that the benefits of water use need to be more equitably spread, rather than the water itself.
5. **Pricing and incentive mechanisms**. The real potential of pricing mechanisms and other incentives to promote long term shifts between water use sectors needs to be investigated. For example, would a shift from irrigation to industrial water use be driven by the cost of water, or by industrial growth – supported by proactive reallocations and incentives?
6. **Moving water ecosystem services up the political agenda**. This is tied somewhat to valuing water ecosystem services addressed under (1). However, specific attention needs to be paid to mechanisms to raise the political profile of these services.

References

Ashton, PJ and MacKay, HM (2004) *Towards cooperative governance in the development and implementation of cross-sectoral policy: Water Policy as an example*. Water SA (30) 1,

DEAT (Department of Environment Affairs and Tourism) (1998) *The National Environmental Management Act, 1998 (Act No. 107 of 1998)*. Pretoria: Department of Environmental Affairs and Tourism. Available [online] at website: http://www.deat.gov.za

DWAF (Department of Water Affairs and Forestry) (1997). *White Paper on a National Water Policy for South Africa*. Pretoria: Department of Water Affairs and Forestry. Available [online] at website: http://www.dwaf.gov.za/Docs/

DWAF (Department of Water Affairs and Forestry) (1998) *The National Water Act, 1998 (Act No. 36 of 1998)*. Pretoria: Department of Water Affairs and Forestry. Available [online] at website: http://www.dwaf.gov.za

DWAF (Department of Water Affairs and Forestry) (2006a). *The National Water Resource Classification System*. Pretoria: department of Water Affairs and Forestry. Available [online] at website: http://www.dwaf.gov.za/Docs/

DWAF (Department of Water Affairs and Forestry) (2006b). *A draft position paper for Water Allocation Reform in South Africa*. Pretoria: department of Water Affairs and Forestry. Available [online] at website: http://www.dwaf.gov.za/Docs/

DWAF (Department of Water Affairs and Forestry) (2006c). *The National Water Resource Strategy*. Pretoria: department of Water Affairs and Forestry. Available [online] at website: http://www.dwaf.gov.za/Docs/

MAR7 (2005). Freshwater Ecosystem Services. Chapter 7 by Aylward, B., Bandyopadhyay, J. and Belausteguigotia, J-C. *et al*. In: *Ecosystems and Human Well-Being: Policy Responses, Volume 3*. Millennium Ecosystem Assessment. Island Press, Washington, Covelo and London, and www.Maweb.org

Mazibuko G and Pegram GC (2006) *Evaluation of opportunities for cooperative governance between Catchment Management Agencies and local government*, Water Research Commission Report, WRC No, 1433/1/06

Quibell G and Stein R (2005) *Can payments be used to manage South African watersheds sustainably and fairly: A legal review*. Report to IIED, London

Quibell G, Stein R and Ncapayi N, (2007) *Transforming legal access to water to redress social inequity and economic inefficiency.* Chapter 3 in a Resources for the Future book (in press)

SafMA (2005) *The Southern African Millennium Assessment*. Available online at www.millenniumassessment.org

Schulze RE ed (2005) *Climate change and water resources in southern Africa*. Water Research Commission Report, WRC Report No. 1430/1/05

Stein, R. (2002). *Water sector reforms in southern Africa: Some case studies*. Chapter 9 in: Turton, A.R. and Henwood, R. (Eds), *Hydropolitics in the Developing World: A Southern African Perspective*. Pretoria: African Water Issues Research Unit (AWIRU). Pages 113-123.

APPENDIX A – POLICY AND PRACTICE MAP

This Policy and Practice map attempts to score some of the water ecosystem services outlined in MAR7 (2005) against specific South African policies and practices. The scoring represents the author's perceptions of the fact that in South Africa policies toward the protection of water ecosystem goods and services are among the best in the world, however implementation of these policies appears to have been hampered by an overly complex approach to implementation.

		WATER ECOSYSTEM SERVICES					Overall Score
		Water Quality	Water Quantity	Water for productive use	Ecosystem services *	Reslience	
DEMOCRACY - APRIL 1994							
POLICY IN PRACTICE	THE CONSTITUTION (1996)	Recognises sustainable development, and the right to have the environment protected in the Bill of Rights. But the inclusion of many of the other benefits of aquatic ecosystems as "Rights". It also places an obligation on the State to progressively realise these Rights. This means that government agencies are hestitant to rely on the vagaries of ecosystem services - **Overall Score = 3**					3
	THE NATIONAL WATER POLICY (1997)	Recognises the unity of the water cycle, and the interelated nature of water quality and quantity. **Score = 5**		Recognises the need to develop a new system of allocation. **Score = 5**	Recognises "silent services" provided by aquatic ecosystems, and that ultimately these provide for the sustainable use of water resources. **Score = 5**	Specifically mentions the need to protect ecosystem resilience. **Score = 5**	5
	THE NATIONAL WATER ACT (1998)	Recognises 11 uses of water at the same level, and that Resource Quality Objectives include both water quality and quantity. Mechanisms include economic incentives and command and control. **Score = 5**		Codifies compulsory licensing and pro-redress authorisation. **Score = 5**	RQOs allow for the inclusion of any characteristic of the resource. But ecosystem services are now implict in water use and RQOs. **Score = 3**	Ecosystem resilience now implict in the protection measures. **Score = 2**	3.75
	CLASSIFICATION SYSTEM and COMP. LICENSING (2006)	Both systems recognise the need to manage both water quality and quantity. However, the CL process focusses on quantity. **Score = 3**		Compulsory licensing process focusses on beneficial use for the nation. **Score = 5**	Classification system specifically recognises and places a value on these services, but the complexity of the system makes implementation difficult. **Score = 1**	Concept of ecosystem resilience now largely lost. **Score = 0**	2.25
	CLASSIFICATION OF RESOURCES and REALLOCATION (2008 -....)	Technical complexity and the desire to integrate everything is slowing implementation. Attempts to speed up implementation may lead to perverse outcomes. Need for redress is becoming lost in the IWRM objective **Score = minus 2**		Legal challenges around the lack of compensation threaten process. **Score = minus 3**	A highly complex system, and the CBA approach balancing the benefits of these services with the benefits of water use may lose the original intent of providing for these services. **Score = minus 2**	Concept of ecosystem resilience now completely lost. **Score = 0**	-1.75
	Average Scores	2.80		5.00	2.00	2.00	2.45

* Ecosystem services are used in the broadest sense as including natural filtration in wetlands, provison of housing materials, cultural uses, recreation, provison of food and medicines and mitigation of floods and flows.

APPENDIX B – IMPACTS OF CLIMATE CHANGE ON POLICY AND PRACTICE MAP

This diagram attempts to map the possible impacts of climate change on some of the water ecosystem services outlined in MAR7 (2005) in South Africa.

	THE IMPACTS OF CLIMATE CHANGE ON WATER ECOSYSTEM SERVICES				
	Water Quality	**Water Quantity**	**Water for productive use**	**Ecosystem services ***	**Reslience**
THE NATIONAL CLIMATE CHANGE RESPONSE STRATEGY	Sets out a natinal response to both mitigate the impacts of climate change, as well as the country's response to its international obligations. It recignises that international action on climate change be a vechicle to redress the historic, inequitable and unsustainable north/south divide of the world's economy and prosperity. The Stragtegy highlights a number of particularly vulnerable sectors, including the health sector, maize production, plant and animal biodiversity, water resources, and rangelands. But also that the South African economy is vulnerable to the responses of developed nations.				
IMPACTS OF CLIMATE CHANGE	**Increase in water borne diseases**, particularly an increase in the areas prone to Cholera. Increased eutrophication, and sediment loads. Shifts toward mining and industrial pollution use due to increasing water stress.	Reduced rainfall, **amplified** in reduced runoff and reduced water yields. Reduced and more variable water yeilds increase unit costs of water. Reduced groundwater availbility.	Increased demands for irrigation water. High vulnerability of small scale water users compromises the effects of water reallocations. Loss of dryland farming areas forces more people into irrigation use.	Potential loss of ecosystem services due to changing runoff and flow patterns. Increased temperatures and widening of rainfall runoff seasons impact on biological triggers. Possible threshold levels reached.	Increased frequency of droughts and floods affects ability of systems to recover.
MITIGATION RESPONSES	Greater effort to realise MDGs for WSS in Cholera affected areas. Tighter controls on industrial discharges as water use patterns shift. Land care and land rehabilitation projects	Promoting shifts in water use that provide more crop and income per drop by pricing and other mechanisms.	Increased assurance of supply to smaller users. Promoting on farm storage to capture short term high runoff events	Maintain Reserve, Class and Resource Quality Objectives by releases from upstream storage, or adapt these recognising the "natural" impacts of climate change.	

* Ecosystem services are used in the broadest sense as including natural filtration in wetlands, provison of housing materials, cultural uses, recreation, provison of food and medicines and mitigation of floods and flows.

APPENDIX C – PERVERSE OUTCOMES

Perverse or unintended outcomes certainly do occur in legislation, and are more likely when;

1) The legislation is very new – and does not have a body of case law to back it up.
2) The legislation is very integrated – and tries to link everything together to achieve an ideal.
3) The legislation tries to shift an existing and "evolved" status quo.
4) The capacity to understand, assimilate and manage the integrated nature of the law (social, political, economic and environmental) is limited.

All of these apply to the National Water Act, and perverse outcomes are likely to arise with the implementation of the NWA (and in fact in any legislation trying to give effect to IWRM in developing countries). An examples is outlined in the following paragraphs.

In 1999 The Minister: Water Affairs and Forestry - Kader Asmal was trying to get the Blyde 800 scheme of the ground. In brief water that used to be delivered in earth-lined canals was going to be put into pipes to be delivered under pressure. This saved sufficient water (no canal losses) to irrigate a further 800 ha (hence the Blyde (name of the River) 800). The idea was to make this available to emerging farmers. This reflected some of the key objectives of the new Act.

But the pipe was expensive and farmers needed collateral for the loan. This had to be based on the verified or confirmed lawful entitlement to water. The principle behind the NWA was that – actual lawfully exercised water use in the 2 years prior to the promulgation becomes lawful under the new legislation. But as it is quite difficult to determine the actual historical water use – they decided to speed things up by indicating that it the water use was scheduled or "listed" under an irrigation board it became lawful under the NWA whether actually used or not – provided that the farmers took it up within a 2 year period[19]. However, based on legal advice the 2 year period was removed as water use is either lawful or not, and can not be determined lawful for just for 2 years. The practical upshot of this that all water use scheduled by an Irrigation Board (IB) as part of any Government Water Control Area (throughout SA), whether actually used or not becomes lawful.

The perverse outcomes of this are;

1) In many areas while the use was scheduled under an IB it was never used because the water in fact did not exist (the original schedules overestimated the water that was available). So we are declaring water that does not exist as being lawfully used!
2) As the land with a scheduled use fetches a higher price, this unpracticed water use actually has a value, and is in effect often mortgaged with the bank even post 1998. (Land changes hands on average every 4 years in SA).
3) If we take the "unused" but scheduled water off the land during CL, we can devalue the land to less than what is owed to the banks – this has certainly contributed to some of Zimbabwe's economic woes.
4) Users can trade this unpracticed water use to other users in areas where the water does exist, and get paid for it.

[19] The initial period suggested by the bureaucracy was 5 years, Minister: Asmal deliberately changed this to 3 years, signalling a clear intent to limit effects of the declaration.

APPENDIX D – KEY STAKEHOLDERS

NAME	DIVISION / INSTITUTION	TEL NO / E-MAIL
Chris Moseki	D: Water Resource Planning Systems	(012) 336 7867
Mokgadi Mathekgana	D:IEE	(012) 336 8322 mathekganam@dwaf.gov.za
Solly Mabuda	D: Option Analysis	(012) 336 8477 mabudas@dwaf.gov.za
Beason Mwaka	D: Water Resource Planning Systems	(012) 336 8188 gda@dwaf.gov.za
Harrison Pienaar	DWAF: RDM	(012) 336 7197 gin@dwaf.gov.za
Guy Preston	DWAF: Working for Water	083 325 8700 gpreston@mweb.co.za
Mazwi Lushaba	DEAT: Air Quality Man	mlushaba@deat.gov.za
Tshilidzi Dlamini	DEAT: AQM	tdlamini@deat.gov.za
Elsie Manale	DWAF: WRIM	gmy@dwaf.gov.za
Johnny Beumer	DWAF: PSC	beumerj@dwaf.gov.za
Raymond Hauptfleisch	DWAF: PSC	acc@dwaf.gov.za
Chris Swiegers	DWAF: PSC	swiegersc@dwaf.gov.za
Roland Schulze	UKZN: Water Resources specialist	schulzer@ukzn.ac.za
Bruce Hewitson	UCT Climate Change specialist	hewitson@egs.uct.ac.za
Michelle Warburton	UKZN	warburtonm@ukzn.ac.za
Sabine Ernst	UKZN	ernsts@ukzn.ac.za
Gavin Quibel	DFID/IIED Consultant	gavin@pegasys.co.za
Rachalet Cronjé	DWAF: WRMS	cronjer@dwaf.gov.za
Zacharia Maswuma	DWAF: D: HS	maswumaz@dwaf.gov.za
F Botha	DWAF: WRPS	ifk@dwaf.gov.za
Johan van Rooyen	DWAF: NWRP	javr@dwaf.gov.za
Dirk Craigie	DWAF: WRIP	craigied@dwaf.gov.za
Sebastian Jooste	DWAF: RQS	joostes@dwaf.gov.za
Mbangi Nepfumbada	DWAF: WRIM	xkj@dwaf.gov.za
Matlala Moloko	DWAF: WRIP	matlalm@dwaf.gov.za
Peggy Moatshe	DWAF: WRIP	moatshep@dwaf.gov.za
Ntuthuzelo Ponoyi	DWAF: FTS	ponoyin@dwaf.gov.za
Michael Peter	DWAF: FTIS	peterm@dwaf.gov.za
Tom Vorster	DWAF: FTIS	vorstert@dwaf.gov.za
Peter van Niekerk	DWAF: IWRP	niekerk@dwaf.gov.za
Petrus Venter	DWAF: NW IWRM	venterp@dwaf.gov.za