NATIONAL WATER CONSERVATION AND DEMAND MANAGEMENT STRATEGY

WATER CONSERVATION AND DEMAND MANAGEMENT STRATEGY FOR THE FOREST SECTOR IN SOUTH AFRICA

Department of Water Affairs and Forestry
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FOREWORD

The National Water Act No. 36 of 1998 (Act) requires the Minister of Water Affairs and Forestry (Minister) to develop a National Water Resources Strategy (NWRS). The NWRS must contain, amongst other matters, 'principles relating to water conservation and water conservation & demand management' (s6(1)(h)).

In order to meet this requirement, the Directorate: Water Conservation of the Department of Water Affairs and Forestry (DWAF), has embarked on a process to prepare a National Water Conservation and Demand Management Strategy. This process has included the preparation of sectoral water conservation and demand management (WC&DM) strategies for the following sectors:

- Water Services
- Industry
- Agriculture
- Forestry
- Environment

These sectoral strategies, along with the Water Conservation and Demand Management National Strategy Framework prepared by DWAF (1999a), will be consolidated for inclusion in the NWRS. This document constitutes the draft WC&DM Strategy for the Forest Sector.

EXECUTIVE SUMMARY

Equitable sustainable economic development runs like a golden thread through the policy framework and mindset of South Africa. In working towards the achievement of this goal, it is essential that our national resources, especially *water*, be used wisely. After thousands of years of human development in which *water* has been a plentiful resource in most areas, amounting to virtually a free good, the situation is now abruptly changing to the point where water scarcity is becoming a threat to sustainable development.

South Africa is a relatively dry country, with irregular rainfall across the country and from year to year. The average annual rainfall is 500mm compared with the global average of 800mm. Water scarcity is further aggravated by the fact that 60% of the river flow arises from only 20% of the land area. In addition, South Africa has limited groundwater supplies (Schreiner 1998).

The total natural runoff in South Africa is estimated at 55 billion m^3 per year, of which only 33 billion m^3 is utilizable. It is estimated that water use will increase from a current level of 18 billion m^3 (1996 estimate) to 30 billion m^3 per year in 2030. From this it is apparent that an action plan is urgently needed to ensure wise supply and use of water. The first step in such a process should be to ensure more efficient and productive use of current water supply. The Department of Water Affairs and Forestry (DWAF) has embarked upon a process to develop sectoral action plans for improving water use efficiency and productivity. These plans are generically referred to as Water Conservation & Demand Management (WC&DM) Strategies.

This document discusses issues relating WC&DM in the *plantation forest sector.* The sector consumes approximately 2.7% (1,5 million m^3 / 55 million m^3 * 100) of the total annual runoff in South Africa. The document discusses the policy framework for WC&DM, and structures that are currently in place within DWAF, which will facilitate the implementation of WC&DM action plans. Three generic elements that are crucial to the WC&DM philosophy are discussed within the forestry context:

- Approaches to achieve efficient **allocation** of water,
- Approaches to **apply** water efficiently and without waste,
- Approaches to maximize water **productivity**.

The ***allocation element*** has an inter-sectoral, as well as an intra-sectoral component, and the relation of forestry to both these components is discussed. For most water use sectors, the ***application element*** holds the greatest leverage for water conservation & demand management, as this deals with activities such as fixing leaks, and reducing other losses that occur during the transport of water from the source to the use. Because forestry is an SFRA, application efficiency is already high, and little scope exists for improving allocation efficiency. The ***productivity element*** provides the only real leverage for forestry to implement water conservation and demand management activities. Productivity relates to the amount of fibre produced per volume of water consumed.

More than 10 years ago, the forest industry began to implement water conservation and demand management activities that relates to application efficiency and productivity increase. Furthermore, with regard to allocation management, the Forest Industries Association (FIA) claims that the industry has sacrificed about 220,000 hectares of plantation as a result of the introduction of the Afforestation Permit System (APS) in 1972.

The three elements of WC&DM, and activities and incentives associated with them are discussed and combined into an action plan for implementation working towards a proposed goal for the forestry WC&DM.

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ACRONYMS AND ABBREVIATIONS

Act	National Water Act No. 36 of 1998
APS	Afforestation Permit System
CMA	Catchment Management Agency
DEAT	Department of Environmental Affairs and Tourism
DWAF	Department of Water Affairs and Forestry
EIA	Environmental Impact Assessment
FIA	Forest Industries Association
FOA	Forest Owners Association
FSC	Forest Stewardship Council
IEM	Integrated Environmental Management
Minister	Minister of Water Affairs and Forestry
NEMA	National Environmental Management Act No. 107 of 1998
NWRS	National Water Resources Strategy
NFAP	National Forestry Action Plan
SEA	Strategic Environmental Assessment
SFM	Sustainable Forest Management
SFRA	Stream Flow Reduction Activity
WC&DM	Water conservation and demand management
WMA	Water Management Area
WUA	Water User Association
WUAp	water use application
WUE	water use efficiency
WUP	water use productivity

SECTION 1: INTRODUCTION

1.1 Background

Water is one of the most important natural resources for human and ecosystem needs, as well as economic development. Sustained growth in human population and economic activity in South Africa, has led to increasing demand for water. South Africa, being an largely arid country, is fast approaching the limits of its water supply. Innovative approaches are required to ensure that the social, economic and environmental needs of South Africans can be met into the future, within the constraints of available water resources. WC&DM is a valuable approach which can be used to help close the gap between water demand and supply.

1.2 What is water conservation and water conservation & demand management?

1.2.1 Water conservation

Conservation, in relation to a water resource, is defined in the Act as being *the efficient use and saving of water, achieved through measures such as water saving devices, water-efficient processes, water conservation and demand management and water rationing* (s1(1)(v)).

The Water Conservation and Demand Management National Strategy Framework (DWAF, 1999a) interprets water conservation as being *the minimisation of loss or waste, the preservation, care and protection of water resources and the efficient and effective use of water (p 12).* This includes an additional concept, related to the care and protection of water resources, which is not referred to in the definition in the Act.

1.2.2 *Water conservation and demand management*

Water conservation and demand management is not defined in the Act. The Water Conservation and Demand Management National Strategy Framework (DWAF, 1999a) tentatively defines the concept as comprising *the adaptation and implementation of a strategy (policies and initiatives) by a water institution to influence the water demand and usage of water in order to meet any of the following objectives: economic efficiency, social development, social equity, environmental protection, sustainability of water supply and services, and political acceptability*.

1.2.3 Relationship between the concepts

Water conservation, in terms of the efficient and effective use of water, can therefore be seen as an overall policy objective. Water conservation and demand management, through the implementation of a coordinated strategy, provides the means through which this policy objective can be met.

1.3 Why is water conservation and water conservation & demand management important in South Africa?

1.3.1 Water scarcity, unpredictability and uneven distribution

South Africa is a water-scarce country. The average annual rainfall is 500mm compared with the global average of 800mm, and is unevenly distributed geographically and seasonally. It is also highly variable over time, resulting in unpredictable and often lengthy droughts (McKenzie *et al*, 1999). The high evaporation rates that prevail mean that much of the rain that does fall is soon returned to the atmosphere before it can be effectively utilised. South Africa is also poorly endowed with groundwater.

1.3.2 Constant increasing demand

Water demand in South Africa has been growing at around 4.5% per annum since the 1930s (McKenzie *et al*, 1999). Within 20 to 25 years, if current consumption patterns continue, the water scarcity problem in South Africa could be extremely severe (Schreiner, 1999). An estimated 41% of the total mean annual runoff in South Africa is already allocated.

1.3.3 Significant potential cost savings

Meeting South Africa's growing water demand through increasing supply is becoming more and more expensive, as cost-effective water augmentation options are being fully exploited. WC&DM can delay the need for additional water supply schemes by many years, with very significant financial savings. For example, McKenzie et al (1999) estimated that if a 10% reduction in water demand was achieved in the Vaal River Supply Area, this would result in a 6-year delay in the need for a new water augmentation scheme with savings of around R6 000 million. These savings could reduce the cost of water to commercial and domestic water users.

SECTION 2: OVERVIEW OF FOREST SECTOR

2.1 Profile of plantation forest sector

Plantation forestry has developed in South Africa because South Africa is a wood-scarce country, because it has a developing economy with escalating wood product requirements, because it has favourable growing conditions (e.g. climate etc.), and because it has world-class forestry knowledge and expertise. It is now a significant contributor to the national economy. Currently, the impact of the Forest sector can be summarized as follows (FIA, 2000):

- the area planted is 1,518,138 hectares (1,2% of SA total land area)
- approximately 400,000 hectares owned by the Forestry Industry remains unplanted (APS restricted), being managed primarily for the conservation of flora and fauna (including water)

- the turnover of the Forest sector is R2 billion per annum which equates to ± 7% of Agricultural GDP
- sustainable annual production is over 18 million m³ per year
- it employs almost 70,000 people, mainly in rural areas, and has an employment multiplier of almost 6 in downstream activities
- it is a major catalyst for rural development
- it can produce wood sufficient to meet 95% of the country's wood products demand
- it is ranked 4th in the world in terms of the number of forest management units with FSC certificates
- only 10% of its output is exported in unbeneficiated form
- it produces enough timber to enable the timber processing sector to achieve the following:
  - a turnover of in excess of R12 billion p.a.
  - the export of 35% of its value-added production to the value of R5,6 billion p.a. (net trade surplus of R3,0 billion p.a.)
  - a contribution of 7,4% to S.A.'s total manufacturing GDP

2.2 Why is water conservation and water conservation & demand management important for the forest sector?

2.2.1 Forest sector is a significant water user

Research on water use within the forest sector has mainly been focussed on commercial forestry. Community forestry has a local effect and this has not been quantified. The forest sector consumes 1,500 million m^3 of water per year. This is the increment in evaporative losses that arises when natural veld is converted to plantation. This is 2.7% of the total mean annual runoff for the country. This is equivalent to the amount of water used by industry, slightly less than the amount of water used for urban and domestic purposes, although much less than the amount used by agriculture (CSIR, 1999a). Low flows in rivers are decreased by 7.8% (Scott *et al* (1998)). The forest sector in South Africa is clearly a significant user of water.

2.2.2 Improved ability to secure water allocation and licences

Commercial afforestation is identified as a stream flow reduction activity (SFRA) under the Act and is subject to licensing. Although forestry is at the moment the only SFRA, DWAF is currently in the process of identifying other land use activities with a view to declaration as SFRAs. One of the considerations when issuing licences is the efficient use of water (s27(1)(c)). Therefore, efforts by SFRAs, such as forestry, to implement WC&DM are likely to improve their ability to secure licences for water use.

2.2.3 Security of supply to forests

As water demands increase, WC&DM should prove to be a useful tool for ensuring security of water supply and sustainable forest production.

2.2.4 Improved marketability of forest produce

Efficient water use will help the forestry industry meet market requirements for sustainable forestry, as specified by certification systems such as that of the Forest Stewardship Council (FSC) (also see Section 3.3.6).

2.3 The water conservation & demand management context

2.3.1 Generic cross sectoral elements of a WC&DM Strategy

Three elements of WC&DM are relevant to all sectors:

- **Allocation management** (to achieve most efficient allocation between and within sectors)
- **Application management** (minimising unproductive losses of water), and
- **Production management** (maximising the productivity of the water use)

In working towards a successful WC&DM, regulatory authorities need to understand the leverages for success in terms of the three WC&DM elements identified above. Rough estimates of allocation, application, and productivity efficiencies at a national scale are as follows:

Elements	Plantation Forests	Other SFRAs	Irrigated Agriculture	Domestic Use	Industrial Use	Environment
Estimated annual consumption (billion m^3)	1.5	?	11.5	2.8	2.5	?
Allocation efficiency	?	?	?	?	?	?
Application efficiency	85 – 100%	?	50%	65%	65%	100%
Production efficiency	70 – 80%	?	70% -	?	?	100%

Application efficiency in forestry is an estimate based on the fact that about 25% of the average forest management unit is not planted. Wasteful losses cannot exceed 25% and because most forests are well managed, the loss will be much less than this. Production efficiency losses are estimated on the basis of the shortfall between current and potential production. This is an indicative analysis of forest sector efficiencies. These may change with better data. **However, it is interesting to note that most effort in forestry apparently goes into riparian management, whereas the greater opportunity for improvement appears to lie in productivity improvement**. However, forest managers invest heavily in site species matching and in controlling weeds in plantations, both measures that contribute to improved productivity. Opportunities for improvement of each of these elements are discussed in section 5.

2.4 Current demand management initiatives in forestry

Water conservation and demand management in forestry dates back to 1932 when the then Department of Forestry began to restrict afforestation close to perennial streams and other surface water. Subsequently, all new afforestation was subject to restriction in cases where national water resources required protection. These policies were eventually enforced through the Afforestation Permit System (APS) under the 1972 amendment (Act 46 of 1972) of the Forest Act of 1968 (Bosch and Gadow, 1990; Van der Zel, 1995).

The Forestry Branch of DWAF administered the APS system. It remained in use throughout the 1990's when its administration was taken over by DWAF's Sub-Directorate: Stream Flow Reduction Allocations. Significant reforms were then introduced to the system of regulating afforestation. These reforms were facilitated mainly by the new Act and water use regulation of SFRAs through licencing.

The Act provides that the Minister may declare '...*any activity (including the cultivation of any particular crop or other vegetation) to be a stream flow reduction activity if that activity is likely to reduce the availability of water in a water course to the Reserve, to meet international obligations, or to other water users significantly'*. Presently only forestry is listed in the Act as a SFRA, but other potential SFRAs are being identified.

The administration of SFRA licencing now follows a specific process of consultation, through afforestation license assessment advisory committees (to reflect the interests of non-forest sectors). Under certain conditions environmental impact assessments are carried out. As discussed in Section 3.3.2, licencing decisions will also be informed by the Decision Support System being established by the SFRA SEA.

2.5 Current challenges facing the forest industry

The forest sector makes a significant contribution to the economy of South Africa and plays an important role in job creation and poverty relief. However, it faces a number of challenges including:

- Increasing its business on a sustainable basis within the constraints of limited land and water resources. A relatively small part of South Africa is suitable for forestry. These are the high rainfall areas (more than 700mm per annum). These areas are also the high water yielding areas of the country. Scott *et al.* (1999) showed that catchments in which some degree of afforestation has occurred comprise only 14% of the country, yet produce 53% of the mean annual stream flow and 70% of the mean annual low flows of South African rivers.
- Retaining its cost competitiveness with overseas rivals
- Meeting potentially tightening environmental certification and market requirements
- Developing informed consensus as to the future development of the forest sector in relation to its resource use and environmental and social costs and benefits (DWAF, 1997)
- Developing stakeholder agreement on the implementation of appropriate systems to achieve sustainable forest management (DWAF, 1997)
- Restructuring the forestry industry to provide new economic opportunities for historically disadvantaged people (DWAF, 1997)

2.6 Opportunities and constraints provided by the forest sector

2.6.1 Opportunities

A number of opportunities for WC&DM in the forest sector can be identified:

Water use application improvement (see section 5):

- There is a great deal of experience in the regulation of afforestation, through the APS system, to draw on in the implementation of the WC&DM Strategy for the Forest sector
- Environmental management systems, which could support WC&DM, are already in place in several forestry companies
- Stakeholder concern about environmental (and social) impacts of forestry could be harnessed to support the implementation of the WC&DM Strategy for the Forest sector
- Good plantation management can assist in improving water quality and therefore potentially the quantity of useable water available within a catchment

Water use productivity improvement (see section 5):

- Existing levels of poor fibre productivity, provide opportunities for improving the productivity of the forest sector
- Implementing the WC&DM Strategy may assist the forest sector in improving the marketability of its products as relates to the requirements of the FSC

2.6.2 Constraints

Several constraints for WC&DM in the forest sector can be identified:

- Forest plantations are often placed in the head waters of rivers and unlike other water users, like irrigation, industry and domestic, forestry cannot be switched off during periods of drought. Restrictions on water use cannot be imposed in periods of need.
- A workable cross-sector WC&DM implementation tool needs to be developed
- The need for the industry to remain internationally price competitive (although if WC&DM initiatives can be coupled with increased productivity this will not necessarily be a constraint)
- (A number of additional constraints are listed in Appendix 5)

SECTION 3: BACKGROUND TO WC&DM STRATEGY FOR THE FOREST SECTOR

3.1 Scope and purpose

3.1.1 Scope of Forest Sector WC&DM Strategy

The WC&DM Strategy covers ***plantation forestry***. This includes community forests. It excludes:

- The wood processing sector, which is included in the WC&DM Strategy for Industry

- Conservation forestry, which is included in the WC&DM Strategy for the Environment.

The definition of 'conservation' in the Act does not refer to water quality. Water conservation and demand management in the National Strategy Framework includes the protection of water resources and thus the management of water quality. Water quality also affects the usability of water downstream and thus has an indirect effect on water use efficiency. However, this Strategy focuses on water quantity, and will need to address water quality later.

3.1.2 The Purpose of Forest Sector WC&DM Strategy

The WC&DM Strategy for the forest sector seeks to achieve the following:

- Identify opportunities to reduce unnecessary water use and improve efficiency
- Provide guidance to stakeholders in the forest sector on achieving conservation and demand managemnet
- Define roles and responsibilities of institutions and stakeholders in the forest sector with regards to WC&DM efforts
- Facilitate co-operation between stakeholders within the forest sector and with those from other water-use sectors
- Provide a framework for implementing WC&DM within the forest sector (a scheduled Stream Flow Reduction Activity) as set out in Section 36(1)(a) of the NWA, through appropriate water management planning.

The Strategy sets out a broad approach to achieving WC&DM in the forest sector. It does not contain a detailed implementation plan.

3.2 Process for the Strategy Development

The consultative process followed to develop this Strategy is described fully in Section 6. It involved the preparation and circulation of a Discussion Document in September 1999, a stakeholder workshop held in October 1999 and the preparation of a Draft Strategy in January 2000, which was circulated to stakeholders for comment, before finalisation. This, the updated draft strategy, will be used as the basis for discussion of a second workshop, to be held on the 5th of April 2000.

3.3 Progress towards Water Management in Forestry

Figure 1 shows the relationship between these initiatives.

There has been considerable progress in water management in South African forestry over the past several decades. This has been achieved at two levels, planning and allocation of water for the sector and improved forest management practices. The historical developments have been integrated into DWAF.

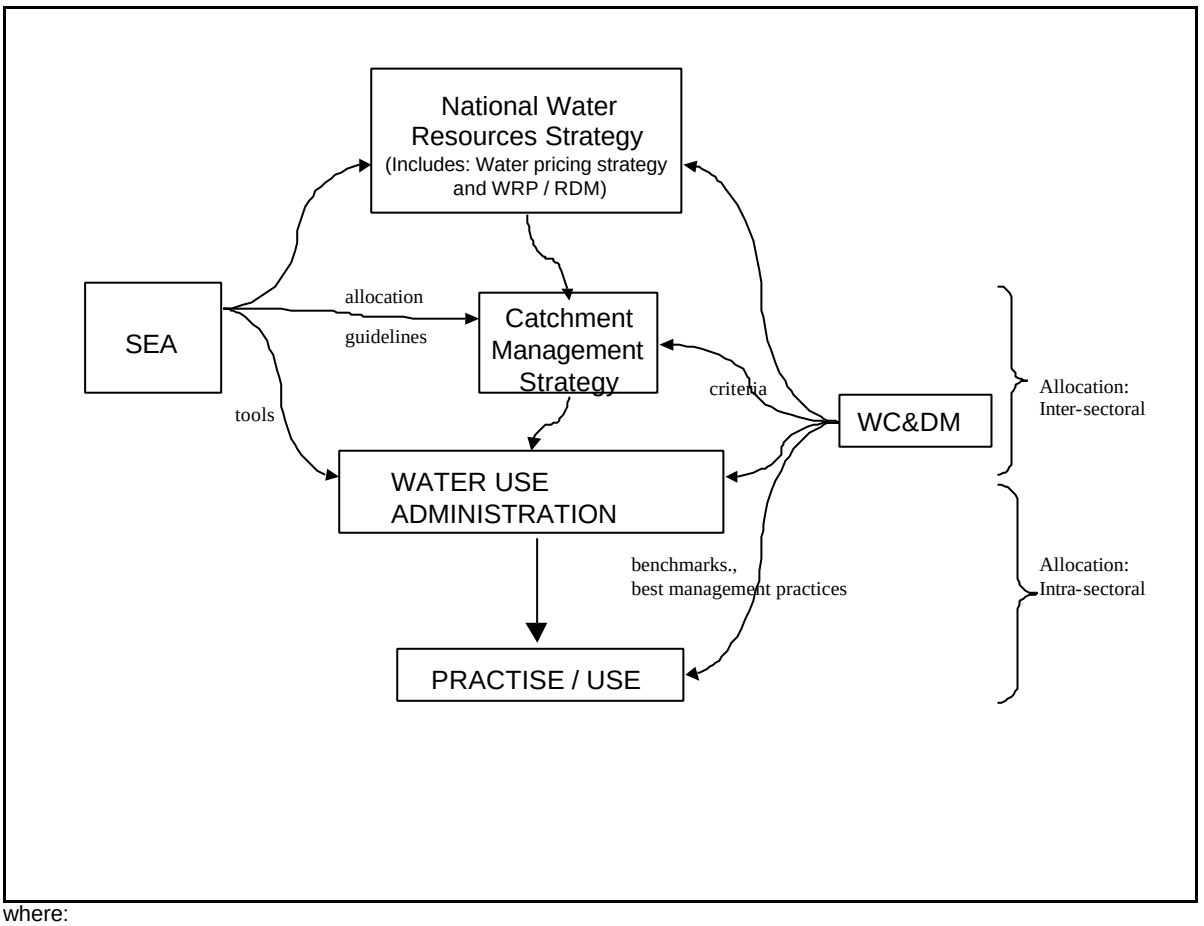
Initiatives to deploy and implement national water and forest policy and linked with private forest management, are outlined below.

The relevant initiatives must all be seen as parts of the overall system for managing water in the forest sector. These parts include catchment management water use licensing, the SEA for SFRA, the water pricing policy, and sustainable forest management (see figures 1 and 2).

3.3.1 Water Allocation Planning and Control: SFRA Licensing

Allocation of water to plantation forests has been regulated by means of the afforestation permit system since 1972. This is now to be replaced by the new system of registering and licensing stream flow reduction activities (SFRAs) through the provisions of NWA.

The DWAF has formulated a detailed policy and procedure for stream flow reduction licensing. This integrates with other statutory requirements for SFRAs, such as Environmental Impact Assessment, giving proposers a single channel for the processing of their applications for authorisation of such activities.



where:

SFRA Stream flow reduction activity
WRP/RDM Water resources planning / Resource directed measures

Figure 1: Relationships between water related DWAF initiatives.

3.3.2 Strategic Environmental Assessment for Stream Flow Reduction Activities

Over the past three years, the Sub-Directorate: Stream Flow Reduction Allocations of DWAF has been conducting SFRA SEAs. This initiative was prompted by a need to improve decision-making in regards to forestry licensing. Although the SEA was initially for the forest sector alone, it addresses a framework within which all water uses will be assessed. The purpose of the SEA is to provide a solid information base and a comprehensive basis for decision-making including social, economic and environmental considerations (DWAF, 1999b).

The outcome of the project is anticipated to be a Decision Support System for the 'responsible authority' charged with licensing SFRAs (either DWAF or a CMA), and any relevant Licence Assessment Advisory Committee established under the Act. This Decision Support System would enable decision makers to identify the implications of any proposed change of land use to a SFRA (DWAF, 1999b).

The WC&DM Strategy for the forest sector and the SFRA SEA both address the impact of forestry on water resources, there are some overlaps between the two initiatives and they can benefit from each other's insights (see **Figures 1 and 2**). However, the focus of each is different. The SFRA SEA is focussed on ***improving the decision making process in relation to the grant of water licences to SFRAs (including forestry)***. The WC&DM Strategy is focussed on ***implementing a coordinated strategy to improve water efficiency of existing and new forestry plantations***.

Elements of the Strategy may be implemented through conditions imposed on licences aimed at improving water efficiency of forestry plantations and could be incorporated into the Decision Support System. However, other elements of the Strategy will be implemented through different mechanisms, as described in Section 7, including research, information dissemination, development of institutional capacity, and implementation of appropriate incentives.

3.3.3 Catchment Management

The Directorate: Catchment Management is supporting the establishment of 19 water management areas, each with its own CMA. With each NMA there will be one or more Water User Associations (WUAs). CMAs are tasked with water resource management within their Water Management Areas. WUAs are cooperative associations of individual water users who wish to pool resources and undertake water-related activities for their mutual benefit.

CMAs are required to develop Catchment Management Strategies for their Water Management Area (s8(1)). These Strategies must be consistent with the NWRS (s9(b)) which will incorporate the WC&DM Strategy for the forest sector (as well as for other water use sectors). Catchment Management Strategies are the prime vehicle through which the NWRS will be implemented. They are also required to set out strategies, objectives, plans, guidelines and procedures for the 'conservation' (amongst other things) of water resources within the CMA's Water Management Area (s9(c)). Catchment Management Strategies will be important mechanisms through which the WC&DM Strategy for the Forest sector will be implemented.

A group of forestry plantation owners within a catchment could decide to form a WUA. One of the issues which such a WUA may wish to address is water use efficiency by its members in order to improve productivity, ability to secure water licences, security of supply and marketability of their products. They may also each establish a water management plan. As they become established, WUAs could provide an important institutional structure for implementation of the WC&DM Strategy for the Forest sector.

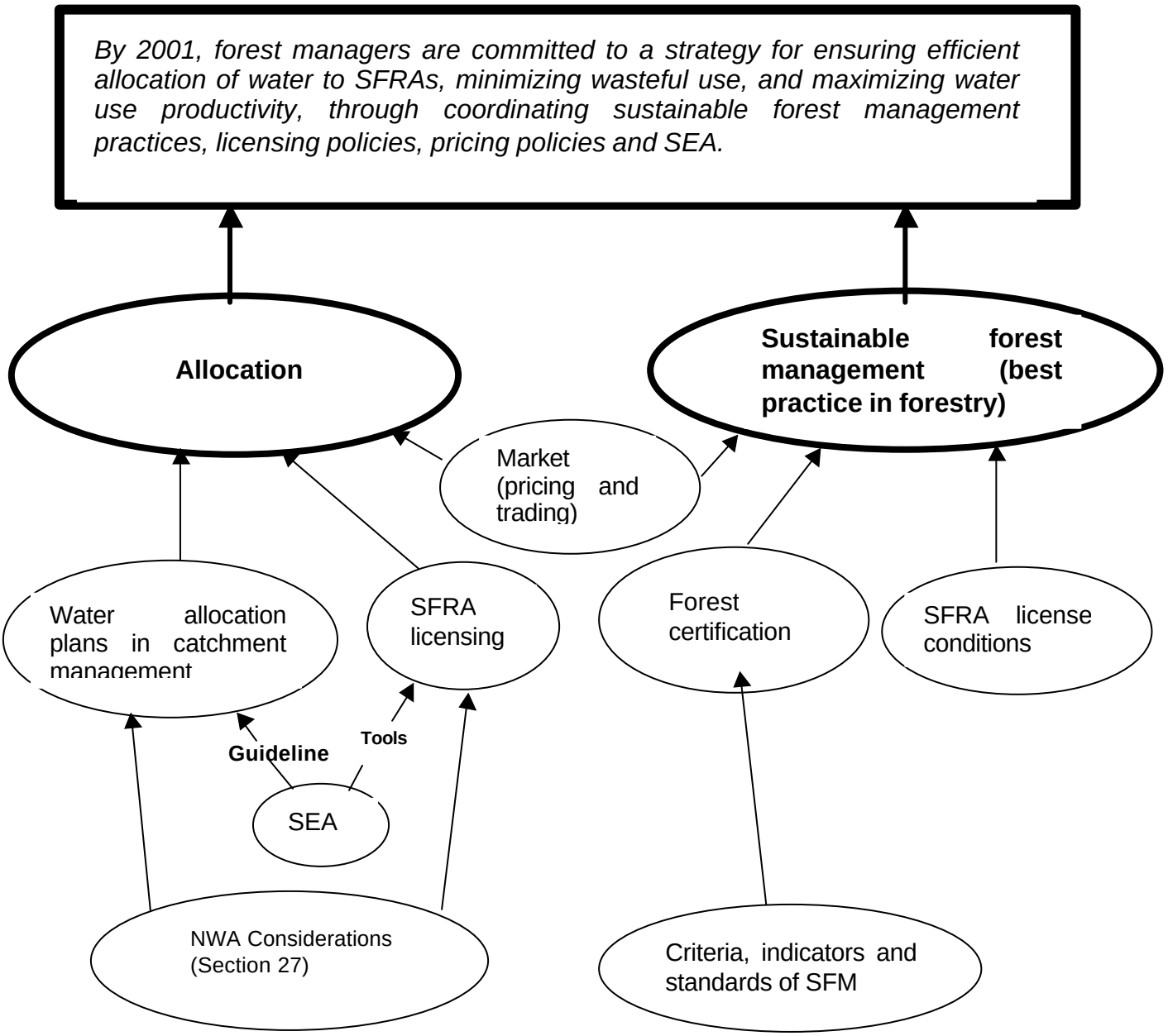


Figure 2. The linkages between different parts of water management in the forest sector. The Water conservation and Demand Management strategy is the integration between all these parts

3.3.4 Water resources planning

The Sub-Directorate: Water Resources Planning has the primary responsibility of planning for future water use and allocation in South Africa. Their work draws on scientific data from stakeholders and other institutions (CSIR and Water Research Commission) within the water use sectors. In planning for future water use, they assess potential runoff at a catchment, regional and national level as well as the social, economic and environmental benefits of alternative water uses, through the National Water Balance Model. Water resources planning can provide valuable information for the implementation of the WC&DM Strategy for the Forest sector, particularly in regards to spatial areas to focus on. Conversely, the successful implementation of the WC&DM Strategy will impact on planning for future water use.

3.3.5 The Water Pricing Policy

The broad principles underlying the new approach to the pricing of water use are reflected in the White Paper on a National Water Policy for South Africa, 1997, and in Chapter 5 of the National Water Act, 1998 (the Act). A comprehensive pricing policy for water use charges has been established by the DWAF (Government Gazette 20615, 12 November 1999).

The new water pricing strategy, addresses the challenges presented by the existing and growing imbalances between the availability, supply and demand for water in South Africa. The policy introduces **demand-side** measures to manage our water resources. By encouraging all water sectors to use water more efficiently, demand management provides a more sustainable long-term solution to the problem of water scarcity than do supply-side measures, because it takes into account the value of water in relation to its cost of provision, thereby treating it more like a commodity.

The following objectives are of equal importance in formulating the new pricing strategy:

- Social equity
- Ecological sustainability
- Financial sustainability
- Economic efficiency

In the context of water scarcity, an argument can be made for the introduction of **economic incentives** in water-stressed catchments to encourage the conservation of water and its shift from low to higher value use. This can be done administratively or by using market-related mechanisms. These mechanisms and others that have application in water demand management in forestry are dicussed in section 5.

3.3.6 Forest Policy, improved Forestry Practice, and Sustainable Forest Management

South African forest management must meet the legal requirements of forest and water policy. Thus, conditions attached is afforestation permits, and now licences,

regarding riparian zones for example have been applied since 1972. The organised industry has adopted the Forest Industry Environmental Guidelines for Conservation Management of Commercial Plantations in South Africa (second edition, in press), which include water management measures. South Africa also has the third largest number of forests in the world, comprising of about 500 000 hectares, that have been certified as sustainably managed in the Forestry Steward Council, and another 250 000 hectares is managed under systems certified under ISO 14001. Both these certifications require compliance with SA Water Law, and contain substantial elements of water management planning.

South African forest policy is directed at promoting a competitive and sustainable forest sector. It has as one of its objections the development of a national set of criteria, indicators and standards of sustainable forest management (C, I & S of SFM) applicable at the national scale, and at the scale of the forest management unit. These will inform the market driven certification schemes, and will also address water management. The National Forests Act requires the minister to establish and implement C, I & S of SFM. This Act also requires that the conditions on SFRA licences should comply with the principles of SFM. Minimum standards of SFM must be enforceable.

The NFAP was prepared as a mechanism to implement the Sustainable Forest Development in South Africa White Paper (Ministry of Water Affairs and Forestry, 1996). It provides a comprehensive strategy for achieving a sustainable forest sector. One of the specific issues addressed in the NFAP is the impact of industrial forestry on water resources. The overall goal set for this issue is '*establish effective, equitable and agreed systems for managing the environmental and water resource impacts of industrial forestry*'. A task identified as part of the strategy to reach this goal is '*develop a policy for forest-sector water use, conservation and protection through stakeholder participation and agreement*'. There is therefore clearly considerable potential overlap between the NFAP and WC&DM Strategy for the forest sector. The two initiatives will need to be closely coordinated.

3.3.7 Water Conservation and Demand Management: Integration

The WC and DM strategy for the forest sector and later SFRAs, will integrate all these elements of water management, as illustrated in Figure 2.

SECTION 4: POLICY AND INSTITUTIONAL CONTEXT

4.1 Policy Context

4.1.1 Constitution

The Bill of Rights, as laid out in the Constitution of the Republic of South Africa Act (No. 108 of 1996), makes provision for *'everyone to have the right to access to sufficient water*' (s27(1)) and for the state to take *'reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of... these rights*' (s27(2)).

The Bill of Rights also makes provision for all citizens of South Africa to have an environment 'that is not harmful to their health or well-being; and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:

- Prevent pollution and ecological degradation
- Promote conservation
- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development' (s24).

This provides the broad context for water use in South Africa and within the forest sector. The basic right of people to have access to water and a healthy environment, as well as justifiable, sustainable economic development, are closely tied to the need to conserve water and manage water demand also within the forest sector.

4.1.2 National Environmental Management Act (No. 107 of 1998) (NEMA)

The government's recognition of the need for sound environmental policy led to the promulgation of NEMA in 1998. This Act provides for co-operative environmental governance in South Africa. NEMA defines a number of National Environmental Management Principles which apply to the actions of all organs of state that may significantly affect the environment (s2(1)). Two principles of particular significance to the WC&DM Strategy for the Forest sector are:

- The development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised (s2(4)(a))

- The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage (s2(4)(o)).

These principles apply to the manner in which the forest sector uses water resources and defines the constraints on water use for the public good.

In addition, NEMA has specific requirements that must be adhered to with regard to water usage. Chapter 5 outlines Integrated Environmental Management (IEM) principles that promote the application of appropriate management and assessment tools for sustainable development. SEA, as initiated by the department, is part of the suite of tools. These tools are important for implementing the WC&DM Strategy for the Forest sector, as they will allow the sector to assess the impacts of proposed forestry development. Regulations are likely to be passed under NEMA to supersede the EIA process currently carried out under the Environment Conservation Act (see Section 4.1.4).

Chapter 8 makes provision for Environmental Management Co-operation Agreements between the Minister of Environmental Affairs and Tourism, a Member of the Executive Council at provincial level or municipality on one hand, and any person or community, *'for the purpose of promoting compliance with the principles laid down in NEMA*' (s35). These agreements can potentially allow stakeholders in the forest sector to work in collaboration with national, provincial and/or local government towards WC&DM goals.

Section 32 of NEMA gives people legal standing to enforce environmental laws. Should an interested or affected party believe that their legal rights are being infringed by the forest sector's use of water, they are empowered to take the matter to a court of law.

4.1.3 National Water Act (No. 36 of 1998)

This Act directly regulates the use of water in South Africa. The overarching objective of the Act is to ensure the beneficial use of water in the public interest. The fundamental principles of the Act centre on the need for sustainability and equity in the protection, use, development, conservation, management and control of water resources. The Act, in its entirety, needs to inform the development of the WC&DM Strategy for the Forest sector. However, the more relevant sections are discussed below.

Chapter 2 of the Act deals with the development of water management strategies. The Act calls for the development of a NWRS and individual Catchment Management Strategies. These strategies form the framework within which water will be managed in South Africa. As discussed in Section 3.3.3, the WC&DM Strategy for the Forest sector will be incorporated into the NWRS. Catchment Management Strategies will provide an important mechanism for implementation.

Water use is regulated by the Act through the use of licencing and authorisations. Authorisations and licences may have conditions attached specifying management practices and general requirements for any water use, including water conservation measures (s29(1)(b)(i)). As indicated in Section 2.2.2, commercial afforestation is recognised as an SFRA in the Act, and is subject to registration and licensing (s36(1)(a)).

The Minister may establish a pricing strategy for charges for any water use (s56). Such a pricing strategy may contain a strategy for setting water use charges '*for achieving the equitable and efficient allocation of water*' (s56(2)(c)). DWAF has recently published a pricing strategy for water use (Gov Gazette 1999). This identifies the potential need 'to introduce additional economic incentives to optimise the allocation of scarce water resources between competing uses'. Mechanisms identified in the strategy to achieve this are the imposition of an economic charge, the trading of water licences, and the establishment of water markets.

An important consideration under the Act is the protection of water resources and the establishment of the Reserve. The Reserve consists of the quantity and quality of water required to (s1(xviii)(b)):

- Satisfy basic human needs by securing a basic water supply
- Protect aquatic ecosystems in order to secure ecologically sustainable development and use of relevant water resources.

The Reserve will be established within the context of water quality objectives established for water resources (s13). As an SFRA, forestry potentially has a significant impact on our ability to meet the requirements of the Reserve. In water stressed catchments, water allocation to the forest sector may be constrained by the quantity of water necessary for the Reserve, and to meet water quality objectives.

All decisions taken in terms of the NWA require the decision taken to apply his or her mind to several considerations in the Act (S.27). These considerations have been developed as a set of criteria to be weighed in taking decisions such as in water allocation planning and water-use licencing (see James Perkins' document).

4.1.4 Environment Conservation Act (No. 73 of 1989)

The Minister of Environmental Affairs and Tourism has, under the Environment Conservation Act, identified activities which may have a substantial detrimental effect on the environment and which require development approval (Gov Gazette 1997). Such activities may be required to carry out an EIA, and include, of relevance to the forest sector, a change in land use from:

- Agriculture or undetermined use to any other land use
- Use for nature conservation or zoned open space to any other land use
- Use of grazing to any other form of agricultural use.

Issues related to WC&DM are likely to be taken into consideration when assessing the impacts of the activity during the EIA process.

4.1.5 National Forests Act (No. 84 of 1998)

The National Forests Act makes provision for the promotion and enforcement of sustainable forest management. One of the principles set out in the Act, to guide decisions affecting forests, is that 'forests must be developed and managed so as to…conserve natural resources, especially soil and water' (s3(3)(c)(v)). There is evidence to suggest that afforestation has a beneficial effect on erosion. Overland flow is usually reduced. Especially in degraded areas, afforestation can assist in stabilization of soils (WRC, 2000).

The Act makes provision for the Minister to determine criteria, indicators and standards and to identify where the breach of a standard is an offence. The Minister is also empowered to create or promote certification programmes and other incentives to encourage sustainable forest management (s4(2)). The scope of these regulations and incentives would include WC&DM issues. They therefore provide a potentially important mechanism through which aspects of the WC&DM Strategy for the Forest sector could be implemented. The Act also required that the conditions on SFRA licences should comply with the principles of sustainable forest management.

The NFAP, which was developed to implement the Sustainable Forest Development in South Africa White paper, provides a strategy for achieving sustainable forest management in South Africa. As discussed in Section 3.3.6, WC&DM in the forest sector is addressed in the Plan. There will therefore need to be close liaison between the implementation of the WC&DM Strategy for the Forest sector and NFAP.

4.2 Institutional Framework

The Constitution establishes a requirement for co-operative governance (s41). Cooperation amongst major forest sector stakeholders is crucial for the successful implementation of the WC&DM Strategy for the Forest sector and would also be of general benefit to the industry. Some of the key stakeholders are described below.

4.2.1 Government

DWAF has created the Directorate: Water Conservation. The Directorate is the main government body championing WC&DM. Its first responsibility was the initiation of the strategy formulation process to develop the WC&DM component of the NWRS. However, other Directorates within DWAF also have a significant role to play in WC&DM in the forest sector including, for example, the Directorate: Catchment Management, Sub-Directorate: Stream Flow Reduction Allocation, Sub-Directorate Water Resources Planning. The Chief Directorate: Forestry in DWAF promotes sustainable forest management (also see Section 3.3).

Provincial government, through its management of the EIA process, has an important role to play in the assessment of impacts, and authorisation, of new forestry ventures. At a local government level, councils interact with the forest sector primarily through development planning. Local authorities also have an interest in water use and supply through their role as water services authorities under the Water Services Act (No. 108 of 1997).

4.2.2 Water management institutions

CMAs are statutory bodies established under Section 77 of the Act to manage water resources within a defined Water Management Area. CMAs are governed by a board representing the interests of water users, potential water users, local and provincial government and environmental interest groups. The role of the CMA is to prepare and give effect to a Catchment Management Strategy. As discussed in Section 3.3.3, CMAs are likely to play a significant role in the implementation of the WC&DM Strategy for the Forest sector through the implementation of Catchment Management Strategies and the licencing of SFRAs and other water uses.

WUAs consist of local groups of water users, as discussed in Section 3.3.3, and potentially provide a useful mechanism through which aspects of the WC&DM Strategy for the Forest sector could be implemented at a local level.

4.2.3 National Forests Advisory Council

The National Forests Advisory Council has been established under the National Forests Act. Its role is to advise the Minister on all aspects of forestry in the Republic. One of the functions of the Council is to establish a Committee for Sustainable Forest Management. This Committee will advise the Council, DWAF and the Minister on all aspects of sustainable forest management and assist in the development of criteria, indicators and standards for sustainable forest management (s 36(5)). The work of the Committee is therefore likely to be of considerable importance to the implementation of the WC&DM Strategy for the Forest sector.

4.2.4 Forest Industry

The South African forestry industry is relatively well organised, with two main industry associations (FIA, 2000):

- Southern African Timber Growers Association representing over 1 000 growers in the farming sector
- Forest Owners' Association representing primarily corporate forestry enterprises (which own 63,2% of the total area of commercial plantations).

The state, through SAFCOL, has also had an extensive interest in industrial forestry. These assets are currently in the process of being restructured.

Many black farmers have entered forestry (currently, approximately 12,000 (FIA,2000)) mainly under contract to large companies (DWAF 1996). This has particular implications for WC&DM.

4.2.5 Research organisations

South Africa has a long history in commercial forestry research. However, 'government funding has declined to a low level, future funding is uncertain, research effort is fragmented, and current research effort is largely short term' (Dyck 1996:5).

Forestry research in South Africa is mainly undertaken by company in-house research divisions (e.g. Sappi Forests, Mondi Forests and SAFCOL), the CSIR (Environmentek), the Institute for Commercial Forestry Research, the Forestry and Agriculture Biotechnology Institute at the University of Pretoria, the University of Stellenbosch and the University of Natal (DWAF 1997).

4.3 Opportunities and constraints provided by the policy and institutional context

4.3.1 Opportunities

Opportunities for WC&DM in the forest sector provided by the policy and institutional context include:

- Use of EIA procedures under the Environment Conservation Act, and any successor regulations under NEMA, to support the implementation of WC&DM
- The water management requirements specified by Forest Stewardship Council certification procedures
- Development of Environmental Co-operation Agreements under NEMA to support joint commitments between government and the forest sector regarding WC&DM
- Incorporation of elements of WC&DM into Catchment Management Strategies and licencing procedures for SFRAs
- Incorporation of WC&DM considerations into the Decision Support System under development by DWAF Sub-Directorate: Stream Flow Reduction Allocation through the SEA

- Formation of WUAs for the forest sector in specific catchments to support implementation of WC&DM at a local level
- The development and implementation of a pricing strategy under the Act to achieve 'equitable and efficient use of water' which could include economic incentives
- The development of criteria, indicators, standards and other incentives to promote WC&DM in the forest sector under the National Forests Act
- Potential institutional support from the Committee for Sustainable Forest Management for WC&DM in the forest sector
- The presence of a champion for WC&DM within DWAF (Directorate: Water Conservation)
- The presence of established industry groupings within the forest sector which will facilitate the implementation of the WC&DM Strategy for the Forest sector so long as the Strategy has the full support of industry associations
- Well-established research organisations and capability.

4.3.2 Constraints

Constraints for WC&DM in the forest sector provided by the policy and institutional context include:

- No explicit framework within the Act for the implementation of the WC&DM Strategy for the Forest sector
- It is unclear how national WC&DM strategies will be implemented, in a coordinated manner, at Water Management Area, catchment and local levels
- A range of overlapping initiatives within DWAF (which although potentially a constraint could also be a significant opportunity if these initiatives are able to support each other)
- A lack of support and recognition by the water authorities for what the industry is doing currently in terms of WC&DM, as perceived by the FIA
- The lack of an existing pricing strategy to promote equitable and efficient allocation of water
- A large number of growers in the forest sector which are not currently represented by existing industry associations
- Fragmented and under-funded research effort.

SECTION 5: POSSIBLE APPROACHES TO WC&DM IN THE FOREST SECTOR

5.1 Introduction

Opportunities for WC&DM in the forestry industry are constrained, for a number of reasons.

Fibre growth is closely related to tree water use. Each additional cubic metre of wood produced requires about as much water.

Possible approaches to WC&DM pertaining to water allocation, plantation water application and plantation water use productivity are discussed below.

5.2 Approaches to achieve efficient *allocation* of water to plantation forestry

The allocation element refers to the quantity of water to which a sector or user within a sector has received entitlement through a water-use allocation plan, authorisation or license. Allocation management involves allocating water to the sector and between users within the sector, to achieve maximum efficiency. Several policy instruments are relevant here.

5.2.1 Identifying 'restricted' catchments

This activity is specific to regulation approaches such as 5.2.3 and 5.2.6 below. Specific catchments could be identified as 'restricted' and therefore unsuitable for afforestation, due to specific criteria, such as critical contribution to the water supply of a town or urban area. The class of water resources within a catchment, and water quality objectives, would also help in identifying restricted catchments. The catchment specific studies proposed by the SFRA SEA would also help to inform such an approach. In support of this, the Mountain Catchment Act (No 63 of 1970) gives the minister the right to declare any area as a mountain catchment area. This has, however, been done since the inception of the APS in 1972.

5.2.2 Promoting new plantation forests in areas where competing demand is low

This activity is specific to regulation approaches such as 5.2.3 and 5.2.6 below. Incentives could be provided for afforestation to locate in catchments where water demand is low, and to move out of catchments where water demand is high. This would apply in instances where new afforestation is contemplated but probably not to existing afforestation, as it will be virtually impossible to simply move an industry, with its infrastructure and processing facilities.

5.2.3 Registration and licensing of commercial afforestation as an SFRA (s36(1)(a))

This replaces the old APS (see above). Conditions requiring water conservation measures may be attached to licenses (s29(1)(b)(i)).

5.2.4 Water pricing in accordance with a pricing strategy established by the Minister (s56)

Water pricing may be used to implement demand management. Its likely impact on the forest sector, in terms of its water efficiency and international competitiveness, needs to be investigated further. The pricing policy for water use in SFRA is outlined in " The pricing policy for water use charges" (Government Gazette 20615, 12 November 1999).
However, a proper market must be established to ensure that trading is effective in achieving efficient allocation. This require (a) proper conferring of water-use entitlements, which, which the NWA provides for (b) adequate security, eg. Through sufficiently long entitlement periods (c) a large number of willing buyers and sellers in

the market, and (d) market equity, so that all buyers and sellers are on an equal footing.

5.2.5 Trading of water licences

The Act allows for trading in water-use licences (s25(2)). Incentives for both inter-sectoral and intra-sectoral trading would depend on the need for water downstream and the value attached to the water, and therefore the opportunity cost of not afforesting /deforesting certain parts of the land.

5.2.6 Full Assessment of Value Added to Water

This requires assessment of looks at the entire industrial water-use system, from raw materials acquisition through the manufacturing, use, reuse, recycling and waste management activities. The growth of timber, extraction and production of pulp, paper and other materials (e.g. rayon, viscose) would be a focus of this technique. This approach could be important to the allocation of water to forestry, as most of the value addition to forest products occurs down stream in the supply chain.

5.2.7 Equity Through Criteria-Based Allocation

As noted above, the considerations in the NWA have been formulated as criteria to apply in any allocation decision. If these criteria are applied transparently, and alternatives for the use of water weighed, consistently according to them, then equitable allocation should follow.

5.3 Approaches to improve the *application* of water and to compensate for stream flow reduction

This requires measures to minimise waste, i.e. water that is consumed unproductively in the forest management unit.

5.3.1 Efficient riparian zone management

Research has indicated that trees within the 'riparian zone' use about twice as much or more than the quantity of water used by upslope plantations (Scott, 1999). As a result, for several years, foresters have been prohibited from planting adjacent to stream banks or perennial streams through conditions attached to afforestation permits. Forest managers in most areas have cleared and continue to clear its riparian zones. Forest managers are required to apply riparian zone management by the conditions on permits and licences, which are reinforced by the "Forest Industry Guidelines on Environmental Management", and the requirements for forest certification. The organised forest industry has also worked with stakeholders to develop improved methods to define the boundaries of riparian zones and other wetlands.

The greatest challenge ahead will be to achieve sustainable management of the natural habitats in these areas.

5.3.2 Controlling Alien Invasive Plants

Alien invaders waste significant amounts of water. Certain alien species are often associated with plantation forestry and can infest riparian areas and other open habitats (Nel *et al*. 1999). The spread of these species needs to be minimised. Forest industry guidelines and certification requirements require invasives to be controlled. Forest managers have made substantial progress in controlling the problem, and participate actively in the Working for Water Programme. The two major companies, Sappi and Mondi, have recently signed an accord with the Minister which approves their commitment to this objective.

5.3.3 Appropriate forest management practices

Wasteful water use in plantations could be significantly reduced through effective weed management within plantations. Weeds transpire significant amounts of water, which could otherwise be available for tree growth.

5.3.4 Striving for normal age classes in Catchments

Even distribution of age classes within quaternary catchments will ensure more evenly distribution of the impact of tree water use over time.

5.3.5 Improving water quality

High quality runoff from areas under well-managed harvesting operations and well-constructed and maintained forestry roads has the effect of increasing the proportion of water which is utilisable. Research commissioned by the DWAF from the CSIR has shown that forest plantations generally enhance water quality (Lesch, 1995).

5.4 Approaches to maximise water *productivity* in forest management

Water use productivity (WUP) can be defined to refer to the volume of fibre produced per volume of water used, at a plantation wide scale. WUP is influenced by two factors: wood fibre market related issues, and the water use efficiency (WUE) of tree species.

To date, there has been no comprehensive assessment of the efficiency (productivity) of water use in the sector. A study commissioned by the Water Research Commission indicated that plantations in the catchment of the Crocodile River in Mpumalanga require from about 17 to 50 cubic metres of water for every cubic metre of harvestable wood produced, depending on the species and site quality. Nationally our plantations have yielded an average of about 12 cubic metres per hectare per year over the five years in 1997/98, and average of about 83 cubic metre of water per cubic metre of wood produced. The Fibre Optics study commissioned by government in 1999 (Box 1) indicated that this productivity could increase by 20% by 2020 with normal forest management, but that full deployment of genetic improvements and best management practice could further augment this gain.

Thus, there is potential to significantly increase the efficiency of water use in plantation forests.

Box 1: Calculation of water use productivity for forestry.

The Jaakko Poyry Fibre Options Study (1999) estimates that 16 201 921 cubic meters of roundwood were harvested from 1 449 345 hectares of land in 1996. This equates to a yield of 11.2 m^3 per hectare per annum.

However, estimates for actual plantation growth were 14.5 cubic meters per hectare. This implies that approximately 30% of growth was not harvested, and consequently production production efficiency was 70%.

As in the previous section, the suitability of the activities defined here, will to some extent, depend on the nature of the method of allocation as defined in section 5.2.

5.4.1 Increasing the value added to water in forestry

Value added in water can be increased (a) by improving forest revenues, and (b) by increasing the value added in wood.

Forest revenues can be increased by (a) producing higher value timber, eg. Logs better suited to processor's requirements (b) greater volumes (c) minimum forest residue, which requires strong residue markets. Multiple-use forestry can also increase revenues.

Value added in processing can be increased by forest manager's producing logs better suited to higher value markets, e.g. for saw timber needed in furniture manufacture.

5.4.2 Optimising the match of species to site

Site conditions vary greatly in South Africa. Substantial productivity gains come from matching tree species correctly to site. The Forestry Industry is continually striving towards improving this match, as it is of significant financial benefit to their business.

5.4.3 Selection of water efficient tree species

Some species or hybrids are more efficient at using water than others. The selection of the most WUE species suited for the market could help increase the water efficiency of the forest sector but requires significant research effort, time and investment. Research efforts to breed for more water efficient species are under way.

5.4.4 Avoidance of unsustainable forests

Ensuring that trees are grown on high productivity areas and encouraging shifts of plantations from unsustainable to sustainable sites, will increase productivity per unit of water used.

5.5 Potential tools for WC&DM in the forest sector

The responsibility for achieving efficiency falls on the shoulders of two categories of role-players: water authorities and water users. Allocation of water is the responsibility of water management authorities such as DWAF and CMA's, whereas

the responsibility for enhanced application and productivity are mostly in the hands of the water users.

In order to achieve WC&DM goals, water management authorities have a number of management tools available. These tools are categorised in three main groups:

- Regulatory tools;
- Market based tools, and
- Suasion tools

These tools can be used individually, or in combination, and incorporate incentives, to achieve WC&DM. See Table 1 below. The selection of an appropriate 'mix' of tools will depend on the economic, social and environmental costs and benefits related to their use.

Table 1: Water Demand Management Tools

Tools	Allocation	Application	Productivity
Regulatory	Water allocation plans; licenses	Licence conditions (riparian zones, invasives); minimum standards of SFM	
Market based	Licence trading (water pricing)	Certification (water management plans, habitat management plans); water charge rebates	Certification (best management practice for forest management); water pricing; water charge rebates
Suasion		Government-private sector accord on working for Water; water wise awards; green awards	Government-private sector agreement on productivity improvement.

5.5.1 Regulatory tools

Regulatory tools can be applied for more effective management of the "allocation" and "application" elements in WC&DM. Water ***allocation*** plans for forestry and other SFRAs in Catchment Management Strategies are to be based on water authorisations and licensing. These could include incentives such as for example:

- In some areas of South Africa plantations are unsustainable. Water allocations could be such that these plantations could be withdrawn over time. This could be compensated for by increased allocation to forestry in areas where it is sustainable.
- Forestry licenses may be allocated for (for example) 40 years. But this incentive will have to be aligned with the requirements of the Water Act.
- Intra-sectoral water markets may be established.

The above incentives will have to be aligned to other SFRAs in order for forestry to be treated equitably. An inter-sectoral SFRA incentive may have:

- Credits awarded for "water-wise" management. These credits could then be taken into account during the water allocation process.

Licence condition, criteria, indicators and standards for SFM are the main regulatory tools to improve water use **application**. Some incentives may be put in place to influence management practices:

- Minimum standards could be set for management ie riparian zone management;

road location, road maintenance, and timber extraction; and fire protection. Management for standards exceeding the minimum could then be credited.

5.5.2 Market based tools.

Market based tools can apply to all three elements (Allocation, application and productivity) of WC&DM (Table 1). These tools include licence trading, certification of forests, best management practices, with incentives that allow rebates on water charges.

Inherently in the business of forestry, market incentives already exist to improve **productivity** as much as possible. This can be further encouraged by:

- A joint public/private sector breeding programme for accelerated development;
- Setting of a minimum productivity standard for mean annual increment eg 12 m^3/ha/a for pines, 18 m^3/ha/a for eucalyptus, and 8 m^3/ha/a for wattle. A revenue/ha benchmark may also be used. In conjunction with this, a credit system could be employed where foresters exceeding the minimum standards could be rewarded during allocation, with more water.
- Financial incentives might be given to foresters for implementing Forest Stewardship Council (FSC) certification. This certification covers, amongst other things, water management aspects; and improves the marketability of forestry products.

Another productivity incentive might be to license foresters for a quantity of water, without specifying area or species, but giving guidelines instead. Intra-sectoal market forces will then act as incentives for foresters to use this water as efficiently as possible.

5.5.3 Suasion tools

Suasion tools found application mainly in the "application" and "productivity" elements of WC&DM. Possible suasion tools are presented in Table 1.

SECTION 6: SUSTAINABLE FOREST MANAGEMENT

Criteria, indicators and standards for sustainable forest management and for SFM are important market based water demand management tools that foresters can use for improving the water application and water productivity elements in WC&DM (see Table 1). The organised industry has adopted the Forest Industry Environmental Guidelines for Conservation of Commercial Plantations in South Africa, which include water management measures.

6.1 Water Management Plans

The National Water Policy requires sectoral management plans. These are to incorporate into the WC&DM Strategies. This section outlines the requirements for the water management plans in the forestry sector.

Water management plans may be formulated at three scales. The **first** would be for the forest management unit (FMU), i.e. as defined in the National Forest Act as “an

area of land on all or part of which there is forest and which is managed as an integrated unit". The **second** would be for a Water User Association comprising of several owners of forest management units within a Water Management Area. The **third** would be for the sector as a whole. What follows are requirements for plans at the level of FMU. Plans at the other levels can be built from these guidelines.

These requirements are built upon the "Environmental Guidelines for Conservation Management of Commercial Plantations in South Africa" (second edition, in press), and the minimum standards for forest certification according to the Forestry Stewardship Council (FSC) as applied in South Africa. These have been enhanced to take account of the requirements of national water policy.

South Africa has adopted principles of sustainable forest management (SFM), which are in harmony with international principles, and which are incorporated in the National Forests Act. These will guide the development and regulation of criteria, indicators, and standards of SFM in South Africa.

Forest management requires as standard practice the development of detailed forest management plans for each forest management unit. These plans deal in detail with the full cycle of forest production, from seedling through final harvest, as well as overall environmental management of the FMU. The Environmental Guidelines for Conservation Management of Commercial Plantations in South Africa stipulate an inclusive set of environmental guidelines that should be followed in forest management planning. The FSC also sets standards to which the plans and their execution must comply if the FMU is to be certified as sustainably managed. The incentive for certification is strong, since a grower wishing to sell forest produce to a processor who exports, needs such a certificate.

Thus, water management planning on the FMU must be an integral part of the sustainable forest management plan for a FMU. Whether or not the water management plan is adequate must be judged by the overall adequacy of the forest management plant itself. Generally, the certification of a forest can be taken as an adequate test of the water management plan if clear standards are available, since the first requirement of certification is compliance with all relevant laws.

6.2 Water Audits in the Water Management Plan

The first section of the water management plan must consist of a documented audit of the water resource of the FMU. This audit must be based upon the best available information, such as the recorder water balance (precipitation and runoff), flow regime, and water quality regime of the catchments or parts of catchment included in the FMU, or the best predictions from appropriate hydrological models. The audit must also include an assessment of the relevant elements of the current management plan for the FMU.

The documented audit must contain at least the following:

- A quantification of the water balance of the FMU under natural conditions, i.e. as it would have been without afforestation, under natural vegetation, during the period since afforestation, together with the flow-duration curve after afforestation.

- A quantification of the water balance and flow-duration curve after afforestation.

- The same for the water quality regime, and an assessment of how this departs from the resource-quality objectives for the river reach fed by the FMU, as set out in the DWAF Resource-Directed Measures.

- From all this, an assessment of current water use, allocation efficiency, application efficiency, and productive efficiency.
- An assessment of the compliance of the water management elements of the forest management plan to accepted minimum standards.

6.3 Management Goals and Objectives

The water management plan must contain a statement of overall goal and of contributory objectives, in terms of mean annual runoff, the flow-duration curve, and water quality objectives, as well as management standards. These goals must take account of normal climatic variation and predicted climate change.

6.4 Elements of Water Management

The principles that apply here come from the National Forest Act, the National Water Act, and the National Environmental Management Act, and are summarised in the Environmental Guidelines for Conservation Management of Commercial Plantations in South Africa.
The South African Forestry Industry is committed to Integrated Environmental Management to ensure that:

- development takes place in the most economic and environmentally acceptable way;
- resources are managed in a manner which will ensure the sustainability of the forestry enterprise; and
- the people on which the Industry depends may work in safety and live under conditions of acceptable quality.

6.5 Principles of Sustainable Forest Management (SFM)

The National Forests Act of 1998 contains the following six principles to guide SFM:

- Maintain the resource base
- Maintain the sustained yield of goods and services
- Maintain biodiversity
- Wise use of water
- Optimise the socio-economic impacts of forestry
- Develop supportive institutional frameworks and policy

The Environmental Guidelines for Conservation Management of Commercial Plantations in South Africa recognises the following as some of the values that could be associated with the above Principles of SFM:

1. **Soil**
    - Soil quality
    - Soil quantity
    - Nutrient status
2. **Water**
    - Water quality
    - Water quantity
    - Wetland habitat
3. **Biodiversity**
    - Species diversity
    - Ecosystem function
    - Important species
4. **Forest Health**
    - Protection against pests
    - Protection against diseases
    - Protection against fire

These form the framework for detailed guidelines on several aspects of environmental management on the FMU, including the following:

- fire protection: adequate and appropriate fire management strategies are imperative to ensure that the forest resource, together with its ecological and other associated values, are protected
- Site/species matching: to ensure optimum yields, quality and economic benefits, the requirements of the species should be matched to the characteristics of the site
- Avoiding monoculture landscapes: monocultures pose a risk in terms of disease and fire, which are heightened when single clones are utilised; If monocultures are unavoidable, a variety of age classes is a suggested improvement for reduction of risk and to improve the general aesthetics.
- Weed potential

- Water use efficiency: efficient species, clones and management regimes should be favoured
- Wetland protection [detailed guidelines under review]
- harvesting system: the environment should determine the type of harvesting system to be used. In choosing the most appropriate system, terrain, weather, extraction routes, timetables and yarding sites should be considered: detailed guidelines for environmental protection are applicable
- roads: the exposed surfaces of roads are the main source of sedimentation in the plantation environment; by restricting this disturbance as much as possible, this impact and the loss of productive land can be reduced: detailed guidelines for environmental protection are applicable (e.g. Box 2)

Box 2: Roads and watercourses

Watercourses are particularly sensitive to the effects of sedimentation caused by run-off from roads. The following guidelines are thus important:

- Minimise the number of stream crossings.
- Legally, roads may not be routed within 10 metres of a watercourse or wetland except where they cross. A 20-metre buffer is however recommended.
- Where existing roads are routed within 10 metres of a watercourse they should, where practicable, be re-routed and/or decommissioned. Caution must be exercised to ensure impacts caused by decommissioning/re-routing are not greater than those caused by the road in the first place.
- No water should be led off roads directly into watercourses but should preferably flow through at least 10 metres of vegetation before entering the river. The least amount of water should be allowed to leave the road at the bottom of an approach to a watercourse.
- Minimise interference with natural drainage. On roads that carry heavy traffic loads over extended periods of time, bridges rather than drift/fords should be used.
- All construction must be carried out in a manner that causes minimal damage to the streambed and banks (a permit is needed from DWAF if construction will cause such damage)
- Movement of construction vehicles in natural areas and across waterways and streams should be limited to existing routes, the proposed roadway or other specified routes.
- Roads should cross watercourses at right angles.
- Where possible a route should not follow a parallel course to a river on flat terrain (Refer .diagram Roads A-3). This not only improves the safety of the route but also reduces construction and maintenance costs, drainage requirements and the ultimate sediment load.

Monitoring

The Water Management Plan must be supported by a monitoring plan that allows the achievement of objectives to be assessed.

6.6 Certification of Water Management Plans

Table 2 summarises the FSC standards that are relevant to water management plans.

TABLE 2. Summary of the requirements for FSC certification that are wholly or partly relevant to forest Water Management Plans. These are excerpts (slightly modified in a few cases) from SGS (2000) Qualifor requirements. (Our numbering does not follow the SGS (2000) full list.)

REQUIREMENTS FOR FSC CERTIFICATION (TAKEN FROM SGS (2000)

TABLE 2. Summary of the requirements for FSC certification that are wholly or partly relevant to forest Water Management Plans. These are excerpts (slightly modified in a few cases) from SGS (2000) Qualifor requirements. (Our numbering does not follow the SGS (2000) full list.) **REQUIREMENTS FOR FSC CERTIFICATION (TAKEN FROM SGS (2000)**
1. <u>COMPLIANCE WITH LAWS AND FSC PRINCIPLES</u> - Forest management shall respect all applicable laws of the country in which they occur and international treaties and agreements to which the country is a signatory, and comply with all FSC Principles and Criteria.
1.1 Forest management shall respect all national and local laws and administrative requirements
There is an up-to-date register or summary of all relevant national and local statutes and regulations. There is a system for ensuring all summaries or reference copies of legislation and regulations are up to date. Employees and contractors are aware of the implications of regulations and statutes. Relevant statutes and regulations are implemented through operational guidelines and procedures. Where non-compliances are identified corrective actions are implemented. There is no evidence of non-compliance with legal requirements.
1.2 All applicable and legally prescribed fees, royalties, taxes and other charges shall be paid
There is evidence that required payments have been made. Provision has been made to meet the costs of future fees.
1.3 Conflicts between laws, regulations and the FSC Principles and Criteria shall be evaluated for the purposes of certification, on a case-by-case basis, by the certifiers and the involved or affected parties.
Any identified conflicts are documented. Involved and affected parties are consulted. Action taken to address the conflict is described.
1.4 Forest managers shall demonstrate a long-term commitment to adhere to the FSC Principles and Criteria
There is a publicly available policy endorsed by the most senior management stating commitment to forest management practices consistent with the FSC P&C. The policy is communicated throughout the organisation and to contractors. The policy is reviewed and updated regularly.
2. <u>BENEFITS FROM THE FOREST</u> - Forest management operations shall encourage the efficient use of the forest's multiple products and services to ensure economic viability and a wide range of environmental and social benefits.
2.1 Forest management should strive towards economic viability, while taking into account the full environmental, social, and operational costs of production, and ensuring the investments necessary to maintain the ecological productivity of the forest
Current and future budgets include specific provision for environmental and social, as well as operational, costs. Where necessary, investments are made to maintain the ecological productivity of the forest.
2.2 Forest management operations shall recognise, maintain and, where appropriate, enhance the value of forest services and resources such as watersheds and fisheries.
Forest managers are aware of the range of forest services and resources. The potential impacts of forest management activities on these services and resources are assessed. Forest management practices minimise negative impacts on services and other forest resources.
3. <u>ENVIRONMENTAL IMPACT</u> - Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and, by so doing, maintain the ecological functions and the integrity of the forest.
3.1 Assessment of environmental impacts shall be completed - appropriate to the scale, intensity of forest management operations and the uniqueness of the affected resources - and adequately integrated into management systems.
Assessments of environmental impacts are carried out (and documented as appropriate) at a landscape and/or operational level, prior to commencement of site disturbing operations. All environmental impacts identified during assessments are considered in plans. Operations are designed to avoid or mitigate adverse impacts. Formal evaluation of environmental impacts is undertaken for all afforestation activities.
3.2 Safeguards shall exist which protect rare, threatened and endangered species and their habitats (e.g. nesting and feeding areas). Conservation zones and protection areas shall be established, appropriate to the scale and intensity of forest management and the uniqueness of the affected resources. Inappropriate hunting, fishing, trapping and collecting shall be controlled.
Conservation zones and protection areas (appropriate to scale and importance) are demarcated and protected. Silvicultural and/or other management systems are appropriate for the ecology of the forest and resources available. Ecological functions (regeneration, succession, diversity, natural cycles) are maintained and where appropriate, there is a programme for restoration of degraded sites.
3.3 Representative samples of existing ecosystems within landscapes shall be protected in their natural state and recorded on maps, appropriate to the scale of operations and the uniqueness of the resource.
Appropriate protection and management activities are prescribed and implemented Burning of wetlands is planned on a partial, rotational basis.
3.4 Written guidelines shall be prepared and implemented to: control erosion; minimise forest damage during harvesting, road construction, and all other mechanical disturbances; and protect water resources.
All environmentally sensitive forest operations are identified and written guidelines, defining acceptable practice, are prepared and implemented. A road network plan is maintained for each plantation. A formal road maintenance plan is maintained and implemented. Roads are not routed within 20m of a watercourse or wetland except for at river crossings. Crossings conform to FESA Harvesting CoP. There is evidence that the access network is fitted to the topography to limit gradients. Gradients greater than 10° (17%) require

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documented justification. Road drainage is adequate to minimise erosion, through road surface design, drains and/or culverts. Water led off roads flows through at least 10m of vegetation before entering a watercourse. Culverts are installed at all points where roads cross a watercourse. Fords/drifts are limited to solid rock sites or constructed of durable material, and only for seasonal use. Formal evaluation of environmental impacts is undertaken for siting of quarries/pits and they are adequately maintained; top soil is stored for rehabilitation. A harvesting plan is prepared for each compartment, drawn to scale (max. 1:5,000). The plan shows topography, extraction routes, yarding sites, and specifies equipment and techniques. The rationale for the harvesting system for each compartment is defined, and takes account of topography and soils. Cable yarders, chutes, animals or manual extraction are used for steep slopes, wet conditions and sensitive soils. Trees are not felled into buffer zones riparian/ wetland/ indigenous forest. Temporary extraction routes are planned before felling; gradients are restricted (subject to a maximum slope of 35%), and rehabilitated after use (slash/cross-drains). Slash is broadcast or stacked in rows along the contour. Burning of slash is acceptable only under cool burn conditions, according to restrictions documented in the Environmental Guidelines. Slash is removed from watercourses following clearance of crop or weed species. Adequate measures are taken to protect the forest from fire.
3.5 Management systems shall promote the development and adoption of environmentally-friendly non-chemical methods of pest management and strive to avoid the use of chemical pesticides.
There is a list of all chemicals used in the organisation and prohibited chemicals are not used. Operators comply with up-to-date guidance for pest and weed management on all sites including nurseries. Where chemicals are used, efforts are being made to reduce their use and/or to test alternative management practices. Appropriate application equipment, protective clothing and training on its use are provided, that as a minimum comply with legal requirements. Chemical storage, mixing and application procedures as a minimum, meet applicable regulations and codes of practice. Operators are aware of and able to implement emergency procedures for clean-up following spillages or other accidents with chemicals (eg. spill kits must be on site, etc.) Records are kept of all incidents involving chemicals.
3.6 Chemicals, containers, liquid and solid non-organic wastes including fuel and oil shall be disposed in an environmentally appropriate manner at off-site locations.
Non-organic wastes (e.g. oil, tyres, containers, etc.) are recycled where possible. Waste that cannot be re-cycled is disposed of in environmentally appropriate ways. On-site facilities for easy collection of waste are provided.
3.7 Use of biological control agents shall be documented, minimised, monitored and strictly controlled in accordance with national laws and internationally accepted scientific protocols. Use of genetically modified organisms shall be prohibited.
If biological control agents are used, there is an awareness of relevant national and international laws. All activities where biological control agents are used are documented and monitored. No genetically modified organisms are used in management, production or research programmes.
3.8 The use of exotic species shall be controlled and actively monitored to avoid adverse ecological impacts
Exotic species are assessed for adverse ecological impacts and such impacts avoided. Unwanted regeneration is monitored, and if necessary controlled.
Forest conversion to plantations or non-forest land uses shall not occur, except in circumstances where conversion: **a) entails a very limited portion of the forest management unit; and** **b) does not occur on high conservation value forest areas; and** **c) will enable clear, substantial, additional, secure, long term conservation benefits across the forest management unit.**
Forest conversion, if any, is limited to small areas (and its extent is acceptable to stakeholders). Conversion does not occur on high conservation value forest areas. Conservation benefits of conversion have been identified and assessed in cooperation with acknowledged experts. Conservation benefits are substantial, additional, secure, and long term.
4. <u>MANAGEMENT PLAN</u> - A management plan - appropriate to the scale and intensity of the operations - shall be written, implemented, and kept up to date. The long term objectives of management, and the means of achieving them, shall be clearly stated.
The management plan and supporting documents shall provide: **a) management objectives;** **b) description of the forest resources to be managed, environmental limitations, land use and ownership status, socio-economic conditions, and a profile of adjacent lands;** **c) rationale for rate of annual harvest and species selection;** **d) provisions for monitoring of forest growth and dynamics;** **e) environmental safeguards based on environmental assessments;** **f) plans for the identification and protection of rare, threatened and endangered species;** **g) maps describing the forest resource base including protected areas, planned management activities and land ownership;** **h) description and justification of harvesting techniques and equipment to be used.**
There is a management plan (or overview linking different planning activities).

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REQUIREMENTS FOR FSC CERTIFICATION (TAKEN FROM SGS (2000)
Management objectives are described. Forest resources, environmental limitations, land use and ownership status, socio-economic conditions, and adjacent lands are described. Environmental safeguards are described. There are maps showing the forest resource base including protected areas, planned management activities and land ownership. Harvesting techniques and equipment are described and justified. Planning includes short (operational), medium (tactical) and long (strategic) term plans. The plan is being implemented and any deviation is adequately justified.
4.2 The management plan shall be periodically revised to incorporate the results of monitoring or new scientific and technical information, as well as to respond to changing environmental, social and economic considerations.
Staff members with responsibility for the overall compilation and updating of the management plan are identified. There are procedures for incorporation of monitoring data into the management planning process. New scientific and technical developments are evaluated and incorporated into revised plans. Revised plans respond to changing environmental, social and economic considerations. A timetable for the periodic revision of the management plan adhered to.
5. <u>MONITORING AND ASSESSMENT</u> - Monitoring shall be conducted - appropriate to the scale and intensity of forest management - to assess the condition of the forest, yields of forest products, chain of custody, management activities and their social and environmental impacts.
5.1 The frequency and intensity of monitoring should be determined by the scale and intensity of forest management operations as well as the relative complexity and fragility of the affected environment. Monitoring procedures should be consistent and replicable over time to allow comparison of results and assessments of change.
All activities that require monitoring are identified. The frequency and intensity of monitoring are defined and are appropriate. Consistent and replicable monitoring procedures for each activity are documented and implemented. Staff members with responsibility for implementing monitoring programmes are identified.
Forest management should include the research and data collection needed to monitor, at a minimum, the following indicators: • **yield of all forest products harvested;** • **growth rates, regeneration and condition of the forest;** • **composition and observed changes in the flora and fauna;** • **environmental and social impacts of harvesting and other operations;** • **costs, productivity, and efficiency of forest management.**
Environmental and social impacts of forest operations, including health and safety, are monitored. Post-harvest monitoring is carried out to assess waste and damage to the site. Data are collected on costs, productivity and efficiency of forest management. Contractors' performance is monitored, including compliance with contract specifications. Waste disposal sites within the FMU are regularly checked.
5.3 The results of monitoring shall be incorporated into the implementation and revision of the management plan.
Records of monitoring activities are kept. The results of research and monitoring programmes are regularly analysed. The results of monitoring are incorporated into periodic revisions of the management plan, policy and procedures. Summaries of monitoring results are available to the public.
<u>6. MAINTENANCE OF HIGH CONSERVATION VALUE FORESTS</u> Management activities in high conservation value forests shall maintain or enhance the attributes which define such forests. Decisions regarding high conservation value forests shall always be considered in the context of a precautionary approach.
6.1 Assessment to determine the presence of the attributes consistent with High Conservation Value Forests will be completed, appropriate to scale and intensity of forest management
Attributes of HCVFs for the region have been adequately defined by the organization (at a level appropriate to the scale and intensity of forest management). The FMU has been adequately assessed and HCVFs have been identified (and documented).
6.2 The consultative portion of the certification process must place emphasis on the identified conservation attributes, and options for the maintenance thereof.
The organisation has consulted with appropriate experts and local people to identify conservation attributes and determine options for the management of HCVFs in the FMU.
6.3 The management plan shall include and implement specific measures that ensure the maintenance and/or enhancement of the applicable conservation attributes consistent with the precautionary approach. These measures shall be specifically included in the publicly available management plan summary.
Each attribute of HCVFs identified, is described in the management plan. The plan describes the specific measures to enhance the identified attributes. All measures are described in the public summary of the plan.
6.4 Annual monitoring shall be conducted to assess the effectiveness of the measures employed to maintain or enhance the applicable conservation attributes.
Indicators are defined to monitor effectiveness of each measure described in the plan. The frequency of monitoring of these indicators is defined. Records of monitoring are kept and used to adapt future management. Managers are actively monitoring research developments which might contribute to management of HCVFs.

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7. PLANTATIONS - Plantations shall be planned and managed in accordance with Principles and Criteria 1 - 9, and Principle 10 and its Criteria. While plantations can provide an array of social and economic benefits, and can contribute to satisfying the world's needs for forest products, they should complement the management of, reduce pressures on, and promote the restoration and conservation of natural forests.
7.1 The management objectives of the plantation, including natural forest conversion and restoration objectives, shall be explicitly stated in the management plan, and clearly demonstrated in the implementation of the plan.
Plantation management objectives are clearly stated in the management plan.
7.2 The design and layout of plantations should promote the protection, restoration and conservation of natural forests, and not increase pressures on natural forests. Wildlife corridors, streamside zones and a mosaic of stands of different ages and rotation periods, shall be used in the layout of the plantation, consistent with the scale of the operation. The scale and layout of plantation blocks shall be consistent with the patterns of forest stands within the natural landscape.
Natural vegetation areas within and adjacent to the FMU are identified. Areas of natural vegetation are retained or restored as wildlife habitat and/or corridors. Streamside buffer zones are protected. The scale and layout of plantation blocks is consistent with natural forest stands. Crop species are not planted closer than 30m from a permanent watercourse of 50m from a wetland unless a rationale for deviation from Bosch model prescriptions is recorded. Plantation planning and re-establishment makes provision for variation in age class within defined landscapes. Formal plans are documented for removing crop and weed tree species from watercourses and wetlands. Buffer zones (width equivalent to one mature tree length where possible) are maintained around indigenous forest areas, sites designated for environmental or cultural value, and natural features such as cliff edges.
7.3 Diversity in the composition of plantations is preferred, so as to enhance economic, ecological and social stability. Such diversity may include the size and spatial distribution of management units within the landscape, number and genetic composition of species, age classes and structures.
A variety of species and/or provenances are used. Maximum clear-cut size is defined. Plantation planning and re-establishment makes provision for variation through age class, species and rotation periods.
7.4 The selection of species for planting shall be based on their overall suitability for the site and their appropriateness to the management objectives. In order to enhance the conservation of biological diversity, native species are preferred over exotic species in the establishment of plantations and the restoration of degraded ecosystems. Exotic species, which shall be used only when their performance is greater than that of native species, shall be carefully monitored to detect unusual mortality, disease, or insect outbreaks and adverse ecological impacts.
Selection of species and provenances is based on documented trials that demonstrated their suitability to the site and management objectives. Exotic species are used only where they outperform native species in meeting management objectives. Information is available on seed sources.
7.5 A proportion of the overall forest management area, appropriate to the scale of the plantation and to be determined in regional standards, shall be managed so as to restore the site to a natural forest cover.
Planning for plantation establishment and re-establishment includes provision for set-aside areas for conservation or restoration of the natural vegetation type. Formal management planning includes natural areas (for operations such as clearance of riparian zones). Natural areas (including riparian zones, wetlands, indigenous woodland and cultural items) are mapped and recorded on a Natural Assets Register.
7.6 Measures shall be taken to maintain or improve soil structure, fertility and biological activity. The techniques and rate of harvesting, road and trail construction and maintenance, and the choice of species shall not result in long term soil degradation or adverse impacts on water quality, quantity or substantial deviation from stream course drainage patterns
There is information on all soil types in the plantation area that indicate their susceptibility to degradation from forest operations. Forest operations that might degrade soils and the potential types of degradation are identified. Soil degradation due to forest operations is minimised. Practices are controlled according to slope restrictions and soil erodibility. Where soils are degraded from previous activities, there are plans to restore them. Major water bodies within the forest area are identified. Forest operations that might degrade water bodies[1] are identified. Degradation of water bodies is minimised.
7.7 Measures shall be taken to prevent and minimise outbreaks of pests, diseases, fire and invasive plant introductions. Integrated pest management shall form an essential part of the management plan, with primary reliance on prevention and biological control methods rather than chemical pesticides and fertilisers. Plantation management should make every effort to move away from chemical pesticides and fertilisers, including their use in nurseries.
Regular plantation staff are given sufficient training to identify health problems in the plantations and, where appropriate, specialist inspectors are used. There are documented procedures to be followed in the case of observation of any occurrence of a health problem. Integrated pest management systems are used where available. There is a documented fire prevention and control system.

[1] eg. through siltation, physical damage, pollution, excess water use, and/or increased water runoff

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There is a fire surveillance system including clear assignment of responsibilities for reporting outbreaks. There are documented procedures for fire suppression that include definition of responsibilities and reporting lines. All employees and contractors, who are required to perform fire control activities, have received adequate training. There are regular audits of fire readiness that test all procedures.
7.8 Appropriate to the scale and diversity of the operation, monitoring of plantations, shall include regular assessment of potential on-site and off-site impacts, (e.g. natural regeneration, effects on water resources and soil fertility, and impacts on local welfare and social well-being), in addition to those elements addressed in principles 8, 6 and 4. No species should be planted on a large scale until local trials and/or experience have shown that they are ecologically well-adapted to the site, are not invasive, and do not have significant negative ecological impacts on other ecosystems. Special attention will be paid to social issues of land acquisition for plantations, especially the protection of local rights of ownership, use or access.
Potential on-site and off-site impacts are identified and monitored including, as appropriate: • unwanted natural regeneration • *effects on water resources • *effects on soil fertility • *effects on local welfare • landscape impacts There is no evidence of invasive tree weed species spreading outside planted compartments. Prior local rights of ownership, use and access [to land acquired for plantation] are protected, or have been compensated with the full agreement of representatives of all parties that previously enjoyed such rights.
7.9 Plantations established in areas converted from natural forests after November 1994 normally shall not qualify for certification. Certification may be allowed in circumstances where sufficient evidence is submitted to the certification body that the manager/owner is not responsible directly or indirectly of such conversion.
The plantation does not occupy land converted from natural forest since November 1994. If the plantation was converted since November 1994, there is adequate evidence that the current manager/owner was not responsible.

SECTION 7: ELEMENTS OF THE WC&DM STRATEGY FOR THE FOREST SECTOR

A consultative process was followed to define a gaol and the main elements of a WC&DM stategy for the forestry sector. The process is outlined in Appendix 1. What follows is a representation of the intermediate objectives required to overcome those obstacles (defined by stakeholders and reflected in appendix 5) to implementing a WC&DM strategy in forestry.

7.1 Overall goal of Strategy

Water scarcity is regarded as one of the factors limiting economic growth and the provision of social equity in South Africa. It is therefore imperative that the strategy developed for the forest sector is in agreement with the national goals of water supply for all South Africans as specified in the Act.

A **measurable goal** for WC&DM in the forest sector will need to be developed through an **ongoing consultative process**. Stakeholders have indicated that not enough information currently exists with which to define a measurables for efficient application and productivity. The gaining of such information should therefore form part of the strategy, and the following goal is proposed:

By 2001, forest managers are committed to a strategy for ensuring efficient allocation of water to SFRAs, minimizing wasteful use, and maximizing water

use productivity, through coordinating sustainable forest management practices, licensing policies, pricing policies and SEA.

The achievement of such a goal should not only achieve the requirements of *economic efficiency, social development, social equity, environmental protection, sustainability of water supply and services, and political acceptability* as defined in section 1.2.2, but should also contribute to increased employment opportunities.

7.2 Overview of Strategy

An overview of the Strategy proposed for WC&DM in the forest sector is depicted in the following figure, **Figure 3**. This is in the form of a flow diagram that shows the intermediate objectives which must be achieved in order to reach the goal of WC&DM. It is hierarchical. The higher-level objectives build on the achievements of the lower level objectives. There are lateral, as well as vertical, linkages between the various components of the strategy. This is necessary because WC&DM requires an integrated approach. Implementation of the strategy will require a number of linked initiatives and achievements.

At present, the Strategy provides a framework which identifies areas of focus. The Strategy is subject to further development as stakeholders take ownership and provide the elements to implement the strategy.

Introducing WC&DM measures in the forest sector is not simply a matter of identifying appropriate economic tools to change people's actions. It is recognised that there are areas where capacity and knowledge need to be developed and communicated, in order to ensure that the forest sector is able to implement WC&DM in a sustainable manner. The strategy identifies goals for research, institutional capacity building, communication and implementation.

The rest of this Section provides a description of the nature of each intermediate objective, its link to the workshop outcomes, examples of tasks that might be necessary to achieve each objective, and likely stakeholders involved in the tasks.

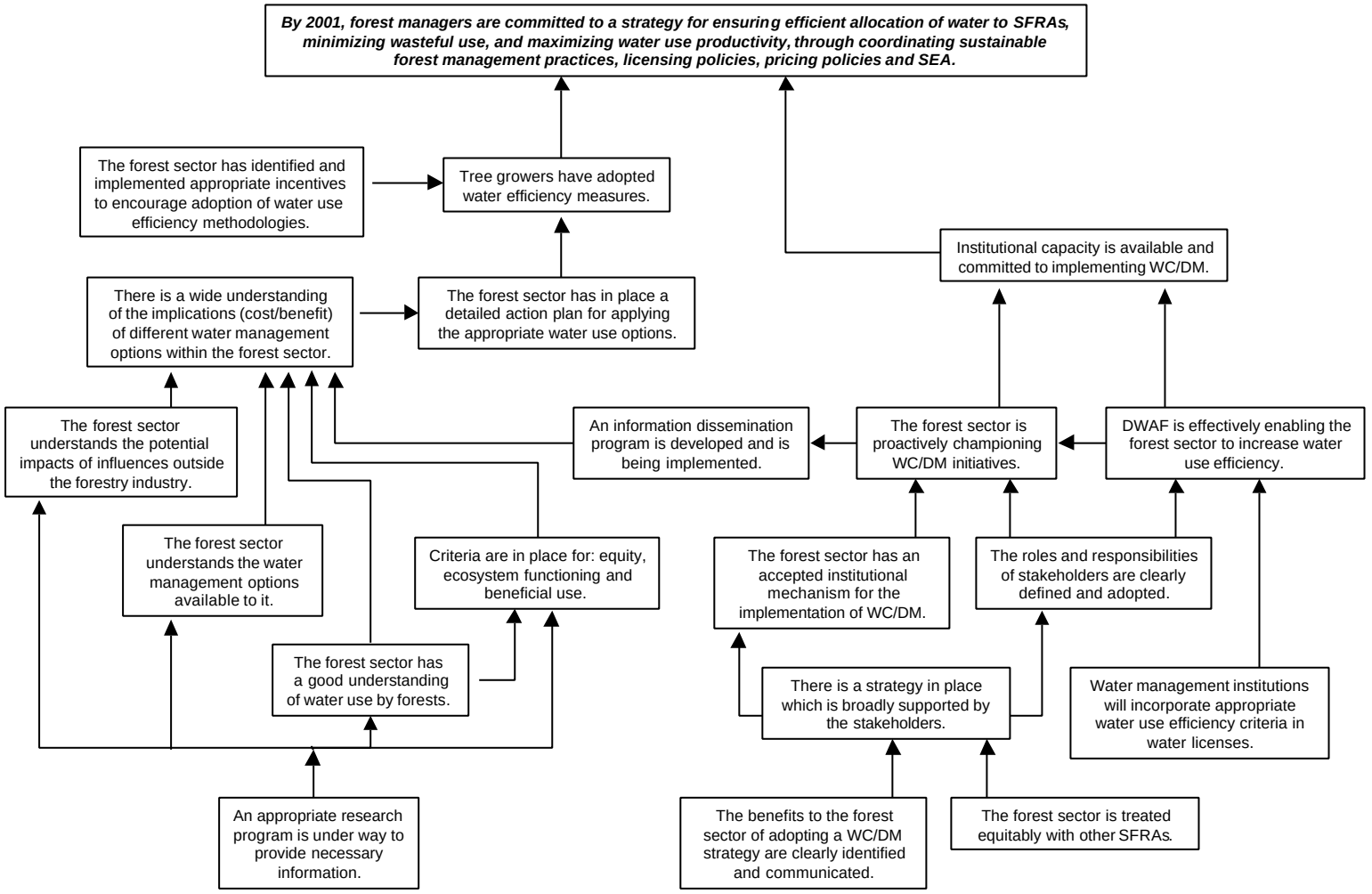

Figure 3: Diagrammatic representation of the WC/DM strategy for the Forestry sector.

7.3 Elements of the Strategy related to research

WC&DM has only recently been introduced into policy through the Act. There is still a great deal of research necessary to understand the requirements for its implementation. There is a need to better understand water use in the forest sector, water management options and the impact of external influences. In addition, consensus needs to be reached on the criteria to define concepts in the Act such as equity, ecosystem functioning and beneficial use. This baseline information is necessary to enable the forest sector to make informed decisions on WC&DM which promote sustainable use of water resources in South Africa.

7.3.1 There is sound and adequate understanding of water use by forests

Considerable research has been undertaken to understand water use in the forest sector. This knowledge now needs to be framed within the context of WC&DM. A strong feeling has been expressed by stakeholders that there is a lack of good qualitative and quantitative, long-term information on water use in the forest sector. This includes the distribution of water use, the relationship between forestry water use and ecosystems, catchment specific information, impacts on groundwater, and the water use by different species in different locations.

There is no agreed method for defining or measuring water use in the forest sector and this is a significant obstacle which needs to be overcome. A key aspect may be an analysis of how a reduction in demand will impact on the performance of the sector. This will lead on to a consideration of water management options.

Current initiatives:

- The WRC has commissioned a three year project to the development of models for quantifying stream flow reduction caused by commercial afforestation in South Africa. This project is jointly run by the CSIR, University of Stellenbosch and the ACRU team.

Potential future tasks involved

- Consolidate past research undertaken on water use by forests
- Identify research gaps and carry out research in these areas
- Set up a reliable monitoring and evaluation (for quantity and quality) system for all dry land crop water use
- Establish a system of knowledge and resource sharing within the forest sector.

Likely stakeholders responsible for championing the objective

The forestry industry and DWAF will need to jointly champion research into water use by forests. They will need to be supported by tertiary and research institutes and community forestry groups. Input from the water allocation teams in DWAF will be necessary for this task.

7.3.2 *There is knowledge and understanding of the water management options available to the forest sector*

There is a range of potential water management options available to the forest sector as described in Section 5. A comprehensive understanding of these options, their implications, and how they could be applied is needed. The forest sector identified this need because there is a poor understanding of demand management; it is necessary to introduce applied knowledge to the decision-making process; and there is little understanding of the economic tools available or of the consequences on the forest sector of water pricing.

Potential tasks involved

- Carry out research to identify and assess the impacts of the water management options available to the forest sector
- Evaluate the acceptability of options to the forest sector and other water use sectors
- Undertake pilot studies to test potential water management options.

Likely stakeholders responsible for championing the objective

All forest stakeholders will be involved, but the process is likely to be driven mainly by the forest sector. Tertiary and research institutes can offer research support. The NWRS will influence this objective and the appropriate staff in DWAF will need to be involved.

7.3.3 *Criteria are agreed upon and are in place for equity, ecosystem functioning and beneficial use and these correspond with the relevant criteria and indicators of sustainable forest management*

Equity, beneficial use and ecosystem functioning are identified in the Act as important goals for water resource management. In addition, the National Forests Act provides for the development of criteria, indicators and standards for sustainable forest management. A research and consultative programme is necessary, because there is little consensus on defining or applying these terms in practice.

Current initiatives:

- The Department of Water Affairs and Forestry has drawn up the policy and procedures for licensing streamflow reduction activities.

- The second edition of Environmental Guidelines for Conservation Management of Commercial Plantations in south Africa, is to be published in July 2000.

Potential future tasks involved:

- Establish an agreed understanding of equity, ecosystem functioning and beneficial use amongst stakeholders
- Set standards for equity, ecosystem functioning and beneficial use
- Develop criteria and indicators to measure the progress and achievement of equity, ecosystem functioning and beneficial use
- Incorporate these criteria into evaluating water use options.

Likely stakeholders responsible for championing the objective

This objective will need to be championed by DWAF, as it requires close alignment with national goals. Issues around water quality may require the involvement of the Water Quality Sub-Directorate. Other areas of overlap may be around water allocation, maintenance of the Reserve and the SFRA SEA.

7.3.4 There is an understanding of the potential impacts of external influences on the forest sector

Water demand by a sector or user is not static or absolute at any given time but dependent on external influences. An identification and analysis of socio-economic factors affecting the forest sector, and individual foresters, is an important component of the Strategy. Those external factors which cause an increase in water demand within the forest sector should be targeted. An understanding of these external influences will help ease some of the insecurities felt by the forest sector surrounding change.

Potential tasks involved

- Identify the external influences on the forest sector
- Carry out research to evaluate the impact of external influences on the forest sector
- Establish collaboration with other sectors influencing the forest sector
- Undertake a scenarios and foresighting exercise to understand future trends
- Develop a strategy to allow the forest sector to maintain stability in the light of external influences.

Likely stakeholders responsible for championing the objective

Joint collaboration between DWAF and the forest sector would be useful in meeting this objective. The two groups can bring different perspectives and knowledge to the study.

7.3.5 An appropriate research programme is underway to provide necessary information

DWAF, the forestry industry and research institutes already support research into the forest sector. This research must be capitalised on and directed towards WC&DM concerns. There are opportunities for collaboration between DWAF, the forestry industry, and tertiary and research institutions to implement an appropriate research programme on water management within the forest sector. The WRC is currently in the process of developing a research program to support SFRA and integrated catchment management.

Current initiatives:

- The CSIR, DWAF and WRC has signed an memorandum of agreement to jointly fund a comprehensive research programme to assist with the implementation of the SFRA policy. The research programme has been developed and the first call on research projects has been made.

Potential future tasks involved

- Identify areas where there are gaps in the current information and knowledge bases necessary for WC&DM
- Establish collaboration between the stakeholders in the forest sector to share learning
- Establish a funding mechanism for research
- Commission research in areas where there are information gaps
- Communicate the findings of the research to stakeholders.

Likely stakeholders responsible for championing the objective

The development of a research programme is dependent on all the key stakeholders taking responsibility. This includes DWAF, the forest sector and tertiary and research institutes. It is advisable for the different directorates within DWAF to work together on mutually supportive research. A committee (see 7.4.5) consisting of representatives from the groups may be set up to oversee the implementation of the research programme.

7.4 Elements of the Strategy related to institutional capacity building

There is unanimous agreement that WC&DM is important within the forest sector with stakeholder groups having expressed approval of the development of this Strategy. To date, the process has been driven by DWAF, but the Strategy will only be successful if there is ownership by all stakeholders and institutional support available for its implementation.

Water is generally governed by institutions which have been historically geared to augment and manage supply rather than to manage demand. Such institutions do not necessarily have the capacity or knowledge needed to support WC&DM. Institutional capacity building, and a shift in paradigm, are part of the Strategy to address demand side management.

7.4.1 The benefits of the WC&DM Strategy for the forest sector are clearly identified and communicated

Meeting this objective will provide the forest sector with an understanding of the social, economic and ecological costs and benefits of WC&DM. This is necessary in order to obtain stakeholder buy-in to the project and to develop a common vision and goal for WC&DM in the forest sector and more broadly in South Africa. This should help alleviate some of the perceptions held by members of the forest sector of being unfairly treated, by providing a clear rationale for WC&DM.

Potential tasks involved

- Identify the potential benefits of the WC&DM Strategy
- Implement a public awareness programme in the forest sector and amongst the general public.

Likely stakeholders responsible for championing the objective

The forest sector must drive this process so that there is a sense of ownership and less opportunity for mistrust and perceptions of unfair treatment.

7.4.2 There is a forest sector WC&DM strategy in place which is broadly supported by all stakeholders

Developing a sectoral strategy allows WC&DM options to be tailored to suit the needs of the forest sector. The forest sector has input into the development of the strategy and can influence its content. A strategy which is adopted by the forest sector will help to ensure buy-in to the concept of WC&DM.

Potential tasks involved

- Develop a strategy for WC&DM in the forest sector with stakeholder inputs.

Likely stakeholders responsible for championing the objective

This task is already underway and has been initiated by DWAF. The involvement of the forest sector in the further development of the Strategy is important to ensure that it is acceptable to all concerned.

7.4.3 The roles and responsibilities of stakeholders are clearly defined and adopted

In order for the Strategy to have impact, there must be a commitment to implementation. This commitment must come from all stakeholders in the forest sector. Identifying roles and responsibilities will support the forest sector in accepting responsibility for WC&DM. Allocating roles and responsibilities will also help to identify the resources necessary for implementation and the need to build capacity amongst stakeholders.

Potential tasks involved

- Identify specific tasks required to implement the Strategy
- Designate roles and responsibilities to perform these tasks through a process of consultation with stakeholders
- Identify mechanisms to overcome potential conflict
- Identify mechanisms to support stakeholders in undertaking their responsibilities.

Likely stakeholders responsible for championing the objective

All the stakeholders involved in WC&DM in the forest sector must be involved in this objective. However, since DWAF has already initiated the development of the Strategy, it may be appropriate for DWAF to drive this process.

7.4.4 Institutional capacity is available and committed to the implementation of the WC&DM Strategy

Support for WC&DM must come from the public sector, as well as the private sector. The goals of WC&DM are closely aligned with the requirements of environmental

policy in South Africa which need to be implemented by the public sector. There are a number of initiatives which have similar goals and integration of the WC&DM Strategy with these other initiatives is important in order to achieve the common vision of sustainable development. There also needs to be financial and human resources available to implement WC&DM effectively.

Potential tasks involved

- Develop a purposeful strategy for national WC&DM
- Align the budget of the responsible authorities to support the WC&DM Strategy
- Develop DWAF's competence and capacity to deliver core functions
- Identify an appropriate institutional body within the forest sector to champion WC&DM
- Clarify roles and responsibilities of the different institutional structures involved in WC&DM
- Establish the co-operative governance structures needed to promote WC&DM at the catchment level.

Likely stakeholders responsible for championing the objective

DWAF must champion this objective within the public sector and the forestry industry in the private sector.

7.4.5 The forest sector has an accepted institutional mechanism for implementing WC&DM

The forest sector is a large and diverse group of interests. It is necessary to establish a forum where representatives can interact to coordinate the implementation of the WC&DM Strategy. The Forestry Industry is already organised into a FIA Water Committee, comprising of 6 Regional Water Committees coinciding with the approved WMA demarcation.

Potential tasks involved

- Set up a fully representative steering committee consisting of representatives from the various groups within the forest sector to champion the implementation of the WC&DM Strategy.

Likely stakeholders responsible for championing the objective

In order for the institutional mechanism to be acceptable, the forest sector must champion this objective. DWAF can offer support where necessary.

7.4.6 The forest sector is proactively championing WC&DM initiatives

There must be stakeholder buy-in to the project. Stakeholders must accept and support the Strategy and roles and responsibilities assigned. Championship of the Strategy by the forest sector be achieved if the lower objectives have been met (see Figure 2). This is a crucial decision point to obtain stakeholder buy-in and acceptance of the need for WC&DM in the forest sector.

Potential task involved

- Adoption of the Strategy by the forest sector by providing assurance that:
  - other SFRAs would be treated in the same manner and at the same time, without one being treated differently from the others;
  - adequate recognition is given to forestry for the efforts that it has already made in terms of WC & DM;
  - the analysis of the Forest sector's water use situation be based on sound an acceptable scientific evaluation

Likely stakeholders responsible for championing the objective

This task is the responsibility of both DWAF and the forest sector.

7.4.7 DWAF is effectively enabling the forest sector to increase water use efficiency

DWAF and other water management institutions must effectively enable the forest sector to increase water use efficiency. In order to do this, water institutions need to link demand side management to conservation rather than to augmenting supply. Effective support from DWAF will clear up some of the concerns identified around the commitment and motivation by DWAF to make decisions and to implement regulatory mechanisms. By playing a supporting role, DWAF can provide institutional capacity and resources for WC&DM whilst the process is being driven by the forest sector.

Potential tasks involved

- Clearly identify DWAF's role in WC&DM
- Ensure DWAF is closely involved with the implementation of the WC&DM Strategy, particularly in regards to the implementation of any appropriate regulatory and economic tools
- Ensure that DWAF provides institutional and knowledge support to the forest sector
- Equip DWAF with the skills and capacity necessary to fulfil its mandate
- Harmonise strategies between various sectors relating to WC&DM
- Clarify the roles and responsibilities in WC&DM of the various structures involved in water management.

Likely stakeholders responsible for championing the objective

As this objective relates directly to DWAF, it naturally falls to this government department, and particularly the Directorate: Water Conservation to champion it.

7.4.8 Water management institutions have incorporated water efficiency criteria into water licencing

One potentially effective way of promoting WC&DM is to attach water efficiency criteria to the grant of licences to SFRAs. DWAF and/or CMAs, who grant such licences, will need to be fully conversant with appropriate conditions to apply in particular cases. These will need to be based on nationally or locally agreed criteria.

Potential tasks involved:

- Develop criteria, indicators and standards for measuring water efficiency
- Ensure water efficiency considerations are included in EIAs carried out to support SFRA licence applications
- Develop model licence conditions related to WC&DM which can be adopted by licensing bodies
- Promote, implement and monitor the adoption of nationally and locally agreed criteria and indicators of water efficiency.

Likely stakeholders responsible for championing the objective

Water licensing will be the responsibility of DWAF and/or CMAs. The Directorate: Water Conservation will need to champion the adoption of water efficiency criteria by the licencing bodies.

7.5 Elements of the Strategy related to communication

A communication strategy targeting the forest sector and the general public is required in order to increase awareness and acceptance of water scarcity in South Africa. This communication strategy should also provide information about WC&DM such as the need for water management, the options and institutional support available to them and the process being implemented. The communication network can also provide opportunities for linkages with other initiatives, such as the SFRA SEA.

7.5.1 An information dissemination programme is developed and implemented

An information dissemination programme will ensure that all stakeholders within the forest sector are kept abreast of developments in WC&DM. This will help to encourage individual tree-growers to champion WC&DM initiatives. A good communication network provides an opportunity for all stakeholders to be involved in the development and implementation of an action plan for WC&DM in the Forest sector.

Potential tasks involved

- Set up a communication network amongst the stakeholders in the forest sector
- Design, evaluate and disseminate a communication plan for providing tree-growers with the relevant information
- Establish and maintain an information system on WC&DM research in South Africa which is accessible to all the stakeholders.

Likely stakeholders responsible for championing the objective

The steering committee set up in the forest sector (see Section 7.4.5) should champion this task with strong support from DWAF.

7.5.2 There is wide understanding within the forest sector of the implications (costs & benefits) of the different water management options

The research programme set out in Section 7.3 is likely to produce a number of conclusions and recommendations, which need to be communicated to the forest sector and the general public. The provision of knowledge will alleviate some of the insecurities surrounding change and provide people with the scientific knowledge necessary to implement WC&DM measures.

Potential tasks involved

- Identify mechanisms for communicating the results of research on implications of different water management options to people in the forest sector
- Communicate research results as they become available.

Likely stakeholders responsible for championing the objective

Research institutions need to take responsibility for communicating the results of their research to the relevant people. The forestry associations can also play an important role in information dissemination. The SFRA SEA initiative can also support this objective through its proposed Decision Support System.

7.6 Elements of the Strategy related to implementation

Once the forest sector has attained the wide understanding of water management options (7.5.2), has developed appropriate institutional capacity to champion WC&DM and has communicated its strategy widely, WC&DM measures can be implemented. The first step towards implementation is the development of a detailed action plan for applying appropriate water use options. Once an action plan has been successfully implemented by tree growers, the forest sector will be on the way to achieving its goal for WC&DM.

7.6.1 We have a detailed action plan for applying the appropriate water management options

The detailed action plan will draw on the research that has been undertaken to understand the impacts of potential water management options, criteria for water use and the potential impacts of external influences on the forest sector (see Section 7.3). The roles and responsibilities to implement the action plan will need to be defined and committed to. The development of institutional capacity will ensure that there is sufficient support for the action plan. Finally, the communication network will be used to publicise and gain buy-in to the action plan amongst individual tree-growers.

Potential tasks involved

- Obtain agreement amongst stakeholders on appropriate water management options
- Design and implement an action plan to apply the appropriate water management options

- Establish clear roles and responsibilities for stakeholders
- Communicate the action plan widely within the forest sector
- Develop capacity amongst stakeholders to implement the water management options
- Establish and implement a system to monitor the establishment of the water management options
- Establish a funding mechanism to implement the action plan
- Establish a basis for ongoing consultation on the application of the action plan
- Communicate widely on progress achieved and the conditions for success.

Likely stakeholders responsible for championing the objective

The action plan will be implemented in the forest sector and it is thus necessary for them to take ownership of this objective.

7.6.2 Appropriate incentives have been identified and implemented to encourage adoption of water efficiency methodologies

The WC&DM strategy can only be applied successfully if individual farmers decide to implement better water management options. An incentives scheme will encourage individual tree-growers to adopt WC&DM measures. Incentives can be a persuasive means of ensuring commitment to WC&DM.

Potential tasks involved

- Design and implement an incentives scheme
- Consult with stakeholders on the acceptability of incentives
- Integrate incentives with water licensing as part of an integrated water management approach.

Likely stakeholders responsible for championing the objective

DWAF will need to champion this objective supported by the forestry industry.

SECTION 8: THE WAY FORWARD

The Directorate: Water Conservation will continue to champion the further development and implementation of the Strategy in conjunction with the forestry industry.

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APPENDIX 1: CONSULTATIVE PROCESS

1. Introduction

The stakeholder consultative process for the preparation of the WC&DM Strategy for the Forest sector had the following key objectives:

- Facilitate the involvement of key stakeholders in the development of a WC& DM Strategy for the Forest sector
- Ensure that stakeholders have the opportunity to communicate their issues of concern which should be addressed by the proposed strategy
- Provide an opportunity for stakeholders to comment on the various stages of the strategy being formulated.

The elements of the consultative process, which are discussed in more detail below, were:

- Preparation and circulation of a Draft Discussion Document to stakeholders
- Stakeholder Workshop
- Preparation of Draft Strategy Document (this document)
- Circulation of Draft Strategy for comment and finalisation.

2. Draft Discussion Document

The CSIR prepared and circulated a Draft Discussion Document on Water Conservation and Demand Management in the Forestry Industry in September 1999 (CSIR, 1999). This Discussion Document, together with the Water Conservation and Demand Management National Strategy Framework, was designed to serve as background information for key stakeholders prior to the workshop. The Discussion Document and its addendum highlighted the current situation and alternative strategies that could be considered for WC&DM in the Forest sector.

3. Stakeholder workshop

A workshop to discuss the development of the proposed WC&DM Strategy for the Forest sector was held on Friday, 15 October 1999 at the CSIR conference centre in Pretoria. A list of people who attended the workshop is attached as **Appendix 2**.

The purpose of the workshop was to:

- Describe the current situation in the South African forest sector
- Identify obstacles that might hinder the development of a WC&DM Strategy for the Forest sector
- Develop objectives for the Strategy
- Identify elements of the strategy.

The agenda of the workshop is attached as **Appendix 3** The following overall objective was circulated to the stakeholders as part of the invitation to the workshop, to guide the development of the forest sectoral strategy:

'By April 2000, DWAF will have an accepted water conservation & demand management / water conservation strategy that will promote efficient water use to help ensure equity of access, beneficial use, and maintenance of ecosystem functioning.'

The workshop was facilitated by Dr Alex Weaver (CSIR) and Raewyn Peart (CSIR). At the early stages of the workshop, participants were asked to state their expectations of what the workshop would achieve. A list of stakeholder expectations, as expressed at the workshop, is shown in **Appendix 4**.

The focus of the workshop was on identifying, and grouping, obstacles to reaching the goal of WC&DM in the Forest sector. The obstacles identified by the workshop participants are shown in **Appendix 5**.

The next phase of the process was to identify intermediate objectives, which if achieved, would overcome the obstacles identified. Due to time constraints, the workshop participants did not succeed in identifying all the necessary intermediate objectives for the Strategy. However, the results of the workshop provided a broad framework from within which the project team could develop the elements of a WC&DM Strategy for the Forest sector.

4. Development of Draft Strategy

Following the stakeholder workshop, the project's core team developed a number of intermediate objectives to resolve the obstacles identified during the workshop. These intermediate objectives form the basis of the Draft Strategy as described in Section 7.

5. Circulation of Draft Strategy for comment and finalisation

An initial Draft Strategy was circulated to the following directorates and sub directorates for review and comment:

- Directorate: Water Conservation
- Chief Directorate: Forestry
- Sub-Directorate: Stream Flow Reduction Allocation
- Strategic Environmental Assessment Team
- Directorate: Planning - Strategic Planning.

Written comments were received from DWAF, and where appropriate, have been incorporated into this revised Draft Strategy.

Once approved by DWAF, the Draft Strategy will be circulated to stakeholders for written comment, prior to finalisation.

APPENDIX 2: LIST OF PEOPLE WHO WERE REPRESENTED AT THE WORKSHOP

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