

4.2. The Water Resource

The Mhlathuze catchment has, for South Africa, a high annual *rainfall* ranging from 850 mm in the west to over 1,200 mm in the east of the catchment. The average *evaporation* in the catchment (1,450 mm in the west to 1,300 mm in the east) is, in turn, lower than for most of the country, so that while the catchment may still display a net moisture deficit, it is still relatively moist in the South African context. *Runoff* figures are difficult to estimate accurately, due to the limited gauging record within catchment. The natural or virgin runoff for the Mhlathuze is estimated to be 583 million m³/annum. This would be the runoff that could be expected from completely natural or virgin conditions were there no users or changes to the catchment from its original natural condition (extraction, farm dams, forestry, alien invasives, etc).

4.3. Land Use

The dominant land uses in the catchment are:

- afforestation ($\pm 554 \text{ km}^2$);
- sugar cane ($\pm 387 \text{ km}^2$ of which 143 km^2 is dry-land and 144 km^2 irrigated);
- irrigated citrus / other crops (16 km^2);
- alien invasives (not a ‘use’ but certainly a ‘user’ with a significant but poorly quantified impact on the catchment);
- grassland (used for livestock);
- industrial and urban land (Richards Bay and Empangeni)

Alien invasives

Data from a study undertaken by the CSIR (Versfeld *et al* 1998) suggests that alien invasions in the Mhlathuze are so extensive that they could account for a water consumption of 92 million m³/annum, which is double the use by the entire forestry plantation sector. The CSIR study was undertaken at a national scale, with the key approach being the mapping of expert knowledge, rather than directly from the ground and/or from aerial photographs. The KZN Department of Agriculture played an important role in the Mhlathuze mapping. It would appear that this report severely overestimates the situation in the Mhlathuze and for this reason the impacts of invasives have not been brought into the water balance calculations. This impact is likely to be significant however, and must be accounted for. Even more importantly any expansion of the area invaded must be prevented in order to preserve the increasingly precious water resource.

Farm dams

Farm dams have a major impact on the water resources of many South African catchments, but are not a major consideration in the Mhlathuze. This could change with time, particularly in the upper reaches of the catchment, where there are little other development options.

4.4. Water Use

The water users in the catchment has been divided into five main categories as set out below:

Table 4.1: Water Use in Mhlathuze catchment (Source: DWAF, 2000c)

Water Use	Demand / Requirement million m ³ /annum
Irrigation	176.5
Urban & light industrial	32.4
Heavy industry	74.4
Environment	23.2
Rural & stock watering	3.1
TOTAL	286.4

These demands and the implications of this water use are discussed in detail in Chapter 9 *Issues in the Mhlathuze*. Some sectors are also discussed here.

4.4.1 Agriculture and forestry

The largest water user in the catchment is **irrigation**, with an allocation of 176 million m³/annum (DWAF, 2000c). The crops irrigated comprise almost exclusively sugar (143 km²) and citrus (16km²). Irrigation Boards control irrigation activities, and each Board has a fixed allocation (see Figure 4.3).

Afforestation is divided into two distinct geographical areas:

- Above the Goedertrouw dam (± 400 km²) – predominantly wattle and pine, with a few stands of Eucalypt
- Below the dam (± 154 km²) - predominantly Eucalypts, with a few stands of pine.

Runoff reduction attributed to afforestation approximates 47 million m³ (which means that **forestry** reduces effective rainfall by approximately 100mm). The impact on the Systems Yield is however not nearly as significant, and is calculated (using DWAF's Water Balance Model) to be in the vicinity of 13 million m³/annum. This low impact is attributed to the placement of the dam, which stores excess runoff. A better understanding is still needed of how dams influence the “value” of water used by trees and other up-stream crops. The impact of afforestation on low flows also needs to be differentiated.

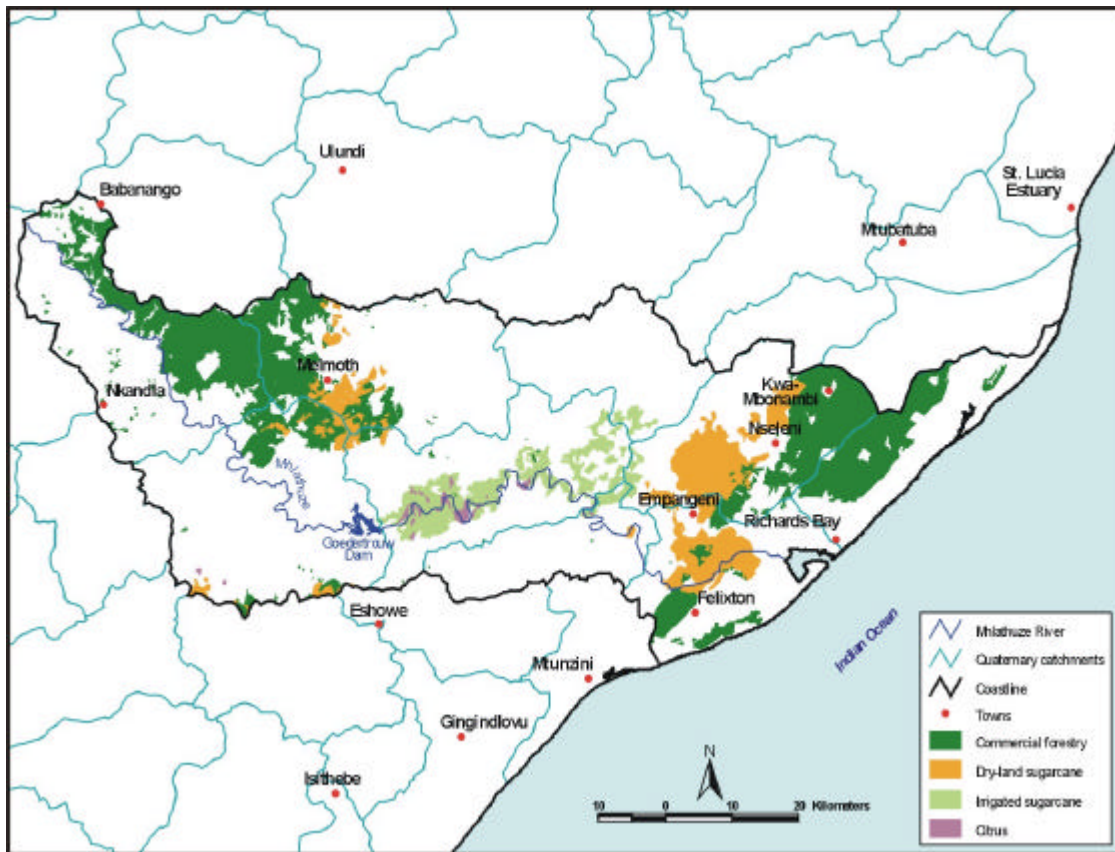


Figure 4.2: Commercial agriculture in Mhlathuze (Source: CSIR, 1999)



Figure 4.3: Irrigation Boards in the Mhlathuze catchment – allocated water in brackets, million m^3 /annum (Source: DWAf, 2000c)

Dry-land sugarcane uses considerably less water than forestry. Estimates of impact are very dependent on location and range from 20 mm in the coastal region to 80 mm in the uplands. Reckoning that area under dry-land cane is about 50% that of forestry and averaging the water use impact to 50 mm, or half that of forestry, we find dry-land cane using in total perhaps 25% of the water required by afforestation. That would mean an impact of 12 million m³/annum on natural runoff and perhaps 3-4 million m³/annum on Systems Yield. These are very rough ‘back of the envelope’ estimates but do offer a useful approximation.

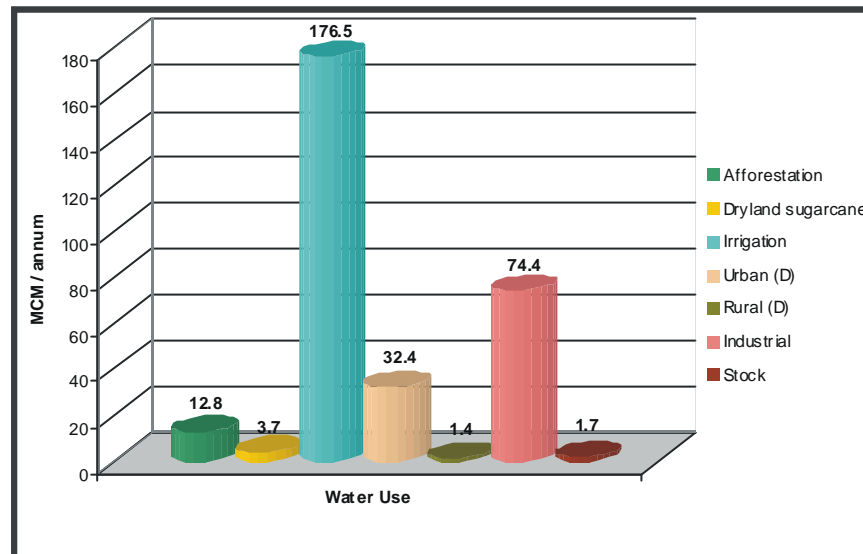


Figure 4.4: Impact of different land uses on systems yield (Source: DWAF, 2000)

Irrigated agriculture (and especially sugar) is clearly the major water user – and indeed the user for which water has been stored and other users (in this case forestry) restricted.

4.4.2 Rural domestic water use

The water used by rural dwellers for domestic purposes is estimated at present to be 1.4 million m³/annum. DWAF is committed to improving access to water in rural areas. Projections are that by 2020 people will be using 60l of water per day (not the 10l average of today and considerably more than the basic minimum of 25l). This would mean a consumption of 8.16 million m³/annum, which are still less than 3% of the catchment’s Systems Yield.

Currently rural domestic and stock water use is about 3 million m³/annum, or just over one percent of Systems Yield. This clear inequality in distribution is discussed at some length in Chapter 9. It can be emphasised here that this water serves more than half of the people on half of the land area of the catchment, and that it is this land which generates much of the water for use by irrigation and industry downstream.

4.4.3 Water use by industry

Industries are located solely in the Richards Bay / Empangeni area. Water is supplied by the Mhlathuze system and by the lakes on the coastal plain. The largest water consumer is Richards Bay Minerals (RBM). Their water sources include the Mfolozi River (Sokhulu Reservoir) and Lake Hlabane. Much of the water used by RBM is used *in situ* for the mining process, and according to sources at RBM 80% of water used flows back into Lake Hlabane as return flow, filtered through the dune system. RBM also recycles 25% of the 33 million m³ it uses per annum (Dallimore, 2000). Mondi Kraft is the next big user (28.5 million m³) and this water is pumped out to sea as polluted water. It can be noted that this is more than twice the volume of water by which all forestry in the Mhlathuze is calculated to impact on systems yield.

4.4.4 The needs of the environment

Environmental needs for the lakes have been determined at a total of 23.2 million m³. The estuary receives environmental releases of approximately 12 million m³/annum. The river itself needs differing volumes along its length. There is no concern (as yet) for the river above the Goedertrouw dam, as there is little demand on this resource at this stage. There are already quite significant flows in the river below the dam, thanks to releases for downstream users. In terms of the Act a **Preliminary Determination** of the **water quantity component** of the **ecological Reserve** has been undertaken for the Mhlathuze River below the Goedertrouw dam. The water quality and groundwater components were not included, and these determinations must still be commissioned. A medium management class will be achieved given the additional release of 16 million m³ per annum.

A detailed discussion on the Reserve and its determination is to be found in Appendix H.

4.5. Supply and distribution system

The supply system consists of:

- the Mhlathuze water supply system (Goedertrouw Dam, Mhlathuze weir, Thukela-Mhlathuze transfer scheme);
- the natural lakes; and
- ground water

4.5.1 Contribution to Systems Yield

The Goedertrouw Dam has a capacity of approximately 300 million m³, and the Thukela-Mhlathuze transfer scheme can add 34 million m³/annum water to the system. The natural lakes have an available firm yield of 49.6 million m³. Groundwater could, by some estimates, deliver 147 million m³/annum – but is not part of the current water balance, and

seems unlikely to make any significant difference, as heavy utilisation will serve to reduce supplies elsewhere. It appears that ‘available water’ (i.e. water available for further distribution) is contributed as follows:

Table 4.2: Contribution of water sources to systems yield

Source	Contribution (million m ³)	Comment
Goedertrouw Dam	186.4	Capacity 300 million m ³
Thukela transfer	34.0	
Lakes	49.6	
Groundwater	0.0	‘Potential’ 147 million m ³ (?)
TOTAL	270.0	

A water balance, volumes of water allocated, and volumes used are presented in the table below (also see Appendix B). ‘Available’ water is given as 270 million m³/annum. Current requirements exceed this at 286.4 million m³, and actual allocations of water (some of which have not yet been taken up) exceed this by a very considerable 25%, at 354.3 million m³. It is recognised that some users will have to do with less. The conflicts, which this can bring, and mechanisms for achieving a best possible allocation and distribution of water, are integral to this SEA.

Table 4.3: Water Balance of Mhlathuze catchment (Source: DWAF, 2000c)

Water availability	Available	Requirement/allocation	Balance
System yield	270		
Current requirements			
Irrigation		176.5	
Domestic			
Urban & light industrial		32.4	
Rural & stock watering		3.1	
Industrial		74.4	
Total		286.4	
Balance 1			-16.4
Allocations			
Domestic		43.7	
Industrial		89.6	
Irrigation		187.0	
Mhlathuze (unspecified use)		34.0	
Total		354.3	
Balance 2			-84.3

4.6 Water quality

This Strategic Environmental Assessment **for water use** has been unequivocally biased towards issues of quantity. “How much water is needed? How much do you use?” In the Mhlathuze even the Reserve determination has been a ‘preliminary determination of the

water **quantity** component'. Yet the Reserve also has a **quality** component, which must still be addressed. It is perhaps a product of history that quality should follow quantity.

This SEA may have been successful in seeing the big **quantity** issues quite clearly, and at addressing these quite provocatively - but who knows what **quality** issues have stayed hidden because the investigating team did not have the eyes to see them? There are many quality-related issues waiting in the wings. We heard whispers of salinity problems in the Mfuli, which might have major impacts on irrigation practice. We have not determined what agriculture 'costs' the Mhlathuze River in terms of quality through return flows. Community members dependent on direct abstraction complained that water was often unfit for use - blaming both identifiable point sources and general degradation. We know that the Goedertrouw Dam has lost 20 million m³ of capacity over the last 20 years due to siltation – yet the upstream catchment is considered to be in good condition. How much of this capacity loss is due to the importation of poor quality water from the Thukela, and does this not add a hidden cost to that water? What other impacts does the transfer of water from one system to another not have?

We know that Mhlathuze Water operates two large wastewater outfalls discharging into the ocean. Mondi Kraft uses 80 000 m³ of water per day, or 29.2 million m³ each year. Seventy thousand cubic metres are discharged each day as effluent. The cost of recycling this water is currently considered too high (Mondi pays R1.28/m³ at present) and no other use has been found for it. (Sappi at Ngodwana irrigate pastures with wastewater but this is not an option open to Mondi Kraft). So the effluent goes, for better or worse, to the ocean. New technologies are available that use far less water – but the impacts of this effluent would have to be recognised as a priority issue before such technologies are implemented.

These are issues, which would typically, be highlighted through DWAF's Catchment Assessment Studies, now being implemented by the Directorate Water Quality. Just as the SEA has been identified as having valuable inputs into the Directorate Water Resources Planning's ongoing Basin Studies, so too should it be adding to the Catchment Assessment Studies, thus providing a further link across this Department.

4.7 Waste discharge and re-use

Domestic and industrial effluent is the main waste discharge sources in the catchment. At the moment both categories are discharged into the sea through sea outfall pipelines. Mhlathuze Water has shown interest in treating and re-using the domestic effluent for mining purposes. The re-use of industrial effluent has been discussed, but due to the high toxin levels, the cost of treatment would be too high at the moment.

Irrigation return flows are generally in the order of 10% applied, returning to the river through groundwater seepage.

4.8 Institutional Arrangements

Four institutions are responsible for managing the water resource of the Mhlathuze catchment. They are:

- Mhlathuze Water (a Water Board with their main function being the provision of bulk water supply services);
- Richards Bay Town Council (responsible for water reticulation within the Richards Bay area);
- Regional Services Council (responsible for water distribution and sanitation in the smaller towns and rural communities);
- Irrigation Boards (which control irrigated water use within their area of jurisdiction)

4.9 Future Scenarios

The future can be viewed in the light of:

- water requirements;
- water supply; and
- catchment management strategies

The Mhlathuze catchment is considered to be stressed, because all available water (and more) has been allocated to users. In practice not all of this water is used each year, and a great deal must be held in reserve in order to meet the high levels of assurance of supply required by the heavy industrial users.

Water Conservation and Demand Management strategies are essential in order to start straightening out inefficiencies and inequities in use.

More realistic water pricing will also encourage efficiencies and will provide mechanisms and incentives for the trading of water as a commodity. Some of these options are explored at length in the section on Hydro-Economics (see Chapter 6 and Appendix G).

If the rural (tribal) areas make strong demands on a rightful share of the water then perhaps an additional 50 million m³ (for example) would have to be found. This would indeed put the catchment under stress.

The largest obvious saving in water can be made by tackling the largest user, i.e. irrigation, and in the case of the Mhlathuze, irrigated sugar.

The growth of Richards Bay as an industrial and economic centre seems to be a foregone conclusion – it is growing all the time and is likely to double in size with a concomitant increase in water demand, although there are likely to be increased efficiencies in some industries, notably pulp and paper.

Nevertheless we do have a scenario of increasing calls on the water resource – for rural development, for urban and industrial use, and by commercial agriculture for its survival as a sustainable primary producer, and one which also employs far more people per m³ of water consumed.

Irrigated agriculture is going to find itself under increasing pressure. This may mean a swing towards dry-land cropping (where this is possible). But irrigation is likely to continue as a mainstay of the catchment economy. Agriculture's job creation capability, and its value and sustainability as a primary producer, count in its favour. Much is made of further augmentation – with the most probable source being the Thukela River. This would either be through the construction of a permanent pipeline (the present augmentation scheme being only temporary) either on the existing axis, or perhaps piped into the bottom of the catchment. Augmentation has a high cost (50c/m³) considered to be beyond the reach of agriculture, and is also based on the assumption that the Thukela has, and always will have, the water to spare. Much will depend on how the industrial development of Richards Bay is valued, and how this squares off against the need for agricultural security and sustainability.

A Catchment Management Agency (CMA) will be in place with the next couple of years to serve the Usutu-Mhlathuze Water Management Area (WMA). The Mhlathuze is likely to have and retain its own Catchment Management Committee. This Agency and its Committee will have strong powers of decision-making with regards to how water in the catchment is allocated and used. It is vital that such decisions should be very well informed.

Further discussion on scenarios is offered by Stephen Mallory (Appendix B), whilst a number of contradictory opinions may be found in the 'Issues' discussion in Chapter 9.