CHAPTER TWO

CHARACTERISTICS OF THE CATCHMENT

2.1 Introduction

This chapter describes the physical characteristics, both natural and man-made of the Mhlathuze catchment. The natural environment is discussed in terms of:
- location;
- topography;
- climate & hydrology;
- rivers & other water features;
- geomorphology; and
- natural vegetation

The following man-made features are highlighted:
- urban development;
- infrastructure; and
- industrial development

2.2 Location

The Mhlathuze catchment is situated in the province of KwaZulu-Natal and lies approximately 160km north of Durban and ± 35km south of the St. Lucia Estuary. The surface area of the catchment is about 4,209km$^2$ and it has nine quaternary sub-catchments, each between 250 – 650km$^2$. The catchment falls within the Usutu to Mhlathuze Water Management Area (WMA), which is one of nineteen new management regions of the Department of Water Affairs and Forestry, declared in October 1999 (Government Notice No. 1160, 1 October 1999). The main river systems in this WMA are:
- Usutu;
- Pongola;
- Sibaya;
- Mkuze;
- Umfolozi; and
- Mhlathuze
Figure 2.1: Location of Mhlathuze within KZN (Source: Government Notice No. 1160, 1 October 1999)

Figure 2.2: Quaternary catchments of Mhlathuze catchments (Source: DWAF, 1992)
The above figures show the geographical location of the study area as well as the demarcation of the quaternary catchments with the major rivers in the Mhlathuze system.

2.3 Topography

The topography in the upper part of the catchment is very rugged, and the land descends rapidly from the upper reaches, from 1,519m to 200m above sea-level over a distance of only 60km. For the next 65km, a more gradual drop in altitude takes place to the ocean.

Figure 2.3: Elevation of Mhlathuze catchment (Source: Univ. of Zululand, 1999)
Figures 2.3 illustrate this point well. One can also clearly see the steep slope angles in the middle and upper sections of the catchment in Figure 2.4. The difficulty in developing and maintaining infrastructure and other activities are clear (compare map of infrastructure, Figure 2.14) and the subsequent lack in servicing and other activity development.

### 2.4 Climate & Hydrology

The warm Agulhas Current plays a significant role in regulating the climate and weather conditions along the eastern seaboard of the subcontinent as a whole and thus has a strong influence on this coastal catchment (SA Water Bulletin, 1999). As a result, the mean annual rainfall of the catchment ranges from about 800mm / annum in the upper and middle parts of the catchment, to approximately a 1,400mm / annum near the coast. The mean annual evaporation figures ranges between 1,300 mm near the coast to approximately 1,450 mm further west (DWAF, 1992). Due to the fact that the evaporation is higher than the annual rainfall, there will always be a net loss from water surfaces in the catchment (also see Appendix B).
Figure 2.5: Mean Annual Rainfall (Source: DWAF, 1992)

Figure 2.6: Mean Annual Evaporation (Source: DWAF, 1992)
The mean annual runoff in the catchment is difficult to estimate accurately from the river gauging stations and record. The available information shows that the highest runoff contribution is in the upper reaches and coastal parts of the catchment – see map below (DWAF, 1992). While rainfall is generally over 800mm (considered the minimum for productive forestry) there are some rain shadow areas in the lower central catchment where annual rainfall may be 750mm or even less. There is significant irrigation in these drier areas, which are therefore also more dependent on this supplementary water.

Figure 2.7: Mean Annual Runoff (Source: DWAF, 1992)
Figure 2.8: Relationship between quaternary catchments and runoff

The following table shows the relationship between the quaternary catchments (from west to east) and the natural runoff in each catchment. The table highlights the fact that the runoff figures in the middle section are much lower than in the upper and lower reaches of the catchment.

2.5 River System & Water Supply

The Mhlathuze River is about 170km in length from its source in the mountainous area close to the town of Babanango, to the river mouth in the Mhlathuze Lagoon at Richards Bay. It sustains various agricultural activities as well as providing the principle source of water to people living in the area (see Figure 2.9). The river reach has been extensively modified, especially from the Goedertrouw Dam eastwards. The dam was completed in 1980 to supply water for irrigation in the catchment as well as assist in bulk water supply for the urban and industrial development near the coast. Its present capacity is some 300 million m$^3$, whilst 20 years ago the capacity was 321 million m$^3$. The reduction in capacity has been due to siltation. There is a prospect that the wall of the dam may be raised at some point in the future. The section of the river below the Mhlathuze Weir (Figure 2.9) is the most modified of the whole system. It was originally a papyrus swamp, which was drained and cleared for sugarcane development. An artificial channel was cut to accommodate the development of the harbour, which opened in 1976 (DWAF, 2000b).

Five lakes near the coast (depicted in Figure 2.9) also play a major role in the water supply system for both urban and industrial users. The sustainable use of these lakes is of the utmost importance in managing the potential of Richards Bay and environs (see Appendix B).
During the early 1990’s, DWAF investigated several options for augmenting the water supply in the Mhlathuze. Of these, the construction of a transfer scheme from Middledrift in the Thukela through a tunnel to the Mvuzane River was deemed the most feasible (DWAF, 1994). Due to lack of funds, the government could not build the scheme. During the drought of the mid-nineties, an emergency scheme had to be constructed, with a pipeline running over the mountain. This scheme was implemented in 1997. The industries in the Richards Bay area co-operated to invest a R100 million in this scheme. In 1998, Mhlathuze Water agreed in principle to build a permanent water transfer scheme from the Thukela to the Goedertrouw Dam (Mercury Business Report, 1998). This scheme will have to be paid in full by its users and is still in its planning phase.

2.6 Geomorphology

Sand based soils predominate (see Figure 2.10). This is the result of the weathering of quartzite, tillite and granite (DWAF, 2000b). Three main soil groupings are found in the catchment (CCWR, 1989):

- sandy clay (upper catchment);
- sandy loam (middle section); and
• sandy coastal area

The highly faulted nature of the middle section of the catchment has exerted great influence over the alignment of the river channel which results in its convoluted twists and turns (DWAF, 2000b).

### 2.7 Natural Vegetation

The ‘value’ of natural vegetation is often determined by the extent remaining. Some important vegetation types, notably the Ngongoni veld (upper, more undeveloped areas) and coastal forest & thorn veld (coastal, developed areas) are found in the catchment. Both of these veld types are more than 70% transformed from their natural state when considered in a provincial context.
Figure 2.11: Acocks veld types (Source: Acocks, 1989)

Figure 2.12: Vegetation communities (Source: Low & Rebelo, 1996)
Important afromontane forests are found along the southern fringes of the catchment. These are formally protected by the KwaZulu-Natal Nature Conservation Services (KZNNCS, 2000).

A more detailed description of sites of conservation significance and the conservation value of vegetation and animal species, can be found in the section on the Biobase (Appendix C), produced by the KwaZulu-Natal Nature Conservation Services (KZNNCS, 2000).

2.8 Urban & Rural development

In terms of urban development, the catchment has two extremes. The coastal area is highly developed, with modern housing, shopping centres and extensive industrial activity. It also houses Africa’s largest port, a modern airport and the largest single coal handling facility in the world. In contrast the upper, and to a lesser degree the central parts of the catchment are very rural and undeveloped, with people largely engaged in a subsistence lifestyle. This inevitably has significant economic and social consequences. These are discussed in more detail in other sections of this report.

Richards Bay is the main urban centre in the catchment. The town is named after Sir Frederick William Richards who relieved Eshowe after the British defeat at Isandhlawana (1878). He was the first to survey the area in 1879 and noted the Mhlathuze Lagoon down as Richards Bay. However Richards Bay was visited by Portuguese mariners long before the British occupation in Natal and was known as Rio-dos-Peixes - the river of many fish (http://www.places.co.za/html/richards_bay.html).

The Richards Bay / Empangeni Spatial Development Initiative (SDI) is one of eight SDI’s in the country aimed at encouraging private sector investment in regions that demonstrate significant economic potential. To date, investment in Richards Bay has been restricted mainly to heavy industrial projects, with little downstream manufacturing activity. The SDI aims to alter this pattern of investment. The SDI will stimulate value-adding industries that build on the rich stock of raw materials available in the area, thereby introducing a base of secondary manufacturing into the economy (http://www.richardsbay.org.za).
In contrast to the development drive in the lower parts of the catchment, initiatives for expansion in the rural areas are more widely dispersed and more modest in scale. In the tribal areas there has been little substantive development. Subsistence farming dominates as an income generator and survival mechanism. In the middle part of the catchment there are some major agricultural developments, including forestry, dry-land and irrigated sugarcane as well as citrus. The construction of the Goedertrouw Dam has assisted in the expansion of irrigation areas and thus boosted the productivity of the commercial agricultural sector.

2.9 Infrastructure

The infrastructure of the coastal area is well developed, with the north-south N2 highway passing between Empangeni and Richards Bay. Main roads also link these towns with Eshowe, Nkandla, Ulundi and the hinterland of KwaZulu-Natal, while fairly good arterial roads service the other major centres in the catchment, (i.e. Melmoth and Nkandla). The rest of the road network consists of dirt roads and tracks, some of which are not well maintained. There is a marked absence of roads in the part of the catchment where slope gradients are above 20% (Figure 2.14).

The industrial heart of the catchment is also linked to the national rail network, with a coastal line from Durban to Swaziland and a major line linking Richards Bay with the coalfields of Mpumalanga. A line to the irrigation scheme at Heatonville also serves to transport sugarcane to the Felixton mill (Surveyor General, 1980 - 1992).
Power lines run from the coast to Melmoth and further north-west towards Ulundi. Eshowe and Mtunzini are on the grid, but much of the rest of the catchment does not yet have access to power lines (Surveyor General, 1980 – 1992).

2.10 Conclusion

The purpose of this chapter has been to provide a general introduction to the catchment and to assist the reader with an understanding of some of the intricacies involved in the dynamics of social and economic development discussed in the rest of the report.