

7. Natural Resources and Environmental Development

This chapter provides the reader with a background to and an analysis of the environmental conditions prevailing within the CUP planning area. The following issues are discussed: - ecological framework, the concept of strategic environmental assessment, the use of natural resources, environmental conservation and protection as well as physical risk and safety aspects on development. A summary statement of the main findings is presented at the end of the Chapter.

Background studies are carried out and presented in the reports on *Technical Risk and Safety Management*, *Environment and Natural Resources Conservation* and *Solid Waste Management* as well as the *King William's Town IDP/LDO Situation Analysis* to which reference is made for further details, as well as to the thematic maps on *Natural&Cultural Assets* and *Environment*.

7.1 Ecological Framework

In the beginning of the evolution of life on Earth, the environment was immensely poisonous and unfriendly to life, as we know it today. Bacteria and successively emerging higher stages of life managed over time to disarm the aggressive environment by gradually engendering the accumulation in the earth's crust of heavy metals, radioactive materials, carbon dioxide (attached to oil, coal and gas) etc.

In the same process, the atmosphere changed in composition. Concentration of oxygen was developed through the disposal of carbon into the earth's crust. The effective radiation filter that is the ozone layer emerged. The only energy source was the radiation of the sun.

The disposal of certain substances in the earth's crust created the vital and necessary conditions for successively development of higher forms of life on the earth's surface and, only at a very late stage did living conditions also became acceptable for human life. The entire process up to the arrival of human life took more than three billion years. The life supporting systems thus developed during that period in the biosphere are maintained by natural ecological cycles, having the sun as the everlasting energy source.

The natural ecological cycle is a delicate balanced process, which has now become seriously disturbed by human activities. Signs of imbalance are already at hand, such as the greenhouse effect, destruction of the ozone layer, pollution of air and water at a global scale.

The burning of oil and coal releases carbon dioxide disposed in the earth crust, causing increased carbon dioxide rate, which in turn will lead to, increased global

warming. The higher global temperature might have adverse effects which presently are difficult to assess, such as a rise in sea levels, which may cause increased frequency of hurricanes and tropical storms, with devastating results on economic and social activities in areas located near shorelines. The release of heavy metals and uranium from the earth's crust is another activity, which threatens the human life conditions.

In conclusion, one could say that human societies and their associated activities are presently effectively reversing the natural evolutionary processes and thus slowly returning the Earth to the poisonous past it once started from. In order to counteract this trend the following four pre-requisites for sustainable development have to be applied.

***Pre-requisite 1:** Substances from the earth's crust must not systematically be allowed to increase in the biosphere.*

Human society produces to an increasing extent, new substances not found in nature, or substances that previously did not occur in such concentrations as they do today. Chloride organic compounds like PBC and DDT are threatening animals' and humans' ability to reproduce. Another example is the ozone layer destruction by the CFC compounds, such as freon, etc.

***Pre-requisite 2:** Substances from society production must not be allowed to increase in the biosphere.*

Substances from the earth's crust and from production processes in societies must be managed by effective technical cycles, applying re-use and re-cycling measures. The inevitable waste must be kept to a minimum and not be more harmful than what the natural eco-cycle can cope with.

The bio-diversity in the world today is a result of billions of years of evolution. In every living bacterium, plant, and animal in their DNA-structure and their role within the eco-systems there are genetically encoded memories of this long evolution process. Bio-diversity is a pre-requisite for preserving the natural environment's capability to resist and to adapt to changes in the living conditions.

***Pre-requisite 3:** The physical foundation for natural ecological cycles and bio-diversity must not systematically be impoverished*

The question of environment is also a question of equity. People living in industrialised countries constitute 20 % of the world population, but consume 80 % of the natural resources. Persons with a high or middle income consume 10-50 times more than persons with a low income do. Increased population and increased living standards in the world will double the use of natural resources by about the year 2015 (about 15 years from now) if no dramatic changes are initiated in the consumption patterns.

***Pre-requisite 4:** The use of resources must be based on effectiveness and equity.*

Illustration 12 : The Eco-Cycle Process

7.2 Environmental Planning Tools and Methods

7.2.1 Environmental Programme

The over-all goal for the CUP project is sustainable development - sustainability from an ecological, social and economic point of view. In the absence of a sufficient and cohesive database on the environmental conditions in the planning area a base-line study, Environmental Situation Analysis, has been prepared. This is the first part of an Environmental Programme consisting of four parts, a Situation Analysis, Environmental Objectives, an Action Plan and Environmental Indicators.

The environmental situation analysis has investigated the present situation within the relevant environmental areas, and also states the major environmental problems and concerns that should be dealt with in the future.

The following environmental issues have been included and presented in detail in the special report on Environment:

- solid waste management
- water supply
- energy supply
- sewerage
- contaminated soil
- health
- natural resources, biological diversity
- open space system, recreation
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7.2.2 The Concept of Strategic Environmental Assessment

Strategic Environmental Assessment (SEA) is a process of evaluating the potential environmental, social and economic impact of policies, programmes and plans applied at a strategic level. SEA provides a basis for decision-making, and it guarantees transparency in the decision-making process, as public participation is an important part of it. It is also a mechanism for taking cumulative effects into consideration and it becomes possible to choose between alternatives in a systematic way. SEA can save time and money by simplifying or eliminating the need for Environmental Impact Assessments (EIA) at project level, as some assessments can be dealt with more effectively at the strategic level. SEA is a proactive environmental assessment tool, measuring sustainable development, which is more important than defining the term per se, and is an essential prerequisite for promoting a sustainable society.

The main principles of a SEA can be summarized as follows:

- A SEA should contain a “zero-alternative” (the situation if no actions are taken)
- Takes different developmental alternatives into consideration.
- Creates opportunity for an open dialogue with stakeholders.

Ideally strategic environmental assessments should be introduced in planning processes like the CUP process. However, because of the changed time frame and scope of the CUP this has only to a minor extent been accomplished, the only activity being the workshop on SEA in April 2000. As the development of planning indicators is part of the work on SEA, they have not either been dealt with. However, indicators for the monitoring of the Environmental Programme have been developed.

7.3 Natural Resources

7.3.1 Water Supply and Management

In the Study Area there are four main water supply schemes. Three of these form part of the Amatola Water Resources System. They are listed below:

- **Upper Buffalo Water Supply Scheme**

The Upper Buffalo Water Supply Scheme is in a mature stage of its development, and to supplies water to urban, rural, industrial and irrigation consumers in the upper portion of the Buffalo River catchment area. The scheme relies primarily on Maden and Rooikrantz Dams. The catchment area is 51 km². Maden Dam is owned by King William's Town TLC, and Rooikrantz Dam by DWAF.

A portion of the yield from Rooikrantz Dam is sometimes released into the downstream river channel for irrigation use between the dam and Dunbar Weir. These releases are not generally made during droughts.

Water is also conveyed from the two dams via two pipelines running down the Buffalo River Valley to King William's Town and Zwelitsha. The line from Rooikrantz Dam has an off-take approximately 6.5 km downstream of the dam,

supplying the Rooikrantz Water Treatment Works. This works currently supplies Frankfort and three rural villages. The works is intended to supply a further 14 rural villages to the north-east and south of Rooikrantz Dam as part of the Rooikrantz Regional Water Supply Scheme. A second off-take supplies the King William's Town Water Treatment Works. Beyond King William's Town, the pipeline forks to supply Da Gama Textiles factory in Zwelitsha and links up with the Zwelitsha reticulation. Raw water is however not supplied to Zwelitsha.

Although King William's Town is currently supplied from the Maden and Rooikrantz Dam, the facility exists to augment King William's Town's supply with water from Laing Dam via King William's Town's Beacon Hill Reservoir. This facility is only used occasionally.

- **Middle Buffalo Water Supply Scheme**

The Middle Buffalo Water Supply Scheme supplies water to urban, rural, industrial and irrigation consumers in the middle portion of the Buffalo River catchment. It relies primarily on the yield of Laing Dam. The catchment area is 913 km².

At present, water is treated at the Laing Dam Water Treatment Works and pumped to Qongqota Reservoir. Water is conveyed from Qongqota Reservoir to Zwelitsha, King William's Town and Bisho by a gravity main and pumping mains. A boosted off-take from the gravity main supplies Phakamisa, Ndevana, Ilitha and Berlin. In addition there are four sub-schemes supplying rural villages in the region. These include Mount Coke and several villages to the south of Laing Dam, two villages to the west of Zwelitsha, five to the south of Berlin and two to the west of Bisho. The facility also exists to convey water from the Qongqota / Berlin line to Potsdam and Fort Jackson at the Western edge of Mdantsane. The system is currently being extended to include five villages to the north of Bisho (Middle Buffalo Water Supply Scheme). A number of additional extensions are also planned.

Some of the yield of Laing Dam was originally allocated to East London and riparian downstream users. These allocations were largely unused in 1995.

- **Sandile Regional Water Supply Scheme**

The status of the Sandile Regional Water Scheme as defined by the "Ciskei National Water Development Plan, Vol. 3 of 4, 1991" is as follows: The Sandile Regional Scheme supplies potable water to the urban centres of Dimbaza and Middledrift. A 44l/s branch off-take from the scheme at Dimbaza supplies water to Bisho airport and, via a widespread distribution network, to 38 rural villages in a 320 km² area to the south and east of Dimbaza. Various service reservoirs and, where necessary, local booster pump-stations are strategically located along this network to the villages. The current condition of this system is not known and there is a possibility that it is not completely functional due to its age.

- **Amatola Water Supply Scheme**

The purpose of the Amatola Water Supply Scheme is to augment the water supply to consumers currently served by the Upper, Middle and Lower Buffalo Scheme, as demands exceed the capacities of these Schemes.

The main water source for the scheme is the Wriggleswade Dam on the Kubusi River. The Wriggleswade Tunnel and a series of canals and siphons convey water from the dam to Kei Road where the water discharges into the Yellowwoods River, a tributary of the Buffalo River with the confluence at the headwaters of the Laing Dam. The canals and siphons between Wriggleswade Tunnel and Kei Road pass through the upper catchments of the Gqunube and Nahoon Rivers and the facility exists to discharge water from the canal into the Nahoon River. Although no specific facility exists to discharge water from the canal into the Gqunube River, this can be achieved by making special arrangements.

KWT is lacking water capacity in the short term. Amatola Water Board is presently working on a strategic Water Systems Analysis, the outcome of which should be fed into the CUP.

Institutional Arrangements

The responsible water supply bodies, as well as their roles in the supply of bulk water are briefly described below.

- **Department of Water Affairs and Forestry**

The Department of Water Affairs and Forestry (DWAF) has no responsibility for the distribution or quality maintenance of the bulk water supply to the King William's Town TLC. It does however have a regulatory function for the allocation of bulk water resources to the various users. The quality of effluent is also monitored.

Presently, the Department of Water Affairs and Forestry is transferring its bulk water supply infrastructure to the Amatola Water Board and it is possible that the operation and maintenance of village reticulation systems will be transferred to the Amatola District Council, in due course.

- **Amatola Water Board**

The Amatola Water Board was opened in April 1998 and took over its main function in July 1998. It is primarily responsible for the supply of bulk raw and treated water for domestic and industrial use as well as bulk water for irrigation purposes on certain schemes.

The Amatola Water Board is currently operating and maintaining the Rooikrantz Dam, Laing Dam, Wriggleswade Dam and Canal, and the Sandile Dam on behalf of the Department of Water Affairs. The Rooikrantz, Laing and Sandile Water Treatment Works and all associated bulk infrastructure (reservoirs and pipelines) will be transferred from DWAF to the Amatola Water Board in the near future. This does not include reticulation infrastructure.

The Amatola Water Board will be subsidised by DWAF on a sliding scale over the next five years in order to smooth the transfer.

- **King William's Town TLC**

The King William's Town TLC is responsible for the internal water reticulation in King William's Town, Breidbach, Zwelitsha, Dimbaza, Phakamisa, Ilitha and

Bisho. The Maden Dam and King William's Town Water Treatment Works are owned and operated by the KWT TLC.

Main problems in terms of water quality

Zwelitsha: Contamination of water channel in Zwelitsha due to upgrading of water reticulation system. Water samples taken show that E-coli content was higher than recommended guideline for drinking water quality.

Buffalo River / Laing Dam : Excessive nutrient loading (inorganic nitrogen and inorganic phosphorus) from sewerage contamination, accompanied by high temperatures in summer months give rise to blue-green algae blooms. These algae blooms adversely affect water quality and have a toxic effect on both animals and humans. The sewerage contamination emanates from sewerage treatment works not operating effectively, e.g. Ilitha sewerage treatment works, Bisho sewerage treatment works.

General: Growth of hyacinth is also facilitated by the introduction of these nutrients into the water system. Hyacinth detrimental in that it promotes excessive evapo-transpiration, blocks up watercourses and thereby restricting / obstructing the flow of the water as well as providing ideal habitats for agents of human disease to flourish e.g. Malaria.

The presence of elevated levels of heavy metals such as Iron and Manganese (Mn) in the water causes failures in water treatment works. Lack of maintenance (in the past) on pipelines, reticulation systems, valves etc. results in disruption of the water supply. Poor workmanship in the laying of pipelines results in breaks, disrupting supply. Vandalising of manholes, air values, as well as theft of these items results in deterioration of water quality.

Effective solutions are being pursued for the supply of water through a multi-catchment analysis of the Amatola Water System. This will ensure that this precious resource does not become depleted and can be utilised efficiently.

The construction of the water supply projects listed as current has been slowed down due to a lack of funds being available at present. As more funds are made available, construction will speed up and projects can be completed sooner. The planned projects are unlikely to commence until a significant number of the current projects are completed.

7.3.2 Energy Supply

The bulk electricity supplier for the TRC is ESKOM. The Network of power lines is extensive with a total of 9 Substations. Four of these substations fall within the TLC boundary.

- **Municipal Supply Network**

The Electrical Department supplies the following townships within the King William's Town TLC : King William's Town, Ginsberg, Sweetwaters, Balasi,

Phakamisa, Breidbach, Qalashe, Schornville, Acorn Valley, Bisho, Zwelitsha and Ilitha. ESKOM supplies bulk electricity to various intake substations of the electrical department i.e. King William's Town, Dimbaza, Fort Murray, Good Hope Textiles, Yellow Woods and Pembroke.

The Pembroke substation receives energy supply from the Orange River hydro electrical scheme, which in turn supplies Dimbaza and Yellow Wood substations with electricity. At present most consumers in the TLC has access to electricity, but a small percentage of consumers use other sources of energy, e.g. gas, paraffin, candles and wood. Prepayment meters have been installed in about 80 % of the households in the TLC.

- **Alternative energy sources**

The Electrical Department does not have any studies concerning alternative energy supply in their TLC boundaries. The bulk electrical supplier, ESKOM, has researched various methods of alternative energy sources. The main areas of their research are renewable energy, namely solar, wind and also micro hydro electricity.

Main problems

As only Pembroke substation is supplied by renewable energy sources (hydro electricity) all other substations receive electricity produced by fossil fuel (brown coal) which is not sustainable and causes, inter alia, sulphur and nitrogen emissions at source (power plant), which in turn contribute to global warming and acid rain.

A big problem is the theft of property. This includes the theft of electrical structures, vehicles and equipment. Another problem that faces the department is the lack of sufficient staff and funds.

7.3.3 The Natural Environment and Biological Diversity

The natural environment, sometimes referred to as the green environment, is of fundamental importance to life in general and to human life in particular. It provides us with natural resources such as water; oxygen; food; metals and material for tools, vehicles and other products; energy derived from sun, wind and fossil sources etc. The green plants (cells) are the only organisms/producers on Earth building up quality in resources and energy without simultaneously depleting other resources of higher order. They, and the ecological systems they are part of, must therefore be recognised, protected and utilised as the assets they are.

Apart from the ecological importance of the natural environment it encompasses also recreational and sensuous assets for humans to experience, visit and for educational purposes.

The green environment must, to function in its ecological context, be kept together in corridors or "islands" of significant size. Some specific habitats for animals and plants are in particular valuable like wetlands and river courses. But also gardens in town, especially when clustered in larger areas, are valuable habitats for birds and insects.

When it comes to the outline of a green structure plan, it has been recognised that there is almost no knowledge about flora and fauna in the study area. Thus, one of the priorities of the Environmental Programme is an inventory of the species in the King William's Town area.

Biodiversity refers to the variability of life in all forms, at all levels and in all combinations. It is the variability of life and the variety of systems in which life exists. The greatest threat to biodiversity stems from the economic value given to it.

South Africa is one of 17 countries in the world that share two-thirds of the earth's biological resources, i.e. "Mega diversity Countries". A vast number of species which have a very limited distribution and which are found nowhere else in the world exist here. Among these are about 7 500 plant species that are threatened with extinction.

Biodiversity is valuable because:

- It is inherently interesting and attractive
- Future practical uses, and future uses of it are unpredictable
- Our current understanding of the immediate environment around us is limited. It is very difficult to predict the consequences of eliminating any component of it.

There is little research conducted on biodiversity in the King William's Town area. Some inventories of bird life and mammals have been undertaken and can be found at the Amatola Museum. The existing data is often outdated.

7.3.4 Pollution

- Air Pollution

Industry : The main potential industrial polluters are Dimbaza Foundries and Da Gama Textiles. Main pollutants include sulphur dioxide (SO₂) and smoke.

Traffic : Air pollution from traffic is not considered a problem in King William's Town. Peak traffic hours are not long enough for the accumulation of hydrocarbons, water vapour, carbon monoxide. It would not be feasible to monitor these emissions.

Use of paraffin, oil and gas : There is still a small percentage of the population in the study area that uses gas, paraffin or wood for heating and cooking, thus being exposed to harmful fumes.

- **Noise Pollution**

Industry : *In all major / minor industries within the TLC, workers are exposed to NIHL as a result of daily activities within the workplace. However, industrial activity does not produce noise pollution that adversely affects the broader community at large.*

Traffic : *There is no recorded data (complaints) of noise pollution emanating from traffic.*

7.3.5 Sanitation

The King William's Town area is currently served by five existing sewage treatment works, located at Bisho, Breidbach, King William's Town (Schornville), Zwelitsha and Dimbaza.

Certain of these treatment works are too small, or are approaching their design capacity, while others are completely non-functional, resulting in untreated or partially treated sewage being discharged into the Yellowwoods and Buffalo Rivers.

These rivers feed into the Laing Dam, the main drinking water supply for King William's Town, Bisho and Zwelitsha. Furthermore, the King William's Town area falls within a Phosphate-sensitive catchment area and the presence of Phosphate in the partially treated sewage is resulting in eutrophication of the rivers, further reducing raw water quality. This situation will only worsen as the population in the area increases.

- **Regional Sewage Treatment Works**

The King William's Town TLC has proposed the construction of a regional sewage treatment works. Four alternative sites were identified – at Breidbach, Tshatshu, Fort Murray and Zwelitsha. The first three are greenfields sites. The fourth site, Zwelitsha, will require upgrading of the existing Zwelitsha sewage treatment works. A study performed by GIBB Africa has recommended that Breidbach and Tshatshu sites should be eliminated from further consideration on the basis of socio-political and economic criteria. The Zwelitsha site is superior to the Fort Murray site from social, environmental, economic and technical points of view. The final selection of the Zwelitsha site should, however, be subject to confirmation that the upgrading will not generate significant additional odours.

7.3.6 Waste Management

The KWT solid waste disposal site is fairly well managed apart from insufficient material to cover waste on a daily basis. A new leachate dam has just been completed to catch any pollutants leaving the site.

Efforts have been made to establish a single site for the region and an adequate site has been identified at Round Hill Site near Berlin. Hence the closure of other sites at Dimbaza and Phakamisa is now possible. Round Hill Site will initially be used

for disposal of general waste. However, it is also designed to handle hazardous waste at a later stage.

- **Possible Contaminated Soil and Water**

In heavily industrialised areas like Dimbaza and King William's Town, the dumping of toxic waste in open spaces has resulted in the pollution of arable land, which has been rendered unusable.

An example of this is Bidley Farm, where some 158 ha of land was used for the disposal of tannery waste in 1950's. Primary polluting components include organics, chrome, sodium (high toxicity). Chrome content of soil renders it not suitable for housing. The road between Bidley Farm and the new development on left hand side of the river (Ginsberg) is polluted in this manner.

In the area from the Buffalo River bridge in Schornville to Ginsberg, faecal and parasitic loads have been identified in the soil. Da Gama irrigation area (Tshatshu) has a high content of sodium, iron and manganese, which affects the absorptive capacity of soil.

The Phakamisa waste disposal site has contents of chrome, primarily wet-blue trimmings, which rendered the land unsuitable for housing.

- **Main problems**

The main problems in waste management can be summarized as:

- Waste management in KWT is not sustainable in a long term perspective, as it only consists of dump sites
- Lack of facilities/programmes that encourages recycling/re-use of waste
- Lack of monitoring of closed disposal sites
- Littering
- Indiscriminate dumping of household and garden refuse on pavements and in open spaces in residential areas
- Hazardous waste is sent to High Tech in Cape Town. A new strategy to dispose of hazardous waste must be found.

Information and data on the health effects of waste disposal site in Dimbaza on surrounding residents is not available. Further studies and data is required in terms of monitoring the disposal of industrial waste within TLC / TRC area.

7.4 Risk and Safety Management

7.4.1 Introduction

Risk and safety management focuses on policies, objectives and proposals for developing attractive residential areas, effective infrastructure, suitable industry locations and solutions for transportation needs, while at the same time ensuring that safety for the public, property and the environment is maintained or improved.

Policies and implementation measures established in risk and safety related parts of the comprehensive plan aim at:

- avoiding the location of people and structures where accidental events are likely to occur, and
- mitigating existing areas at risk; thereby minimizing the future loss of life, property and environmental resources in the area, resulting from natural and induced disasters and hazards.

Possible risk scenarios from a general point of view are the following:

- severe restrictions on water and electricity supply,
- flooding and dam failures,
- release of chemical substances,
- fires and explosions,
- epidemic diseases,
- failure of critical computer-based or electronically controlled systems due to viruses or electromagnetic influence,
- major traffic accidents,
- occurrence of natural hazards, such as earthquakes, tornadoes etc.

Four main principles for risk reduction can be applied i.e. inherent safety, accident prevention, preventive mitigation and instant mitigation.

Safety measures, or risk control options, are to be planned, which will focus on the avoidance or reduction of risk to an acceptable level, which balances the cost of incorporating them in planning and development actions, with the benefit of protecting life and property. *Acceptable risk* is the level of hazard below which no specific action by local authorities is deemed necessary, other than making the risk known. Land use and public facility actions taken by the municipality are to be based on an assessment, indicating that the risk involved does not exceed any acceptable level. Risk and safety issues in the planning process may be addressed in terms of policies and objectives in the context of the various planning items, i.e. land use, environment, traffic and transport and waste management.

7.4.2 Current Situation

Technical and physical risks are present in the area, but not to a great extent. From discussions and field studies it appears that both natural and industrial risks are relatively low, while in particular the traffic risks are comparatively high in South Africa as a whole.

Below is a description of objects and activities that have been found to be potentially risky, and which should be addressed in the planning.

Natural Risks

- ***Flooding***

Flooding of certain areas has occurred with a frequency of about 0.1-0.2 events per year. It affects residential houses in the lower parts of Breidbach towards the

Yellowwoods River, and houses and structures in Schornville, close to the Buffalo River. The 50-year flooding level should be considered before planning undeveloped areas near the rivers. For the part of the Buffalo River flowing through the town area of King William's Town an analysis has been carried out in 1993 to determine the 50-year flood level.

Bridges may be affected by high water or a flash flood, in particular the very low bridge across the Buffalo River linking to the West Bank. There is an automatic warning stoplight. It is now out of order, so barriers are set up manually when there is a risk of flooding. The 50-year flood level determined here is 7 m above the bridge.

There are three major dams in the area, the Laing Dam, the Rooikrantz Dam and the Maden Dam. The Laing Dam is the largest with about 20 million m³ of water.

A dam failure is unlikely. Essentially, a few causes are conceivable for the failure of a concrete dam; either a major earthquake, or a high overflow. For earth dams such as the Rooikrantz Dam, over-streaming and pipe forming also need to be considered as threats.

Effects of a dam failure would hit the area downstream, which could have severe consequences for property and the environment. A failure of the Rooikrantz Dam may thus cause severe flooding as described above. The Department of Water Affairs & Forestry has made an assessment of the risk of a dam failure, including a mapping of expected "sunny day break" flood lines downstream the Buffalo River. The maximum probability for a dam break is calculated to 5×10^{-4} , i.e. once in 2000 years.

The dams are also water supplies for the area, and a failure would thus imply severe consequences in this respect. A dam overflow warning system has been proposed at the district level but no implementation has been attempted.

- ***Drought***

South Africa has been afflicted by spells of drought periodically, which has caused famine in parts of the country. Eleven drought / food shortage situations affecting over 6 million people have been recorded since 1964, primarily in former homeland areas, including the Ciskei.

- ***Earthquakes***

Earthquakes (up to a magnitude of approximately 4, Richter scale) have occurred occasionally in the Eastern Cape, The risk for a specific area or installation is small, but should be considered in the construction of dams and other critical development, and in contingency planning.

- ***Severe wind conditions***

Severe wind conditions include storms, hurricanes, tornadoes etc. For severe wind conditions there have been eight major events reported since 1900, with some 138 fatalities and more than 500 000 otherwise affected. This figure includes a recent tornado in Umtata, resulting in 18 fatalities in 1998.

Hogsback and parts of the KWT TRC area have also recently (1999) been struck by a tornado, resulting in fatalities.

- ***Landslides***

Landslides may occur on slopes, which are disturbed by development activities and water accumulation. Steep slopes, clay-rich soil, increasing development in vulnerable terrain, periodic heavy rains, possible global climate changes and vegetation loss (such as from wildfires) increase the risk. The risk in the KWT area is considered very low. Some concern has been expressed concerning buildings in lower parts of slopes, such as in Sweetwaters, where heavy rain may cause water and mud to overflow there.

- ***Wildfires***

Wildfires represent a quasi-natural risk, since they are in many cases ignited through human activities. While having existed always in South Africa and kept at a small scale contribute to the growth cycle of vegetation, they are a threat to densely populated areas, developments and plantations. Uncontrolled wildfires also contribute greatly to air pollution.

- ***Lightning***

Lightning may cause fatalities, fires and failure of electronic devices. Preventive measures are to be taken mainly on the individual level.

Induced Risks

- ***Traffic***

Road infrastructure

The N2 road toward East London has a freeway character, which allows for high speed and dense traffic, but does not exclude pedestrians, cattle and grade crossings. Some intersections are accident-prone, due to a less than ideal design. In particular the intersection between N2 and R63 at the West Bank (Alice Junction), the intersection Alexandra Road (N2)-Maitland Road (R63) in KWT, the Breidbach-N2 crossing and the intersection of the Bisho-Zwelitsha Road (M690) and the KWT-Mt. Coke road (Zwelitsha Road, R346) are hazardous in this respect. The location of facilities often generates hazardous pedestrian behaviour, such as the absence of facilities in Sweetwaters, necessitating pedestrian traffic across the heavily used Zwelitsha Road.

There is currently a lack of maintenance of roads and pavements. Unexpected pot-holes, soft shoulders, loose gravel and damage to the road may contribute to accidents, and, on pavements, pedestrians, in particular elderly and disabled persons, may suffer injuries due to unexpected holes, broken tiles, level differences and unmarked work areas.

Heavy or fast traffic also generates noise, which may be perceived as a nuisance.

Rail infrastructure

The railway passes Dimbaza and King William's Town. It is a narrow-gauge railway with very sharp curves, which implies that trains must keep a very low

speed. There is no passenger traffic, but about two freight trains per day carry coal and other commodities. There are reportedly no dangerous goods transported by rail. Risks to be investigated include derailment, which would have limited consequences, due to the low speed and the absence of passenger traffic, dangerous goods carriage, and grade road crossings, e.g. on the Ginsberg road.

Airports

The airport in the area is laid out for a substantial amount of commercial traffic, but due to the relative proximity of the East London airport, it is presently not used for that purpose. Risks associated with airports are chiefly the handling of flammable substances and airplane failures or crashes. Noise can be perceived as a great problem (not an actual risk) and should be addressed in the planning process.

• *Transport of dangerous goods*

There appears to be no statistical data on the transport of dangerous goods, specifically with reference to preferred routes, carried substances or volumes. Since there are no chemical producers in the area and also not much heavy industry of other kinds, it can be assumed that there are no significant amounts of dangerous goods originating or ending up in the KWT area. Exceptions are, of course, fuel, in particular petrol, paraffin, diesel oil and LPG (propane/butane).

Chlorine is transported for water treatment, but in relatively small quantities in cylinders. The textile industry in Sweetwaters and Dimbaza uses chemicals for dyeing and other treatment. Some transit transport of dangerous goods occurs.

Hazards associated with the transport of dangerous goods are of several kinds, depending on the nature of the goods carried. Apart from the specific hazards arising from a release of dangerous substances, the transport is a traffic risk, because the vehicles are often large and the cargo sometimes improperly secured.

In transport the lack of adequate cargo securing constitutes a hazard, which may be significant. As a result of under-securing, cargo may fall off and hit other cars or pedestrians or block the road. Dangerous goods may leak and cause subsequent accidents.

• *Industrial and business installations*

Large-scale industry

Industrial areas are primarily located in Sweetwaters and Dimbaza. Many of the factories in Dimbaza are however closed, although a foundry, some textile (chiefly garment) and plastics factories remain in operation.

Large-scale industry focuses on textiles, such as the Da Gama factories, which is the largest enterprise in the area. Risks to be considered both for existing and planned industry locations comprise heavy traffic and transports to and from the sites, unsuitable access roads, pedestrian access for the work-force, storage and transport of hazardous materials, pollution of air and water, and possible production of hazardous waste. Noise may become a nuisance. There is however no serious problem reported regarding noise in public areas, and it should not be looked upon

as a risk. Nevertheless the planning should take it into account with regard to quality of life.

Petrol stations

There are several petrol stations in the area, which generate risks due to their storage and handling of flammable substances and the necessary supply of dangerous goods, primarily petrol and diesel oil. There seems to be a tendency to overfilling when filling up cars, which causes excess spillage of petrol, implying increased fire risk, increased exposure of personnel to hydrocarbons, extra environmental stress, and a theoretical risk of individual fuel tanks bursting or leaking.

Petrol stations should have a protective distance to other buildings and objects, and be inspected at appropriate intervals with regard to fire and health safety.

LPG distribution centre

Liquid petroleum gas, chiefly propane / butane, is extensively used as a household fuel. A distribution station is located at Buffalo Road in KWT. It receives LPG by road tankers, transfers it to a stationary tank and, from there, fills gas cylinders for retail distribution. The site is subject to periodic inspections by pressure vessel and occupational safety inspectors.

There are other installations, particularly in townships, where LPG is retail sold and often transferred between cylinders and bottles. Safety precautions in these places have not been assessed.

Paraffin filling enterprise

A paraffin distribution enterprise is situated in the Sweetwaters area. The enterprise also distributes petrol and diesel oil, by direct transport from supply (East London) to user. Paraffin is retail sold at the site. The flammability of paraffin is considerably lower than e.g. petrol (high flashpoint). Applicable regulations are complied with, including equipment of tanks and tank vehicles, inspection intervals, licenses, marking and separation.

Electrical power and transformer stations

There is no electrical power production within the area. A major transformer station is located at Pembroke, close to Ilitha, while there are smaller substations in KWT, Dimbaza, Yellowwoods and Fort Murray. A fire in the station will affect the electricity distribution, but is not likely to affect adjacent areas adversely in other ways. The possible presence of poly-chlorinated biphenyls, PCB, in transformer oil should be considered.

Mines

There are no mines within the area investigated.

Hazardous waste sites

A source reduction of hazardous waste is preferable, to decrease the need for transportation, end treatment and possible environmental stress. Conversion of hazardous waste to non-hazardous is practiced in Dimbaza. Other hazardous waste has been transported to a site in Port Elizabeth, which induces long-distance

transport and unsustainable conditions, since that site shall be closed. A new site is planned at Round Hill in the Berlin area, which eventually shall be able to handle hazardous waste.

Earlier hazardous waste has been dumped in various locations. The environmental analysis within the CUP project reports areas with contamination and not suitable for housing to be Bidley Farm and the road from there to Ginsberg, the area between the bridge in Schornville to Ginsberg, the Phakamisa waste disposal site (closed or to be closed) and the outflow area from Da Gama industries.

- ***Failure of automated systems***

Hazards may arise from attacks on automated systems, which are vital for safety, such as computer systems subject to virus attacks, electricity failure or electromagnetic influences. There has been developed a Y2K contingency plan for the TLC administration, which can be a basis for preventive and mitigating work in this field.

There is always a certain amount of risk associated with developments of any kind. Minimising risk is an essential focus of public safety planning. Every land use or public facility action taken by local government should be based on a recognition that some risk exists. The level of risk involved then becomes critical in determining when government involvement becomes necessary or desirable. When the level of risk is unacceptable, government action may be necessary to protect citizens and property.

In the review of a new development proposal, all impacts and concerns should be considered, but safety and environmental concerns should take precedence over aesthetic concerns. Contingency plans should be developed and continuously updated at the municipality level for identified and anticipated risks. Adequate funding and administration of disaster management and emergency actions should be ensured, by budget considerations and appropriate agreements with suppliers and other key role players.

7.5 Summary Statement

Ecological sustainability should be an objective in all community planning. The adjustment of society to ecological sustainability will only succeed if buildings, transport systems and other infrastructure meet the environmental criteria and are resource-efficient. The growth of the population and the demand for higher standard of living leads to higher consumption of resources, which in turn increases the pressure on the environment.

The over-all goals of sustainable development can be described as follows:

- Protection of human health
- Preservation of biodiversity
- Economic management of natural resources
- Protection of natural and cultural resources

The protection of the environment means that the emissions of pollutants must not damage human health or exceed nature's capacity for absorbing or breaking them down. Natural substances must be used in such a way as to protect the natural eco-cycles. Biological diversity must be preserved and valuable cultural environments protected.

A large portion of waste, both non-renewable and renewable resources, ends up in landfill sites. Recycling and the reuse of waste is an important factor and resource management will lessen the negative impact on the environment.

The main environmental issues identified in the planning area are water supply, sewage and solid waste management, including hazardous waste.

The recommendations concerning land use address the prevention of risks through controlled development. Land use activities must not aggravate, accelerate, or increase the level of risk from natural hazards. Hazardous waste must be handled with extreme care, to avoid exposure by direct contact or by polluted land, water or air.

Regarding traffic and transport it is recommended that continuous attention be focused on providing and maintaining a safe and efficient multi-modal transportation network, with a minimum of environmental impact. This will affect the location and planning of residential, industrial and business areas. Traffic and transport safety has to be paid full attention to whereby the separation of pedestrians from other modes of transport, and access control at major through roads are elements in this effort. Dangerous goods transport should be monitored and the corresponding regulations enforced.

The fire and rescue services should define the level and type of service, which they provide, and successively develop and adopt appropriate operational plans. A knowledge base for fire protection should be developed and maintained and cooperation between agencies involved in fire and rescue services encouraged.

Contingency/emergency plans should be developed and maintained, concerning traffic accidents, accidents in transport of hazardous materials, to fire protection in developed residential areas as well as in informal or rural areas, accidents from natural hazards, wind and flooding of residential areas, dam failure, electrical power failure, water supply failure and epidemic diseases.

In conclusion, the assessed strengths, weaknesses, threats and opportunities in relation to the environment and use of natural resources in the King William's Town area are outlined below:

Strengths

- Beautiful landscape and sceneries
- Rich natural resources with a wide biodiversity
- Fairly good provision of electricity in the planning area
- Alternative energy sources under investigation.

- Few disturbances in terms of noise and air pollution.
- Well functioning solid waste management site in KWT.

Weaknesses

- Poor sanitation system at places leading to contamination of drinking water.
- Most electricity produced from fossil fuel.
- Little research and data collected on natural resources.
- Situated in a drought prone region.
- No data on transport of dangerous goods i.e. routes/substances/volumes.
- Need for development of contingency/emergency plans for natural and induced hazards.
- The concept of environmental assessments not applied.
- Hazardous waste not handled regionally.

Opportunities

- Natural resources with wide biodiversity create a good base for e.g. tourism.
- Scenic and attractive environs for recreational purposes.
- Regional waste disposal site to be developed.
- Development of regional waste management
- Development of regional sewage treatment.

Threats

- Water sources and infrastructure soon reaching capacity
- Indiscriminate dumping of waste and general littering.
- Pollution of water resources.
- No dam overflow warning systems in place.
- Increasing car traffic might cause traffic congestion, traffic safety risks and environmental problems.