

## 2. PRESENTATION OF THEMATIC REPORTS

### 2.1 Biodiversity and Open Spaces

#### Introduction

Biodiversity is the variety of all life forms (plants, animals and micro-organisms), the genes they contain and the ecosystems of which they form a part of (see glossary). Biodiversity supports essential “ecosystem services” such as maintaining water and nutrient cycles, the pollination of plants, soil integrity, and is fundamental to sustaining these ecosystems, which provide the basic resources (eg. air and water) humans need for survival. It also provides valuable recreational and economic benefits to humans, such as tourism and use of bio resources such as thatching and medicinal plants. The state and health of biodiversity is a key indicator of environmental health, and ultimately human health.

Midrand is currently facing environmental challenges and conflicts of both the first and third world as it contains on the one hand the pressures of a rapidly developing industrial, mining and urbanisation sector and in contrast a high-density, poverty-driven, developing community with little access to basic services. Development in both these sectors has in the past and continues to impact on the biodiversity of Midrand.

#### The current situation

The following are the main issues identified with the loss of biodiversity in Midrand:

##### A) Habitat loss

The characteristic vegetation type found in Midrand is mainly grassland, the dominant veldtype being Bankenveld (Acocks 1975). Bankenveld is a unique form of grassland that is characterised by rocky ridges and rolling hills. It is potentially rich in biodiversity, as it acts as a transition zone between the grassland and bushveld biomes, thus containing elements of both. In Midrand, 65% of the land has already been transformed (see Table 7) and Bankenveld has undergone a 46% transformation.

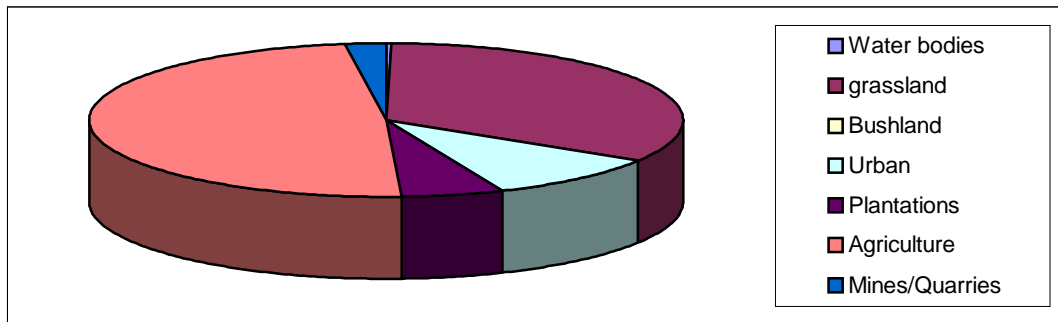
Table 7: Percentage of natural vegetation and transformed areas, as based on land use cover, for Gauteng and Midrand estimations (data from satellite imagery)<sup>14</sup>

Land use cover category	Gauteng [%]	Midrand [%]
Transformed areas	45	65
Natural vegetation	55	35

The pie chart (Figure 1) below shows that the biggest forms of land use change in the Midrand resulting in loss of natural habitat are (in order of significance): agriculture, urban development, plantations, mines and quarries. This is taking place in a context where Midrand has no formal conservation or protection status. This is critical, as the crucial area of concern for Midrand is not the loss of a single species of plant or animal, but entire habitats that affect whole

<sup>14</sup> Source : National land cover database project, CSIR

communities, brought about by vegetation clearance, pollution stress and invasion by foreign or exotic plants. Vacant open spaces account for 41% of the land cover. Only about 1.4% of Midrand area is considered as public open space, resulting in the majority of biodiversity and its conservation being in the hands of private land owners (See Map: Midrand open spaces).



**Figure 1: Percentage land cover for given categories in Midrand.** Water bodies - 0.17%, grassland - 34.6%, bushland - 0.15%, urban - 9.9%, plantations - 5.66%, agriculture - 49.9%, and mines/quarries - 2.4%.

#### B) Habitat Fragmentation

Habitat fragmentation is one of the consequences of habitat loss, which occurs as a result of human activities, as seen taking place in Midrand with rapid urbanisation, agricultural, mining and industrial development. Land is not divided along ecological lines, but according to land use that prevents continuity in the landscape that is important for biodiversity conservation. Fragmentation results in pockets of vegetation in the midst of industrial and urbanised areas, which are often too small and affect the survival of plant and animal species that are accustomed to unimpeded landmasses.

#### C) Loss of wetlands and destruction of riparian habitat

Numerous rivers and their associated riparian habitat dissect the grasslands. Three main river systems form part of the Midrand municipality: Kaalspruit/Olifantspruit, Rietspruit and Juskei River (see Map: Water bodies and river systems in the Midrand area). Wetland areas, which include vleis, rivers, flood plains and pans, provide a transition between terrestrial and aquatic environments and therefore support an amazing diversity of life forms. The main wetland areas in Midrand are the: Vorna Valley Vlei (22 ha); Kaalspruit (52 ha); Beaulieu Bird Sanctuary (16 ha); Glen Austin pan (9.7 ha); Hennops River ( $\pm$  64 ha) and Juskei River ( $\pm$  68 ha). Wetlands are essential to the ecological system as they: maintain water quality; act as natural filters and sponges, absorbing run-off; trap sediments; and reduce erosion.

The zone that forms the essential link between land and water environments is called the Riparian zone which is found along the beds of rivers, riverbanks and adjacent land. Riparian zones are increasingly being recognised for maintaining the productivity and stability of river catchments as they act as a final filter for any surface water run-off that may enter streams directly. The riparian vegetation intercepts surface water flow and in the process traps sediments and pollutants. The vegetation also controls erosion. The important feature here is that riparian areas have vegetation that is aquatic and semi-aquatic that serves as a special habitat for food,

shelter and breeding sites for various organisms. Given that riparian areas are generally scenic, they are also attractive places for recreation.

Riparian areas have been severely degraded, resulting in negative impacts on water quality and recreational potential of Midrand area. The riparian habitats have been seriously modified and destroyed as a result of formal and informal urbanisation and industrial, agricultural and domestic activities close to riverbanks. Pollution, erosion, and the invasion of exotic plants also seriously impact on these areas. The conversion of land has extensively modified wetland areas and the extent to which wetlands have been lost in Midrand is unknown at the moment.

#### D) Midrand's diversity and Red Data species

Midrand area is rich in flowering plants and grasses (+/- 2000 plants). There are around 14 plant species listed in the Red Data book<sup>10</sup> that possibly occur in the Midrand area and need special protection. Red data bird species, dependent on the grasslands, are grass owl, secretary bird, peregrine falcon, and melodious lark. Three red data mammals, which are probably found in the Midrand area are: the spring hare, rough haired golden mole, and Juliana's golden mole. One amphibian species, the Giant bullfrog, is a red data species, which has been severely affected by the transformation of grasslands. There are no recorded red data fish species. Midrand is also rich in cultural, historical and archaeological sites, with around 51 sites being recorded in the area. (See Map: Distribution of fauna and flora in and around the Midrand area - Distribution localities are recorded as quarter degree squares. Midrand falls within the quarter degree squares, 2628 AA and 2528 CC. The figure in the block in the top and bottom right hand corner indicates the number of species found in that quarter degree square.)

#### E) Alien invasives

Introduced species, also referred to as exotic or alien plants, are a major threat to biodiversity, by out competing native species of habitat and food. In addition, exotics are also known to dry up streams because of their high rate of water consumption and they reduce soil fertility. In this way they can completely alter ecosystems of the area. They can also alter the landscape, potentially affecting the tourism value by transforming visual perception. At present, it is estimated that about 40 species of tree, shrub and other plants have become part of the habitat of Midrand. The main exotic species found in Midrand are: wattle, poplar and eucalyptus trees. It is estimated that 6-10% of Midrand is covered with exotics, which is regarded as a fairly high level of coverage.

### Management Responses

- At the national level a policy framework exists, while new conservation legislation is being contemplated for Gauteng as a whole. In addition, the national Water Act has stipulations that are aimed at ensuring that water for the environment is incorporated into water management strategies so as to preserve aquatic biodiversity.
- Integrating biodiversity that is under private control within the environmental management approach and system for Midrand.
- Expansion of public open spaces. The international standard for public open spaces is in the region of 3.9ha/1000 people. To meet this standard Midrand will require at least 1486 ha of open space, where the current acquisition stands at 409 ha. However, the Midrand Town

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<sup>10</sup> 1996 IUCN Red Data List of Threatened Animals. Compiled and edited by Jonathan Baillie

Council has initiatives in place to acquire more public open spaces, particularly in ecologically sensitive areas such as riparian corridors and wetlands. The acquisition of more public open spaces is outlined in Midrand's Master Plan<sup>11</sup> (see Map: Midrand open spaces).

- Undertaking public education and awareness programmes, with field visits to Midrand's key biodiversity areas.
- Midrand Town Council, through the EIA regulations, is adopting the institution of Environmental Control Areas<sup>12</sup>, for sensitive areas such as wetlands (See Map: Environmental control areas). This will help to minimise, to some extent, negative impacts on biodiversity.

## Trends and Indicators

The scenario for biodiversity conservation in Midrand is not a positive one. The situation is expected to deteriorate as population pressures increase, with a concomitant increase in demand for land. The rapid growth of Midrand's economy is expected to continue with associated impacts on the environment. Current development trends and population growth would indicate that if effective environmental management strategies are not adopted soon, within the next five years we can expect a significant deterioration from the current state. A qualitative modelling scenario (See Figure 2) describes the main driving variables (extrinsic and intrinsic factors) that are most likely to influence the future state of the environment of Midrand.

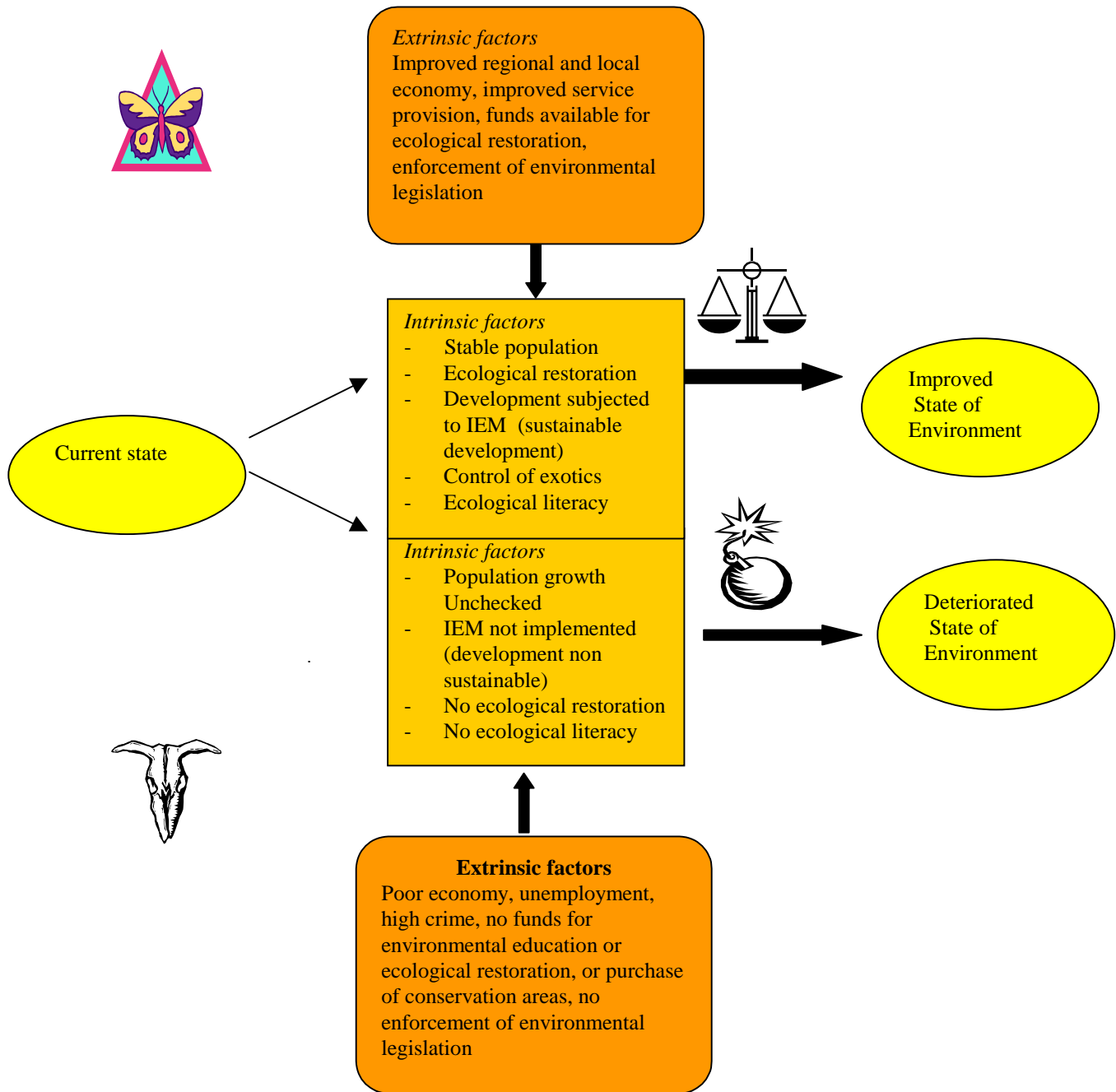
Key indicators for different biodiversity issues are:

- Terrestrial biodiversity integrity
  - sensitive plants such as orchids, lichens, and geophytes.
  - egg shell thinning in raptors and insectivorous birds.
- Aquatic biodiversity integrity
  - indigenous fish species diversity
- Habitat loss and fragmentation
  - percentage land area of open space that is: a) natural vegetation, and b) connected to other areas, and c) with formal protection status.
- Destruction of riparian corridors
  - riparian plant species composition and density.
- Rangeland degradation
  - basal plant cover
- Loss of wetlands (and aquatic habitat)
  - assessment of instream flow
- Declining water quality
- faecal coliforms Introduced species
  - % area infestation
- Biodiversity and human health
  - opens space: ha/1000 people
- Conservation of historical, cultural and archaeological sites
  - number of sites officially protected

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<sup>11</sup> Midrand open spaces development framework master plan. 1998. Report commissioned by the MMLC.

<sup>12</sup> Environmental control area policy for KMC. June 1999. Report commissioned by the MMLC.



**Figure 2: Midrand State of Environment trends.** Abbreviation: IEM = Integrated Environmental Management (the procedure of integrating economic, social and ecological considerations into sustainable development planning). It is predicted that if effective environmental management strategies are not adopted, within the next five years a significantly deteriorated environmental state can be expected.

### Gaps and Recommendations

The following areas are considered as information gaps:

- Comprehensive plant and animal inventories.
- Exact location of red data and other unique plants and animal to the area.
- Bio-resource use data (medicinal plants, fire wood thatching grass)
- Level of environmental education and awareness amongst informal settlements.
- Detailed inventory and status of wetland areas in Midrand (specialist report)

Recommendations:

- Involvement of local communities, in conservation awareness and educational programmes. These should include: clean-up and anti-littering campaigns; indigenous tree planting and nature appreciation programmes.
- Implementation of a clean-burning fuel source for Ivory Park and other areas with high pollution levels, and provide electrification to reduce air pollution.
- Incorporation of the principles of Integrated Environmental Management (IEM)<sup>13</sup> at all levels of planning and development.
- Provide official conservation protection status to sensitive areas (See box below).
- Implement recommendations made in Conservation Control Areas report<sup>14</sup> for Midrand (See Map: Environmental Control Areas).
- Implement recommendations made in a Midrand Open space: Master planning Report 1998 (See Map: Midrand open spaces).
- Implement principle of ecological restoration for damaged riparian habitats.
- Conduct survey for location of red data plants and animals and other sensitive species and habitats.

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<sup>13</sup> Integrated Environmental Management Guideline Series, Department of Environmental Affairs and Tourism 1992.

<sup>14</sup> Environmental control area policy for KMC. June 1999. Strategic Environmental Focus. Report commissioned by the MMLC.

## Guide to environmentally sensitive areas in Midrand

### **Wetlands: pans and vleis**

- *Where:* Glen Austin pan, Vorna valley vlei, Beaulieu Bird Sanctuary. (See Map: Water bodies and river systems in the Midrand area).
- *Importance:* Areas of high biodiversity, particularly aquatic life and birds. Important ecological functions. Valuable areas for outdoor recreation.
- *Threats:* Highly sensitive to industrial, urban and agricultural pollution, particularly the endoric pan of Glen Austin. Drainage through up-stream damming and increased urban, agricultural and industrial water demands. Bad road planning cutting across drainage lines. Polluted storm water run off and excessive buildup of sedimentation. Alien invasive plants.

### **Riparian zones**

- *Where:* Along rivers including, Juksei, Kaalspruit, Olifantspruit, Modderfontein spruit and smaller drainage lines. (See Map: Water bodies and river systems in the Midrand area).
- *Importance:* Riparian zones have important ecological functions, they are also areas containing high animal and plant species diversity. Important as corridors linking fragmented habitats.
- *Threats:* Vegetation clearing, agriculture along banks, industrial and urban pollution. Alien invasive plants. Wood collecting.

### **Rocky ridges and outcrops**

- *Where:* high lying areas, included in environmental control areas (See Environmental control areas Map).
- *Importance:* Aesthetic and visual reasons (areas usually along skyline). Important habitat for trees and rare plants, particularly species sensitive to fire.
- *Threats:* urban development, plant collectors.

### **Specific areas of open grassland**

- *Where:* refer to Map: Midrand open spaces and Environmental control areas Map.
- *Importance:* areas most likely to contain red data plant and animal species.
- *Threats:* urban and industrial development, overgrazing and trampling, environmentally damaging agricultural practices.

### **Areas of cultural, historical and archaeological importance**

- *Where:* refer to environmental control areas (see Environmental control areas Map).
- *Importance:* Cultural, historical and scientific value. Tourism and recreational potential.
- *Threats:* urban and industrial development, lack of planning.

## 2.2 Pollution

### 2.2.1 Air Pollution

#### Introduction

Air pollution is a complex issue to describe in terms of the Midrand area alone as air is highly mobile and moves freely across municipal boundaries. For this reason air pollution was looked at in the broader context of air quality in Gauteng.

#### Current Situation

Climatology of the Highveld, in the form of inversion layers, is the main reason why air pollution is such a major problem in the Midrand region. Generally we would expect temperatures to decrease with height, as seen by snow on high mountains, but inversions are an increase of temperature with height. Surface inversion layers (5 – 600m above the ground level) trap vehicular, domestic and industrial pollution, because stable air conditions, particularly in winter months, prevent mixing and dispersal of air below it. Only industrial and power station smoke stacks that are very tall and which emit air pollution at high temperature and speed can actually get their pollution load through the inversion layer. This means that where ever coal is used at ground level or where vehicles travel the emissions will be trapped in that immediate area. This explains why areas such as highways, Ivory park, Tembisa and Diepsloot have such bad air pollution problems - it is because the lid traps all the air pollution made at the ground and does not allow it to disperse.

The major source of air pollution in Midrand is, in essence, smoke from the domestic use of coal fires exacerbated by the burning of waste material for fire or waste control. Source contributions differ for Midrand and Gauteng because land uses differ (See Map: Air quality zones and air pollution envelopes based on land-use in the Midrand area). The difference between Midrand and Gauteng main pollution sources is shown in Table 8. Midrand generally has very limited industrial emission sources in comparison to Gauteng, but has more pollution from domestic coal combustion. The attached map (Main air pollution areas in Midrand) depicts the main air pollution areas found in Midrand which correspond to the three main source contributions in Midrand seen in table below.

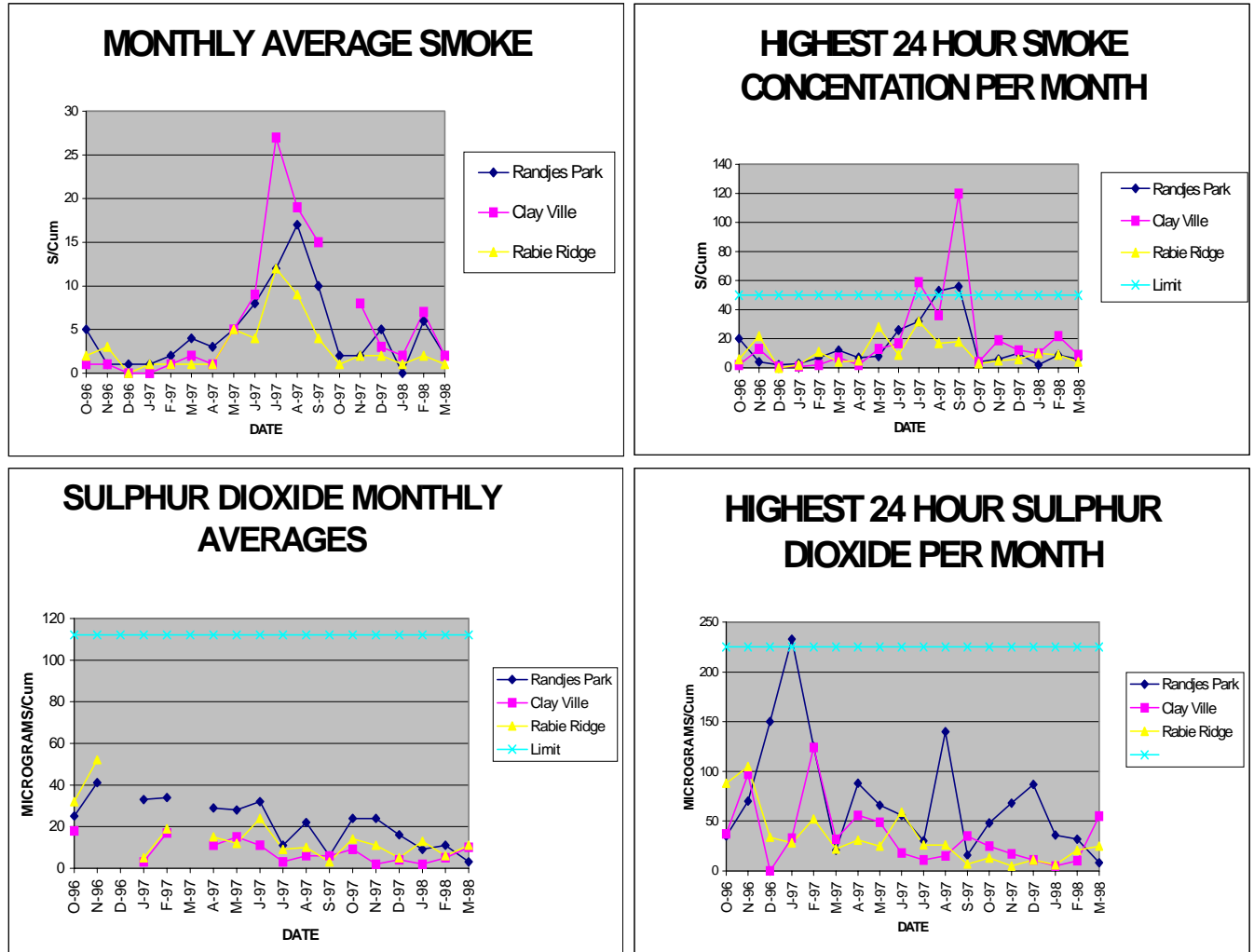
Table 8: Approximate breakdown of the various source contributions to the total load of particulates (minute particles that make up smoke and haze).

Source Description	Midrand (%)	Gauteng (%)
Industrial	15-20	60
Vehicular and road surface	20-30	35
Household combustion	50-65	5

Midrand air quality averaged over the whole year meets the ambient air quality guidelines of the Department of Environmental Affairs & Tourism (DEAT). The real problem is over the short-term, particularly in winter at night, as dictated by the surface inversions (Figure 3-6 below). In some of the informal settlement areas such as Ivory Park the local air pollution will in most cases exceed the ambient air quality. The density of housing and the number of coal fires in these areas determine that air pollution will reach hazardous levels. Suspended particulates on winter days in

coal burning communities can exceed the World Health Organisation standard of 0.12mg/m<sup>3</sup> by over 1100%.

**Figure 3-6: Monthly smoke and sulphur dioxide averages for Randjespark, Clayville and Rabie**



The main human health impacts that can be expected are presented in the Table 9 below. These impacts are further exacerbated in winter months.

Table 9: Potential health impacts of coal burning verses electrified areas.

Description	Risk increase comparison of coal using areas to electrified areas (expressed as number of times higher)
Upper respiratory tract illness	3.9
Lower respiratory tract illness	5.0

Based on figures in *Household Energy Sources in South Africa*

## Management Responses

- Capacity in the MMLC:

The following table shows the structure determined for the Midrand Metropolitan Local Council with respect to environmental and pollution matters.

Table 10: Organisational structure for the Midrand Metropolitan Local Council

Position	No of posts	Location
Head Environmental Health Services	1	Midrand
Asst. Head Environmental Health Officer	1	Midrand
Regional Health Officer	3	Midrand
Environmental Health Officer	10	Midrand

The Midrand council area is divided into sub-regions with one environmental health officer (EHO) per sub-region. Each environmental health officer is responsible for all environmental and health matters in the respective sub-regions. Because of this, there is no single person who is responsible for air pollution alone at local council level. In many cases, EHOs have formal training in public health, which means that they received formal tuition on the health impacts of poor air quality, rather than air quality management and air pollution control. Many of the environmental health officers require additional formal training in environmental issues.

- Policing and Management

Air pollution management is not considered to be a major responsibility of local council as air quality is handled by the Air Pollution Directorate in the Department of Environmental Affairs and Tourism (DEAT). Under the current legislation, EHOs are only allowed to report pollution events to the regional air pollution control officer, they perform no inspections. The limits to authority and the exact boundaries of responsibility are not clearly defined or accepted by the people involved in the control of air pollution in Midrand. Due to limited resources, air pollution receives a low priority at local council level and is mostly addressed on a reactive basis. The limited technical knowledge on air quality management, monitoring and control further limits effective air quality management within the Midrand local council area.

- National Regulations

Currently the main legal tool for air pollution control in South Africa is based on the Atmospheric Pollution Prevention Act, Act No 45 of 1965. The Act specifies the scheduled processes and these are controlled by the Chief Air Pollution Control Officer (CAPCO), who holds office nationally at the DEAT. A regional air pollution officer focuses on identifying the major air pollution sources and scheduled processes, and checking on their compliance. On the whole, the CAPCO holds all the authority. When power is conferred to a local authority, it is generally confined to dust and smoke pollution where there is the capacity to do so.

- Local Laws

The Midrand area has numerous by-laws that can be related to air pollution directly or indirectly. In the KMC Integrated Pollution Control Master Plan study, these were found to be outdated and of low relevance. The by-laws are currently being revised which will see the formation of a Pollution Management Agency and the setting up of locally specific by-laws more applicable to the Midrand area. The Pollution Management Agency concept was developed to facilitate education and awareness as well as pollution control and management.

- **Monitoring Infrastructure**

The limited monitoring of air quality undertaken by the local council is conducted as part of other monitoring programmes such as Airkem (Air Pollution Monitoring Committee on the East Rand set up by industry and local councils), SAM (Soweto Air Monitoring), and smoke and sulphur dioxide (SO<sub>2</sub>) monitoring programmes. The Airkem and SAM (Soweto Air Monitoring) studies are the only sources of ambient air quality data. These two programmes are limited, however, in terms of resources. Moreover, they focus mainly on the Ivory Park, Kempton Park and Lethabong areas, with limited monitoring in Midrand. In many cases, the monitoring stations require regular maintenance and quality control in operation.

- In the private sector, industry takes an active role in air quality monitoring (through Airkem) and control. At the community level, air quality issues are also being pursued through Airkem. In general, communities do not take active steps themselves as they see air pollution to be someone else's responsibility.

### **Future Trends and Indicators**

- **Coal fires/smoke:**

The increasing number of people residing in informal settlements without adequate services or who cannot afford electricity is increasing and therefore a concomitant increase in air pollution is predicted. An Airkem study, monitoring sulphur dioxide and nitrogen oxide concentrations in Kempton Park and Modderfontein areas confirms these increases.

- **Dust:**

An increasing trend in dust is predicted which is due to the increase in number of vehicles and the expansion of unpaved road network in informal settlements. As Midrand becomes more developed and the land surface is being covered, the greater Midrand area is expected to have a decreasing dust trend. This is confirmed by the Airkem study findings.

- **Vehicle emissions:**

Expected to increase as more employment opportunities are created and as the Ben Schoeman and the proposed PWV-9 become more heavily used as routes to work. An anticipated increase in the residential component will also contribute to this.

The main indicators that should be used for monitoring the main sources of air pollution described above are:

1. PM10 (particulate matter smaller than 10 microns);
2. Sulphur dioxide; and
3. Oxides of Nitrogen (NO and NO<sub>2</sub>)

These require continuous monitoring i.e. 365 days a year 24 hours a day with a greater than 90% operability of monitors.

## Gaps and Recommendations

The following main gaps have been identified in the current system:

- Local council:
  - Need for a formal air pollution management strategy.
  - Need for long-term experience and financial input in air pollution management.
- Laws and Bylaws:
  - By-laws need to be made consistent with recent changes at National Government level.
  - The local authorities do not have the power to manage and control air pollution.
  - Lack of powers to prosecute owners of industrial processes, which is responsibility of CAPCO.
- Infrastructure, data management and training:
  - Midrand council lacks a proper database to monitor and store air pollution data.
  - There is a need for more training and capacity within the EHOs for improved air pollution management and control.
  - Air pollution infrastructure, monitoring and networks are limited in local council.

Points of recommendation are:

- There is a need for an overall air pollution management strategy involving all stakeholders in the Midrand, greater KMC and Johannesburg area.
- The by-laws need to be revised in terms of applicability to Midrand, and to align them with changes in legislation at national level.
- An air pollution monitoring network needs to be established to monitor air quality in Midrand, the KMC area and in the Gauteng Province as a whole.
- There is a need for an “air pollution management specialist” to be appointed at the level of local government with a view to co-ordinating and managing air quality issues in the greater area.
- EHOs should receive technical training to improve or expand competence in air quality management.
- An education and awareness campaign on air quality issues is required.
- Town planners should try to preserve open areas that have indigenous natural vegetation since they provide a natural cover and sink for air pollution.
- Major roads with high volumes of traffic should not be planned near residential areas.

## 2.2.2 Noise Pollution

### Introduction

Noise is often recognised as the most important environmental issue, ahead of other pollutants. With Midrand being one of the fastest developing areas in South Africa and situated alongside one of the busiest transport corridors (N1) in the country, noise control must form part of the planning stage of any development.

### Current situation

There are numerous issues and causes for noise pollution in Midrand (See attached Map: Midrand Noise Pollution Zones):

- Road traffic:

The main roads and highways forming part of the Midrand area contribute in different degrees to the ambient noise climate. The N1 and R562 (connecting Midrand area with Olifantsfontein area) have the most influence on noise levels. The severity of its impact varies in accordance with the proximity to roads and the amount of traffic using them. At low traffic volumes, the noise is dominated by single events, before it drops back to the general ambient noise level. As traffic density increases the noise will take on a continuous character, with a significant low frequency content at larger distances.

- Air traffic:

Aircraft noise is internationally considered to be the most severe problem. It is rated more disturbing than many other sources. Grand Central and Johannesburg International airports contribute significantly and moderately significantly to air traffic noise in Midrand respectively.

- Industry:

Alpha and Olifantsfontein quarries are the two main sources of industrial noise in Midrand. Other noise from industry receives a few, but manageable, complaints.

- Entertainment:

Amplified sound is a major problem, especially in the evenings from health clubs and discos. Kyalami race track is the major source of disturbance.

- Community:

General noise including lawnmowers, power tools, hi-fi music and dogs make a significant contribution to noise complaint but is well controlled.

The following general conclusions are made regarding the current contribution by the above issues to ambient noise levels:

- Transportation: causes the most significant noise impact, whether by road or air.
- Industry: impact is generally moderate.
- Entertainment: moderate and localised.
- Community: although localised, the noise impact is widely spread through the community.

### Management Responses

- Noise control falls under the National Health Department and is treated as a health problem. Four of the ten environmental health officers have a National Diploma in Noise Control.
- Local authorities are responsible for noise control. Noise Regulations (published under the Environmental Conservation Act) have been adopted by the MMLC and provide an effective legislative framework for the control of noise.
- The present system for noise control is effective in that the procedures, follow-up, and law enforcement for noise complaint are conducted.

### **Future trends and Indicators**

Due to high growth rate in Midrand, with increased development in the industrial, business and residential sectors, there will be an inevitable increase in noise emissions from road traffic, industrial sources and community noise. Careful and effective planning is therefore required to minimise the effects of noise pollution.

The level of noise, expressed in decibels (dB), is used as an indicator of noise control. The Code of Practice SABS 0103 'The measurement and assessment of environmental noise with respect to annoyance and to speech communication' gives definitions of the quantities used for the measurement of noise. Methods are also provided for measurement and assessment of noise levels in terms of the expected community reaction to noise impact.

The impact of noise on a community may be described by:

- Absolute noise levels:

The limits to which a given community/development may be exposed are specified in terms of a specific noise level. For example, the local authority, according to the Noise Regulations, may proclaim a controlled zone, if the noise level caused by traffic noise exceeds 65 dBA over a period of 18 hours (See attached Map: Typical Ambient Noise Levels in the Midrand area).

- Increase in noise levels:

Limits and/or community reaction are specified in terms of the increase in the existing ambient noise levels caused by an intruding noise. For example, if the ambient noise level rises by 7 dB or more.

### **Gaps and Recommendations**

The following gaps have been identified in the present system of noise control in Midrand:

- The Legal Framework:
  - Although the Noise Regulations used by MMLC are an effective tool, they do have several flaws which need amending such as contradictions with other noise related documents (eg. SABS 0103), inaccurate definitions, and the assessment of noise caused by different sources over different time periods, which can cause some confusion amongst users, and can result in a reactive response to noise control.
- Public Understanding:
  - There is a need to provide more information and understanding amongst the general public as to their rights concerning the noise and noise regulations.

- Human Resources:
  - Shortages of staff (caused by insufficient funding) prevent proper implementation of regulations.
  -
- Administrative System:
  - Is fairly effective, but an improvement in information access to specific noise issues that can be easily and readily used and updated.
- Intergovernmental interaction:
  - There is a communication gap between the provincial and local government.

The following specific recommendations are made:

- Legislation:
  - Every endeavour should be made to keep abreast with developments in legislation for the control of noise. The Noise Regulations should continue to form the basis of noise control.
- Personnel:
  - More officers should be trained in various aspects of noise control and funding must be made available to support an effective staff complement.
- Planning for noise:
  - Continuous planning and review of existing management plans can alleviate problem experienced later. A mandatory noise impact assessment for every major new development and the regular recalculation of noise contours around airports and next to major transportation routes is required.
- Public awareness:
  - Communities should be educated in terms of their rights and obligations regarding noise.
- Administration:
  - Enough staff and electronic resources must be made available in order to ensure an effective administrative system of record keeping. Regular statistics on noise related issues must be generated and published in a status report.
- Communication:
  - An effective channel of communication between Gauteng Province and MMLC must be established. It is suggested that meetings are held at regular intervals, during which mutual interests and problems can be discussed and experiences interchanged.

## 2.2.3 Water Pollution

### Introduction

The MMLC area contains part of three surface water catchments. All three catchments contain small, and local dams that eventually drain into the Crocodile River and from there to the Haartebeestpoort Dam (See Map: Catchments, rivers and sampling points in the Midrand Area). The three catchments are:

- **Kaalspruit/Olifantspruit:**

The main source of this catchment is found in Lethabong and Kempton Park/Tembisa Municipality areas to the south. The spruit flows through Ivory Park into Midrand. Data indicates that stream water is often polluted, particularly with respect to microbiological contamination. Run-off from dense informal settlements (such as Ivory Park along the banks of Kaalspruit) and overflows from municipal sewage lines contribute to the pollution. Flowing through Midrand, the spruit joins with a major tributary from the Clayville industrial area; the effluent stream from Olifantsfontein sewage works; and with the Olifantspruit, which collects mainly agricultural drainage.

- **Rietspruit:**

This is a small north flowing tributary of the Hennops River with a catchment that is mainly agricultural and semi-urban in nature. No water quality data is at present available for the Rietspruit.

- **Jukskei River:**

The Jukskei River has its source in the Lethabong Municipality and the Eastern Metropolitan Council area, and flows along the southern part of Midrand and the northern part of the Eastern Metropolitan Council area, eventually joining the Crocodile River. Run-off from the urban and industrial areas and some localised agricultural inflows during storms are primary contributors to pollution in this river. Water quality is highly variable.

### Current Situation

All three catchments described have limited monitoring (See Map: Catchments, rivers and sampling points in the Midrand area). Four points along the Kaalspruit are monitored (from 1997) by Midrand Community Services. The Kempton Park/Tembisa Municipality also conducts monitoring of the Kaalspruit at the municipal boundary (data from 1997). Data from four points (since October 1993) along the Jukskei River within Midrand is available from the Jukskei River Forum. Ground water quality data is more limited with no routine monitoring system in place. Sewage discharges are permitted and controlled by the Department of Water Affairs (DWAF).

There are two types of sources of water contamination:

- **Point source pollution:** where a specific pipe, culvert etc. allows a direct discharge to the watercourse. These are generally easy to control and are quantifiable.
- **Non-point source pollution:** where the pollutants enter the watercourse over a diffuse area, such as storm water and agricultural run-off. These are difficult to quantify and control.

The contribution (%) of each of these sources cannot be assessed because of the lack of data.

*Main issues of concern:*

The main issues or concerns on water pollution raised during the production of the Kyalami Metropolitan Council (KMC) Master Plan were:

- Social

The community felt broken sewer and water pipes, pit latrines, grey water, uncontrolled storm water and industrial pollution were important issues.

- Industrial

There are known discharges of industrial effluent into the Modderfonteinpruit (a tributary of the Jukskei). The municipality does not consider industry to be a significant contributor to surface water pollution, under normal operational conditions. Uncontrolled discharges of industrial effluent and industrial storm water into the Kaalspruit, mainly in the Clayville area, have been observed. This is also likely to occur into the Rietspruit and Jukskei River in the industrialised areas.

- Sewer system

Sewage enters the watercourses from sewage treatment works such as Olifantsfontein and Vorna Valley. Sewer spills through blockages, vandalism and abuse by users disposing of solid wastes is also a problem.

- On-site sanitation

Aquaprivies provided in dense informal settlements, specifically Ivory Park, are often a problem because of a high water table and poor flush system, resulting in some of them being abandoned by the community. This increases the likelihood of sewage contamination of the grey water run-off from the area.

- Solid Waste Disposal

There are a number of illegal dumping sites, in terms of industrial on-site dumps and domestic dumps. Seepage and run-off from these dumps can potentially contribute to surface and groundwater pollution, as well as litter, odour and insect/pest nuisance.

The KMC Master Plan deemed the following areas to have most potential problems and therefore of high priority: -

Table 11: Selected conceptual pollution hazard assessment and prioritisation for surface water.

		PRESENT DAY RATING	RECOMMENDED PRIORITISATION
INFORMAL SETTLEMENTS		HIGH	HIGH
SEWAGE WORKS	Vorna Valley	MED	MED
	Olifantsfontein	MED	MED
SEWER LINES		HIGH	HIGH
OFFICIAL WASTE DUMPS		LOW	LOW
ILLEGAL WASTE DUMPS		HIGH	HIGH
QUARRIES	Alpha Quarry	HIGH	HIGH
	Rietspruit Quarry	MED	HIGH

OTHER ACTIVITIES	Khyalami Race Track	LOW	LOW
SMALL INDUSTRIES		LOW	MED
AGRICULTURAL PLOTS		LOW	MED

*Impacts:*

- Domestic - increase in water borne disease because of high bacteriological levels. High salt levels may also effect the taste of water and may contribute to domestic disorders.
- Livestock - same as domestic.
- Irrigation - high bacteriological levels possibly being passed from the crop to humans and livestock. High salt levels may affect the growth of sensitive crops.

The KMC Masterplan indicates that water quality of the Kaalspruit is generally unsuitable for the above reasons. No information is available on the Rietspruit and Olifantspruit, however, it is suspected that these rivers experience similar problems.

### Management Responses

Water pollution activities are carried out by Midrand's Community Services, Town Engineering, and Environment and Parks Department. Ten Environmental Health Officers (EHOs) from MMLC are currently responsible for water pollution in specific areas of Midrand. Management responses, however, are currently reactive (only in response to complaints) because of limited resources and capacity. The general feeling is that the majority of Midrand's surface water quality problems are inherited from upstream and therefore the responsibility of other municipalities, or soon to be formed Catchment Management Agency. There seems to be little formal opportunities for liaison between the EHOs and the relevant provincial and national departments that enable integrated approaches to be taken.

Currently, the three municipalities' (Midrand, Kempton Park and Lethabong) environmental management is in the process of being integrated into a consolidated management programme through the KMC. Noted proactive work undertaken by the MMLC include the following:

- Contribution and participation in the KMC Integrated Pollution Control Masterplan
- Kaalspruit water quality management project
- Jukskei Forum - for management and awareness
- School sanitation project - regarding the use of toilet facilities and reporting blockages and water leakages.

### Future Trends and Indicators

Figures 7 and 8 attached indicate changes in salt concentration (EC) and organic pollution (COD) over time taken from the limited data available for the Kaalspruit and Jukskei River monitoring points. Water quality is highly variable as values vary above and below the general standard for ECs and CODs. There is generally no trend, or no indication of trends over time or season. The Jukskei River data indicates that there may be a general decrease in quality with respect to salt pollution load since sampling started in 1993.

Future trends could not be considered because of limited water quality and flow data for the Kaalspruit, Olifantspruit and Rietspruit Rivers. It can be predicted, however, that increasing pressure and demand for water resources and inadequate management of sanitation and storm water facilities will cause deterioration in water quality.

Chemical oxygen demand (COD) concentration is used to indicate organic pollution and the potential of pollutants to take oxygen out of the watercourse. South Africa does not have COD standards with respect to receiving water qualities that could be used to indicate pollution. In general terms, however, it would be expected that the COD of receiving waters should not exceed about 5-8mg/l. Other specific water quality indicators are:

- Electrical conductivity (EC) to assess changes in salt loads.
- pH as a general indicator of the buffering capacity of the stream.
- Suspended solids to determine sediment transport in the river.
- Microbial quality to indicate levels of bacteriological contamination.

Physical indicators, which provide an indication of the aesthetic potential of the water resource and a visual indicator of potential adverse impacts, include litter, solid waste, erosion, odour, turbidity/colour, biophysical diversity, point and no-point discharges and catchment management

### **Gaps and Recommendations**

Existing gaps identified are:

- Monitoring:
  - Although more informal monitoring is undertaken no formal monitoring programme of surface water resources is available for Midrand. Only small parts of the total surface water system of Midrand are monitored.
  - No formal regular monitoring of sanitation, sewerage and domestic waste handling facilities eg. pit latrines and illegal dumping.
  - No formal regular monitoring of sewerage systems, excessive storm water inflows and illegal connections
  - No formal monitoring programmes of selected commercial, industrial and agricultural operations
- Lack of formal management plans or programmes to manage and mitigate deteriorating water quality.
- Limited resources and capacity with MMLC staff and finances to manage and address water pollution problems eg. repairing broken sewer lines.
- Legislation:
  - Industrial discharges to watercourses are limited and lodged with DWAF, thus MMLC has little power over the matter.

Recommendations:

- Continue developing an integrated approach to water pollution control (as seen being developed through the KMC programme) to co-ordinate water pollution management upstream, downstream and within Midrand borders.
- Upgrade and enhance the capacity and resources of the Pollution Control Officers and EHOs with regards to proactive water pollution management and monitoring programmes.
- Initiate formal ground and surface water monitoring programmes, to include identification of point and non-point source discharges.

- A network of monitoring points covering the major surface waters and aquifers needs to be set up.
- Establish effective communication channels between DWAF, the other relevant municipalities and MMLC for effective legislation, management and control of water pollution in Midrand.
- Continue developing education and community awareness programmes with regards to sanitation, waste disposal and environment in the informal settlements (some proactive work is currently being done by the Community Services Department).
- Ensure industrial discharges have the appropriate permit, in conjunction with DWAF.

## 2.2.4 Land Pollution

### Introduction

There are no formal guidelines in South Africa to characterise contaminated lands or a programme for remediation or rehabilitation. As a consequence, there is very limited data available on land contamination, and generally, little to no public information is to be found on sites that are potentially contaminated.

Land contamination may be derived from leakages, spills or dumping of waste materials, application of fertilisers, herbicides and effluents and activities which strip the surface soil covers for redevelopment, etc. Often the soil will act as a buffer between the contamination and the receiving environment, such as surface and groundwater, the atmosphere and adjacent areas. If the natural 'buffer capacity' of the soil is exceeded by the amount of contamination, the contamination may impact on other areas, specifically through mobilisation into groundwater and surface water. Soil may also be the secondary receiver of contamination where the contamination has been transported from another area.

### Current Situation

Midrand can be broadly divided into two land use types:

1. Areas in their natural state with limited impact by humans.
2. Areas that have been substantially transformed from their natural state by human activities.

In Gauteng and Midrand respectively, 56% and 35% of the land is still in natural or near natural condition. Agriculture and urban development are the dominant forms of land use by man (See Table 12). Most of the land use in Midrand is for agriculture (50%) and housing (9.3%). (See Map: Land-Use in the Midrand Area).

Table 12: Comparison of land use (in percentage of land cover) in Gauteng and Midrand.

Land use	Gauteng (%)	Midrand (%)
Natural areas		
Wetlands	0.45	0.03
Water bodies	0.50	0.14
Grassland	42.06	34.60
Bushland	3.21	0.15
Forest/Woodland	10.01	---
<b>Subtotal</b>	<b>56.23</b>	<b>34.92</b>
Transformed areas		
Urban – housing	19.29	9.30
Urban – Commercial/industrial		0.60
Forest plantations	1.37	5.66
Agriculture	20.96	49.93
Mines/Quarries	2.11	2.4
<b>Subtotal</b>	<b>43.73</b>	<b>67.89</b>

*Main issues and causes of contamination*

Land contamination in Midrand may arise due to:

- Industrial manufacturing and processing sites – potential for spillage and on-site waste disposal – historical and current.
- Formal and informal solid waste disposal sites.
- Agricultural use of land (fertilisers and pesticides).
- Lack of service provision to informal settlements such as sewage and waste management.
- Occurrence of illegal dumping.

1) Non-industrial land contamination potential

- Low-cost residential areas:  
Thembisa, Ivory Park and Winnie Mandela Park can cause particular problems due to inadequate infrastructure, specifically sanitation, waste disposal, storm water management and roads: -
  - Inadequate sanitation, such as blocked and leaking sewerage pipes and flooded manholes, will cause bacterial and nutrient contamination of soil and potentially the underlying groundwater. An estimated 75 to 300 people per square kilometre may have inadequate on-site sanitation in Midrand.
  - Erosion and sediment load into rivers caused by roads being washed away, high density movement of people impacting on grass cover leaving the soil exposed, or limited storm water management control and limited surface land management.
  - Use of coal or wood for fires because of lack of electricity will cause air pollution and in turn impact on the soil.

Impacts are associated with the high population densities found in the low-cost residential areas, eg. Ivory Park alone holds 80% of the Midrand population, and increasing development of informal settlements in these areas will only exacerbate the situation.

- Informal and illicit domestic and commercial waste disposal including litter, coal, rubble, oils, paints, tires and associated debris etc. are other main causes of land contamination.

2) Industrial land contamination potential

- Sources of industrial and commercial contamination might be derived from the storage of raw materials, or from disposal of wastes on-site. Pollution management infrastructure, such as controlled discharge of contaminated storm water and seepage, is often non-existent.
- Sources from spillage or leakage of industrial chemicals during handling, and impact on environment are often unavoidable. Improvements in waste and water management can minimise remediation requirements.

*Impacts of contamination*

In the absence of soil quality data for Midrand, contamination in Midrand is broadly based on the contamination that may occur typically to land use in certain areas and how they may impact on the land.

- Contamination from seepage, discharges and surface run-off may impact on the several water courses that run through Midrand. This may be microbial, organic, nutrient and heavy metal pollution. Soil contamination in low cost settlements, which could affect human health, has been observed. The same applies to industrial and commercial areas.
- Air pollution from domestic fires and veld fires (see Air pollution), as well as industry and vehicles, may create land and surface contamination. This may, however, be considered to be low risk because the effects are mitigated by the productivity potential of local vegetation and the wash-off effect of storm events, but this then contributes to surface water and sediment pollution.

## **Management Responses**

Land contamination is generally considered in terms of the potential impacts upon receiving watercourses, as covered by the Water Act (DWA 1998), and Minimum Requirements for the Handling of Wastes (DWA 1998).

Land contamination is generally not considered a standard assessment responsibility of MMLCs Environmental Health Officers. There has been no reported formal training, resources or capacity in land contamination investigations or procedures for EHOs to assess impacts on health and environment. There is also no formal registration of sites containing land contamination, both locally and nationally.

The local authority tends to investigate land contamination issues in response to complaints lodged with the MMLC by members of the public or in association with national authorities such as DWA or DEAT. Most complaints eg. spills from industry or sewage discharges tend to be considered in terms of protecting the receiving water courses.

Some chemical companies have adopted programs such as “Responsible Care” which develop environmental management systems with a specific focus on the minimisation and liabilities associated with waste generation.

## **Future Trends and Indicators**

As there is no soil quality data available trends could not be established. Increased commercial and industrial development, however, may be expected to increase land contamination, unless properly managed. The same will occur for increased urbanisation, particularly in the further establishment of low cost and informal settlements.

Generic indicators for land contamination or degradation are:

- Changes in vegetation, particularly cover or a decrease in diversity.
- Changes in surface water quality – run-off of contaminated storm water
- Changes in groundwater quality – indicates soil contamination
- Increased sediments in surface water bodies - erosion.

## **Gaps and Recommendations**

The whole issue of land contamination is a gap in the current system (this is both locally and nationally).

It is recommended that part of the KMC IPC implementation plan, investigate and define the significance of land contamination in Midrand and develop appropriate measures for the characterisation of the contamination, its management and control, and where necessary, its remediation. Considerable effort must also be undertaken in the future in the collection and assessment of data related to soil contamination.

It is recommended to address the following points, which are aimed to increase the information, understanding, and management of land contamination:

- Collection of relevant information:
  - Access to soil quality data should be obtained from contamination assessments.
- Education and awareness training:
  - The public and EHOs should be educated in understanding the relation between contamination causes and impacts and how to avoid and minimise contamination.
- Appropriate budget allocations:
  - Given that the number of EHOs is already limited and their job portfolio requires them to attend to a range of duties, external specialists and facilities may be needed. An expert would conduct contamination assessments and analysis.
- Urban development planning and zoning:
  - Contamination and degradation potential must be taken into consideration during the planning phase where contamination assessments and analysis would need to be conducted.
- Introduce appropriate legislation to alleviate or prevent potential contamination.

The following practical responses are recommended to management to mitigate against soil contamination or degradation (which can linked to water pollution management):

- Containment and clean up should be undertaken as soon as possible following a recent impact eg. fresh spills.
- Assessments of the extent of historical contamination and impacts should be undertaken and the impact should be managed according to the outcome of the assessment.
- To prevent erosion, improvements in storm water management and establishment of vegetation on bare ground should be undertaken.
- Good house keeping and preventative care, eg. frequent control and maintenance of water pipelines, is essential to minimise the potential impacts on the land.

## 2.3 Waste Management and Recycling

### Introduction

Urban waste management requires the full co-operation of households, communities, the private sector and municipal authorities. The waste management strategy and technologies adopted by the MMLC will determine the success of their waste operation, and in turn the degree of impact on human health and the environment. Within South African townships, waste management is usually a luxury, only considered after other basic services have been provided, such as water and energy supply. Ivory Park, a Midrand township containing more than three quarters of Midrand's population, has little or no waste management services and is therefore the focal problem area for Midrand. The situation in Ivory Park currently presents negative impacts on public health, sustainability of urban residential areas, as well as the productivity of the economy. The state of waste management, recycling and reuse is looked at within a broad national context, but with a particular focus on Ivory Park.

### Current Situation

There are obvious differences between waste produced and managed between affluent and poor communities (see Table 13). This situation is very apparent in areas of Midrand.

Table 13: Typical differences between affluent and poor communities

Affluent Communities	Poor Communities
Well organised waste management systems	High levels of littering and illegal dumping
High environmental ethics of individuals	Low environmental ethics
Recycling schemes	Little or no recycling schemes for income generation, high levels of waste recovery and scavenging.
High percentage of recoverable waste	Little or no recoverable waste

### Ivory Park:

Townships were created during the apartheid era with little or no waste management services. Ivory Park is a low-income area which contains about 80% of Midrand's population. High levels of unemployment and poverty exacerbate the situation of waste management and most of the community cannot afford to pay for services. The main waste problems in Ivory Park are littering, illegal dumping (see Figure 9 below), and the illegal operation of informal waste sites.

- Littering and illegal dumping

Main types of waste that are illegally dumped are: garden refuse, domestic waste, industrial waste, building rubble, and dead animals (385 dogs in 8 months). Littering is a problem in the informal settlements. Dry-cell batteries thrown out with the rest of the waste and used cooking oil often dumped in open veld are potentially a serious problem for health and the environment.

- Recycling

Some sections of Ivory Park are aware of waste management and recycling activities are growing because of lack of jobs and the need to generate income. Glass, all types of paper, beverage cans and plastics are recycled. Community efforts at recycling are, however, stunted because of:

- transport problems associated with moving material to buyers.
- there is only one buy back centre.

- returns on recycling are low because the buy back centre pay less than market buyers. There are four formal mini dumps and one transfer station<sup>15</sup> (Dale Road) in the Midrand area (See Map: Areas and sites of significance for waste management in the Midrand area). Only the new transfer station in Kempton Park is accessible to Ivory Park residents.

- Sanitation

There are two types of toilets in Ivory Park, the full water borne system, found in all formal houses and the aquaprivie system, found in informal settlements. The latter is run along the lines of a bucket system, where sludge is collected (weekly, monthly and six monthly basis depending on the size of the container used), transported and emptied into the main sewer in Olifantsfontein. Spillages sometimes occur on route to the main sewer. Residents dump waste into the sewer system, which causes blockages.

**Figure 9: Illegal dumping in Ivory Park**



The most important issues pertaining to waste management in the Midrand summarised as:

- High population density and the high prevalence of informal settlements with limited waste service provision.
- Unsuccessful recycling initiatives to date - due to a poor funding; poor project management skills and support; and lack of proper infrastructure to support recycling schemes.
- The high costs of transport have meant that any recycling activities have to be localised.
- The buy back centre in Ivory park has not been well supported by waste separation at source, meaning that much of the recyclable materials are taken to the landfill.
- No waste separation at source in Ivory Park, resulting in little waste being recycled, and therefore inability to support a viable recycling business.
- Much of the material that is recycled has to come from affluent areas in Midrand.
- Many residents consider domestic waste storage containers, such as skips, to be undesirable. This results in waste dumping which leads to the contamination of land and waterways.
- Residents often burn the waste in the skips (sometimes hot coal ash, batteries and other types

<sup>15</sup> The idea of a transfer station is to facilitate waste separation and sorting by ensuring that recyclable and non-recyclable material is sorted before either being sold for recycling or taken to landfills for disposal.

of waste are thrown into one skip). This leads to air pollution.

- The “Polluter Pays Principle” has not been applied to industry, and is complicated for applying it at the residential level.
- Consumer patterns have promoted the continued use of disposable packaging material.
- Waste material, sometimes used to construct fragile shack dwellings, is a fire hazard.
- There is neither a general waste site nor a hazardous waste site in the whole of the Midrand. All general waste has to be transported to Chloorkop, located in Kempton Park. Therefore any sorting of waste at Chloorkop for recycling purposes is done by people outside of Ivory Park.

The main causes of the current waste problems are:

- Rural-to-urban migration and poverty has led to illegal settling and illegal dumping.
- National and council laws and regulations have not been effectively enforced and there is little capacity within the council to enforce such laws. There is also the dilemma of having to enforce laws, while at the same time accept that most of Ivory Park is faced with high rates of poverty and unemployment which prevents them paying for services.
- Little value has been placed on waste at the national level with a disregard for environmental health and poor recycling. This has translated into poor reuse and recycling initiatives at the local level eg. Ivory Park.
- Government at all levels, with particularly the MMLC, can do a great deal more to promote waste management and recycling.
- Lack of community awareness and capacity to reuse and recycle waste.

The impacts associated with inadequate waste management are:

- Sludge spillages (from the aquaprivie system) cause land and water pollution.
- Negative visual impacts of illegal waste dumping and littering.
- Illegal dumping impacts on water resources and biological diversity of the Kaalspruit River.
- Burning of waste eg. paper, metal, or tyres causes air pollution
- Potential fire hazards in informal settlements from uncollected paper.

## **Management Responses**

- National level

In terms of Section 20 (1) of the Environmental Conservation Act 73 of 1989, all waste disposal sites which were in use or which closed after August 1990 have to be permitted. In September 1994, the Department of Water Affairs and Forestry produced the Minimum requirements for the handling, disposal, and monitoring of waste (These are only guidelines). The National Environmental Management Act (NEMA, 1999) calls for co-operative governance amongst all spheres of government for purposes of integrated environmental management.

The white paper developed by the National Department of Environmental Affairs and Tourism (DEAT) on Integrated Pollution Control and Waste Management strategy (IPC & WM) seeks to promote, within the waste management sector, sustainable development, waste minimisation and treatment, the polluter pays principle, waste avoidance, treatment and handling, storage and final disposal, management of litter, and the transportation and packaging of materials.

- Local Council

70% of the business refuse is collected in bulk containers by council (30% collected by private companies). A total of 3100 tons of waste is collected each month, of this about 1000 tons (32%) is collected from Ivory Park, Rabie Ridge and surrounding areas. Currently, local entrepreneurs, subcontracted by the MMLC, collect waste once a week from Ivory Park, but lack of proper roads in informal settlements prevents waste being collected from each household.

The local Eteke Environmental Group in Ivory Park is involved in various community campaigns, such as clean up campaigns and the buy back centre for a recycling project. The project has the support of local council and council officials participate as ex-officio members. There is one newly built transfer station where collected waste is supposed to be separated for recycling purposes.

- Policy and legal responses

Much of the legislation that is in force in Midrand is either nationally derived, or is outdated.

- Institutional capacity and enforcement

Waste management in Midrand is controlled by the MMLC's solid waste department. This department is responsible for employing, organising, and supervising employees dealing with waste management. The solid waste management's staff complement is as follows: -

Table 14: Staff complement in the solid waste department.

General workers	Supervisors	Senior Staff	Total
107	3	2	112

The Midrand Environmental Health Section is headed by a degreed person with water, noise and air pollution certificates. The two regional officers have B-Tech Degrees, and the ten Health Officers in the department hold national Diplomas or B-Tech Degrees. There is a need to increase the staff complement of these two departments in order to improve the council's institutional capacity to enforce legislation.

- Paper, glass and can recycling

a) Paper: A Mondi operation in Halfway House recovers between 800-1200 tons of reusable papers from local industries, homes, schools and offices. The supply from Ivory Park mainly comprises of newspapers and magazines. Paper recycling has not been successful in low-income residential areas because there is very little paper use compared to affluent areas.

b) Glass: Consol, currently responsible for glass recycling, has decided to outsource its function to the Glass Recycling Association (GRA). This is because of inadequate source separation, which forced Consol to do it, costing them large amounts of money. GRA buys glass at lower rates than Consol and the community is not happy with GRA work strategies and management at local level. Overall glass recycling has not been successful because it is difficult to sort and pays less than paper. Advantages of bottlebanks have not been realised.

c) Cans: Collect-a-can, subsidised by ISCOR, recycles beverage cans. Collect-a-can supplies storage bags on loan to can collectors and payment varies depending on whether they have to collect the cans or not.

The council responses are largely reactive and any involvement has been minimal. Lack of funding and project management capacity has hindered the success of any recycling initiatives.

## **Trends and Indicators**

If employment, poverty alleviation and services are not provided, with increasing population trends, the environmental situation will only get worse. If recycling is not funded or subsidised, current initiatives will fail. Continued dumping in rivers will only lead to further water pollution and impacts on biodiversity. Current lack of accurate data with regard to amount and volume of waste products prevents statistical projections and proper management responses.

Indicators for changes in waste management are:

- Decreased industrial dumping (visual)
- Decreased littering and illegal dumping in open spaces
- Increase in the number of successful income generating recycling schemes and transfer stations.
- Competitive waste collection services, and less dominance by one or few companies
- Increase in number of formal houses and provision of user-friendly waste storage facilities.
- Increased use of returnable/reusable packaging.

## **Gaps and Recommendations**

Gaps in the current system are:

- Information regarding waste produced and dumped is too general. Many studies have focussed on provincial issues or the whole of Kyalami and more attention needs to be given to Midrand, particularly Ivory Park. Little attention has been given and statistics unknown in terms of recyclable and non-recyclable material produced.
- The information that does exist is not easily accessible to the Ivory Park community. Specific impacts per waste type and source are needed.
- The benefits of recycling are not widely known. Lack of awareness.
- Battery, used oil, and tire waste need to be quantified to establish recycling potential.
- Lack of policy or legal responses from the local council to address waste management largely due to the MMLC having limited resources.
- Limited resources and capacity within MMLC to upgrade waste management in Ivory Park and aid recycling initiatives.
- Poor infrastructure in terms of recycling requirements eg. there are no waste dumps within Midrand and only one buyback centre.

Recommendations:

- Educational initiatives and awareness by council on waste management and recycling.
- Improve community access to waste and environmental information.
- Quantify and monitor waste production and management. The impacts of improper waste management must be monitored and mitigated
- Increase law enforcement, coupled with adequate service provision, and promote initiatives like “adopt a pavement/street” schemes where communities can take pride in keeping their streets clean.
- Public release of information on hazardous waste and its effects.
- Development of hazardous waste inventories.
- Compulsory transport tracking of all hazardous waste that passes through communities

such as Ivory Park.

- Formation of small co-operative recycling enterprises that can promote recycling. Such enterprises are more likely to attract funding than individuals.
- Subsidisation of funding for community based recycling schemes. These should be developed as an integral part of integrated waste management in Ivory Park.
- An integrated waste management strategy by council should include educational initiatives, waste separation at source, sorting, and the funding of a transfer station as well as a buyback centre.
- There is a need for effective lines of communication between the MMLC, and other councils whose activities, may affect the Midrand environment.

#### Recycling:

- People cannot live on recycling nor will it make them rich. As a first step, council should decide what they want to achieve through recycling.
- Council should legislate waste sorting and separation at source. This will ensure that all recyclable materials end up being recycled. Council could encourage recycling by providing residents with two bags for waste separation at source. The two types of waste can then be collected on separate days. The priority should be on separation at source. Currently most of the recyclable domestic waste is being thrown away because it is mixed with organic waste.
- Council should be responsible for the construction of recycling infrastructure such as the shed at Chloorkop, and the buyback centre being run by Iteke. Council can then have someone manage recycling by open tender.
- The waste bank initiative should not presuppose that residents have transport to take their materials to the various banks that exist.

#### Priority areas:

- Informal settlements should be treated as a priority area because this is where domestic waste dumping is rampant. The Kaalspruit river is threatened by illegal dumping.

## 2.4 Household Energy Use

### Introduction

Household energy use in Midrand is focussed primarily on Ivory Park. There are two reasons for this:

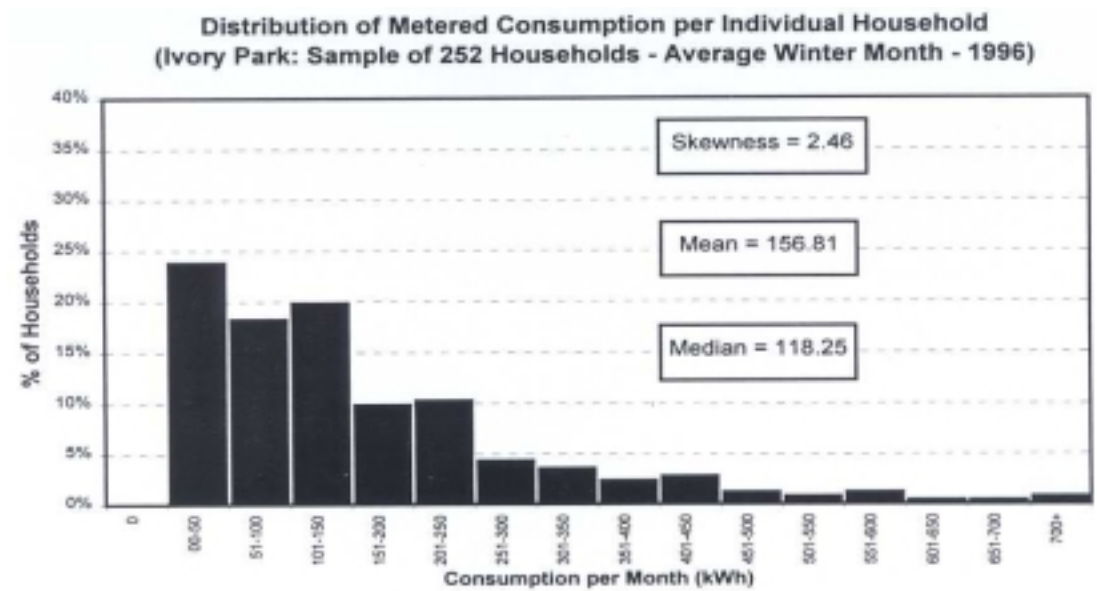
- Approximately 80% of the people in Midrand live in households located in Ivory Park. While basically all formal households in Ivory Park are electrified, most households still use other fuels that are less expensive. In addition, there are a great number of informal households in Ivory Park. These low-income households use a wide range of energy sources that are mostly inefficient and environmentally unfriendly.
- The middle and higher-income housing areas of Midrand are all supplied with standard electricity services. This energy use is relatively efficient and has low levels of negative environmental impact on Midrand.

For the purposes of this report and due to lack of data on up-to-date information, a household survey in Ivory Park was undertaken. A total of 40 households and nine energy businesses were interviewed, using specifically developed questionnaires. Ivory Park largely represents the situation in other, smaller low-income settlements. While residents of Ivory Park expressed their dissatisfaction with their energy situation, they indicated that there are much more important issues for them, such as the provision of healthcare, safety, water, and waste removal.

### Current Situation

Midrand is serviced through two electricity suppliers, Eskom Central Distribution and the MMLC. As far as developing areas are concerned, Eskom is the distributor for Ivory Park, Ebony Park and a small portion of Olifantsfontein. The MMLC is the distributor for Rabie Ridge and Clayville. Furthermore, the Kempton Park/Tembisa MLC will supply electricity to the Winnie Mandela Township. While formal stands in Ivory Park reached electrification saturation levels in 1995, informal stands are largely unconnected. There are plans to establish about 1000 and 7000 electrical connections in Olifantsfontein/Clayville (Eskom) and Winnie Mandela Township (MMTC) respectively. (See Map: Energy sources and zones in the Midrand area).

In February 1999 the average monthly electricity consumption per household was 225 kWh/month (Figure 10 shows average electricity consumption during winter months in 1996 in Ivory Park). This indicates a rather low usage of electricity compared to other typical urban and suburban areas, where the monthly consumption is in the region of four times this figure. It also indicates that other energy sources such as coal are used to supplement electricity.



Generally, those people with high electricity usage levels are more satisfied than those using “other energy” sources. Dissatisfaction arises mostly because of the costs of energy use rather than the services supplied (See Figure 11 and 12).



**Figure 11: Responses by Ivory Park residents to the question “How satisfied are you with your energy situation?”**

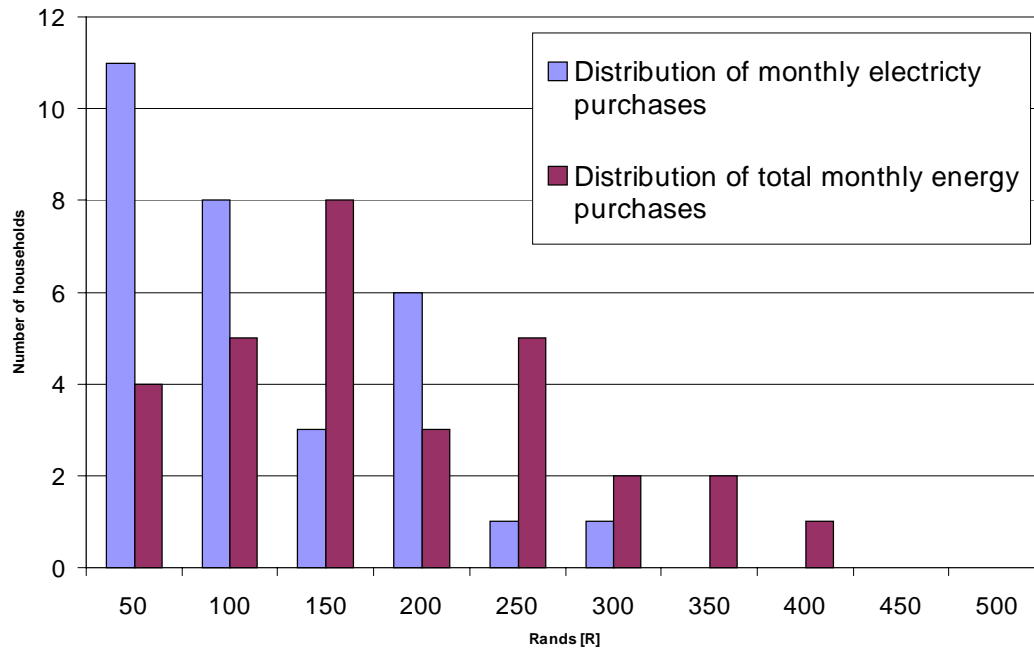
Ivory Park meets its “other energy” needs mostly from spaza shops, general dealers, and coal yards. There is a high demand for paraffin (30 litres/customer/month) and candles (two boxes/customer/month) in spaza shops and general dealers. An average customer buys about seven 5kg-bags of coal per month (see Map: Energy sources and zones in the Midrand area for existing coal yards in Ivory Park).

The general energy situation in Ivory Park is problematic for the following reasons:

- All households rely on a mix of energy sources, most of which are pollutant. Informal households rely mostly on low cost, low-grade coal for heating and cooking. Affluent households also use an energy mix because of the sometimes insecure electricity supply and

low costs of coal. The environmental and health impacts of coal use are much higher than for electricity.

- Low-income households spend a disproportionately higher amount of their income on energy than medium and high-income households (see Figure 12). This is due to poor economies of scale – buying small quantities of fuel at a time – and inappropriate choices of fuel and appliance, which leads to inefficient utilisation of energy sources.
- Housing is of poor quality and urban design has been badly planned. The iron sheets used for shacks are good transmitters of energy and therefore extremely ill-suited to keep a house warm. Few houses are orientated to maximise the thermal benefits of the sun and few have ceiling boards which prevents warm air from escaping.
- A big problem is the lack of proper stoves that have pipes or vents. Many households have open fires in their homes where the smoke generated is allowed to escape. This is very energy inefficient and has health implications.
- Poverty and the limited availability of disposable income prevents households from being more effective and efficient in their energy use, like using ceilings and thermal insulation, gas or electrical cookers. Most of the dwellings are low-cost and little or no measures have been undertaken to insulate the dwellings.
- A large number of informal households are not electrified and many use illegal energy connections.
- The less affluent households rely on candles and paraffin for energy and are exposed to health risks, like fires and paraffin poisoning.
- Access to full range of energy services is restricted due to poor distribution and availability of retail outlets, especially for gas.

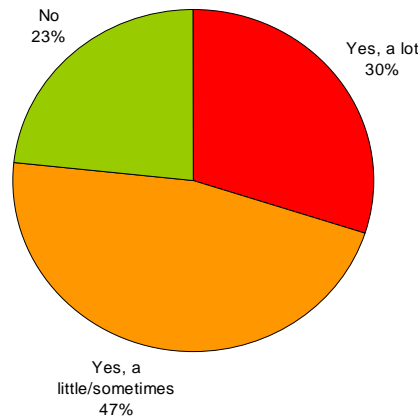


**Figure 12: Frequency distribution of monthly electricity purchases versus monthly total energy purchases.**

Impacts from the described energy situation are:

- Health – eight out of 30 formal households interviewed has at least one person with respiratory problems, which is regarded as significant (Figure 13).
- Safety – such as burns, explosions or poisoning.

- Environment – air pollution and unsustainable burning of trees and shrubs.
- Property – destruction from fires.



**Figure 13: Responses by Ivory Park residents to the question: “Do you have smoke in your house?”**

### Management Responses

- The most significant energy intervention has been the provision of basic electricity services in Ivory Park starting in the early 1990’s. MMLC also electrified the neighbouring smaller settlement of Rabie Ridge.
- Other programmes have not been implemented although there has been awareness of broader energy issues. A FINESSE<sup>16</sup> initiative involving MIDDEV failed to ignite a commercially viable business. This involved providing hot water on tap to households in Ivory Park using solar energy which cost less than using coal and is also more environmentally and health friendly.
- A range of enabling activities, however, have been started and planned. These include development of business plans under the FINESSE programme, household energy studies, and placement of a SEED (Sustainable Energy & Environment Division) advisor in MIDDEV.
- Energy studies have been undertaken in Ivory Park, such as a household energy and hot water consumption survey, and an electrical load monitoring study was undertaken by Eskom.
- Midrand is likely to become a partner in the urban sector of the DANCED-funded Sustainable Energy, Environment and Development Programme (SEED) which is undertaken by the Energy & Development Group.

### Trends and Indicators

Future trends predicted are:

<sup>16</sup> Energy & Development Group (1997), FINESSE (Financing Energy Services for Small-Scale Energy Users): South African country study, SADC Energy Sector – TAU and UNDP Energy & Atmosphere program: Sustainable Energy & Environment Division.

- Increased population (15% growth per annum in Ivory Park) will cause concomitant increase in the number of households, particularly in the informal attached settlements that are not officially recognised to date. Increase in the combustion of coal will occur if these areas are not electrified.
- Increase in household income, which will lead to increase choice of electricity over other energy sources, and reduction in fossil fuel burning.
- Increase use of electricity as households buy electricity appliances.
- Energy consumption is expected to increase slowly but constantly.

Indicators for determining any changes directly related to problems identified in Ivory Park are:

- Percentage households electrified.
- Percentage of house with energy efficient features eg. ceilings (formal only).
- Percentage houses using renewable energy (ie. solar water heaters).
- Number of households using clean fossil fuels (LPG or low-smoke coal)
- Number of households using coal stoves as opposed to open fires.
- Number of houses with proper pipes attached to the coal stoves.
- Number of respiratory problems per 1000 households per year.
- Number of fire-related accidents per 1000 households per year.

### **Gaps and Recommendations**

Gaps identified are:

- While MMLC has provided electricity, the realities of using multiple fuel types that characterise low-income housing has not been dealt with adequately. The use of coal will continue to play a dominant role in households of Ivory Park because of its low cost and measures to lessen the impact of coal burning need to be taken.
- There is no reliable data on: -
  - Consumption of coal, batteries, candles and paraffin.
  - Energy related sales of spaza shops, general dealers, as well as coal yards.
  - Uncertainty around data on health problems (respiratory and poisoning) and fires.
- The lack of an energy policy framework for Midrand within which to plan and implement better energy services.
- The lack of a national energy management plan for the implementation of more effective energy services.
- The lack of effective regulation and enforcement in the sale and use of different energy sources.
- Lack of administrative capacity to manage, monitor and control different energy uses.
- Households do not have knowledge or awareness about energy efficiency, such as insulation measures, or access to information about the costs and benefits of the full range of energy services.
- Lack of energy related waste schemes to monitor and regulate the disposal of dry-cell batteries and ashes from coal or wood.

Recommendations:

- The development of concrete plans and regulations regarding the inclusion of energy efficiency and conservation measures in all levels of household energy use.

- Establish a regulation that aims at phasing out pollutant fuels, and progressive enforcement of such regulation.
- The encouragement of the use of renewable energy, such as solar water heaters eg. FINESSE initiative.
- Provision of low-smoke coals (anthracite) and phasing out the presently used low-grade coal.
- Development and implementation of programs and regulations aimed at the use of proper coal stove (with vents), instead of open fires.
- Establish a network of gas depots through local entrepreneurs.
- Monitoring and quantifying sales at energy suppliers (spaza shops, general dealers, and coal yards).
- Development and implementation of a health and safety awareness programmes.
- Implementation of an energy awareness campaign using the Soul City Household Energy booklet - *Using energy in the home*.
- The establishment of recycling schemes for dry-cell batteries (in conjunction with the waste component of this report).