Monitoring and Mapping of Repeat Disasters in the Cape Town Metropolitan Area

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Executive Summary

In 1999 the Disaster Mitigation for Sustainable Livelihoods Programme (DiMP) at the University of Cape Town developed *an approach for tracking recurrent urban disaster losses*, known as MANDISA **(Monitoring, Mapping and Analysis of Disaster Incidents in South Africa).** This approach, developed in collaboration with a range of local partners, aimed to monitor both declared 'disasters', as well as large, medium and small scale incidents. MANDISA consolidates information in text as well as GIS formats, allowing for both spatial and temporal analysis of many different disaster types, with differing impacts and scales. This initiative to track recurrent and small-scale incidents was encouraged by the experience of LaRed in Latin America, and the disaster events database *DesInventar.*

MANDISA was initiated as a pilot study in the Cape Metropolitan Area (CMA) to record incidents for 1990-1999. However, after consolidating incident reports from over 12 different sources, which included Fires Services, Social Services and the Red Cross, approximately 12 500 incidents were identified for the period 1990-1999.

The City of Cape Town Mayor's office has recognised the need for robust risk information in the Metropole to be able to track changing trends in disasters. In light of this, UCT/DiMP was commissioned to update the MANDISA database from 2000 to 2003. The scope was subsequently extended to include 2004. To date UCT/ DIMP has been successful in the following:

- Approximately 11 000 records collected
- Capturing of records for 2000 to 2003 complete
- Capturing of 50% of the records for 2004 complete

An initial analysis was conducted with records that have been collected for 2001 to 2004. It shows that there has been an increase of 53% in the dwellings damaged by informal dwelling fires between 2001 and 2004. There has been an increase of 283% of dwellings destroyed.

One purpose of this report is to discuss the challenges and constraints in the collection and consolidation of disaster incident records. The fire records were collected from the different fire control centres across the Metropole.

During the collection of fire incident records, informal discussions were held with fire fighters on the ground. These discussions revealed the numerous challenges that they face on a day-to-day basis. There were also many challenges that the UCT/DiMP project team faced in the collection process. These challenges include the following:

- Uneven storage of incident reports across the Metropole. The storage of information relates to the storage of the hardcopy incident reports. In certain areas there is not enough physical space to store information.
- Uneven quality of information.
- Low levels of computer literacy amongst fire fighters who must complete electronic reports.
- There is no dedicated IT or database person in Fire Services.
- MANDISA dataset is incomplete due to an Emergency Services System (ESS) design problem. ESS is the incident management system used by Fire Services.

In February 2005, a workshop was conducted with relevant stakeholders to determine practical outputs that could be generated to assist with planning and other activities. Recommendations from this workshop include the following:

- Generate a macro risk map for the Metropole. Initially this would focus on informal settlement fires but the methodology would be used to generate maps for other types of fires. This would be used for planning and the allocation of resources.
- Comparative analysis of various areas should be conducted to determine the drivers of risk.
- Micro analysis that focus on a particular area should be conducted.
- Enhance the Metropole's risk monitoring and analytic capabilities by linking the MANDISA database its intranet.
- Establish a forum that focuses on informal settlement fires.

Acknowledgements

The Disaster Mitigation for Sustainable Livelihoods Programme (DiMP) would like to thank the City of Cape Town Mayor's office for their support in this project. Also thanks are due to the Fire Services and Disaster Management within the Metropole for their ongoing assistance.

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Part 1 Introduction

1.1. Background

The City of Cape Town Metropole has experienced spectacular informal settlement fires in the last ten years. The most notable of these was the fire in Joe Slovo, Langa in 2000. This event was declared a national disaster. Since then there have been other areas that have hit headlines. These include Imizamo Yethu in Hout Bay (February 2004) and more recently another large fire in Joe Slovo (January 2005). This has forced attention to the issues that affect the households in informal settlements and the factors that drive fire risk in those areas. Unfortunately disaster risk information is currently not very well consolidated in South Africa. This makes it difficult for practitioners to access information to inform intervention programmes.

The Disaster Management Act (no. 57 of 2002) was promulgated in 2003. This progressive legislation focuses on reducing the risk of vulnerable communities and households. The draft National Disaster Management framework requires district municipalities and metropoles to report on recurring events. This would include not only the declared disaster events, but also the smaller events that usually go unnoticed. This would assist to identify at risk communities. The City of Cape Town has recognised the need for robust risk information, putting it in line with the requirements of the Act and the proposed Framework.

The University of Cape Town, through its Disaster Mitigation for Sustainable Livelihoods Programme (DiMP), has developed a powerful database that allows planners and managers to track changing trends in disasters. At the start of 2004 MANDISA (Monitoring, Mapping and Analysis of Disaster Incidents in South Africa) contained approximately 12 000 incidents from 1990 to 1999. With generous funding from the City of Cape Town, the process of updating the information in MANDISA commenced in May 2004.

This report aims to focus on the process of collecting and capturing data. This would include reflecting on information gathered through informal discussions with fire fighters. The challenges to them and to the project team are looked at. A consultative meeting was held with officials from the City. Suggestions from this meeting are included.

The report is structured in the following way:

- Part 1 Introduction
- Part 2 Collection of fire records in CoCT
- Part 3 Analysis and capturing of fire records for CoCT
- Part 4 Analytic capabilities of MANDISA: defining end user needs
- Part 5 Recommendations

At the end of each chapter the key points of that section are listed in a text box.

1.2. Methods Used

This section details the methodology used for collecting, analysing and capturing the fire data. It also shows the manner in which the recommendations in Part Four were reached.

1.2.1. Collection of Incident Reports

The acting head of the Fire Services was approached to gain access to the incident reports. Once this was done, the fire control centre in each local administration was contacted to arrange collection.

The method of collecting the fire data varied across the Metropole. It generally entailed a combination of photocopying hardcopies and printing out electronic incidents. Data from 2003 onwards were printed from ESS in the Goodwood Control Ccentre.

Incidents on ESS are assigned different statuses by the Fire Services depending on the completeness of the report. These different statuses - 'not updated', 'incomplete' and 'complete' – are described below.

'Not updated'
When a caller reports a suspected fire, the call-taker captures all the details of the caller. She/he also captures the location and suspected type of the fire. The call-taker then alerts the fire fighters. At this point the status of the incident report is 'not updated'.

'Incomplete'
Once the fire fighters have returned from the call, the lead officer adds details to the report. This would include the type of fire, a description of the damage and the resources used. The details need to be added within a certain time period after the incident has taken place. The status of the report changes to 'incomplete' once the lead officer has added to the report or if the set time period has elapsed.

'Complete'
Only once a senior officer has checked and signed off the report is it 'complete'.

When the collection of the data for MANDISA was underway, a number of reports were found to be 'incomplete'. In these cases it was necessary to go back to hard copies to acquire the completed report.

1.2.2. Analysing and Capturing of Incident Reports

After the data were collected and filed by UCT/DiMP, they were captured electronically into the MANDISA database. This task cannot be undertaken by unskilled data-capturers and requires data analysts specially trained to understand Cape Town's disaster risk profile as well as the varying recording formats from different disaster management and fire control centres. MANDISA's data analysts must be skilled to interpret the information in the incident report before entering it into the MANDISA database.

The information that is captured includes:
- the location, which is mapped,
- the date
- the type of fire
- the source of the information.
- the cause of the fire if it is recorded in the incident report. Often times the cause of a fire is unknown, as the fire fighter does not have the time or the authority to conduct a forensic investigation after an incident.

- the impact of the fire. This includes those dwellings that are damaged and destroyed. The cost to the service responding is also entered. The amount of water used in responding to a fire can be entered into the database. This is particularly relevant in the drought currently facing the Metropole.

1.2.3. Determining the way forward

A workshop was conducted with officials from the City of Cape Town Metropole and other relevant role-players. The purpose of the workshop was to determine the needs of the possible users of the information in MANDISA. The format and detail of the information was also discussed.

The participants made several recommendations. These are discussed in this report.

1.3. Ethical considerations

In order to ensure confidentiality of information provided by resource people in the course of collecting and capturing data will not be referred to by name, but rather by official designation or local administration.

Part 2 Collection of Fire Records in CoCT

Fire incident records were collected for 2000 to 2003 initially and then 2004. There were many challenges with the collection of the data. This section looks at how the records were collected and outlines the challenges associated with it.

This section includes the following:

- The context within which the records were collected. This looks at the institutional aspects within which the records are kept.
- The challenges in recording and collecting fire records. This would include those faced by both the fire fighters as well as the UCT/DiMP project team.

2.1. Context within which records collected

In 2000 the new City of Cape Town came into being. It amalgamated six metropolitan local councils. These include Blaauwberg Municipality, City of Cape Town, City of Tygerberg, Helderberg Municipality, Oostenberg Municipality, South Peninsula Municipality and the Cape Metropolitan Council. Administratively the metropolitan still operates under these names.

Before 2000, each fire services in each local council used a different incident management system. There was no uniform method of reporting and recording of fire incidents. For example, in one local administration a system called the Fire Management system (FMS) was used. Upon amalgamation a slow process of moving onto the same system started. This was done in a phased approach. In 2003 all the administrations were moved onto the Emergency Services System (ESS), which is a DOS based system.

There are currently six fire control centres in the Metropole, one in each local administration. The main control centre is located in Goodwood, which doubles as the centre for the Tygerberg administration. This is where the server for ESS is housed and all records are stored. The fire control centres in other local administrations are connected to this server.

2.2. Challenges in recording and collecting fire records

There have been many challenges in collecting the data for MANDISA. Some are a direct result of the challenges that are faced by the fire fighters to record the incidents. Other challenges were faced relating the information management system used by the fire services.

2.2.1. Challenges faced by the fire fighters

The collection of the fire data for the MANDISA database entailed visiting all the control centres in the Metropole. In many centres there was great support for the work being conducted. A number of informal discussions between the project team and the fire fighters took place. These discussions shed some light on the challenges that they face both in responding to as well as recording the fire incidents.
Some of the critical challenges include:

- Difficulties in maintaining response capabilities given the rate of growth and expansion of the Cape Town metropole
- Difficulties in sustaining connectivity to the ESS system located at Goodwood Fire Control Centre, and implications this has for accurate electronic recording once connectivity is restored.
- Low levels of computer literacy among fire fighters
- Inaccessibility of ESS
- Declining human resources

Difficulties in maintaining response capabilities

Cape Town's rapid growth and expansion has created increasing pressures on critical services such as fire fighting. For example, many active fire fighters reported lack of resources, pressure in the hoses and taps when fighting a fire and low number of fire fighters on duty on a given day.

Difficulties in sustaining connectivity to the ESS system located at Goodwood Fire Control Centre

Previously it was stated that the fire control centres are linked to the ESS to the main control centre in Goodwood. This has resulted in connectivity problems in certain areas. In one local administration ESS is not operational at least once in the month in the last year. When this happens the fire fighters record all calls in a logbook. They record only the date, location and type of fire. When ESS is running again they are meant to complete the incident reports in the book. This is made difficult, as the loss of connectivity is a regular occurrence. The particular control centre also has only two computers connected to ESS.

Low levels of computer literacy among fire fighters

There are low levels of computer literacy especially amongst the older fire fighters. This makes them reluctant to complete the electronic incident reports. In one administration it was said that the call-taker first writes all the details of the call on a piece of paper and then alerts the fire fighters. Once this is done does he logs the call onto ESS. This was done as the call-taker could only type with one finger and so could not type while speaking on the telephone.

Inaccessibility of ESS

ESS is also not a very accessible and user-friendly system. It is a DOS based system and there are no drop-down menus so fire fighters can easily choose categories that are used repetitively. This adds to the reluctance to use the system.

Declining human resources

It seems from the informal discussions that the number of fire fighters has diminished over the years. Studies have shown that the number of fires is increasing. This has put a strain on the capabilities of the fire services, especially in terms of recording incidents and managing the information. There is no dedicated IT or database personnel in the fire services. These duties have been allocated to fire fighters who have managed remarkably thus far, but these skills are not part of their core expertise.

2.2.2. Challenges faced by the UCT/DiMP project team

The UCT/DiMP project team faced many challenges in collecting the data from fire services.

There was a challenge in terms of the technical resources needed to copy incidents. In one local administration the photocopier could not do bulk copies as it was very old. An alternative means of copying the records had to be found. In the same administration the incident management system used before the amalgamation was run off a computer that used the Windows 3.1 operating system. A printer was necessary to obtain the records. The stiffy drive on the computer did not work so the drivers for the printer (the programme that allows the printer to be used) could not be loaded onto the computer. The project team had to use its own printer as those drivers were on the computer. Numerous logbooks had to be looked at to find structural fire incidents. These were then printed off the computer.

In another local administration the photocopier gave problems as well. It jammed continuously and resulted in three months of incident reports taking half a day to be copied as opposed to only one hour. After much negotiation with the fire services, the machine was sent for repairs and copying could continue.

In some areas the storage of incident reports is problematic. In one local administration there was not enough space to store hard copy reports. This resulted in old reports being destroyed to make more space. There are other areas however who have a very good storage system for their incident reports.

Once all the 'complete' incident reports until 2003 were copied, a list of the incomplete reports was obtained. The team attempted to locate the hardcopies for these incidents but were largely unsuccessful. The number of 'complete' and 'incomplete' reports for 2001 to 2003 is shown in Table 1. The year 2000 is not shown, as all the local administrations were not using ESS at that time. South Peninsula is not included as all the incidents are stored in hardcopy format for this local administration. The number of records recovered was very few. A request for the records has been lodged repeatedly with the different control centres but nothing has been forth coming. One administration has admitted to not having the information.

Table 1: 'Complete' and 'Incomplete' Incidents

Municipality	2001		2002		2003	
	Complete	Incomplete	Complete	Incomplete	Complete	Incomplete
Blaauwberg	165	--	187	118	235	51
City of Cape Town	730	13	906	201	666	252
Helderberg	41	123	58	162	111	138
Oostenberg	41	76	58	189	7	259
Tygerberg	360	115	588	322	701	300
Total	1 337	327	1 797	992	1 720	1 000

In trying to find the 'incomplete' incident reports, an opportunity was given to see the storage system of the hardcopy information. In some instances, storage of hardcopies is urgently in need of improvement. In some areas piles of documents could not be traced. There was no system to keep track of the reports.

Incident reports have been collected for 2000 to 2004. The total number of reports collected is shown in Table 2 for each municipality. This totals to approximately 11 000 incidents.

Table 2: Total number of records collected

Municipality	2000	2001	2002	2003	2004	Total
Blaauwberg	151	129	224	187	159	850
Cape Town	527	723	745	663	732	3 390
Helderberg	238	58	55	58	193	602
Oostenberg	118	114	207	143	38	620
South Peninsula*	1271	1358	780	594	240	4 243
Tygerberg	0	168	433	638	439	1 678
Total	2305	2550	2444	2283	1801	11 383

*2000 to 2003 includes bush and grass fires

An initial analysis was run on a specific informal settlement. In doing this it was discovered that the MANDISA dataset was incomplete despite having printed all the information from ESS and photocopying reports. The exact problem could not be identified. It is suspected that it is related to the way one queries ESS, which in turn is linked to its design.

The design problem is illustrated in the following example. The project team asks ESS for all building fires when running a query. When doing this some building fires seem to be left out. It has been recommended that the entire ESS database be electronically exported. This information should then be sifted through to find all the building fires.

Key Points

- Uneven storage of incident reports
- Uneven quality of reporting
- Uneven infrastructure
- Low levels of computer literacy
- No dedicated IT or database person in Fire Services
- ESS design problem
- Approximately 11 000 incident reports collected

Part 3 Analysis and Capturing of Fire Reports for CoCT

DiMP has been successful in consolidating and capturing fire incident reports from 1999 to 2003. The fire reports for 2004 were also collected. Fifty percent of these have been captured into the MANDISA database as the collection of these records took place in February 2005. Table 3 shows the percentage of the records captured.

Table 3: Percentage of collected records captured

Year	Percentage Complete
2000	100%
2001	100%
2002	100%
2003	100%
2004	50%

An initial analysis has been conducted with the data captured in MANDISA. The analysis examined the number of dwellings that had been fire affected between 2001 and 2004. This included dwellings both damaged and destroyed. The analysis indicated that between 2001 and 2004 11 178 dwellings had been affected, as indicated in Table 4 below. This is made up of 6 029 destroyed and 5 149 damaged over the four year period. This is with only 50% of 2004 captured.

Table 4: Total number of dwelling affected by fire for 2001 to 2004

Year	Destroyed	Damaged	Total
2001	635	1 262	1 897
2002	1 208	1 104	2 312
2003	1 752	847	2 599
2004	2 434	1 936	4 370
Total	**6 029**	**5 149**	**11 178**

Figure 1 shows the total number of dwellings damaged and destroyed from 2001 to 2004. As can be seen the number has been increasing for both. Figure 2 and Figure 3 shows the trend for both damaged and destroyed. These figures represent an increase of 53% in the number of dwellings damaged and a 283% increase in the number of dwellings destroyed in informal dwelling fires.

Figure 1: The number of dwellings affected by fire for 2001 to 2004

***2004 capturing still in process**

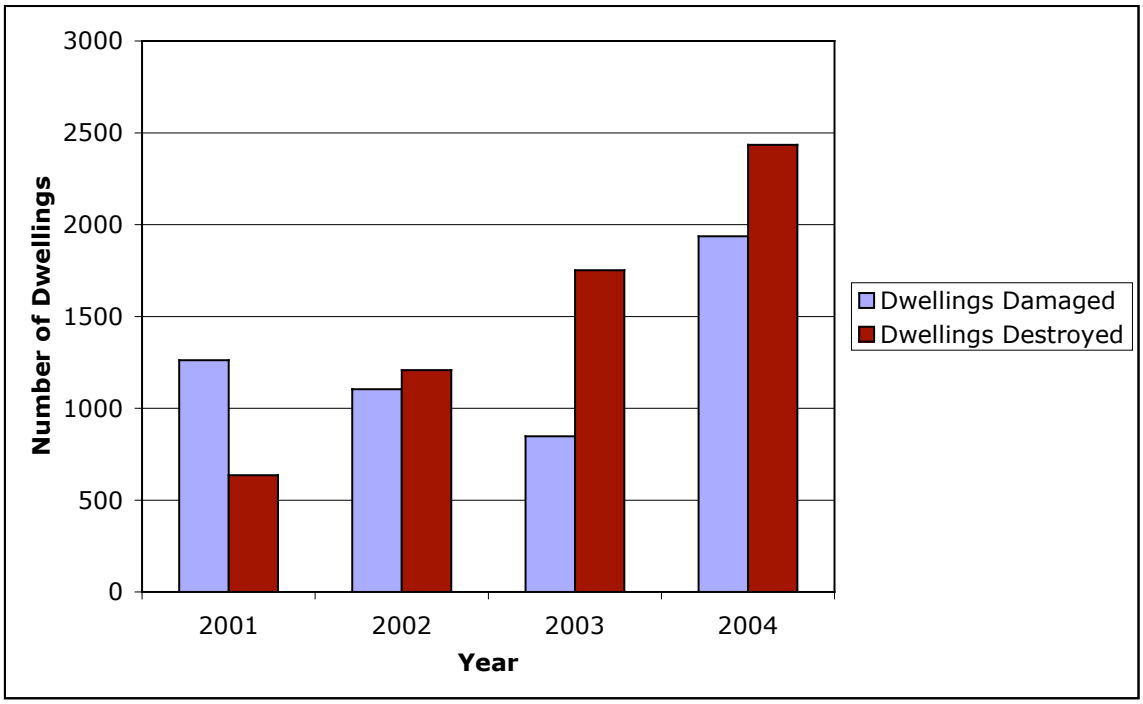


Figure 2: Trend of dwellings damaged for 2001 to 2004

***2004 capturing still in process**

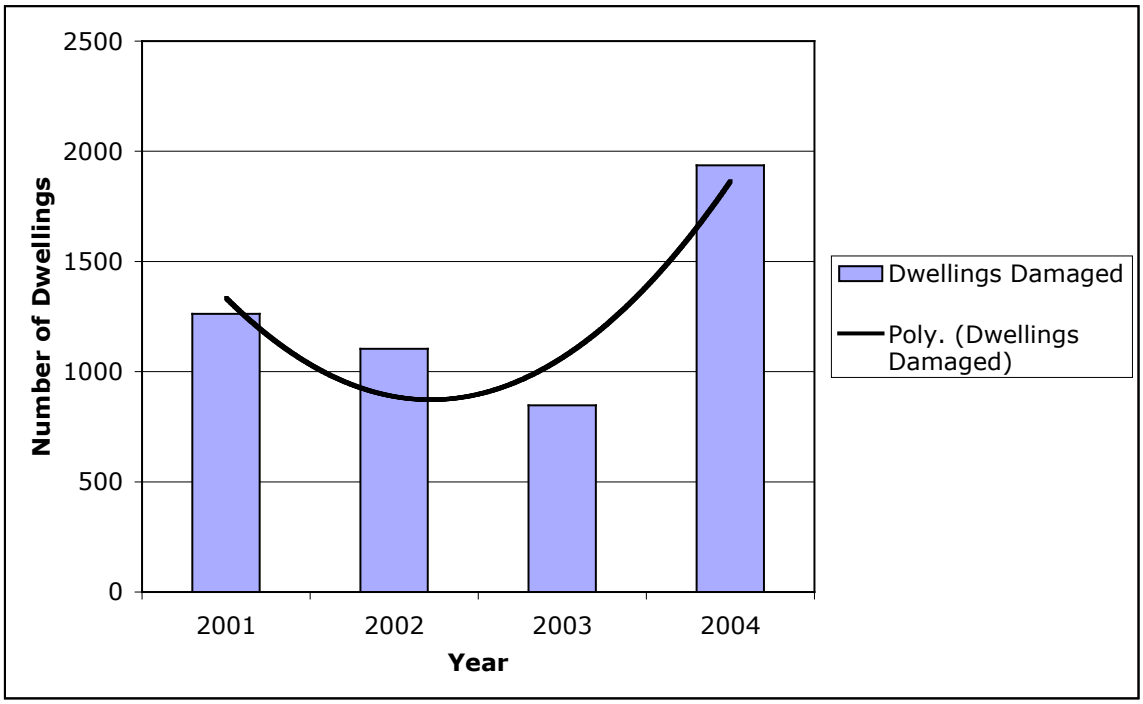
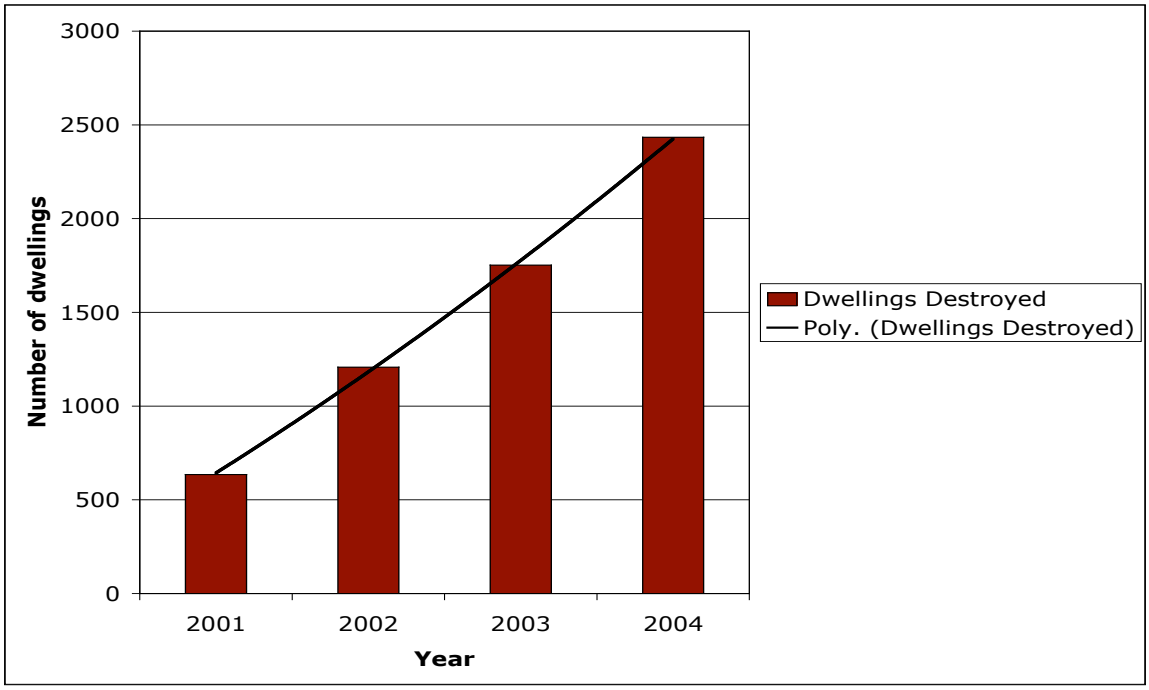


Figure 3: Trend of dwellings destroyed for 2001 to 2004

***2004 capturing still in process**



Key Points

- All information collected for 2000 to 2003 has been captured
- 50% of 2004 has been captured
- Initial analysis of the information collected shows an increase in the number of dwellings affected by fires

Part 4 Analytical Capabilities of MANDISA: defining end user needs

MANDISA has analytical capabilities which enable an analysis of fire incident reports both spatially and temporally**.** This involves generating maps, tables and graphs. The tables and graphs assist in determining trends over time. These analyses can be conducted at different levels. The levels of analysis would include the following:

- Macro, which looks at the entire Metropole. This enables comparison of local administrations
- Meso or Intermediate, which looks across two or more suburbs or settlements.
- Micro, which focuses on one suburb or informal settlement.

Each will be discussed in this section.

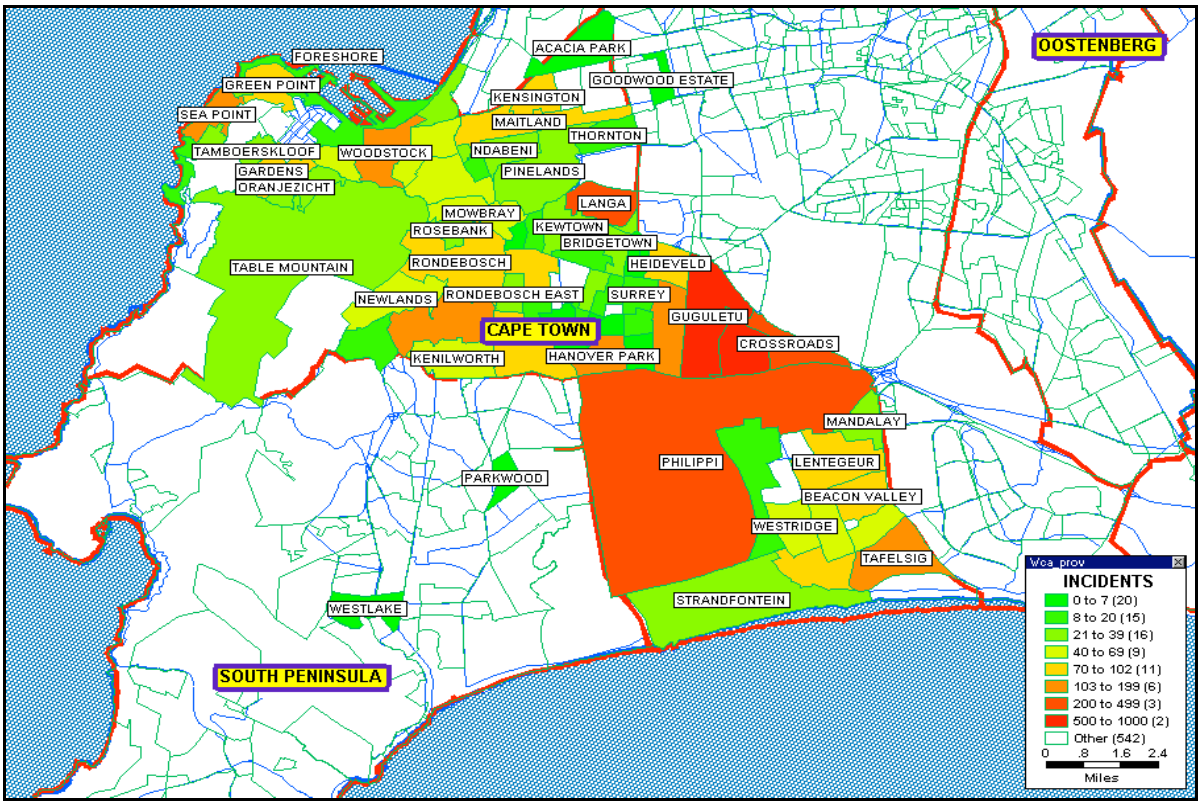
In February 2005, a consultative meeting was held with representatives from various departments within the City of Cape Town as well as other stakeholders, which included non-governmental organisations and Provincial Disaster Management. The purpose of the meeting was to define the user needs of City of Cape Town officials. This meeting was critical in ensuring that the analytical outputs generated from MANDISA would be useful and support local planning needs. The following were recommendations presented at this consultative meeting.

4.1. Macro Analysis

Participants at the meeting recommended a Macro analysis. The analysis will include the graphic representation of fire incidents across the Cape Town Metropole. An example of this kind of map is shown in Figure 4. This is a dated map and is not an accurate representation of the data that MANDISA currently has. This kind if map will enable a comparison of fire frequency and severity across the seven administrations. The seasonality of fire incidents could similarly be explored. The generation of these macro level maps for the Metropole where identified as being most useful in assisting with planning (at what level) and resource allocation. It would be ideal to do this for every type of fire, but more practical to start with informal dwelling fires.

As this Macro level analysis will be used to support planning and resource allocation it was recommended that the maps, tables and graphs be updated every 6 months to a year. This would track the changes in risk.

Figure 4: Number of Incidents Per Suburb in Cape Town Municipality from 1990 - 1999

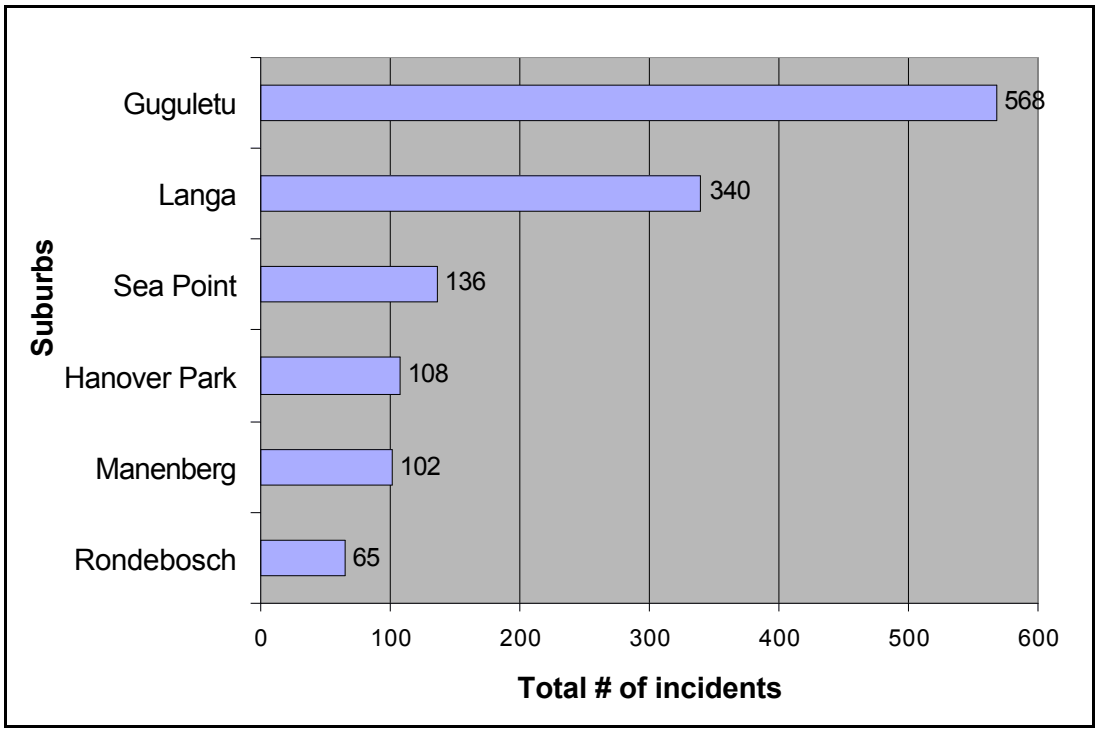


4.2. Meso Analysis

The stakeholders recommended a meso or intermediate analysis. The analysis should include the graphic and tabulated representation of fire incidents at a suburb or informal settlement level, enabling a comparison of risk between suburbs (see Figure 5 for an example). A meso analysis is however dependant on the completion of both macro and micro level analyses, in that only once the macro risk map is completed can high-risk areas be identified, therefore informing the settlements in which the micro assessment is conducted. On the completion of two or micro level assessments can a meso analysis be conducted to compare or contrast the risk of two or more settlements.

Informal settlements that are similar in size and population but have different risk profiles can be studied. Questions as to why fire risk is lower in one settlement than in the other could be addressed.

Figure 5: Total number of fire incidents over a 5 year period (1995-1999) for five suburbs



4.3. Micro Analysis

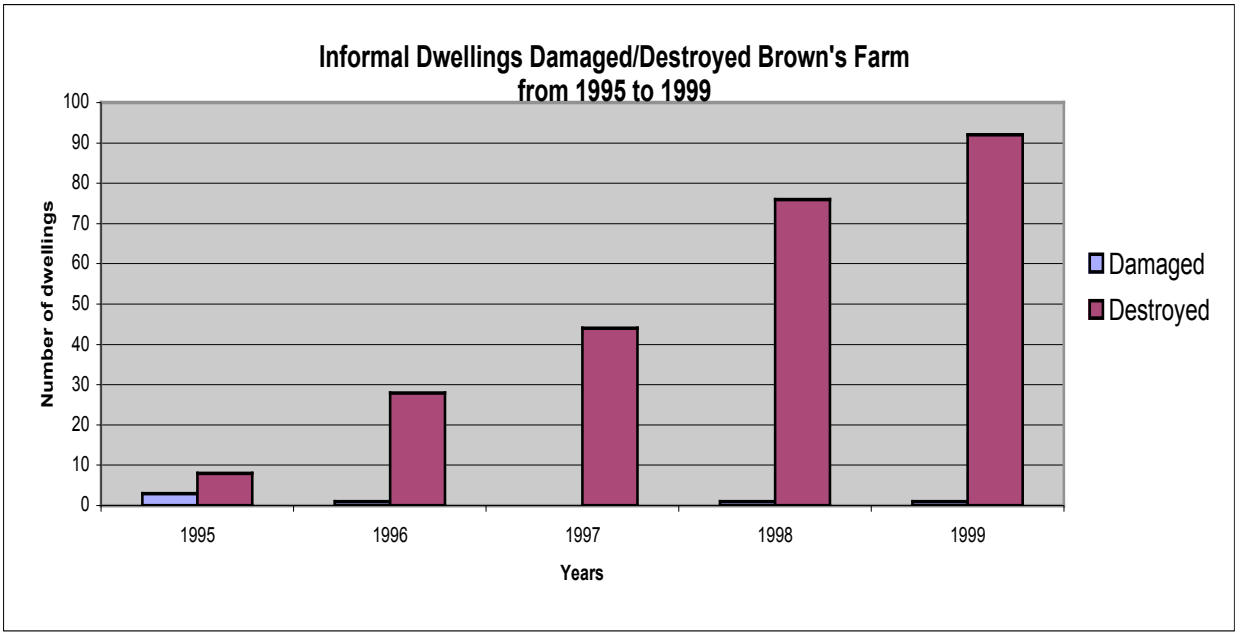
This analysis will include a detailed study of fire risk in only one settlement or suburb. The triggers, severity, frequency, seasonality, weekly and even the time of day when most fires occur could also be investigated. An example of a graph at a micro level can be seen in Figure 6. This type of analysis will inform the design, implementation and monitoring of education and public awareness programmes. It could also inform the development of risk reduction programmes.

A micro level analysis is however best complimented with field research in the settlement or suburb, to compliment the quantitative information from MANDISA. It would also assist in contextualising the study as well as give greater insight into the causes of these fires. An example of this is the research conducted in Imizamo Yethu[1].

During the meeting it was recommended that future research should not only focus on the fires in informal settlement areas, but also the 'backyard shacks' in formal housing areas. Informal discussions with those who work on the ground have indicated that this type of fire may be on the increase.

[1] Bucher, N; Durham, C; Falcao, M; Morrissey, J; Silverman, I; Smith, H and Taylor, A (2005) Hazard Profile and Vulnerability Assessment for Informal Settlements: An Imizamo Yethu Case Study with special reference to the experiences of children

Figure 6: The number of dwellings damaged and destroyed in Brown's Farm for 1995 to 1999



4.4. Enhancing the City's risk analytic capabilities

In the long term it is important for the Metropole to strengthen its own risk monitoring capabilities. This will assist with ongoing planning, programme development and resource allocation. To strengthen its capabilities, the Metropole must ensure availability of robust disaster risk information. There must also be opportunity to share and discuss this information.

Metropole officials can monitor risk by querying data on the MANDISA system. An Internet reporting module can be developed for the City that allows officials to view maps, tables and graphs for selected areas. The reporting module can be developed in a collaborative way with selected officials. This will ensure that the capabilities of the reporting module are customised to the needs of the City.

It was recommended at the meeting that a forum be established which focuses specifically on informal settlement fires. This forum should ideally include all those City departments, non-governmental organisations and community based organisations that are involved in these issues.

Key Points

- Map that shows the risk profile for the Metropole should be compiled
- Comparative studies should be conducted for informal settlements to determine the root causes for the fires
- Settlements considered high risk should be targeted for public awareness and education programmes
- The City's risk analysis capabilities should be strengthened by incorporating MANDISA on an ongoing basis
- Establish a forum for informal settlement fires

Part 5 Recommendations

The recommendations can be divided into short, medium and long term. This will include actions that can be taken on the part of the City.

5.1. Short term recommendations

- Complete MANDISA dataset by exporting the ESS information and compare datasets. The outstanding data will be captured.
- Macro risk map for the Metropole focussing on informal dwelling fires.
- Complete report on the fire risk status of the City.

5.2. Medium term recommendations

- Select two informal settlement areas and conduct comparative risk assessment. This can be linked to the TEAM project that has been initiated by provincial disaster management.

5.3. Long term recommendations

- Integrate MANDISA into the City's IT infrastructure.
- Establish a forum that deals with issues relating to informal dwelling fires.

Key Points

- Complete the MANDISA database
- Compile informal dwelling fire risk maps for the Metropole
- Compile a report on the informal dwelling fire risk
- Conduct comparative studies
- Integrate MANDISA into the City's IT system