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

A Focus on Informal Settlement Fires

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Prepared for SASRIA

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Part 1 Introduction

1.1. Background

1.2. Methods Used

This section details the methodology used for collecting and capturing the fire data.

1.2.1. Collection of data

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 Fire Services' incident management system (ESS) at the main control centre.

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. This is relevant when trying to understand the challenges faced by MANDISA data analysts when processing and capturing incidents.

'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. In many instances the hardcopy could not be found. Ideally records would have to be collected more than four months after the incidents have happened to ensure that all the records have been updated. For example January's incidents should be collected after May.

1.2.2. Capturing of data

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, time of day and duration of the incident
- the type of fire
- the source of the information
- the cause or trigger 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.

It is possible to capture the reconstruction and recovery costs for incidents in MANDISA. There is however no readily available data for that can be entered into these sections. This kind of information is usually difficult to source and correlate with fire incidents.

Part 2 Collection and Capturing of Fire Records

Fire incident records were collected for 2000 to 2004. There were many challenges with the collection of the data. This section looks at how the data 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 data. 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 though the boundaries have recently been changed and are referred to as local administrations.

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 LINUX based system.

There are currently six fire control centres in the Metropole, one in each local administration. The server for ESS is housed at the main control centre and all records are stored here. The fire control centres in other local administrations are connected to this server.

2.2. Challenges in recording and collecting fire data

There have been many challenges in collecting the data for MANDISA. These include the following:

- There is *uneven storage of incident reports* across the Metropole. This relates to the storage of hardcopy incidents reports.
- There is *uneven quality of information*. The quality of reporting relates the capturing of incidents on the Emergency Services System (ESS) system. It also relates to the completeness of the information recorded for each incident. Therefore data in certain local administrations where reporting is better, the dataset would be more robust.

Incident reports have been collected for 2000 to 2004. The total number of reports collected is shown in Table 1 for each municipality. This totals to approximately 11 000 incidents.

Table 1: Total number of records collected

Local Administration	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*	1,271	1,358	780	594	240	4,243
Tygerberg	0	168	433	638	439	1,678
Total	2,305	2,550	2,444	2,283	1,801	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 was suspected that it is related to the way one queries ESS, which in turn is linked to its design.

When printing incident reports from the ESS system, the project team asks for all building fires when running a query. When doing this some building fires appeared to have been left out. This resulted in MANDISA containing an incomplete dataset. A full comparison between the incidents in MANDISA and those in ESS had to be conducted to determine the discrepancy. Due to limited time available five suburbs were chosen to run a comparison of informal dwelling fires, defined as those fires that affect wood and iron structures. The areas were chosen because they are considered to be ‘typical’ of Cape Town.

The entire ESS database was extracted from Fire Services from 2001 to 2004. Incidents that occurred in 2000 that were recorded in ESS could not be accessed as Fire Services struggled to access their archives. Once the incidents that could be accessed were extracted, individual incidents for the areas selected were extracted. These were then compared to the incidents that were captured in MANDISA.

There were challenges associated with this process of electronically comparing the ESS data to the MANDISA data and took more time than was initially anticipated. The location given on the ESS fire report may not be accurate. The MANDISA data capturer would find the street given on the fire report and this suburb in which the street is located may not coincide with the one given on the ESS fire report. This complicated the comparison process.

Another challenge was the classification of an incident by a MANDISA data capturer might not be the same as the ESS fire report. For example, a capturer may have an incident that was classified as a formal house fire. On analysing the report in details, the MANDISA data capturer could decide that the incident is in fact an informal dwelling fire.

This complicates an electronic comparison of incidents. There were certain incidents that had to be manually compared.

Once a comparison was complete, the outstanding data from MANDISA was included. Information for the five informal areas was then drawn from the database.

Part 3 Analysis

This section focuses on the analysis of the data from MANDISA. The fire incidents that are focussed on are those that affect informal dwellings. The project team defines this as a structure used as a dwelling made of wood and iron materials. It will be divided into the following levels of analysis:

- A macro analysis. This looks across the entire Metropole.
- An intermediate analysis, which looks across suburbs thus enabling comparison between suburbs.
- A micro analysis, which will look at each within each suburb individually.

3.1 Macro Analysis

The macro analysis looks at the fire information for the Metropole as a whole. The data at this level represent only the incidents in MANDISA. There has been no comparison with the ESS dataset at this level to determine outstanding incidents.

Table --- shows the total number of all fire incidents recorded for a fifteen-year period amounts to 18,504. This includes fires that affected formal and informal homes, commercial, industrial and institutional buildings. Of those over 8 000 fires affected informal dwellings. This is about 47% of the total incidents of fire from 1990 to 2004.

Table--- : Fire incidents recorded in MANDISA currently

Year	Number of Fire Incidents	Number of Informal Fire Incidents	Informal Fires as % of All Fire Incidents
1990	535	251	46.92
1991	702	259	36.89
1992	560	183	32.68
1993	743	278	37.42
1994	963	390	40.50
1995	1,566	624	39.85
1996	1,358	578	42.56
1997	1,492	704	47.18
1998	1,364	665	48.75
1999	1,448	727	50.21
2000	1,976	918	46.46
2001	1,537	799	51.98
2002	1,314	718	54.64
2003	1,350	802	59.41
2004	1,596	891	55.83
Total	**18,504**	**8,787**	**47.49**

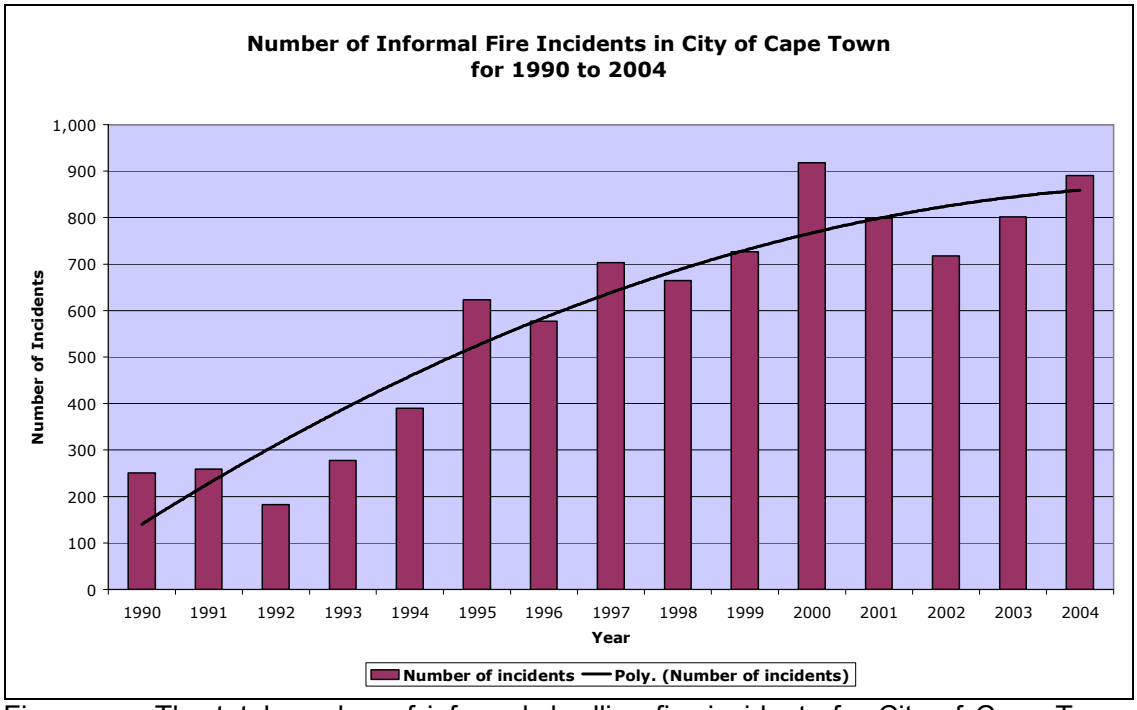

Figure ----: The total number of informal dwelling fire incidents for City of Cape Town (1990 to 2004)

Figure --- represents the total number of informal dwelling fire incidents per year for Cape Town. It can bee seen that the occurrence of informal fires is on the increase rising from 535 in 1990 to 1,596 in 2004. This is a 198% increase. One of the factors that could have influenced such a huge increase is that the reporting of incidents improved from 1995. Nevertheless, the number of incidents is still significant.

The number of dwelling affected comprises of those that have been either damaged or destroyed by fire. From 1990 to 2004, there were approximately 41,000 dwellings affected as can be seen in Table ----.

Year	Number of Informal Fire Incidents	Number of Informal Dwellings Damaged	Number of Informal Dwellings Destroyed	Total Informal Dwellings Affected
1990	251	893	263	1,156
1991	259	1,042	561	1,603
1992	183	394	266	660
1993	278	783	353	1,136
1994	390	908	1,664	2,572
1995	624	95	2,821	2,916
1996	578	196	4,526	4,722
1997	704	94	3,276	3,370
1998	665	68	2,081	2,149
1999	727	57	4,118	4,175
2000	918	577	2,360	2,937

2001	799	987	953	1,940
2002	718	905	1,277	2,182
2003	802	762	1,733	2,495
2004	891	2,064	5,224	7,288
Total	**8,787**	**9,825**	**31,476**	**41,301**

Figure --- illustrates the number of dwellings affected over the fifteen-year period. It should be noted that the years that recorded the highest number of dwellings affected are those that had a local or national election. These events occurred in April (national elections in 1999 and 2004) and May (local elections in 1996).

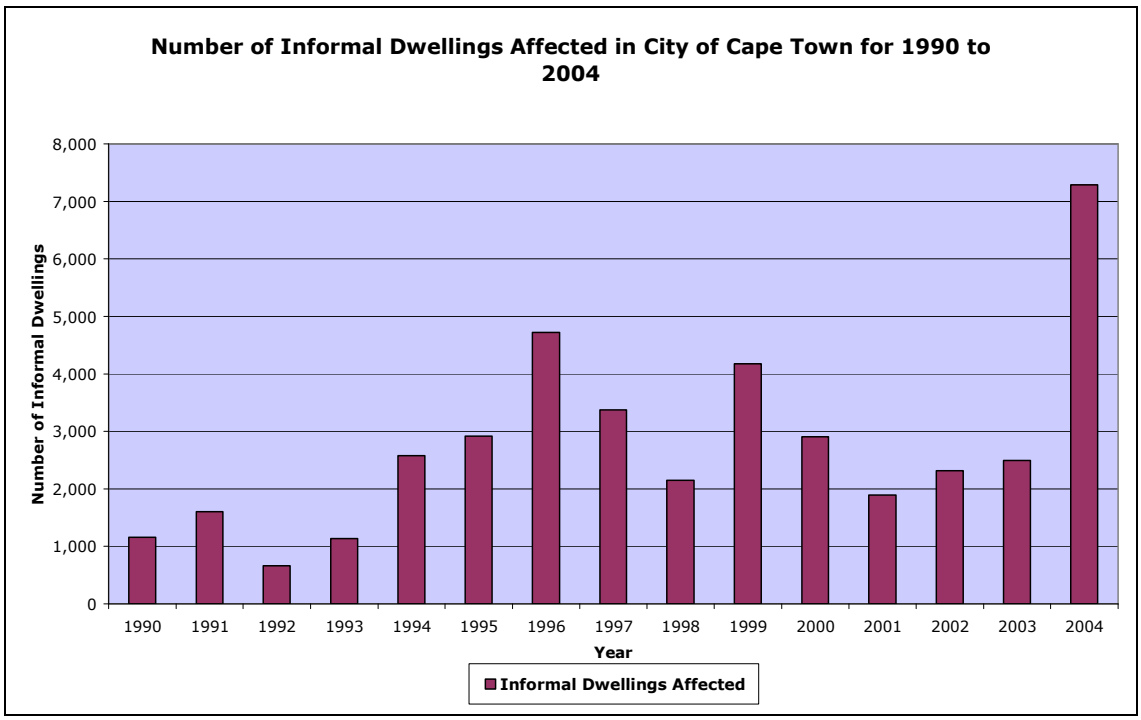

Figure ----: The total number of informal dwellings affected by fire in the City of Cape Town (1990 to 2004)

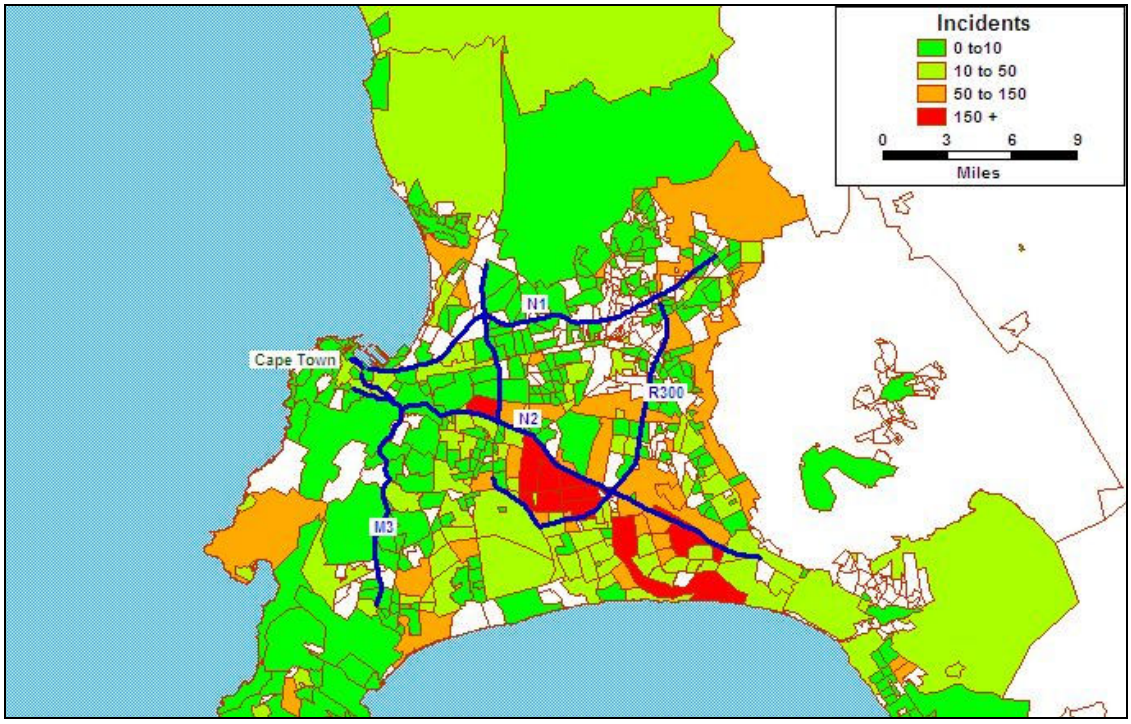

Figure ---: The number of informal dwelling fire incidents for the City of Cape Town (1990 to 2004)

Figure --- represents the total number of informal dwelling fires across the Metropole for fifteen years illustrated by suburb. The green category represents those suburbs where a total of between 0 and 10 incidents of informal fires have occurred from 1990 too 2004. The red category is for those suburbs where over 150 incidents in total have occurred in fifteen years.

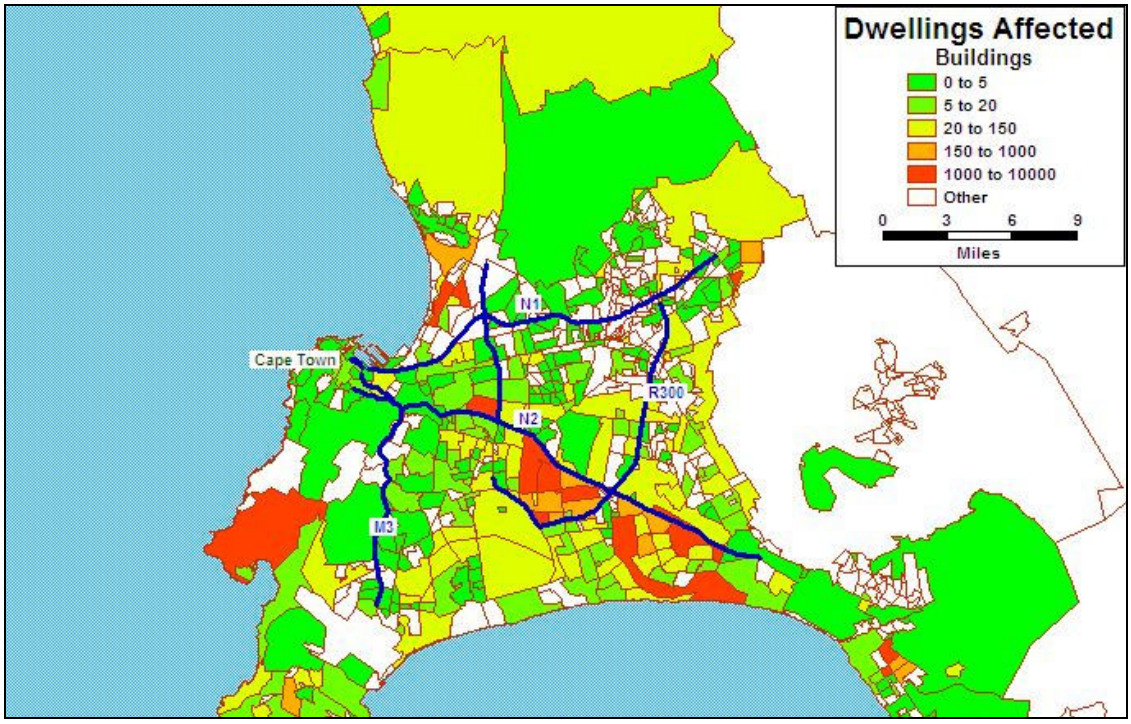

Figure ---: the total number of informal dwellings affected by fire in the City of Cape Town (1990 to 2004)

Figure --- illustrates the total number of informal dwellings either damaged or destroyed by fire from 1990 to 2004. Again, the map represents the total number of dwelling for each suburb over the fifteen-year period.

The maps give an indication where areas of greater risk may be. However, the maps cannot illustrate the trend over time. The categories chosen to determine the shade for the different suburbs were not determined statistically. This means that a suburb that had only 200 incidents over fifteen years is lumped with a suburb that has experienced over 1,000. Therefore the map cannot be used in isolation of tables and graphs at the suburb level to draw comparison.

3.2 Intermediate Analysis

The intermediate analysis investigates trends across suburbs. This provides an opportunity to draw comparisons between different areas within the Metropole. The following suburbs were selected:

- Langa
- Khayelitsha
- Gugulethu
- Nyanga
- Crossroads

These areas are circled in Figure ---. The suburbs are made up of a combination of low-income housing and informal settlement areas. The low income housing generally have what is known as ‘backyard’ dwellings. These are wood and iron structures that have been built in the back of a formal, brick and mortar structure. The figures in this section

include fires that have affected these structures. The informal settlement areas are large areas were there are many informal dwellings and no formal ones.

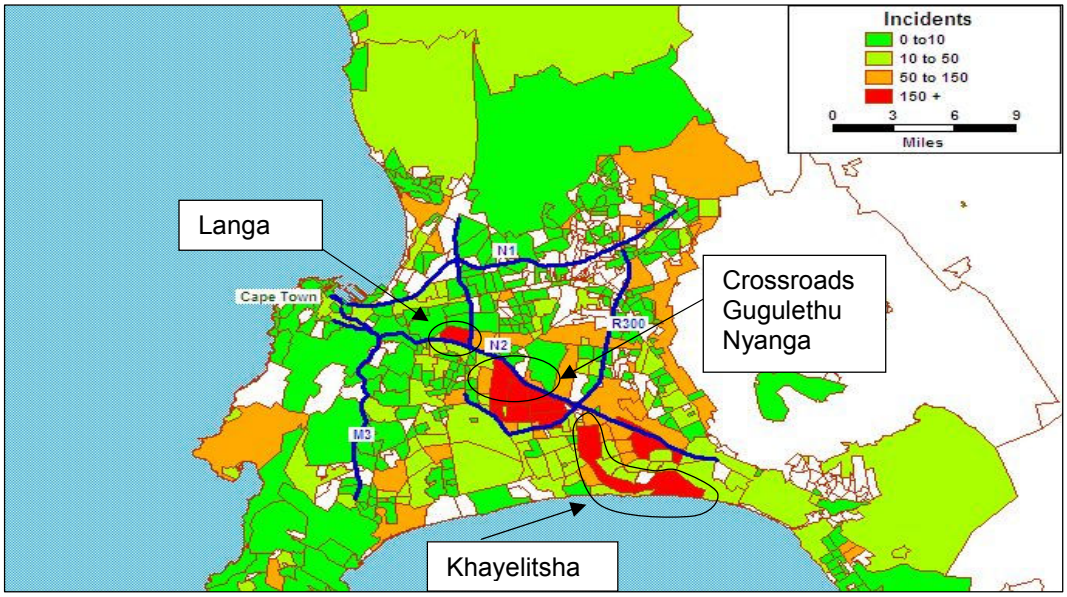

Figure ----: Map illustrating where chosen suburbs are located within the Metropole

The data for Crossroads, Gugulethu and Nyanga had to be consolidated into a single figure. These three areas are located next to one another. There appears to be no clear boundaries that demarcate these suburbs. This proved challenging when trying to spatially locate the incidents in these areas. Therefore it was decided to merge the information into one.

Say why data looked at from 1995.

Suburb	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**Total**
Langa	55	55	58	53	63	46	44	37	35	34	480
Khayelitsha	177	44	35	29	76	158	147	188	213	205	1,272
Crossroads / Gugulethu / Nyanga	133	160	202	222	161	118	147	153	133	157	1,586
Total	**365**	**259**	**295**	**304**	**300**	**322**	**338**	**378**	**381**	**396**	**3,338**

Constitute almost 50 % of all informal dwelling fires recorded in MANDISA

Suburb	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**Total**
Langa	788	395	160	460	1,473	1,419	298	513	336	1,222	7,064
Khayelitsha	372	323	529	224	62	52	80	307	320	399	2,668

Crossroads / Gugulethu / Nyanga	615	436	1,703	387	452	136	348	294	321	370	5,062
Total	**1,775**	**1,154**	**2,392**	**1,071**	**1,987**	**1,607**	**726**	**1,114**	**977**	**1,991**	**14,794**

Though Langa comprises 14% of the total incidents, it has makes up approximately 48% of the total dwellings destroyed for the five areas.

Show the graphs compiled for Khayelitsha (clearly shows a seasonal trend) and Langa (does not show same trend) to show that trends cannot be transferred or extrapolated to other areas. Include all tables in the annex.

An attempt was made to investigate the single dwelling fires and get probability of large-scale events. Catergories not robustly determined. Insert table to show the percentage of small events are largest.

Data will be made available on cd.

Micro level

Backyards included in analysis, have to separate this out
Difficult to determine informal settlement area within suburb
Boundaries not clearly demarcated.

Recommendations

Cluster analysis should be conducted to determine more robust categories for further analysis
Further in depth statistical analysis to determine links or relationships between no of incidents, severity (dwellings affected), time year etc.
Given the current information it is recommended that further study be conducted to determine a robust risk index for informal fires. Given the current trend it the exposure would be too great to insure these areas.