Evaluation of The Fire Mitigation Programme in Joe Slovo Informal Settlement, Cape Town:

A Cape Argus/Santam Ukuvuka Operation Fire-Stop Funded Initiative

By the Disaster Mitigation for Sustainable Livelihoods Programme (DiMP)
University of Cape Town
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Executive Summary

Background

The Joe Slovo informal settlement in Cape Town has faced the recurrent threat of fire over the past decade, a risk aggravated by poverty, inadequate infrastructure and the ongoing influx of informal residents. By 2000 the number of dwellings had grown to 4 300 - a staggering 100% increase between 1998 and 2000.

While informal settlements typically face a high risk of fire, the hot, dry, low -rainfall conditions in the La Ninã year of 2000 resulted in an increased frequency of fire events in Joe Slovo. Of particular significance was a major day-time fire in November 2000, which led to the destruction of 950 informal dwellings. This event, declared a "National Disaster"[1] , was viewed more seriously than other similar occurrences due to the location of the affected informal dwellings beneath an Eskom power line. In part, the fire's severity was attributed to inadequate access roads and tracks within Joe Slovo. These prevented timely access for fire tenders, and made fire containment difficult.

The devastation wrought by this disaster provided the impetus to develop and implement a Fire Mitigation Plan in Joe Slovo[2]. This comprised three major elements.

1) The immediate relocation of the fire-affected community to a resettlement site, to prevent the reoccupation of the Eskom servitude.
2) The configuration and reconfiguration of Joe Slovo through the installation of tracks and water supplies in the resettlement site of Zone 30 (November 2000 - March 2001) and later the remaining Zones 30, 31 and 32 (April 2001 - May 2002). It was intended that the 5m access tracks would increase the access of fire tenders as well as provide fire-breaks at 8m intervals, creating "fire-proof

[1] A disaster was declared under the Fund Raising Act of 1978

[2] The label 'Joe Slovo Fire Mitigation Plan' is slightly misleading, as Joe Slovo comprises (July 2002) Zones 30, 31 and 32 of the Langa Township. The initial plan focused primarily on relocation and site development for fire-affected residents of Zone 30, and NOT the non-fire-affected Zones 31 and 32. Subsequently, in 2001, the remaining Zones (31 and 32) were reconfigured. Fire-affected is referred to in terms of the residents of Joe Slovo affected by the fire on 26 November 2000 fire.
In this evaluation, the terms 'Fire Mitigation Plan' and 'Fire Mitigation Programme' are used interchangeably. 'Plan' is preferably used to describe the planning activities and decisions that underpinned the subsequent activities. 'Programme' is the preferred term to describe the 18-month mitigation process/activities that followed the 26 November 2000 fire.

cells". Approximately 60-150 dwellings were planned for each “cell”. However, after a financial analysis was conducted it was realised that it would not be possible. As a result the cells range in size from 100 dwellings to 200 dwellings.

3) The proposed development of a greenbelt on the Eskom servitude, facilitated by Ukuvuka and the National Botanical Institute.

The later two initiatives, co-financed by Ukuvuka, began in February/March 2001. As more than 12 months have now elapsed since the Fire Mitigation Programme was initiated, Ukuvuka assessed this to be an appropriate opportunity to evaluate the programme’s impact and efficacy to date. In this context, in April 2002, Ukuvuka appointed the Disaster Mitigation for Sustainable Livelihoods Programme (DiMP) at the University of Cape Town to evaluate the programme. The actual evaluation was conducted between April and August 2002.

Methodology

A range of quantitative and qualitative methods were used to assess the effectiveness of the Fire Mitigation Programme.

Quantitative methods included:

- Collection of information on fire occurrences in Joe Slovo from January 2000-31 January 2002 from five different data sources.
- Review of dwelling density by counting of individual dwellings shown on aerial photographs (March 2001, April 2002).
- Collection and consolidation of detailed meteorological data from WeatherSA, containing rainfall, temperature and wind speed information for the period under review.
- Consolidation of fire-related information in DiMP’s MANDISA database.
- Summation of costs and benefits with respect to the Fire Mitigation Programme.
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Qualitative methods included:

- Interviews with key stake-holders
- Desktop study using the internet, library and newspaper sources
- Joe Slovo community research by participants on the Disasters and Development Courses (April and June, 2002)

Time frame
Although the actual evaluation took place from April – July 2002, fire incident records were reviewed from 1 January 2000 to 31 December 2001. This time-frame spanned the two-year period, one year prior to and one year following the introduction of the Fire Mitigation Plan in February 2001. It provided information with which to compare trends in fire incidents a year before and a year after the initiative began.

Findings

Reported fire incidents: frequency and severity

The incidents reported here generally apply to the entire Joe Slovo settlement, including zone 30/31/32. Reported fire incidents indicated that there the frequency of fire occurrence declined over the two-year period from 23(2000) to 11(2001). In assessing this, a series of structural and non-structural mitigation measures were assessed. These included the roll out of electrification that reduced the use of candles and paraffin (two of the major triggers of fire in Joe Slovo). Furthermore, the prevailing climatic conditions data were analysed. These indicated that the annual average rainfall increased by 15% in 2001 compared to the 26 year annum average for Cape Town. Whilst this had similarly resulted in declines in fire frequency at Brown's Farm, another Cape Town informal settlement, the rate of decline in Joe Slovo was twice as fast. In terms of non-structural mitigation measures, the increased awareness generated as a direct result of the 26 November 2000 fire and through the Fire Prevention Awareness Campaign run in October 2000, further contributed to the decline

When assessing the 'severity' (the number of dwellings destroyed in a specific event), research findings indicated that for 2001 there had been no events that exceeded the size of a fire proof cell (maximum size of 200 dwellings), suggesting that the reconfiguration had been successful in averting an extreme event (a fire that exceeds the size of a fire proof cell). However, it was difficult to accurately assess the recurrence interval for such events, given the wide range of structural, socio-economic, climate and weather risk factors that contribute to their occurrence.

In assessing the overall severity for fires in Joe Slovo, the study, indicated that the number of medium fires (destroying between 30-99 dwellings) to large scale fires (destroying over 100 dwellings) had increased. In 2000, when excluding the 26 November 2000 fire (which destroyed 950 dwellings), 22 fires destroyed 296 dwellings (average number of 13.45 dwellings destroyed per event), whilst in 2001, 11 fires destroyed 185 dwellings (average number of 16.82 dwellings destroyed per event). The increase in medium to large-scale fires was significantly influenced by the increase in overall dwelling density. This was due to the massive influx into Joe Slovo between 1998 and 2000, with the resultant increase in flammable materials per square meter.

Challenges

The Joe Slovo Fire Mitigation Programme illustrates challenging issues associated with risk management in marginal urban communities. In the initial plans for Joe Slovo, there were no plans for formal upgrading. The upgrading that was undertaken was all done on the premise that the informal settlement would be there for at least another three years. Whilst this type of upgrading was not intended to be permanent, the underlying principles of long-term sustainability are challenged.

The measures subsequently implemented were located in a context that simultaneously conveyed conflicting messages of permanence and non permanence. The challenges generated by this tension are reflected in:

- Separate initiatives for Joe Slovo and Langa and de-linking of Joe Slovo plans from the Langa IDF (Integrated Development Framework).
- Unsustainable funding for maintaining access tracks/fire-breaks due to government policies.
- Shifting perceptions by Joe Slovo residents with respect to permanent occupation of the area despite consultation with the community.
- Increasing in-migration, raising cell-densities and increasing fire/flood loss potential.
- Questionable sustainability of the green-belt.
- Questionable execution of 'Duty of Care' with respect to the integrated management of multiple risks.

Recommendations

To achieve sustained reductions in both the frequency and severity of fires in Joe Slovo, it is recommended that efforts should be taken to:

- Build community ownership of fire risk
- Improve fire forecasting and planning in times of high risk
- Explore measures that monitor in-migration, especially settlement density
- Strengthen emergency/relief response services to monitor changing fire trends and risk patterns
- Increase the competitiveness of electricity with paraffin

To achieve strategies that ensure the long-term sustainability of the programme efforts should be taken to:

- Locate further mitigation efforts in a long-term strategic planning framework
- Locate fire mitigation efforts in a broader disaster risk reduction framework
- Encourage community responsibility for managing the greenbelt
- Consolidate relevant information on ongoing mitigation measures in one organisation/office

To achieve strategies related to implementing the fire mitigation programme elsewhere, efforts should be taken to:

- Carry out baseline risk and community research before implementing the programme
- Establish processes for monitoring progress
- Establish a business plan prior to the commencement of the intervention
- Ensure recurrent infrastructure maintenance costs do not exceed available budget

Acknowledgements

The Disaster Mitigation for Sustainable Livelihoods Programme (DiMP) would like to express its appreciation to a number of key people and organisations who generously gave of their time and support in the course of this evaluation.

We are grateful to all those who set aside time from their busy work schedules to participate in interviews and to provide information relevant to the Joe Slovo Fire Mitigation Plan.

In this context, we would specifically like to thank the Joe Slovo committee leaders as well as the community members at large. We would also like to thank Mr Van Niekerk and Mr Gumede from Development Support, Mr Alers; Mr Peters; Mr Lightly; Mr Hendricks and Mr Smitt from the Fire Services; Mr Pillay; Mr Mashazi and Mr Leader from Disaster Management; Mr Lombard and Ms Khosi from Social Services; Mr Davis; Mr Dyiki; Ms Magija and Ms Shaide from the National Botanical Institute; and Ms Fowkes and Mr Lamb from The Santam/Cape Argus Ukuvuka Operation Fire Stop.

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Part 1

Introduction to the Evaluation and Structure of the Report

1.1 Background to the evaluation and its focus

The Joe Slovo informal settlement in Cape Town has faced the recurrent threat of fire over the past decade, a risk aggravated by poverty, inadequate infrastructure and the ongoing influx of informal residents. Joe Slovo's rapid growth in the late 1990s resulted in almost 1 000 dwellings being constructed beneath an Eskom power line.

While informal settlements typically face a high risk of fire, the hot, dry, low -rainfall conditions in the La Nina year of 2000 resulted in an increased frequency of fire events in Joe Slovo. Of particular significance was a major day-time fire in November 2000, which led to the destruction of 950 informal dwellings. This event, declared a "National Disaster"[3], was viewed more seriously than other similar occurrences due to the location of the affected informal dwellings beneath an Eskom powerline.

In addition to the direct damage to the dwellings that were destroyed, the fire led to major electricity disruptions across Cape Town. In part, the fire's severity was attributed to inadequate access roads and tracks within Joe Slovo. These prevented timely access for fire tenders, and made fire containment difficult.[4]

The devastation wrought by this disaster provided the impetus to develop and implement a Fire Mitigation Plan in Joe Slovo.[5] This comprised three major elements.

- The relocation of the 950 displaced households whose homes had been destroyed in the fire beneath the Eskom servitude to an adjacent site within what later became known as 'Zone 30' in Langa. The new site was configured to provide 'tracks' (unpaved service roads) along with water supplies.

[3] A disaster was declared under the Fund Raising Act of 1978

[4] Dwellings in Joe Slovo are built from thermoplastics and wood both of which are highly flammable. Before the introduction of electricity people were cooking with gas or paraffin and using candles for light. People's risk was further compounded by their socio-economic conditions - increasing unemployment and the rapid influx into the informal settlement.

[5] The label 'Joe Slovo Fire Mitigation Plan' is slightly misleading, as Joe Slovo comprises (July 2002) Zones 30, 31 and 32 of the Langa Township. The initial plan focused primarily on relocation and site development for fire-affected residents of Zone 30, and NOT the non-fire-affected Zones 31 and 32. Subsequently, in 2001, the remaining Zones (31 and 32) were reconfigured. Fire-affected is referred to in terms of the residents of Joe Slovo affected by the fire on 26 November 2000 fire.
In this evaluation, the terms 'Fire Mitigation Plan' and 'Fire Mitigation Programme' are used interchangeably. 'Plan' is preferably used to describe the planning activities and decisions that underpinned the subsequent activities. 'Programme' is the preferred term to describe the 18-month mitigation process/activities that followed the 26 November 2000 fire.

- The configuration and reconfiguration of Joe Slovo through the installation of tracks and water supplies in the resettlement site of Zone 30 (November 2000 - March 2001) and later the remaining Zones 30, 31 and 32 (April 2001 - May 2002). It was intended that the 5m access tracks would increase the access of fire tenders as well as provide fire-breaks at 8m intervals, creating "fire-proof cells". Approximately 60-150 dwellings were planned for each “cell”. However, after a financial analysis was conducted it was realised that it would not be possible. As a result the cells range in size from 100 dwellings to 200 dwellings.
- The development of a greenbelt beneath the Eskom servitude.

The latter two initiatives, co-financed by Ukuvuka, began in February/March 2001. As more than 12 months have now elapsed since the Fire Mitigation Programme was initiated, Ukuvuka assessed this to be an appropriate opportunity to evaluate the programme’s impact and efficacy to date. In this context, in April 2002, Ukuvuka appointed the Disaster Mitigation for Sustainable Livelihoods Programme (DiMP) at the University of Cape Town to evaluate the programme. The actual evaluation was conducted between April and August 2002.

As this initiative required the participation of a large number of collaborating partners, the evaluation findings are also generated for other organisations and interested parties.

These include:

- The Santam/Cape Argus Ukuvuka Operation Fire-stop Campaign team and governance structures (Board and Steering Committee).
- Groups wishing to replicate this process/project elsewhere (such as Disaster Management, Fire Services, Social Services, or municipal planning departments).
- Sponsors and partners who are interested in evaluating the costs and benefits of their investment/ involvement in this project.
- Other interested parties (such as residents off the Campaign area/ participants in the World Summit on Sustainable Development).

It is intended that the evaluation findings will generally assist in providing insight and feedback to enable the adjustment of activities during the remainder of the campaign to improve effectiveness and efficiency. Specifically, the evaluation intends to outline indicators and recommendations that will guide the effective conceptualisation, planning and implementation of similar projects in the future.

1.2 Evaluation Methodology

A range of quantitative and qualitative methods were used to assess the effectiveness of the Fire Mitigation Programme.

1.2.1 Quantitative methods included:

- Collection of information on fire occurrences in Joe Slovo from January 2000-31 January 2002 from five different data sources.

- Review of dwelling density by counting of individual dwellings shown on aerial photographs (March 2001, April 2002).

- Collection and consolidation of detailed meteorological data from WeatherSA, containing rainfall, temperature and wind speed information for the period under review.

- Consolidation of fire-related information in DiMP's MANDISA database.

- Summation of costs and benefits with respect to the Fire Mitigation Programme.

- Summation of costs and benefits with respect to the fire mitigation programme

Collection of information on fire occurrences in Joe Slovo from January 2000 - 31 January 2002 from five different data sources

Fire incident data were collected from the CCT Fire Services, Disaster Management, Social Services and the South African Red Cross Society (SARCS). In addition, relevant information was gathered from newspaper articles. Data were collected on all scales of fire, including single dwelling, as well as multiple dwelling fire events. This was intended to track changes in frequency as well as severity of fire occurrences. The root causes of fire incidents were similarly explored.

The fire incident data were applied generally to all three zones of the whole of Joe Slovo, as the Fire Service reports were not spatially geo-referenced. Unfortunately, this made it difficult to compare fire occurrence between those areas that had been configured and those that had not. In light of this constraint, data were collected from the CCT officials who had personal records for the location of fires in 2001. Spatially referenced data for 2000 however did not exist.

Review of dwelling density in the configured resettlement site in Zone 30

Individual dwellings reflected on two aerial photographs from Zone 30 were counted and compared. This was undertaken to determine whether there were changes in density between March 2001 and April 2002.

Collection and consolidation of detailed meteorological data from WeatherSA

Detailed rainfall, temperature and wind speed information for the period under review was collected and consolidated. These were subsequently overlaid on fire frequency and severity data to identify possible atmospheric co-risk factors for fire severity.

Consolidation of information in DiMP's MANDISA database

These data were consolidated into the MANDISA database (Monitoring, Mapping and Analysis of Disaster Incidents in South Africa). MANDISA allows for the consolidation of disaster event data from different information sources in one

database, and reflects analytical outputs in maps, graphs, tables and photographs.

One of the constraints in using a spectrum of information sources is the wide variety of still non-streamlined systems for tracking human and other disaster impacts. When large discrepancies in data were noted across the information sources for a specific event, DiMP gave priority to the most accurately recorded and detailed data.[6]

Summation of costs and benefits with respect to the fire mitigation programme

In addition to information on actual fire occurrence, the research team gathered costing data for fire response prior to and following the implementation of the fire mitigation plan (for all services specified above). The team also collected and then matched cost information for the actual implementation of the fire mitigation plan and subsequent programme.

1.2.2 Qualitative methods included:

- Interviews with key stake-holders
- Desktop study
- Joe Slovo community research by participants on the Disasters and Development Courses (April and June, 2002)

Interviews with key stakeholders

Interviews with key stakeholders were conducted. These included representatives of the Joe Slovo Community, CCT Disaster Management and Fire Services. Interviews were also undertaken with representatives of South African Red Cross, Social Services and the CCT Department of Development Support. A stake-holder advisory group was established, which included these partners, as well as Ukuvuka and the DiMP research team.

Desk-top study

A desktop study was conducted using the Internet and library. Library sources were predominately in the form of newspaper clippings from the Cape Argus and the Cape Times that particularly focused on the 26 November 2000 Joe Slovo Fire and its aftermath. Sources from the UCT Library and the DiMP Resource Centre were also used, particularly focusing on the history of informal settlements in South Africa and their dynamics. The findings were consolidated in the papers found in Appendix.

Joe Slovo community research by participants on the Disasters and Development Courses (April and June, 2002)

A field-based case study is one component of the Disasters and Development Course offered by DiMP. Working in collaboration with the research team, the Risk

[6] Discrepancies refer to impacts - number of dwellings or people affected. In most instances, information was sourced from Disaster Management, which generally provides information fire impacts affecting ten or more households to Social Services and SARCS.

Reduction Facilitator conducted a desk-top study of the fire mitigation initiatives in Joe Slovo.

During the April Disasters and Development course, participants conducted a risk assessment in Joe Slovo. The findings from this intervention in both English and Xhosa are attached as Appendix 3/4.

In DiMP's June Disasters and Development short course, thirty participants were assigned to four groups, each focusing on specific initiatives undertaken in Joe Slovo on electrification, installation of tracks, establishment of the greenbelt or efforts to promote fire prevention awareness. The groups conducted an hour–and-a-half of field research in Joe Slovo in the three zones - 30/31/32, after which they presented their findings at the course. Overviews of these presentations have been included as Appendix 5. Similarly, vulnerability assessments were conducted by four of the June course participants. These have been included as Appendix 5.

1.3 Time frame

Although the actual evaluation took place from April – July 2002, fire incident records were reviewed from 1 January 2000 to 31 December 2001. This time-frame spanned the two-year period, one year prior to and one year following the introduction of the Fire Mitigation Plan in February 2001. It provided information with which to compare trends in fire incidents a year before and a year after the initiative began.

Stake-holders had initially indicated a preference to extend the time frame to 1999. However, incident reports prior to 2000 had been unevenly imported into the database from the Fire Services ESS system. In this context, it would have required additional work beyond the time available to make data sources compatible for the preferred time-frame.

It is significant to note that the time-frame under review coincided with an intense global La Nina event[7]. The climatic conditions generated in La Nina years are reflected in heavier-than-average rainfall across most of southern Africa, but increased temperatures and lower-than-average rainfall in the Western Cape. The destructive 2000 Joe Slovo fires followed the widespread veld and urban fringe fire events in Cape Town's South Peninsula nine months earlier.

It is important to note that 2000 was a year of generally heightened fire risk and low rainfall across the Western Cape.

[7] La Nina generally refers to a cooling of the Eastern Pacific Ocean, which triggers global weather patterns. It is the opposite to El Nino that refers to a warming of the Eastern Pacific Ocean.

1.4 Evaluation limitations

The findings generated from this evaluation are limited by several important constraints.

First, the data from the Fire Services, Disaster Management, Social Services and SARCS refer to Joe Slovo in general, and cannot be more specifically located into actual zones. For this reason it was impossible to accurately locate or compare incident patterns between areas that had been configured and those that had not. According to reports from Ukuvuka there were no fires in the newly configured site for the households displaced after the 26 November 2000 fire until one year minus two hours after the new site was developed.

Moreover, the absence of zone-specific reports from the fire services meant that it was impossible to accurately calculate a reduction in their callout costs for the period under review.

Second, the research process initially foresaw greater community consultation than that which actually took place. Consultation was viewed from the outset as an essential element for identifying both the direct and indirect benefits of the Fire Mitigation Programme to the Joe Slovo community.

The research process also anticipated a more thorough analysis of the implications of the Fire Mitigation Plan for multi-hazard mitigation planning, with specific emphasis on flood risk.

Due to institutional delays in both engaging community leaders and establishing a stakeholder advisory process, it was decided to set aside the extensive community consultation initially planned. Fortunately, useful field research conducted as part of the Disasters and Development short course helped to inform the evaluation outcomes, and is included as Appendix 4.

1.5 Ethical considerations

In the interests of confidentiality, all informants are referred to by title rather than name.

1.6 Structure of this report

The remainder of this report is structured in the following way.

Part 2 focuses on the Fire Mitigation Programme in Joe Slovo. This section addresses the informal settlement's history, and details the mitigation measures adopted.

Part 3 examines the programme's effectiveness, by reviewing changes in reported fire trends, assessing costs and benefits and exploring the efficacy of the measures taken.

Part 4 concludes with a commentary on the challenges of implementing mitigation strategies within a long-term sustainable development framework. It reflects on the difficulties of balancing short-term imperatives for basic services against the long-term sustainability of settlements located in endangering environments. Strategies adopted to promote sustainability are similarly reflected.

Part 5 proposes a series of recommendations both for Ukuvuka and the CCT to ensure that the plan meets the objective of long-term sustainability.

Part 2

The Fire Mitigation Programme in Joe Slovo Informal Settlement, Cape Town

The Fire Mitigation Programme in Joe Slovo was initiated in 2001 after the fire in November 2000 was declared a 'National Disaster'. This section addresses the history of informal settlements in South Africa, providing a context within which to understand the history of Joe Slovo. This section will also address the various initiatives undertaken, with the aim of providing a context within which the mitigation measures were adopted.

Part 2 will cover the following areas:

- A brief history of Joe Slovo
- The Ukuvuku/Disaster Management Fire Prevention Awareness
- The Turning Point - A National Disaster
- The relocation of the 950 destroyed dwellings
- The configuration and reconfiguration of Joe Slovo
- Establishment of a greenbelt on the Eskom servitude

2.1 A brief history of Joe Slovo

Joe Slovo is an informal settlement situated on the eastern and southern side of the Langa township, in a narrow strip of land between hostels, formal houses and a 'coloured' settlement, Bonteheuwel. Joe Slovo began in early 1994 with a gradual influx at the intersection of Vanguard Drive and Washington Street. This area was originally known as Mpumza Park, but later through the expansion became known as Joe Slovo.

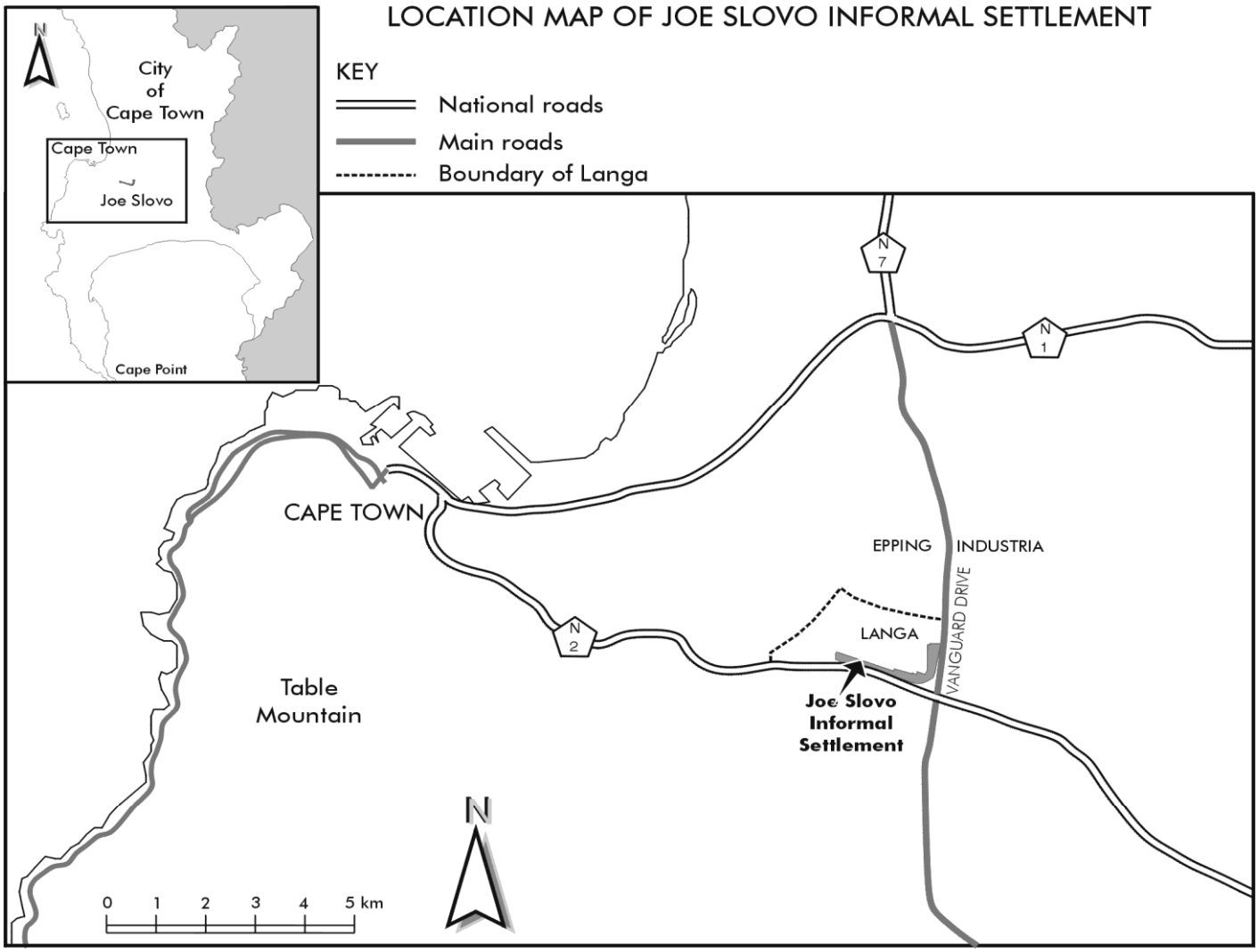
The now Joe Slovo settlement lies in the buffer strip that was intended to define the edge of Langa, adjacent to the N2 and M7. Langa specifically is one of the Western Cape's oldest townships, having been formed in the 1970s [8]. At the time of Langa's formation, influx control measures were in place, particularly through the Pass Act, which limited migration into the urban areas, and the Group Areas Act which defined the residential location of people according to race. However, with the abolishment of Apartheid so came the cease in influx control measures. According to Disaster Management, the local authority was not prepared for the massive influx that followed South Africa's liberalisation in 1994.

The emerging Joe Slovo was therefore a direct consequence of this new liberalisation. There is the belief that the residents of Joe Slovo were old Langa residents, primarily migrant workers, whose families had moved to Cape Town to join them. In this way Joe Slovo was first believed to be a half way house to people moving in from the Eastern Cape. Furthermore, the positioning of Joe Slovo made it

[8] Langa is named of after Chief Langalibalele

highly attractive, in that it was close to, not only Epping Industria, but also to established transport networks which linked to the CBD.

Figure 2.1.1
Location of Joe Slove informal settlement in Cape Town



Joe Slovo is now densely populated and in a constant state of flux as people continue to move in, now mainly from settlements nearby. Joe Slovo's population has increased dramatically in recent years. A dwelling count, conducted in May 1996 indicated 1 195 informal homes, which increased to 2 153 by May 1998 (Abbott, J.1999). By 2000 the number of dwellings had grown to 4 300 - a staggering 100% increase between 1998 and 2000[9].

[9] The dwelling count for 2000 was taken by the Development Support Department of the City of Cape Town

Table 2.1.3
Trends in dwellings counted in Joe Slovo (1996 – 2000)

Year	No. Dwellings Counted	Increase (%) since previous count
1996	1 195	
1998	2 153	34
2000	4 300	100

In 2000, Joe Slovo comprised approximately 4 300 dwellings on an estimated 30 hectares of land. Attempts by the local authority to evict people have proven fruitless. In 1998, with the withdrawal of the Prevention of Illegal Squatting Act, it became unlawful to evict people from their homes. Moreover, an individual dwelling could no longer be demolished without a court order costing a minimum of R800[10]. This posed challenges to the local authority to control influx and the haphazard nature of informal settlement development. Furthermore, local authorities were not in a position to respond to the increasing demand for basic infrastructural and health services. It was only in 1998 that the first toilets were provided to Joe Slovo.

The issue of providing services and infrastructure to informal settlements is highly complex and made difficult by the absence of policies on informal settlements. In cases where local authorities are to provide basic services, they are not to be seen as promoting or "legalising" the informal settlement. The provision of services to informal settlements by the local authority has been undertaken on the condition that the settlement will be around for at least three years. In light of this condition the electricity department has agreed to provide basic electrification to informal settlements situated on council land.

The installation of electricity in Joe Slovo was initiated in 2000 and was to accompany a storm water project coordinated by Development Support. In the latter part of that year, a sanitation project was also undertaken to provide toilets to Joe Slovo. All these projects, although initiated by separate line departments, were to be coordinated by the Development Support Department of the City of Cape Town. These projects were to run over a two-year period, ending in 2002.

2.2 The Ukuvuku/Disaster Management Fire Prevention Awareness Campaign

In 2000 extensive media profile was given to the fires occurring in Joe Slovo[11]. The settlement is particularly prone to fires as the majority of dwellings are built from untreated wood and thermoplastics. Exacerbating this was the high use of paraffin for cooking and candles for lighting[12]. The haphazard development of the settlement further increased the risk by reducing access for fire tenders in the case of a fire. Whilst these are more generic risk factors, it was precisely these that underlay the assumptions of the responses taken.

[10] Independent newspapers
[11] For an overview of fires in Joe Slovo for 2000 refer to Chapter 3
[12] Refer to chapter 3 for a breakdown of fire triggers in Joe Slovo

The media profile of fires in Joe Slovo and the subsequent political pressures to respond, resulted in Disaster Management running two fire awareness campaigns in Joe Slovo. The first was undertaken in June 2000 when Disaster Management profiled Dora, a young African girl severely burnt in a informal dwelling fire, in Joe Slovo. The aim of the campaign was to illustrate the dangers of informal settlement fires through public display of the likely impacts.

The second campaign was the "Fire Prevention Campaign"[13], later to be termed the "Fire Behaviour, Response and Prevention Campaign". It was initiated by Disaster Management and funded by Ukuvuka Operation Fire-stop. Over a period of two weeks, Ukuvuka, Disaster Management and volunteers from Joe Slovo distributed about 5 000 fire education and awareness kits. These kits consisted of a bucket, whistle and a colourful laminated education poster written in Xhosa, English and Afrikaans. The National Environmental Affairs Minister, Ronnie Kasrils took part in the Campaign.

To illustrate the use of the kits, demonstrations and training were held at strategic points within Joe Slovo. The Joe Slovo volunteers formed part of the demonstrations where a mock fire was created and the bucket chain system used to extinguish it. The bucket chain system was seen as a means of extinguishing small-scale fires, acknowledging its limitations in cases where a dwelling was in full blaze.

The education posters were designed to graphically illustrate how to "stop fires before they start!" and "If a fire breaks out…". The messages ranged from "Keep matches, gas, paraffin and petrol in a safe place and away from children" to "Try to put out the fire using your bucket of water or sand. But don't put yourself in danger". The posters were to include five "proactive" hints and five reactive hints.

The Fire Prevention Campaign was well received by the community but it was recognised by Disaster Management that a more extensive structural mitigation initiative was required if the fire risk was to be reduced. Financial constraints, however, limited the implementation of the structural mitigation initiative designed by Disaster Management and CCT Fire Services. The plan outlined the installation of 8m fire breaks, which would divide the settlement into "fire proof cells".

2.3 The turning point- A national disaster

Plans to reduce fire risk through the installation of the firebreaks and access tracks had been imminent in the discussions between Disaster Management and Fire Services. However, the access tracks that were to be installed through the electrification project would not necessarily serve the full purpose, in that the 8m width had not been standardised. The November 2000 fire, however, which was declared a 'National Disaster', after 950 dwellings were destroyed, provided the impetus to "fast track" the plans that had been in place by Development Support, by integrating disaster risk principles into the existing plans. For many, the November 2000 fire is described as providing the "opportunity" for change.

[13] For more detail on the Fire Prevention Campaign refer to the evaluation on the Campaign conducted in 2002 by the Disaster Mitigation for Sustainable Livelihoods Programme for Ukuvuka Operation Firestop

It should be noted that there were additional pressures to respond positively to the 26 November fire. These included the forthcoming local elections in December 2000, and an urgency to avert potential legal action by Eskom if the servitude were reoccupied after the fire. Furthermore, the amalgamation of the City of Cape Town into the new Unicity on 5 December 2000 generated further impetus to respond.

In direct response to the 26 November 2000 fire, CCT's Department of Disaster Management, responsible for providing emergency shelter for the affected households, began working with Ukuvuka, Eskom and other City departments to integrate the risk reduction strategies into the existing projects. Other departments included Departments of Development Support, Fire Services, Spatial Planning, Electricity, Roads and Stormwater Drainage, Water and Housing. The intent of this collaboration was to develop strategies in line with the already-existing upgrading plans to minimise the likelihood of such an event ever recurring.

It is important to highlight that this was an ideal opportunity for Disaster Management to begin integrating risk reduction strategies into other line departments, which had not been involved in fire risk reduction previously. The risk reduction strategies were to form part of the Fire Mitigation Plan for Joe Slovo. Over the following 18 months, the mitigation actions listed below were initiated sequentially and coordinated by Development Support.

- The immediate relocation of the fire-affected community to a resettlement site, to prevent the reoccupation of the Eskom servitude.
- The configuration and reconfiguration of Joe Slovo through the installation of tracks and water supplies in the resettlement site of Zone 30 (November 2000 - March 2001) and later the remaining Zones 30, 31 and 32 (April 2001 - May 2002).
- The proposed development of a greenbelt on the Eskom servitude, facilitated by Ukuvuka and the National Botanical Institute.

2.4 The relocation of the 950 destroyed informal dwellings

After the 26 November 2000 fire, several options existed for rehousing the fire-affected population.

Option 1: The 950 destroyed dwellings could at 'no cost' be re-established on the Eskom servitude as there was an impending court interdict, with the possibility that the City could be sued if they allowed any resettlement on the servitude.

Option 2: The displaced residents could be relocated to an alternative site away from Joe Slovo. This would involve relocation to suitable land (Greenfield) with the view to provide government-subsidised formal housing to the affected households. Extensive investigation took place in connection with this option. While this option was viewed as the most

viable both economically and in the long term, the absence of available land made it untenable[14].

Option 3: The displaced residents could remain in Joe Slovo outside the Eskom servitude, if Isilemela Comprehensive School (east of the Eskom servitude) were willing to negotiate the release of school land for resettlement purposes[15].

Option 3 was selected as the most practical. In exchange for releasing land for site development, it was agreed that Isilemela Comprehensive School could use new land beneath the Eskom servitude playing fields. This agreement to temporarily resettle people on school land was reached through negotiations between the Isilemela School governing body and the Western Cape Education Department. In exchange, the CCT funded the grassing of one playing field with irrigation and sports changing rooms[16]. The CCT also financed fencing to demarcate and protect the school grounds, and the installation of a borehole and pump. [17] Finance was also provided to repair damage caused by the settlers during occupation[18].

While those people who still resided under the power lines and were not affected by the fire did not move, it was considered critical to prevent reoccupation of the fire-affected area of the servitude. As a result, an awareness initiative underlining the dangers of living beneath high voltage lines was undertaken in conjunction with the local committee leaders. Pamphlets were distributed in December to inform of these dangers. Later pamphlets were distributed in English and Xhosa during April/ March 2001 informing the community about the later reconfiguration of Joe Slovo. The development of the pamphlets was done in consultation with the community.

Following this, steps were taken jointly between Ukuvuka and the National Botanical Institute to transform the servitude into a greenbelt with the aim of creating an alternative use of the space to prevent relocation.

2.5 The configuration and reconfiguration of Joe Slovo

The Fire Mitigation Programme was to make use of current storm water and electrification projects underway at the time. Whilst basic upgrading had been initiated prior to the fire, with a particular emphasis on storm water drainage and imminent electrification, the plan was in effect to add value to these existing projects.

Following the 26 November 2000 fire, the first configuration efforts in Zone 30 intended to accelerate these already planned upgrading processes. However, funding for the installation of tracks was limited and was initially sourced from existing allocations earmarked for a storm water project.

[14] It is important to note that the land was largely unattainable due to the political nature of the land that was available
[15] It is important to note that the school was on council land under Apartheid schools regulation
[16] The change rooms were still to be provided at the time of the evaluation
[17] Despite constant negotiations there is a concern that the school may request the land back in two years creating a stalemate
[18] Inspections of the school indicated that there had been additional damage over and above existing damage post the housing of the fire-affected community for three weeks

In this context, the initial steps to reconfigure Joe Slovo, including the installation of the tracks, were to “add value” to the existing project that required tracks in erecting electricity poles and constructing storm water drainage. However, the November 2000 fire underscored the consequences of poor road access into the community for the fire tenders, and resulted in additional funding of R 726 000 from Ukuvuka to further upgrade the tracks.

The November fire thus provided a useful platform for linking this planned integrated services upgrading with fire mitigation efforts, expanding the partnerships to include Disaster Management and Ukuvuka.

To support this process, and in consultation with the community, the Department of Development Support demarcated the Joe Slovo settlement into three zones, Zones 30/ 31/ 32, comprising a total of 38 blocks. Prior to this, the community had been working in blocks S, T and Y, but to create consistency between Langa and Joe Slovo, it was labelled 30, 31 and 32. A chairperson was appointed by residents of each zone to head the zonal committees. These chairpersons were responsible for liaising with the local councillor, City of Cape Town officials and Ukuvuka, as well as attendance at monthly coordination meetings. At these meetings the committee secretary and other members were present[19]. Coordination meeting attendance varied during the course of the project, but overall was well attended. However, the Joe Slovo community was represented by the zonal committee members. Prior to this there had only been one committee chairperson representing the entire Joe Slovo[20].

The site reoccupation process was supported by the establishment of a database to register Joe Slovo residents.[21] This was achieved by linking a list of residents collected by the Electricity Department with GIS (Geographic Information System) data.

2.5.1 The reconfiguration process and measures to reduce fire risk

A key factor that influenced the configuration and reconfiguration process was the need to improve road access for the Fire Services. It was recognised that poor road access for fire tenders had contributed significantly to the severity of the 26 November fire. A second contributing factor limiting the Fire Services’ capacities to extinguish the fire timeously was lack of access to water supplies.

[19] It is important to note that at the same time as these meetings a Sanco meeting was being held, which the community attended simultaneously

[20] These meetings however are largely reliant on the City’s involvement in Joe Slovo and there are concerns that once the City's contract in Joe Slovo expires the meetings, will fold

[21] The establishment of this database was seen as one of the benefits to the community in the following two cases

- It allowed for the development of a postal system.
- In the informal buying and selling of dwellings it provided a geographical numerator by which to locate the sale.

The only problem with the database is that it has not been updated, posing a problem later when registering the residents. Similarly, it has not accounted for the influx of new residents.

As is the case with many informal settlements, Joe Slovo has established itself such that dwellings are positioned close to each other. This clearly increased fire risk by densifying the potentially combustible fuel source, especially as informal dwellings are wood- and iron- structures containing thermoplastics that are highly inflammable.[22] One of the main aims of the reconfiguration was to reduce the spread of fires and increase the effectiveness of the City response services to fires, hence reducing fire risks as opposed to eradicating them.[23]

The reconfiguration process for Joe Slovo occurred in two phases. It first began with the establishment and configuration of a resettlement site within Zone 30 for the population displaced by the 26 November fire[24]. This process occurred during the period November 2000-March 2001. The area developed during this phase accounts for about 20% of the entire Joe Slovo settlement. It includes blocks A/B/C/D/E/F/G/H and parts of N and P.

The second phase involved the reconfiguration of Zones 30 (not resettlement site), 31 and 32 within Joe Slovo, which account for 80% of the settlement. The reconfiguration of these remaining zones began in April 2001 and concluded in May 2002. (Figure 2.5.1.1 represents the physical changes in Joe Slovo, reflecting the settlement prior to the 26 November fire, the fire's impact, as well as the configuration of the new site and the completely reconfigured settlement in 2002. Figures 2.5.1.2/3/4/5/6 represent these changes by aerial photograph).

Given these factors, a core component of the Mitigation Programme was the installation of access tracks. It was intended that the 5m access tracks would increase the access of fire tenders as well as provide fire-breaks at 8m intervals, creating "fire-proof cells"[25]. Approximately 60-150 dwellings were planned for each "cell". However, after a financial analysis was conducted it was realised that it would not be possible. As a result the cells range in size from 100 dwellings to 200 dwellings.

2.5.2 Configuration of the resettlement site in Zone 30

In establishing the framework for the tracks before the community resettled on the site, the blocks were pegged and sites allocated at approximately 44m^2 per dwelling. Whilst this was ongoing, households began to resettle, with community leaders overseeing the site allocation process. The newly configured site was thus divided by unpaved access/gravel roads ('tracks') into fire-proof 'cells'. Following this, the access tracks were created through grading and compacting of the ground with 'Faerie Glen', a nonporous building material.[26]

[22] In addition to these structural factors, weather conditions also contributed significantly to fire severity. The 26 November 2000 fire event occurred during the September to December period known for its 'south-easter' winds that can reach gale-force speeds

[23] Joe Slovo Fire Mitigation Plan Project Team Meeting, 23 March 2001 (4)

[24] The fire-affected area refers to the burnt area of the 26 November 2000 fire

[25] The road widths were not standard throughout the settlement as there were sections where only a 4m width could be achieved.

[26] To assist the contractor in this process, local labour was drawn from Joe Slovo

2.5.3 Reconfiguration of Zones 30/31/32

The reconfiguration process in the remaining area of Zone 30, as well as Zones 31 and 32 occurred over a longer time frame. The reconfiguration process required the willing relocation of dwellings from within the planned fire-breaks/access tracks. To create an incentive, there was the "no move - no electrification" policy [27]. Similarly there was an awareness generated within the community that it could not build underneath the "bare copper conductors" that were being installed[28].

This meant that only once the framework for the tracks had been established would electrification follow. Furthermore, the contractor could only come in and harden the tracks after they had been cleared of dwellings. According to City officials, most residents moved willingly, although in some instances it did require additional pressure[29]. The move required full cooperation from the community, and was characterised by rather haphazard dwelling relocation processes.

An initial track width of 8m was required, which, after creating walkways or informal "pavements", resulted in an access track of 5m. This width was a feature of the Fire Mitigation Programme that would allow for access by fire tenders and similarly create "fire breaks" between the cells at 8m widths.

2.5.4 Improved access to water supplies in Zone 30/31/32

The November 2000 fire highlighted the issue of access to water in times of fire, as fire tenders had limited access to nearby fire hydrants and subsequently had to run hoses from fire hydrants within Langa. During the November 2000, fire limited access to water meant that the Fire Service had to run a hose of almost 1km from Langa.

The upgrading of water services was achieved through the installation of water mains, and the provision of taps and 16 fire hydrants.[30] It began with the installation of water mains and fire hydrants in Winnie Mandela Road where there had been no water mains or fire hydrants. The installation of water mains and fire hydrants throughout Zones 30/31/32 occurred over a longer time period following the reconfiguration process.

Simultaneously, Ukuvuka funded the purchase of four -floatable fire-fighting pumps to the city's fire services and the purchase of 16 fire hydrants.

[27] Prior to this a detailed community consultation was undertaken by the Development Support Department to ensure buy-in from the community

[28] This has subsequently changed with the installation of "bundle conductors" which are safe to build under

[29] The project manager explained that the reason for additional pressure was as a result of the poor leadership of the Joe Slovo committte leaders

[30] Ukuvuka provided the funding for the purchase of the fire hydrants and surface water pumps

2.6 Establishment of a greenbelt on the Eskom servitude

Following the relocation of the 950 dwellings from beneath the Eskom servitude, it became critical that the servitude be well managed. Steps taken to achieve this were reflected in:

- Eskom's court interdict against people who erected shacks beneath the servitude.
- Ukuvuka and the National Botanical Institute's (NBI) joint plan to transform the servitude into a greenbelt.

The greenbelt was intended for use in gardening projects and playing fields. The aim was that by creating community ownership of the servitude, it would be kept clear. In June 2001 the NBI began training 30 community volunteers who had been involved in a gardening project at Isilimela High School. The aim was that these 30 volunteers, once having completed their training, would be able to co-manage the greenbelt. They would also be responsible for liaising with the community around the greenbelt and more generally around environmental issues.

A business plan is currently being formulated where the suggested use of the greenbelt has ranged from greening projects to establishing playing fields. The implementation of the greenbelt is intended to begin in the latter part of 2002. The greenbelt process has also involved other stakeholders. These include the local environmental group Tsoga from Langa[31] and Abalimi Bezakhaya[32] in Guguletu.

[31] Some concerns were raised as to why an organisation outside the Joe Slovo was chosen to partnership in the greenbelt. According to some residents, Tsoga has never been involved in Joe Slovo, questioning their current involvement as being part of their political manoeuvring

[32] Abalimi Bezakhaya is reluctant to establish gardens because of the issues discussed in Part 4

Part 3

Effectiveness of (Re)Configuration in Reducing Extreme Fire Events

The process of assessing the efficacy and impact of the Fire Mitigation Programme involved complementary quantitative and qualitative research components as described in Part 1. The findings from these processes are reflected below.

Part 3 will cover the following areas:

- Trends in frequency of fire occurrence for the entire Joe Slovo settlement, including recorded events in the configured resettlement site in Zone 30
- The distribution and trends in fire severity in Joe Slovo from January 2000-December 2001
- Interpretation of fire occurrence trends
- Assessment of the recorded direct losses from fire incidents to the services listed above.
- Assessment of the cost benefits to the City for the configured resettlement site within Zone 30 as well as reconfigured Zones 31 and 32.

3.1 Trends in fire frequency and triggers

As explained earlier in Section 1.4, it was not possible to precisely reflect fire occurrence in the configured resettlement site within Zone 30. Unfortunately, fire incidents for the period prior to and following the 26 November 2000 fire were not geo-referenced in Fire Service records for either the newly configured resettlement site or Zones 31 and 32. Therefore, the incidents reported here are applied generally to the entire Joe Slovo settlement.

It should also be noted that as reconfiguration of Zones 31 and 32 only commenced in September 2001 and concluded in May 2002, the incidents reflected here (to December 2001) took place before the reconfiguration was complete. In an attempt to address this shortcoming, data from the CCT were used to construct an account of fire incidents in the newly configured resettlement site for 2001.

3.1.1 Frequency of fire events

During the period under review, 34 fires were recorded in the Joe Slovo informal settlement. 23 of these occurred in 2000, compared to 11 in 2001, reflecting a 47.8% decline over the 24 months studied. The period under review also coincided with juxtaposed rainfall conditions, characterised by 373.4 mm and 594.5 mm annual rainfall recorded respectively for 2000 and 2001 (refer Figure 3.1.1.2). This represents rainfall totals 28% below and 15% above the 26-year average for Cape Town.

Table 3.1.1.1
Include summer into summer
Recorded fire events in Joe Slovo January 2000 – December 2001

Month	2000	2001	Total	No./ month Cluster	%/month cluster	Season
Dec	2	2	4			
Jan	5	0	5	10	29.4	Summer
Feb	1	0	1			
March	2	1	3			
April	1	0	1	10	29.4	Autumn
May	5	1	6			
June	1	0	1			
July	2	0	2	6	17.6	Winter
Aug	2	1	3			
Sep	0	2	2			
Oct	0	2	2	8	23.5	Spring
Nov	2	2	4			
Total	**23**	**11**	**34**	**34**	**99.9**	

Figure 3.1.1.2
Number of fire incidents recorded/month, and recorded monthly rainfall
January 2000 - December 2001

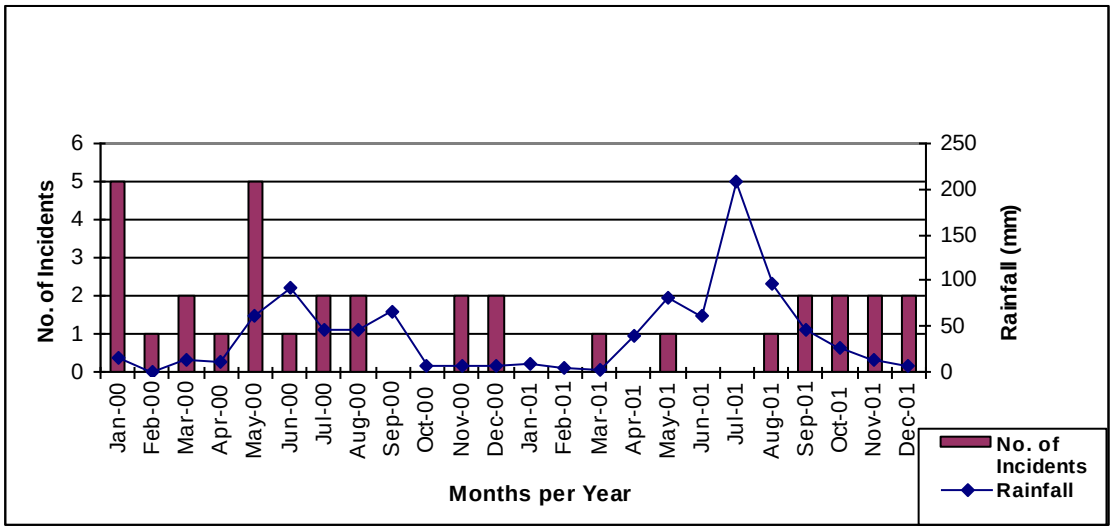


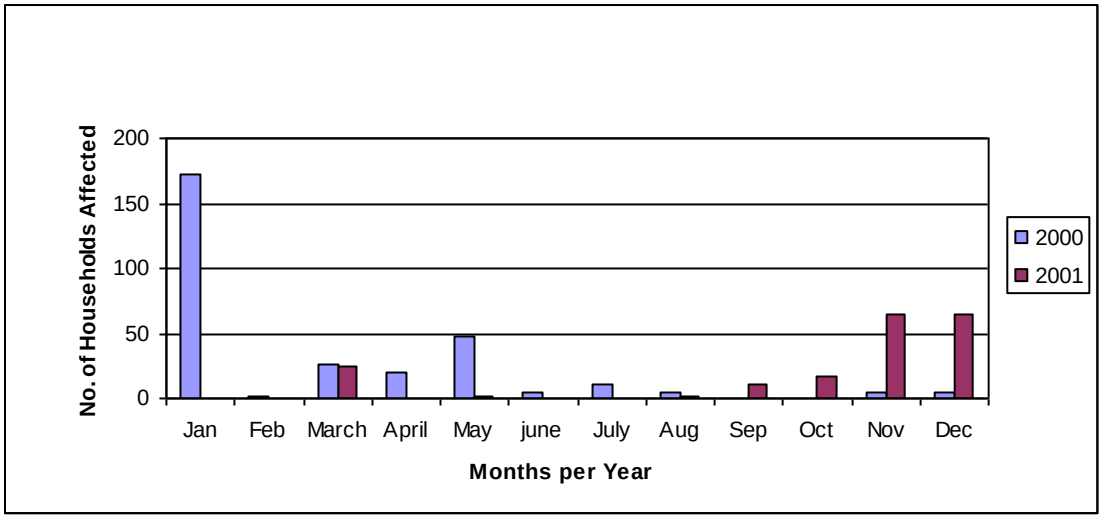
Figure 3.1.1.2 reflects a relationship between monthly rainfall and fire occurrence in the two years studied[33]. The high number of incidents from January to May 2000 relates to low monthly rainfall over the period of time. As mentioned earlier, the year 2000 was a strong La Nina event. This is reflected graphically in the rainfall pattern

[33] There were mixed thoughts on the relevance of figure 3.1.1.2

illustrated between May-August 2001, during which time only two fire events were reported. As rainfall declines in the latter months of 2001, fire occurrence rises. To compare monthly rainfall averages with those during the study period, please refer to Figure 3.3.1.3.

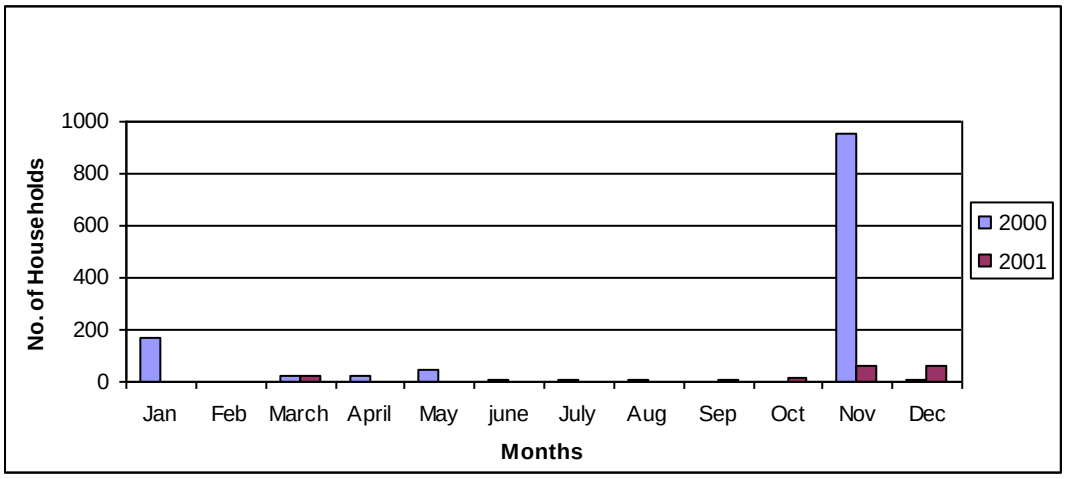
These findings, with respect to frequency of incidents, are consistent with those reflecting the numbers of dwellings destroyed monthly over the two years studied. This is shown in Figure 3.1.1.3 below.

Figure 3.1.1.3
Number of dwellings affected per month for 2000-2001
(Excl. 26/11/2000 fire)



The graph demonstrates a trend of elevated and sustained dwelling losses attributable to fires during 2000, culminating in the 26 November disaster (refer to Figure 3.1.1.4). This is followed by an initial significant fall-off in dwelling losses in 2001, and then increased impacts with the onset of summer later in the year.

Figure 3.1.1.4
Number of dwellings affected per month for 2000-2001
(Incl. 26/11/2000 fire)



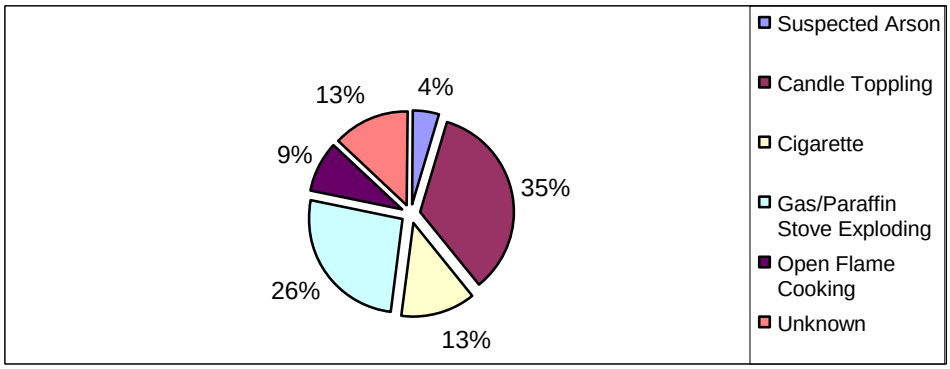
3.1.2 Triggering factors

The frequency of fire occurrence is partly affected by household and community exposure to different fire 'triggers'. As a result of mitigation and upgrading efforts, it was expected that the introduction of electricity and public awareness initiatives could have changed exposure to the 'triggering' factors that typically cause fires in informal settlements.[34] Information on the distribution of 'triggering' factors is reflected in Table 3.1.2.1, Figure 3.1.2.2/3 below.

Table 3.1.2.1
Distribution of recorded 'triggers' (causes) of fires in Joe Slovo, 2000- 2001

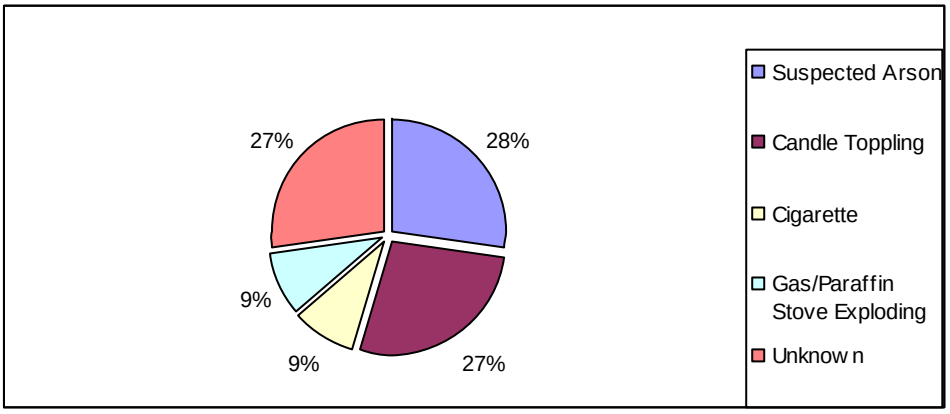
Triggers	2000		2001		Total	
	No.	%	No.	%	No.	%
Suspected Arson	1	4.35	3	27.3	4	11.75
Candle Toppling	8	34.8	3	27.3	11	32.4
Cigarette	3	13.04	1	9.1	4	11.75
Gas/Paraffin Stove Exploding	6	26.09	1	9.1	7	20.55
Open Flame Cooking	2	8.7	0	0	2	5.88
Unknown	3	13.04	3	27.3	6	17.65
Total	**23**		**11**		**34**	

Figure 3.1.2.2
Distribution of fire-triggering events in Joe Slovo, 2000



[34] 'triggering' factors refer to those behaviours, events or processes that constitute the 'necessary cause' of a fire or other disaster event. They can also be known as 'hazards' or phenomena with the potential to cause harm.

Figure 3.1.2.3
Distribution of fire-triggering events in Joe Slovo, 2001



During the period under review, 'candle toppling' was reported as the most frequent trigger, accounting for 32% of all events. 'Gas/paraffin stove exploding' accounted for 21% and 'unknown trigger' 18% of all reported fires.

From 2000 to 2001, the reported percentage of fires triggered by 'candle toppling' declined slightly from 34.8% to 27.3%. A significant reduction however, was reported in the percentage of fires triggered by 'gas/paraffin stove exploding', which declined from 26.09% to 9.1%. 'Cooking over open flame' also dropped from 8.7% to 0% of all reported triggering events.

These reported reductions however are compared with significantly increased triggering events attributed to both 'suspected arson' and 'unknown trigger'. These increased respectively from 4.35% to 27.3% and 13.04% to 27.3% over the two years.

Concerns are frequently expressed about the accuracy of reported 'causes of fire', as it is often almost impossible to independently verify the 'cause' of a specific fire event. The 33% reported reduction in fires triggered by 'candle toppling', 'gas/paraffin stove exploding' and 'open flame cooking' is virtually counter-balanced with a 37% increase in 'suspected arson' and 'unknown cause'. It is possible that increased community sensitivity to fire triggers that can be 'blamed' on a specific household has resulted in more fires being reported as triggered by ambiguous 'untrackable' causes.

3.2 Fire Severity

In addition to changes in frequency of fire occurrence, data were also collected and consolidated on fire severity during 2000 and 2001. 'Fire severity' for the purposes of this report, refers to the number of dwellings/households destroyed in a specific fire event.

Table 3.2.1 reflects fire events by date and number of dwellings destroyed for 2000 and 2001. During this period, 1 431 dwellings were destroyed in 34 separate fire

events. 1 246 dwellings were destroyed in 2000 in 23 events, compared with 185 dwellings destroyed in 11 events during the following year. The destruction of 950 dwellings in the 26 November 2000 fire accounts for 76.2% of all dwellings destroyed in 2000, and 66.42% of total dwellings destroyed.

Table 3.2.1
Fire events, recorded by month and number of dwellings destroyed for 2000 and 2001[35]

	2000				2001			
			Wind				Wind	
Month	**Date**	**No. of Dwellings**	**Speed**	**Direction**	**Date**	**No. of Dwellings**	**Speed**	**Direction**
January	5 13 16 23 27	100 2 40 20 10	7.2 10.6 7.5 10 8.8	S SSE SSE S S				
Total		172						
February	8	1	10.1	SSW				
Total		1						
March	4 25	20 6	1.5 10.7	SSW SSE	3	25	4.9	SSW
Total		26				25		
April	1	20	4.2	S				
Total		20						
May	1 3 8 15 24	20 5 2 10 10	6.4 4.6 1.7 5.9 3.5	S S SE N NE	31	2	2.2	NNE
Total		47				2		
June	10	5	11.7	NNW				
Total		5						
July	16 24	10 1	3.5 2.5	NNW NE				
Total		11						
August	11 19	1 3	1.8 3.4	WSW WSW	4	1	9.1	ESE
Total		4				1		

[35] Wind data from the Weather Bureau

Table 3.2.1
Fire events, recorded by month and number of dwellings destroyed for 2000 and 2001[36]
Cont.

Month	Date	No. of Dwellings	Speed	Direction	Date	No. of Dwellings	Speed	Direction
September					9 16	10 1	6.2 4.7	NNW NW
Total						11		
October					4 21	10 7	3.5 2.8	NW N
Total						17		
November	19 26	5 950	4.8 10.5	N S	26 30	60 4	8.8 7.7	SSE S
Total		955				64		
December	13 15	4 1	7.2 9.1	SSW SSW	10 27	5 60	1.8 4.6	WSW SSE
Total		5				65		
Grand Total		**1 246**				**185**		

3.2.1 Fire severity ranking scale

While it is useful to track seasonal trends by reviewing fire loss information totalled by month, this does not always enable tracking of changing patterns in fire severity. To address this, a simple fire severity ranking scale was developed, based on the numbers of dwellings destroyed/fire event for the two years under review. This is represented in Table 3.2.1.1

The lower clusters were informed by the operational criteria applied for the intervention of CCT Disaster Management (specifically when a fire's impact destroys ten or more dwellings). The upper clusters were similarly informed by the capacity of the fire-proof cells that were created through the reconfiguration process.

An average cell accommodates 100 - 200 dwellings. The ranking scale therefore defined medium-large fires in relation to the **minimum density** of a fire-proof cell while large fires were defined in relation to a cell's **maximum potential density** (ie those events that destroy up to a cell's maximum capacity of 200 dwellings). The ranking scale assumed that the protective value of the access tracks/fire-breaks should prevent extreme fire events (those exceeding 200 dwellings destroyed).

When this scale is applied, only the 26 November 2000 fire was classified as an extreme event.

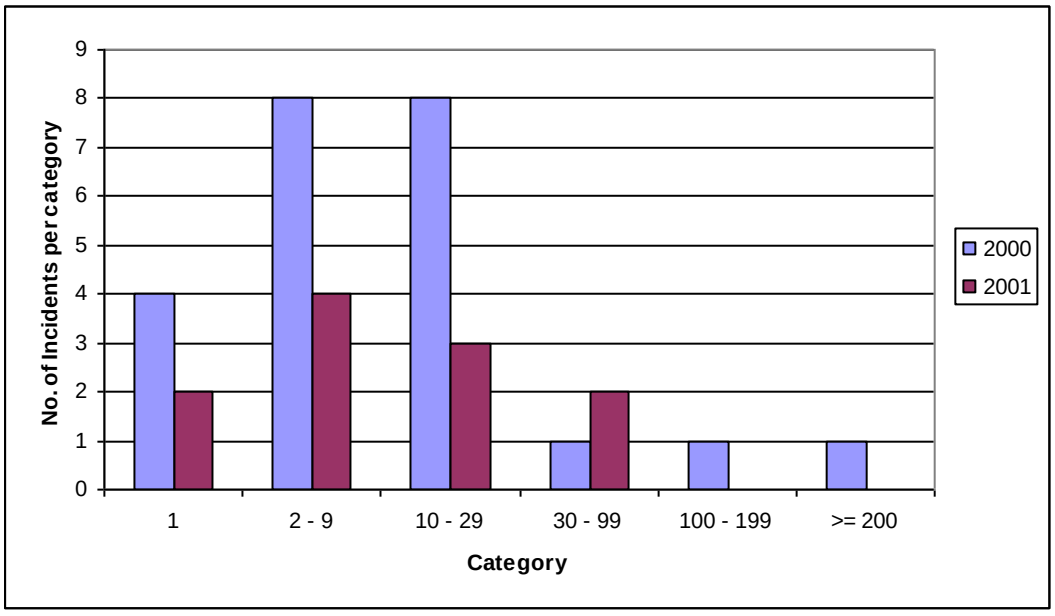
[36] Wind data from the Weather Bureau

Table 3.2.1.1
Medium-large 30-99 and large 100-199
Fire severity ranking scale for Joe Slovo 2000-2001

Category	No. of Dwellings Destroyed/ Event	2000	2001	Total	% all events
Single Dwelling	1	4	2	6	17.6
Small	2 - 9	8	4	12	35.3
Medium	10 - 29	8	3	11	32.4
Medium-Large	30 – 99	1	2	3	8.8
Large	100 – 199	1	0	1	2.9
Extreme	> 200 dwellings	1	0	1	2.9
Total		23	11	34	99.9

During the period studied, the greatest frequency of fire events was reported for fires affecting 2-9 dwellings (35.3%), followed by fires affecting 10-29 dwellings (32.4%) When combined, medium-large and large events destroying between 30-199 dwellings account 11.7% of all fires. Overall percentages of fire events for the different severity categories do not vary significantly when reflected proportionately for each year.

Figure 3.2.1.2
Fire severity ranking scale per incident for Joe Slovo 2000-2001



Yet, when the 26 November 2000 fire extreme event is separated from the data set, an average of 14.6 dwellings are destroyed per fire event for both years. This compares with an average loss of 13.5 dwellings/event in 2000 and 16.8 dwellings/event in 2001 (increase of 24%).

These findings demonstrate a significantly reduced frequency in fire events over the two years under review. They also illustrate the sensitivity of informal settlements such as Joe Slovo to climatic patterns and weather events.

3.3 Interpretation of fire occurrence findings

This section examines these changing patterns in fire frequency and severity more closely. Specifically, it focuses on:

- Possible explanations for reduced fire frequency
- Changing patterns in fire severity
- The structural mitigation value of the access tracks/fire-breaks
- The recurrence probability of extreme events
- The role of density in increasing structural fire risks.

3.3.1 Frequency of fire events

The frequency of fire events declined by a significant 48% during the period studied. Reductions in fire occurrence can be attributed to the impact of the **non-structural** and **structural mitigation** measures implemented, as well as more general weather/climate conditions during the years studied.

Non-structural mitigation measures

'Non-structural' mitigation measures refer to those strategies and activities that minimise exposure of households and property to the fire hazard by 'keeping people away from fire'. Key **non-structural mitigation measures** that apply to the Joe Slovo Fire Mitigation Programme included the following:

Increased awareness of fire risk within the community as a direct result of the 26 November 2000 fire.
The severity of this extreme event is likely to have had a psychological effect on the community as a whole, specifically on those who were directly affected.

Increased fire awareness through fire prevention awareness campaigns
Awareness campaigns within the fire-affected community had been well received by the community and are believed to have contributed towards the increased fire awareness. The Fire Prevention Campaign in October 2000 was recognised as one of the most successful campaigns initiated in Joe Slovo. At this campaign, the City's Disaster Management in collaboration with Ukuvuka issued buckets, whistles and education posters to the community through local community volunteers. Demonstrations were held to show how to use the kits. However, the community expressed serious concerns that there had been no follow up and that the zone committee meetings did not allocate sufficient time to discuss fire prevention[37]. Similarly there had not been sufficient focus on the social factors that increase fire risk such as alcohol abuse, arson and conflict. For this reason the community attributed

[37] For more detailed insight into the fire prevention initiatives refer to Part 2 or Appendix 2

the decrease in fire frequency more on the structural mitigation measures than the fire prevention campaigns.

Increased community ownership of risk/social controls

Field reports suggest that households may have become more sensitive about triggering fires in the community. Instances were reported of home owners who had triggered fires resulting in loss and who had then fled the community due to fear of reprisals.

Structural mitigation measures

Structural mitigation measures refer to those strategies and activities that minimise the potential for fire by 'keeping the fire hazard away from people'. The following are key structural mitigation strategies:

Electrification

In this context, the most significant intervention was the 'roll-out' of electrification in the community. It is possible that 'rolling-out' electrification reduced the household use of paraffin and candles for cooking and lighting. Recognising that the majority of informal settlement fires are the result of candle toppling[38], electrification is a key strategy for reducing fires related to candle use.

However, there are constraints around the use of electricity that limit its protective benefits, particularly around household preference to cook with paraffin rather than electricity[39]. This is primarily due to the capital expenses as well as recurrent costs associated with the use of electricity for cooking. For instance:

- Households cannot afford the capital costs of electrical appliances such as kettles and stoves.
- Households prefer paraffin for cooking as it is a more cost-effective form of cooking fuel.

Such cost constraints clearly limit the use of electricity, even after it has been installed. Field research revealed several instances in which electricity boxes were not in use.

Relocation from the Eskom servitude

The relocation of the population affected by the 26 November 2000 fire also had protective value by moving households from the extreme risk associated with living under electricity pylons. High voltage power lines have the marked potential to exacerbate fire severity through 'flash downs' of electricity that can cause potential injury or death.

[38] Candle toppling, as cause of fire, is most significant during the summer months with the South Easter

[39] Community leaders commented that people do not use electricity for cooking as it is more expensive

Prevailing climate/weather/climate conditions in 2000/2001

To determine whether declining fire trends in Joe Slovo reflected general downward patterns in fire occurrence in other informal settlements, fire incidence data were compared with those for Brown's Farm in Philippi. Table 3.3.1.1 reflects these data.

Table 3.3.1.1
Fire incidence data comparing events and rates/1000 dwellings for Joe Slovo and Brown's Farm, 2000 - 2001

Informal settlement	No. dwellings	2000 No. fires	2000 Rate/1000 dwellings	2001 No. fires	2001 Rate/1000 dwellings	Decline Per 1000 dwellings	% decline 2000-2001
Joe Slovo	4 300	23	5.35	11	2.56	2.79	52.2
Brown's Farm	7 824	36	4.6	27	3.45	1.15	25

In 2000, 36 fires were reported in Brown's Farm compared with 23 in Joe Slovo. However, when events are expressed as a rate per thousand dwellings, Joe Slovo reported a fire incidence rate of 5.35/1 000 compared with 4.6/1 000 for Brown's Farm. In both informal settlements, fire occurrence declined significantly in 2001, with 11 and 27 fires being reported respectively for Joe Slovo and Brown's Farm, reflecting rates/1 000 dwellings of 2.56 and 3.45. In this context, fire incidence declined by 52% in Joe Slovo compared with 25% in Brown's Farm, reflecting a steeper and more significant drop in fire events/1 000 dwellings.

It is important to note however, that a general downward trend was reported in both communities, possibly reflecting the weather extremes of the two years being reviewed. Figures 3.3.1.2/3 for instance, reflect patterns in rainfall over the two years studied, illustrating percentage departures from the 26-year monthly average.

2000 recorded only two months in which rainfall exceeded the 26-year average, while 2001 recorded four months in which rainfall was greater than the recorded average. It is likely, given the extremes, that prevailing weather conditions contributed significantly to both increased fire frequency in 2000 and reduced fire occurrence in 2001.

Figure 3.3.1.2
Graph representing rainfall as percentage departure from monthly average for 26 years

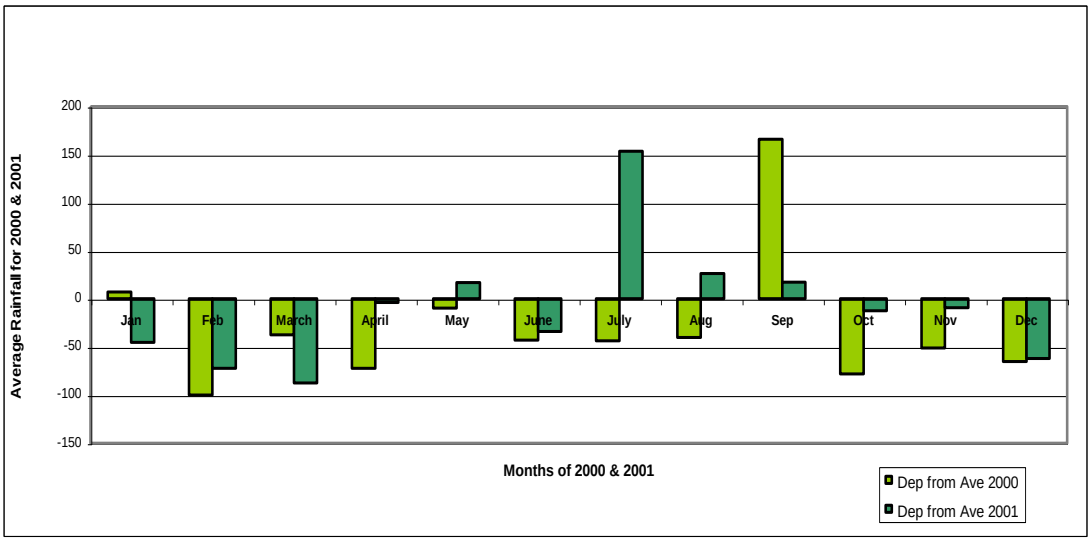
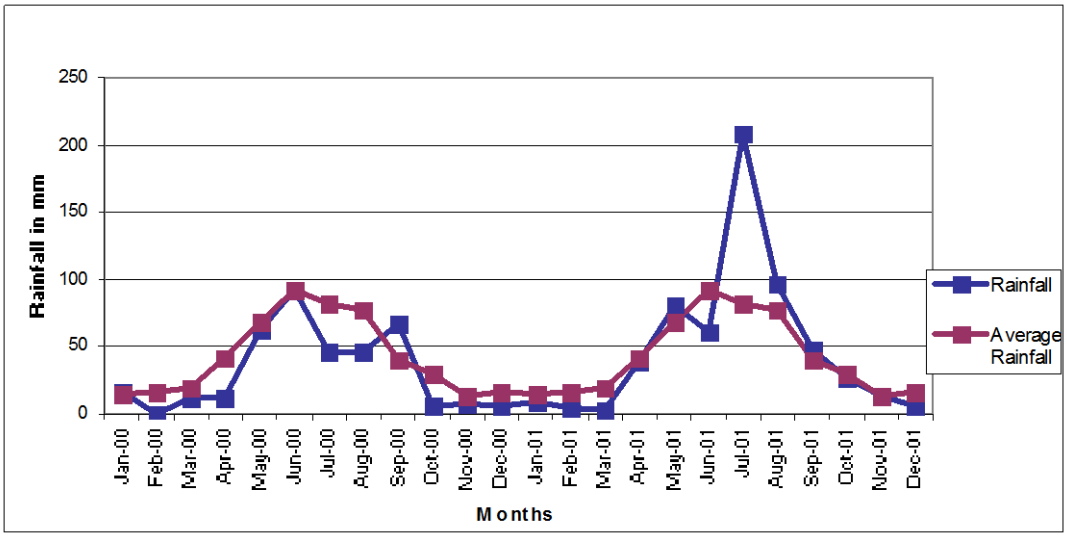


Figure 3.3.1.3
Monthly rainfall for 2000-2001, compared with average monthly rainfall



3.3.2 Fire severity, with specific reference to extreme events

For the purposes of this report, fire severity is defined in relation to the number of dwellings destroyed. Unfortunately, this indicator is limited in that it fails to incorporate other important loss information, including injury and death data, as well as indirect economic losses. Regrettably, the data-base on burns injuries to children as well as fire-associated deaths recorded in hospitals are difficult to relate to specific fire incident reports consolidated by Fire Services and Disaster

Management. A more comprehensive fire severity ranking scale would incorporate human impacts as well as those relating to physical infrastructure.

During the period under review, only one extreme fire event occurred on 26 November 2000. However, 'early warning' information signalling increasing fire risk had been apparent from December 1999 when one event destroyed 300 dwellings, and in January 2000 when over 150 dwellings were destroyed in repeated fires.

Several risk factors contributed to the increasing probability of an extreme fire event. These included:

Non-structural conditions that increased fire risk

Many socio-political and economic conditions increased fire risk, including the prevailing poverty and poor urban development, which led people to live in an endangering environment such as beneath the Eskom powerline. These conditions were aggravated by community instability that accompanied the rapid in-migration of 1998-2000, characterised by the population doubling.

Structural conditions that increased fire risk

Rapid in-migration resulted in dwellings being constructed in close proximity to each other[40]. Furthermore, structural risks were increased by building with highly inflammable thermoplastics as well as wood and iron. Similarly, the poor access by fire tenders to the settlement reduces the fire services effectiveness in its ability to respond.

Aggravating climate and weather conditions

The La Nina general climate pattern in 2000 (associated in the Western Cape with above-average temperatures, below-average humidity and significantly reduced rainfall), created atmospheric conditions conducive to fire events. These factors were amplified by specific weather conditions, notably southerly winds that reached gale force speeds on 26 November 2000 (refer to Table 3.2.1).

Tables 3.3.2.1/2/3 demonstrate the powerful role that wind plays in driving severe informal settlement fires. For the three recorded events reporting dwelling losses of $\geq$ 60, all were accompanied by significant winds. With specific respect to the 26 November 2000 fire event, the fire began at approximately 1400 hrs, fanned by a fresh breeze (Beaufort Scale 29-38 km/hr; Beaufort No. 5)[41]. At 15h36, winds gusted to nearly 62 km/hr (Beaufort No. 8 "Gale"), and gradually subsided.

In all three events, the strongest daily wind-speeds occurred during the course of the fires, and are likely to have contributed to the extensiveness of the burned area.

[40] Abott challenged this assumption with case studies from Site B in Khayelitsha who have a higher density per hectare but with a lower fire risk. In this case their risk is reduced through community cohesion, whilst in Joe Slovo the community has been destabilised through rapid influx

[41] For an overview of the Beaufort Scale categories refer to Appendix 6

Table 3.3.2.1
Wind speed/direction data for fire events on 26/11/2000

(* Indicates the begin time for the fire, ** Indicates the end time of the fire, * Indicates the maximum wind speed for the day)**

Wind data for 26/11/2000 : 950 Households Affected

	Wind Speed			
Time (24HR)	**M/S**	**KM/H**	**Direction**	**Beaufort Category**
13	11.4	41.04	S	6
14*	10.5	37.8	S	5
15	10.6	38.16	S	6
15:36	17.2***	61.92	S	8
16	12.3	44.28	S	6
17	11.9	42.84	S	6
18	11.2	40.32	S	6
19	10.3	37.08	SSW	5
20**	9.2	33.12	SSW	5
21	8.5	30.6	SSW	5

Table 3.3.2.2
Wind speed/ direction data for fire event on 26/11/2001

Wind data for 26/11/2001: 60 Households Affected

	Wind Speed			
Time (24HR)	**M/S**	**KM/H**	**Direction**	**Beaufort Category**
16	9	32.4	S	5
17*	8.8	31.68	SSE	5
17:09	13.9***	50.04	SSE	7
18	8.7	31.32	SSE	5
19	7.8	28.08	SSE	4
20**	8.3	29.88	SSE	5
21	8.4	30.24	SSE	5

Table 3.3.2.3
Wind Speed/direction data for fire event on 27/11/2001

Wind data for 30/11/2001: 60 Households Affected

	Wind Speed			
Time (24HR)	**M/S**	**KM/H**	**Direction**	**Beaufort Category**
00*	9.1	32.76	SSE	5
00:52	13.3***	47.88	SSE	6
01**	8.8	31.68	SSE	5
14	8.7	31.32	S	5

3.3.3 The structural mitigation value of access-tracks/fire-breaks.

The data suggest that the installation of the 8m firebreaks and 5m access-tracks contributed to reducing the probability of an extreme fire event (ie a fire that destroys 150 dwellings or more). While not necessarily contributing to a reduction in small/medium-scale fire frequency, the tracks lower the probability of an extreme event by preventing spread across fire-breaks under conditions of increased wind and other risk.

It is significant to note that in 2001, two fire events occurred in November and December, both destroying 60 dwellings in Zones 30 and 31. In both instances, more extensive damage was averted through the containment of the fires' spread within the configured cells. Moreover, the tracks improved access for the responding fire tenders.

Comparing the 2001 fires: potential extreme fire incidents

26 November 2001 fire: Zone 30, Block G (configured resettlement site for those displaced one year previously).

This fire was allegedly started by a woman who left her primus stove unattended in winds that gusted to moderate/near gale conditions, destroying 60 dwellings. An infant also died in the fire - apparently due to smoke inhalation. A newspaper article reported that the woman was hounded by the community, seeking reprisal for the fire. This resulted in the need for police intervention to control the crowd. (Source City Vision: Cape Peninsula Township News (29 November 2001).

According to Disaster Management and Fire Service officials, an extreme fire event was prevented by the tracks that allowed rapid access for the fire services and mitigated the extensive spread of the fire. The fire was contained to this one cell(G) through the fire breaks created by the tracks.

27 December 2001 fire: Zone 31
By December 2001, Zone 31 had been reconfigured, but not provided with fire hydrants. The winds were moderate. The 27 December fire followed the long Christmas weekend that ended on the 26 December. Poor access to water may

have contributed to the severity of this event. Similarly, the destruction of 60 dwellings within Zone 31, despite the moderate wind conditions may also be as a result of densification. According to City officials Zone 31 has the highest density within Joe Slovo.

3.3.4 The recurrence probability of extreme fire events

Data suggest that the fire mitigation plan, in particular the installation of tracks, contributed towards decreasing the recurrence of extreme events. Unfortunately, it is difficult to accurately project the recurrence interval for such events, given the wide range of structural, socio-economic, climate and weather risk factors that co-contribute to their occurrence.

However, recognising the reality of global climate change, it is expected that this will be accompanied by greater climate extremes, such as those portrayed in the Joe Slovo case study. Moreover, the study demonstrates the clearly increased seasonal fire risk from November-March and the role of exacerbating wind conditions. Should these conditions increase, newly forming informal settlements and/or those lacking social cohesion, characterised by rapid densification, will similarly face the risk of extreme fire events.

In this context, (re)configuration with access tracks may significantly reduce the occurrence of extreme events, but will need to be accompanied by extensive non-structural mitigation (ie vulnerability reduction) interventions to sustainably drive down frequency of fire occurrence.

3.3.5 Density and increasing structural risk: measuring an acceptable level of loss

In Joe Slovo the increasing densification within the cells could adversely contribute to increased fire risk. Although the tracks demarcate the cell boundaries, they do not control densification within cells. This results in increasing the total flammable surface area, increasing the potential severity of fire incidents.

It may even negate the effect of the tracks in reducing extreme fire incidents. In some ways, it challenges the assumption that a rapid-onset extreme fire event is one that exceeds an acceptable level of loss determined at 200 dwellings/event. Given the current dwelling densities in Zone 30, one can anticipate a series of medium/ large incidents that could equal, if not exceed, an extreme event defined according to these criteria.

The importance of densification as a key risk factor for fire severity is reflected in Table 3.3.5.1, which shows changing density patterns within specific blocks in Zone 30 (drawn from aerial photographs taken in March 2001 and April 2002). It is clearly of concern to note several blocks have increased density in excess of 50%. In April 2002, there was only one block containing less than 100 dwellings, compared with six blocks a year earlier. It is also significant to note that the 26 November 2001 fire

occurred in Zone 30's Block G, which increased its dwelling numbers by 71% in less than a year following configuration.

Under such dwelling densities and in the presence of adverse weather conditions, the potential fire risk is expected to increase considerably.

Table 3.3.5.1
Numbers of dwellings counted in aerial photographs and % increase of Joe Slovo 2001-2002

	2001	2002	%
Block A	171	200	17
Block B	85	125	47
Block C	92	127	38
Block D	104	135	3
Block E	93	145	6
Block F	73	142	95
Block G	80	137	71
Block H	None		
Block N	89	96	7
Block P	123	147	2
Total	**910**	**1 254**	**38**

Increasing settlement densities and the role of climate in driving fire conditions illustrate the complexities in effecting successful fire mitigation efforts in informal settlements. While both structural and non-structural mitigation efforts can contribute to reduced losses, they must be implemented in ongoing consultation with their partner communities to avoid unintended conditions and behaviours, which may inadvertently drive fire and other risks upwards.

3.4 Tracking fire losses: extreme and recurrent events.

This section focuses on the cost implications of extreme and recurrent events, specifically focusing on the recorded economic losses incurred in the 26 November 2000 fire. Recorded economic losses for small, medium and medium-large events are also reflected for 2000 and 2001. Cost information is provided for the reconstruction/site development and configuration of the resettlement site in Zone 30, as well as data reflecting the establishment of the greenbelt.

Specifically, this section will present and discuss:

- The direct economic losses recorded from November 2000 fire
- The direct costs associated with resettlement site development/configuration in Zone 30
- Recorded economic losses for small, medium, large fire events 2000 - 2001

3.4.1 Direct disaster-related losses from the 26 November 2000 fire

Table 3.4.1.1 Summarises recorded economic loss information for the November 2000 fire. In determining the direct losses from this event, costs were attributed to the Joe Slovo-affected community, City of Cape Town Fire Services and Disaster Management and humanitarian relief organisations. Direct costs incurred by Eskom and the Isilimela High School are also included.

Table 3.4.1.1
Direct recorded losses from the 26 November 2000 fire

Services	**Type**	**Amount (ZAR)**	**% Total losses**
Fire Services	Response cost (excl. staff)	113 533.00	2.06
Social Services	Relief cost (R500/family)*	834 000.00	15.1
Losses to Households	Est. costs of dwellings and contents (950 dwellings)	1 400 000.00	25.4
Eskom	Damaged pylons**	138 000.00	2.5
City of Cape Town	Losses from power failure	1 500 000.00	27.18
Red Cross Society	Relief: blankets and food***	1 000 000.00	18.1
City of Cape Town	Hiring trucks and cleaning up debris	248 000.00	4.49
Additional costs	Security	80 000.00	1.45
	Repairs to Isilimela school	195 000.00	3.53
	Aerial photography directly after fire	11 000.00	0.2
Total		**5 519 533.00**	**100.01**

* Social Services costs per family and not per dwelling
** In the future, Eskom's insurance provider will require Eskom to pay an excess of at least R 500 000 before covering similar losses
*** Red Cross relief reflects donations from the Cape Argus and the public

The 26 November 2000 fire resulted in recorded direct economic losses of R 5,5 million. Of these, R 1,5 million (27.18%) were costs incurred by the City of Cape Town, with R 1,4 million (25.4%) estimated as direct losses to household dwellings and their contents. Costs of R 1 million (18.1%) and R 834 000 (15.1%) were incurred respectively by the South African Red Cross (SARCS) for relief and Social Services to assist with family recovery. Eskom incurred R138 000 costs (2.5%) for damage to the pylons. The average cost of relief/recovery assistance per household affected when all costs are totalled is R 5 632 (for 980 households) or R 5 810/dwelling destroyed (for 950 dwellings).

It is important to note slight discrepancies specifically with respect to household impact data that may be variously referred to as ‘dwellings destroyed’, ‘households affected’ or ‘families affected’.

‘Dwellings destroyed’ vs ‘households affected’
Detailed scrutiny of aerial photographs of Joe Slovo prior to November 2000 by CCT Department of Development Support indicated no more than 950 structures located beneath the Eskom servitude. These, technically, were the ‘dwellings destroyed’ in the extreme fire event. However, immediately following the November fire, other households in non-fire affected areas also presented themselves for relief and assistance, increasing the numbers of ‘households affected’ to 980.

‘Dwellings destroyed’ vs ‘families affected’ or ‘households affected’
Fire Service reports typically refer to ‘dwellings destroyed’, while SARCS and Social Services refer to ‘families affected’ or ‘households affected’. There may be more than one ‘family’ or ‘household’ per dwelling.

3.4.2 Recorded costs for resettlement site development/greenbelt development

Table 3.4.2.1 reflects recorded costs for resettlement site development and configuration in Zone 30, as well as greenbelt development, across a range of services and sectors.

Table 3.4.2.1
Recorded costs for resettlement site and greenbelt development in Zone 30

Services	Intervention type	Amount (ZAR)
City of Cape Town	Water (basic standpipe supply)	218 000.00
Ukuvuka	Water (additional cost to upgrade with fire hydrants)	90 000.00
	Tracks	726 000.00
	Stormwater drainage	367 000.00
	Dwelling relocations & numbering	30 000.00
		15 000.00
Estimated sub-total		**1 446 000.00**
National Botanical Institute & Ukuvuka	Consultation with Community	66 060.00
	Grey Water Gardens	389 136.00
	Sports Field / Play Ground	1 351 980.00
Estimated sub-total		**1 807 176.00**
City of Cape Town	Negotiating of Isilemela High School land (trade-off 1.450,000 – 195,000)	1 255 000.00
Grand total		**4 508 176.00**

Total costs for the development of the resettlement site and greenbelt totalled R 4.51 million. These costs exclude the roll-out of electrification in the newly configured area. Excluding electrification, this constitutes an average expenditure/affected household of R 4 600.

3.4.3 Recurrent small, medium and large fire events, 2000 and 2001

In addition to the extreme fire event in November 2000, 33 small, medium and large events were reported over the two years reviewed. Regrettably, the absence of systematically collected impact information for these recurrent events across most services, makes it almost impossible to establish a baseline economic loss pattern.

With the exception of the Fire Services, most other emergency response partners, Social Services and humanitarian agencies fail to consolidate information for smaller events, compared to those affecting ten or more dwellings. The absence of data for smaller events also raises important equity concerns about whether emergency assistance and recovery support are as equally accessible to families affected by less spectacular events as those by extreme occurrences.

Table 3.4.3.1
Direct recorded losses for small, medium and large-scale fires in Joe Slovo, 2000

Services	Type	Amount (ZAR)	% total loss
Fire Services	Response cost	110 989.00	20
Social Services*	Recovery cost	Data not available	
Red Cross	Relief cost	25 000.00	4.5
Losses to Households	Loss to property No. of dwellings (296)	419 000.00	75.5
Sub Total		**554 989.00**	**100**

*if Social Services recovery assistance had been provided at R 500/affected household, this cost would be R 148 000.00, resulting in an overall financial impact of R 702 989 across all direct losses

Information from small, medium and large scale-events indicate recorded direct losses of R 554 989 in 2000. This excludes Social Services assistance (which, if recovery aid were provided at R 500/family, could have reached R 148 000). When compared with the declared November fire disaster, direct household loss comprises a greater share of the total cost (76% of all losses, compared with 25% of losses recorded in the November fire). The average cost per household destroyed when expenses for all direct losses are totaled is R 1 875.

In 2000, the total recorded direct fire-related losses from the Joe Slovo informal settlement therefore reached R 6 074 522 for extreme, as well as small, medium and large-scale fire events.

3.4.4 Direct losses for fires in Joe Slovo, 2001

During 2001, considerable effort was invested to develop and configure the resettlement site in Zone 30, as well as to reconfigure Zones 30 and 31. During this period, 11 fires were reported for Joe Slovo, with ten recorded in Zones 31 and 32 and one reported in the resettlement site within Zone 30. This is reflected in Table 3.4.4.1 below.

Table 3.4.4.1
Reported fire events in Joe Slovo, 2001, reflecting direct losses (where possible) in South African Rand

Date	No. of Dwellings	Fire Serv. Costs	Estimated Household Loss	Social Serv.	SARCS	Total (when complete data available)
03-Mar	25	5 899.00	25 000.00	17 000.00	532.00	48 431.00
31-May	2	2 940.00	3 500.00			
04-Aug	1	1 244.00	2 000.00			
09-Sep	10	1 499.00	10 000.00		380.00	
16-Sep	1	152.00	1 600.00			
04-Oct	10	1 690.00	40 000.00			
21-Oct	7	462.00	10 500.00			
*26-Nov**	60	7 829.00	96 000.00	26 500.00	2 128.00	132 457.00
30-Nov	4	455.00	8 000.00			
10-Dec	5	1 636.00	10 000.00			
27-Dec	60	14 316.00	90 000.00	40 000.00	3 040.00	147 356.00
Total	**185**	**38 122.00**	**296 600.00**	**83 500.00**	**6080.00**	**328 244.00****

* this event occurred in Zone 30. Source for dwellings destroyed and household loss information is the CCT Fire Services
** totals reflect only three events affecting 145 dwellings

During 2001, over R 300 000 in recorded fire losses were reported for Joe Slovo. Regrettably, complete information could only be provided for three of the 11 reported events, which affected 145 of the total 185 households. For those events for which data were complete, the average response costs per household affected were R 2 264. If these unit costs per-household are applied to all 185 households, total fire response/recovery costs could be estimated at R 418 840 for 2001.

Table 3.4.4.2
Comparative change in fire-related losses 2000, 2001 for small, medium and large-scale events

Indicator	2000	2001	% change
No. of events	22	11	↓ 50
No. dwellings destroyed	296	185	↓ 38
No. dwellings destroyed/fire event	13.5	16.8	↑ 24
Est. cumulative economic loss/ households affected (summed for all costs and services)	R 2 375	R 2 264	↓4.6
Fire services costs/dwelling affected	R 375	206	↓45
Fire services costs/fire event	R 5 045	R 3 466	↓31
Cumulative household losses/fire event (total annual household costs/no. of events)	R 19 045	R26 964	↑ 29
Household property losses/individual household affected	R 1 416	R1 603	↑12
Household losses as % of total loss*	68%	60%	↓ 8

* compare these household losses as a percentage of total loss with household losses of 25.2% of the total loss recorded in the November 2000 fire. 2000 total losses include estimated costs of R 148 000 incurred by Social Services.

Table 3.4.4.2 represents interesting comparative information reflecting changes in economic loss for non-extreme fire events during the years studied. Encouraging reductions are shown in the frequency of fire events and numbers of dwellings destroyed, which declined by 50% and 38% respectively. Similarly, fire service costs fell by 45% per dwelling affected and by 31% with respect to service costs per fire event.

These improved indicators are counter-balanced with less favourable findings for the households directly affected. During the two years studied, the number of dwellings destroyed per fire event increased by 24% from 13.5 to 16.8. Similarly, total summed

household losses/event increased by 29%. While external service costs fell as an overall percentage of the total recorded loss, household losses remained constant. Household losses constitute a significantly greater proportion of the fire costs in small, medium and large events than in extreme fire occurrences.

These findings highlight the complexities in achieving sustainable reductions in fire losses. They indicate the clear benefits for emergency services in improved access and provision of water supplies. However, simultaneously, they underline the high costs borne by at-risk households in 'small, medium or large' fire events.

3.5 Assessing costs and benefits from mitigation interventions to prevent extreme events

The Joe Slovo project provides a useful opportunity to assess the costs and benefits of mitigation to avert extreme fire events.

3.5.1 Costs for mitigation, settlement development and upgrading

Table 3.5.1.1 summarises all mitigation and settlement configuration/upgrading costs for Zones 30, 31 and 32 between 2000 and 2002, when reconfiguration of Zones 31 and 32 was completed.

Table 3.5.1.1
Summary of all (re)configuration and upgrading costs, Zones 30, 31and 32.
(South African Rand)

Intervention type	**Costs, Zone 30**	**Costs, Zones 31, 32**	**Total costs (ZAR)**
Water (basic standpipe supply	218 000	204 000	422 000
Water (upgrading hydrants)	90 000	84 000	174 000
Tracks	726 000	1 989 000	2 715 000
Storm water drainage	387 000	147 000	534 000
Dwelling relocations	30 000	78 000	108 000
Dwelling numbering	15 000	35 000	50 000
Sub-total	**1 446 000**	**2 517 000**	**3 983 000**
Expend/household (950 households Zone#30; 3 320 households Zone#31/32)	1 476	758	926
Eskom electrification costs			10 500 000
Total expenditure Joe Slovo			**14 483 000**
Expenditure per household			**3 368**

Total costs for site development, (re)configuration and service upgrading in Joe Slovo totalled R 14.4 million, including Eskom's electrification costs of R 10.5 million. Basic (re)configuration costs and essential services totalled R 3.98 million.

3.5.2 Assessing costs and benefits for fire mitigation

In assessing the protective value of core mitigation activities to avert an extreme fire event, the following assumptions were made:

- The recurrence interval for extreme fire events ≥ 150 dwellings is estimated as three years (taking into consideration the frequency of La Nina conditions).
- While fire events affecting up to 149 households reflect an 'acceptable level of loss', extreme events affecting ≥ 150 households are unacceptable.
- The direct economic costs of an extreme event when summed according to all categories listed in Table 3.4.1.1 **including Eskom losses**, are R 6 053 212. When spread over three years, annual costs are R 2 017 737 (R 5 553 212 plus R 500 000 for Eskom's new excess).
- The direct economic costs of an extreme event summed for all categories in Table 3.4.1.1 and **excluding Eskom losses** are R 3 915 212. When spread over three years, annual costs are R 1 305 071.
- Mitigation costs can be tiered, ranging from 'Do nothing' (no cost) to provision of near-to-complete services (major service upgrade).
- The Joe Slovo intervention reflects both fire mitigation and service upgrading efforts.
- The mitigation costs reflected below **refer to capital expenses and not recurrent costs**. The tables assume that key protective structures (ie access tracks) will be maintained, but does not incorporate these costs. A more comprehensive cost-benefit analysis would include such recurrent expenses to assess the long-term economic sustainability of protective interventions.
- The population remains relatively stable and densification within 'fire-proof' cells is avoided.

Table 3.5.2.1
Fire mitigation options, costs and benefits, Joe Slovo, 2000-2002 when **Eskom losses are factored in** (South African Rand)

Mitigation option	Description of activities	Mitigation costs involved (cumulative)	Likely losses from (extreme event)/yr	Extreme disaster event savings/yr (cumulative)	No. years for return on mitigation investment
1	Do nothing	0.00	2 017 737	0.00	N/A
2	Buy H.S land Relocate dwellings Estab. Greenbelt	3 092 176	1 305 070	712 667	4.3
3	Option **2 Plus** Install standpipes Install hydrants Establish tracks	4 126 176	0.00	2 017 737	3
4	Option **3 Plus** Est. storm water Number dwellings	4 508 176	0.00	2 017 737	3

Table 3.5.2.1 represents the different options available in Joe Slovo for mitigating extreme events.

Option 1 ('do nothing')
Is the most costly, as it fails to avert recurrent extreme events.

Option 2 (the negotiation of resettlement land, relocation of dwellings and establishment of the greenbelt)
Eliminates extreme event consequences for Eskom. However, it does not necessarily minimise exposure to fire risk in unplanned and unserviced informal settlements. Nor does it facilitate access for emergency vehicles and access to water. Under this option, extreme fire events could recur within three years. Yet, it would require at least four 'event-free' years to realise full economic return on the mitigation investment.

Option 3 (installation of access tracks, water supplies and hydrants)
Virtually eliminates the probability of an extreme fire event, and requires three 'extreme-event-free' years to recover the investment. This option however, is the most dependent on sustained financial support to ensure recurrent costs are met, especially with respect to maintenance of the access tracks and their regrading after the winter rains.

Option 4 (begins to include more developmental interventions that address a wider range of risks (ie flooding).
Is the more expensive option also requires around three 'event-free' years to be cost effective. It also has implications for recurrent and maintenance costs.

Table 3.5.2.2
Fire mitigation options, costs and benefits, Joe Slovo, 2000-2002
when **Eskom losses are factored out** (South African Rand)

Mitigation option	Description of activities	Mitigation costs involved (cumulative)	Likely losses from (extreme event)/yr	Extreme disaster event savings/yr (cumulative)	No. years for return on mitigation investment
1	Do nothing	0.00	1 305 071	0.00	N/A
2	Buy H.S land Relocate dwellings Estab. Greenbelt	3 092 176	1 305 071	0.00	N/A
3	Option **2 Plus** Install standpipes Install hydrants Establish tracks	4 126 176	0.00	1 305 071	3
4	Option **3 Plus** Est. stormwater Number dwellings	4 508 176	0.00	1 305 071	3.45

When Eskom losses are set aside from the calculation, Option 3 still provides an effective suite of interventions, and virtually eliminates the prospect of an extreme event. However, it requires more than three 'extreme event-free' years to recover the investment. As in the earlier estimates, **the effectiveness of this option is highly**

dependent on the protection and maintenance of the protective tracks and hydrants.

While these data underline the effectiveness particularly of Option 3 to mitigate extreme fire events, they under-represent the dynamic nature of informal settlements such as Joe Slovo. The assumptions underlying the fire-proofing value of the (re)configuration process include achieving maximum densities of 60-150 dwellings/fire-proof cell, and maintenance of the access tracks/fire-breaks.
Changes in these assumptions could well result in increased probabilities of large fire events within congested cells, and their possible spread across access tracks, especially in hot dry windy conditions, in the presence of reduced seasonal rainfall.

Part 4

Challenges of Implementing Mitigation Strategies within a Sustainable Development Framework

4.1 Introduction

The Joe Slovo Fire Mitigation Programme illustrates challenging issues associated with risk management in marginal urban communities. In the initial plans for Joe Slovo, there were no plans for formal upgrading. The upgrading that was undertaken was all done on the premise that the informal settlement would be there for at least another three years. Whilst this type of upgrading was not intended to be permanent, the underlying principles of long-term sustainability are challenged.

The measures subsequently implemented were located in a context that simultaneously conveyed conflicting messages of permanence and non permanence. The challenges generated by this tension are reflected in:

- **Separate initiatives** for Joe Slovo and Langa and de-linking of Joe Slovo plans from the Langa IDF (Integrated Development Framework).
- **Unsustainable funding** for maintaining access tracks/fire-breaks due to government policies.
- **Shifting perceptions** by Joe Slovo residents with respect to permanent occupation of the area despite consultation with the community.
- **Increasing in-migration**, raising cell-densities and increasing fire/flood loss potential.
- **Questionable sustainability** of the green-belt.
- **Questionable execution of 'Duty of Care'** with respect to the integrated management of multiple risks.

4.2 Separate initiatives for Joe Slovo and Langa

An Integrated Development Framework for Langa is in the planning process. Infrastructural upgrading is currently taking place within certain parts of Langa. Within the current IDF, the areas now occupied by Joe Slovo is intended for the extension of formal housing from Settlers Way. Joe Slovo has been strategically excluded from the framework as it is perceived as a temporary site and therefore outside of the framework's jurisdiction. Given the close proximity of the two settlements, these de-linked planning and implementation processes may:

- Isolate Joe Slovo from Langa's formalised development processes
- Perpetuate conflicts between Joe Slovo and Langa residents[42]

[42] There are numerous cases of conflicts between the Joe Slovo and Langa residents. One of most long-standing conflicts is between the Settlers Way land owners and Joe Slovo Zone 31 and 32. There is the case of housing being provided in Langa next to the cemetery, to which the Joe Slovo

4.3 Government Informal settlement policy: the cost effectiveness of the tracks and their subsequent sustainability

Government policies advocate a non-committal approach with respect to informal settlements, resulting in an absence of long-term planning and commitment to service delivery. Mitigation interventions undertaken within this context face the challenge of financial sustainability. This is clearly illustrated by the access tracks, as the CCT has not budgeted for their long-term maintenance, although Ukuvuka and City of Cape Town funded capital costs for their installation.

Moreover, the tracks installed in Joe Slovo are of a lower quality than those established in areas where plans exist for permanent upgrading, and include tarring or linking with underground storm water drainage[43]. For the long term, the maintenance of the tracks is not viewed as a core CCT function. After external funding ceases, it is expected that Joe Slovo will receive attention comparable to that provided other informal settlements requiring basic infrastructure and maintenance.

The roads are the clearest example of an attempt to balance mitigation efforts with a temporary service. The roads or "tracks" are simply compacted soil, inlaid with imported "Faerie Glen". The tracks were initially created at 5m and 8m intervals, a width wide enough to allow service trucks and fire engines to enter Joe Slovo. The roads were intended to be simple and cost effective, but have subsequently proven otherwise as the maintenance costs may potentially outweigh the benefits. There are two reasons for this, especially for Zone 30:

- After each winter the roads need to be re-graded. Moreover, the tracks are not designed to deal with high run-off and may subsequently contribute to flooding. Engineering attempts to minimise these unintended consequences have included:

    - Grading the tracks so that they have a "V" within which the water will flow.
    - Creating runoff channels in the greenbelt.

- People have begun building close to and on the tracks. Whilst Joe Slovo leaders could assist in averting this type of development, it is their apparent weak leadership which has undermined their control. In the early stages of the project Development Support negotiated extensively with the committee leaders to control in-migration. Furthermore, policing by the City Police is not possible as they may only destroy a dwelling within the first 24 hours of it being erected. Settlement on the tracks is therefore a direct result of the rapid and uncontrolled in-migration to Joe Slovo[44].

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residents were denied access. There is also the perception from Langa residents that Joe Slovo residents are outsiders - in some instances refered to as rural people (a derogatory term)

[43] Options such as tarring were however not considered as Joe Slovo was not zoned for permanent development

[44] In the recommendations, it is highlighted how a strategy needs to be sought in consultation with the community to address the problem of rapid and uncontrolled growth in Joe Slovo

In the future, maintenance of the tracks will become the responsibility of the CCT. There are concerns about whether such costs will need to be transferred onto other CCT services that are already facing serious financial constraints[45]. This raises serious issues around the opportunity costs to other communities and services if this "special" attention afforded Joe Slovo is not extended to similar settlements.

One attempt to minimise maintenance costs for the tracks has involved engaging the community to work directly with the contractors. The engagement of local labour for this requires both capacity building and empowerment, as well as the assurance of remuneration from the CCT.

4.4 Creating a sense of permanence in a temporary site

One of the unintended consequences of the initiative has been the creation of a sense of permanence for settlement residents. Although long-term CCT plans for the formalisation of Joe Slovo have not existed to date, the initiatives taken in the course of the Fire Mitigation Programme have created the opposite impression for many community members. Community leaders have expressed the view that "now that Joe Slovo has been provided with electricity, water and sanitation that there is no reason to move". They say all that they "still need are houses".

As a result, for many Joe Slovo residents, relocation is no longer a viable option[46]. This is despite a CCT plan to relocate 1 200 informal dwellings to Delft[47], an area not viewed by large sections of the community as a viable location. Despite the lack of promise from the City to provide houses, Joe Slovo remains one of Cape Town's most attractive informal settlements. This is illustrated by the following reasons:

- Joe Slovo is in walking distance to Epping, the industrial heartland of Cape Town and is within close proximity to the Cape Town CBD
- The costs for transportation are minimal in comparison to Delft[48].
- It is close to converging railway lines servicing the city, Bellville, Khayelitsha, Mitchell's Plain and Old Mutual stations[49].

The reasons for staying in Joe Slovo may also include an awareness that Joe Slovo property values will increase due to its prime location. According to a specialist in informal settlement development, the differential value of Langa properties, including those of Joe Slovo will increase. There is considerable speculation as to whether this will further encourage permanent settlement[50].

[45] Budgetary cuts have occurred across all City of Cape Town services
[46] See appendix 4 for more information on the perceptions of the community
[47] Plans to move 1 200 Joe Slovo residents were part of an overall initiative known as 'Operation Shack Attack' designed by the Unicity mayor Peter Marais (Cape Times. May 15 2001)
[48] Estimated transport costs to Cape Town from Delft at R20 a day
[49] The majority of informal settlements in CT do not have direct access to train lines. In many instances people have to travel by a mini bus taxi before they can catch a train. Trains are also cheaper than mini bus taxis
[50] It is also believed that Joe Slovo may be a temporary site for people coming to Cape Town from the Eastern Cape. In comparing Joe Slovo with Site C, in Khayelitsha where there are higher densities of people but yet with lower fire incidence ratings there is the indication that many of the people living in Joe Slovo are not adequately equipped to deal with the living conditions of an informal settlement

Ukuvuka's perspective with respect to the long-term prospects for Joe Slovo has been characterised by the notion that such informal settlements are "here to stay". Although this is partly true, without strategic long-term planning and community consultation, informal settlements such as Joe Slovo, will continue to operate outside of the objectives of sustainability and integrated development.

4.5 Absence of process to guide rapid in-migration into Joe Slovo

The 100% increase in Joe Slovo's population between 1998 and 2000 graphically illustrates patterns of in-migration that contribute to fire and other risks. Among the factors that have contributed to this process is the role played by the zone committee leaders:

- It is believed that committee leaders use in-migration into Joe Slovo for personal financial gain[51].
- Many Joe Slovo residents now own multiple dwellings, which they rent or sell. It is believed that these changes with respect to property ownership and rental would only be possible with the approval from committee leaders

According to community members there has been extensive building along the N2, next to the Jakalsvlei Canal. In addition, limited dwelling construction has begun on the Eskom servitude, although with considerably reduced numbers.

While this expansion into outlying areas is one key aspect of in-migration, densification is perhaps a more significant concern. The current density of Joe Slovo is about 143 dwellings/hectare[52]. This is viewed as about the maximum density for an informal settlement. In the case of Joe Slovo, the cells demarcate the boundaries for expansion but do not limit densification within the cells[53]. In this context, the impact of continuing in-migration is extensive and may contribute significantly to sustained fire impacts.

In response to this in-migration pressure, the CCT has considered introducing formal policing to prevent more arrivals. It has also considered increasing community ownership by creating incentives to discourage further settlement. Whist policing is not a viable option, creating incentives and strengthening community leadership is imperative to control the in-migration.

Efforts to increase community ownership, while well intentioned, remain problematic, given the continuing uncertainties around Joe Slovo's long-term future.

One constraint in determining the extent of in-migration is the limited in/out-migration monitoring systems. A household database was established by Development

[51] Financial opportunities are gained through the sale of dwellings and the social support networks that are created as a result of being a leader.
[52] Professor J Abott (2002)
[53] There is the possibility that the dwellings are decreasing in size but increasing in density. A detailed study would be needed to confirm this.

Support to monitor residential movement in Joe Slovo is constrained for several reasons

The absence of measures to monitor and guide in-migration limits the effectiveness of mitigation initiatives, as changing population densities, settlement demographics and combustible fuel mass all influence the risk pattern for fire and other threats.

4.6 The sustainability of the greenbelt

At the time of the evaluation, the greenbelt was one area that remained open space. However, concerns have been expressed with respect to the sustainable management of the servitude. These include concerns that:

- The servitude is currently used as a "defecation site" as there is no sanitation. The City is in the process of providing toilets to the community, but this is likely to be problematic in terms of access[54].
- The community remains uncertain as to the future of the greenbelt. Some residents believe that RDP houses will be provided on the greenbelt.
- There has been an increase in the number of informal dwellings under the pylon. At the time of the 2000 fire, the people living on the servitude not affected by the fire, were not relocated. This is despite the court interdict held by Eskom.

To manage these concerns constructively, the National Botanical Institute has established a community consultation process that will create “buy-in” from the community to build a sense of collective ownership to protect the greenbelt. The objective is that both Joe Slovo and Langa communities will claim ownership of the greening process. Some suggestions to achieve this include creating community liaison meetings using the 30 volunteers to chair the meetings, and establishing a newsletter that will create dialogue within the community.

4.7 Duty of care

“Duty of care” refers to the responsibility of a statutory authority to protect persons or property in areas within its jurisdiction from a known risk, when it has the means of preventing or averting it, or bringing it to the knowledge of individuals at risk[55].

It is a governmental responsibility to protect people from known harm. On one hand, the proactive fire mitigation measures in Joe Slovo clearly illustrate a commitment to minimise hardship and loss to the settlement’s residents.

On the other, given current uncertainty regarding the maintenance of the access tracks/fire breaks and continuing in-migration, it is possible that over the long term, fire risk may be driven upwards, especially in hot, dry, windy conditions.

Moreover, while efforts to reduce fire risk have had positive impacts on other threats (ie crime) by improving lighting, they may contribute to increased flood and health risks, due to increasing hard surfaces and greater dwelling densities in an area

[54] Access can be problematic as a toilet is shared amongst dwellings, often kept under lock and key

[55] Refer ‘Guidelines for Municipal Emergency Management Planning’, Part 3: Emergency Management Manual Victoria, Australia (p. 3-23), Feb 2001

characterised by a high water table and poor sanitation despite efforts currently being undertaken to reduce flood and sanitation risk.

These examples underline many of the difficulties in minimising disaster risks in at-risk settlements that are exposed to multiple natural and other threats. While the Joe Slovo Fire Mitigation Programme demonstrates a very positive 'duty of care' with respect to fire risk in the short term, the challenge is to extend this duty of care beyond a three-year time frame, and across other risks.

International best practice in disaster mitigation increasingly calls for multi-hazard mitigation interventions, recognising that these are the most cost-effective strategies for reducing fire and other risks.

The 'duty of care' challenge for the CCT as it supports Joe Slovo and similar settlements is not to create a 'false sense of security' through fast-tracked structural interventions that minimise one category of risk in the short–term, but increase the probability of other serious impacts in the long-term. It requires a more developmental approach that incorporates a careful participatory risk assessment, as well as appropriate support that balances both structural and non-structural mitigation efforts.

Part 5

Recommendations

The Joe Slovo Fire Mitigation Programme presents an excellent case study to explore the constraints and opportunities associated with undertaking mitigation interventions in a settlement facing multiple natural and other threats. Recommendations generated by this evaluation are grouped into three major categories:

- Those relating to strategies that achieve sustained reductions in the frequency and severity of fires.
- Those relating to fire mitigation strategies that can be sustainably implemented over the long-term
- Those related to implementation of similar fire or other mitigation interventions in the future

5.1 Strategies that achieve sustained reductions in the frequency and severity of fires

To achieve sustained reductions in both the frequency and severity of fires in Joe Slovo, it is recommended that:

- Increased attention is placed on building **household and community ownership of fire risk** and the vulnerability factors that increase the likelihood of fire occurrence as well as severe fire events.

- Greater effort is taken to **improve fire forecasting** and planning in times of high risk, particularly at community level.

- Strategies are explored, jointly with the community, **to monitor in-migration, especially densification** within fire-proof cells.

- Measures are adopted to strengthen the effectiveness of emergency response/relief services to **monitor changing trends** and patterns in fire risk.

- Strategies are jointly developed with the community to **increase the competitiveness of electricity** compared to paraffin

5.1.1 Build community ownership of fire risk

International best practice repeatedly stresses the need for ongoing community engagement around sustainable risk reduction measures. While it is generally recognised that structural engineering interventions play a critical protective role, non-structural measures are equally essential for achieving sustained reductions in loss.

In the Joe Slovo example, structural interventions have certainly curbed the occurrence of extreme fire events. However, there are pressing needs for continued engagement with the community to better anticipate and manage conditions of increased risk, as well as to adopt behaviours that reduce vulnerability to fire. External measures that simply impose definitions of 'acceptable' or 'unacceptable' behaviour do not create behavioural change in the long term and do not instil a sense of ownership of responsibility for reducing fire risk.

The process of community engagement might include workshops and consultations in which the answers to reducing fire risks come from the community members themselves. It could involve the establishment of a community-based fire recording/monitoring system that makes current and future fire occurrence information accessible and visual to all. It could involve specific capacity-building around the use and consolidation of fire/other risk information. It could involve sharing and discussion of the findings of the current evaluation.

5.1.2 Improve fire forecasting and planning in times of high risk

During La Nina and other hot dry years, as well as periods characterised by high wind speeds, it is imperative that fire danger forecasting processes are established. Community ownership of risk implies the development a community-based forecasting strategy, accompanied by appropriate warning, preparedness and response measures. This may include reference to the Fire Danger Index that is based on windspeed and direction, last rainfall, temperature and humidity.

Fire danger forecasting also applies to instances where alcohol abuse, arson and conflict may increase fire risk (ie elections, public holidays or celebrations). Appropriate responses should also be generated in consultation with the community.

5.1.3 Explore measures that monitor in-migration, especially settlement density

<u>Establish partnerships with the Housing Department</u>
As housing density increases the inflammable fuel mass, as well as the potential for human and property loss, it is a key contributing fire risk factor. In this context, future fire mitigation efforts should more actively engage cross-sectoral partnerships with the Department of Housing as well as the CCT's Dept of Development Support and Joe Slovo residents. These efforts should focus on assisting the community to identify innovative solutions to control influx.

At a community-based level this could form part of a strategy to assist Joe Slovo residents in placing their own control on density. External influx control is not recommended. External policing of the tracks is neither cost effective nor sustainable in the long term.

<u>Complete the database</u>
Monitoring of the density should occur through the database established by Development Support . There needs to be greater community ownership of the database, which will require community capacity building. There are case studies of communities in other countries that have been involved actively in GIS monitoring

and mapping. As the Zone committee leaders are almost always present at the sale of a dwelling, they could serve as the starting point to monitor change.

Assess land occupation patterns in Joe Slovo

An assessment of land ownership patterns should be conducted. Strategies to monitor and control density, along with possible reoccupation of the servitude, need to be located within the context of land ownership. Changing ownership/rental patterns could influence settlement demographics, and change risk factors for fire and other threats. This may also include an assessment of the roles that rentlords play in increasing shack density.

5.1.4 Strengthen emergency/relief response services to monitor changing fire trends and risk patterns

An issue underlined repeatedly in the course of the evaluation, was the absence of consistent fire report and impact data.

This is reflected in the following ways:

- With the exception of Fire Services, fire impact information for events affecting fewer than ten dwellings was virtually unobtainable.

- Given that more than 50% of all recorded fire events affected less than ten dwellings each, it is critical to capture this information. This is not only to strengthen fire-tracking methods, it is also to ensure that fire-affected households in small events receive their relief/recovery entitlements as readily as those affected by larger fires.

- From a risk-management perspective, this is also essential for identifying increasing small-scale fire occurrence, as an 'early warning' of highly vulnerable areas and communities.

- Although Joe Slovo was reconfigured into Zones from early 2001, fire reports failed to geo-reference specific fire events, even as coarsely as to Zone levels. With the settlement now configured by zone and block, it is practical for all services to use these spatial markers consistently. The schematic map shown in Figure 2.4.1.5 is a practical guide, and allows for an 'X' to be marked on the affected block. This map could be used by all services, and the community.

- There are needs to standardise all the data capturing sets to ensure that they accurately reflect the location, trigger and severity of the incidents concerned. Impact information particularly, requires urgent standardising across services, given the variability in impacts recorded and differences in use of terms. For instance, different services use the terms 'dwellings destroyed', 'households affected' and 'families assisted' for slightly different purposes. Reconciling differences in human impacts remains difficult in the smaller events, with as much as 30% variation in impacts reported between services.

5.1.5 Increase the competitiveness of electricity with paraffin

While paraffin is the cheapest energy source, people living in poverty will continue to use it, and more so in cases where people have not purchased electrical appliances. Positive community perceptions of status associated with the use of electrical appliances, will help further the adoption of electricity but are likely to be undermined by poverty.

However, access to electricity alone will not serve to reduce fire risk. One way of addressing this is to work with the community to discuss the cost benefits of electricity compared to paraffin and open flame stoves. While the short-term costs of electricity appear greater, its fire-aversive value could prevent future losses.

5.1.6 Comparative research in other informal settlements

Comparative research in informal settlements with varying fire risk needs to be conducted. This may include building materials, cooking practices and overall community management.

5. 2 Strategies that ensure the long-term sustainability of the programme:

The fire mitigation initiative was initially designed with short-term objectives. However, these strategies implemented in this programme will only be effective if sustained over an indefinite time-frame. To achieve this, it is recommended that:

- **Continuing mitigation efforts are located within a** long-term strategic planning framework **that is multi-sectoral, and is integrated with the Langa Integrated Development Framework.**

- **Fire mitigation efforts are located in a** broader disaster risk reduction framework **that includes attention to other threats such as flood and health risks.**

- **The community assumes full responsibility for** managing the greenbelt**, and is no longer dependent on external agencies to protect it.**

- **Systems are established to** consolidate key information **on mitigation and related measures taken, costs and monitoring records in one organisation/office.**

5.2.1 Locate further mitigation efforts in a long-term strategic planning framework

It is clear that mitigation efforts that influence Joe Slovo residents' perceptions about the permanence of the settlement have long-term implications for continuing in-migration, and affect the lives of those living in Langa as well as residents of Joe Slovo. Similarly, developments planned for Langa have a direct bearing on Joe Slovo's future. As the extensive development that has taken place in Joe Slovo is

still not factored into the Langa development framework, this has resulted in de-linked planning despite the reality of spatial coexistence. In this context, sustainable mitigation initiatives should be better institutionally integrated to minimise tensions between the two communities.

Moreover, there are pressing needs to generate clear and consistent messages about the future of Joe Slovo. Current messages provided to the community call for relocation, but simultaneously deliver compacted tracks, water supplies, electricity and sanitation services at levels not achieved in similar informal settlements, and imply permanence.

Similarly, increasing settlement densities within blocks have direct implications for housing, health and the social/demographic characteristics of Joe Slovo. There may be opportunities to add value to existing services, by better integrating fire awareness and prevention activities with existing community development services, rather than setting these aside in a parallel programme.

5.2.2 Locate fire mitigation efforts in a broader disaster risk reduction framework

International experience that increasingly calls for multi-hazard and integrated vulnerability reduction efforts is clearly reflected in the Joe Slovo example. The community faces other threats besides fire, including winter flooding and communicable diseases**.**

Whilst flood risk was identified and counterbalanced by the Stormwater project, the extent to which reconfiguration may have directly or indirectly contributed to increased flood risk, and densification to growing health risks is unclear. However, during 2001 and 2002, flood impacts were recorded in Joe Slovo. In this case it makes cost-effective sense to consider more than one threat when implementing a sustainable mitigation programme, with specific attention to the common vulnerability conditions that underlie different hazard types.

In this context, consideration should be given to the changed risk conditions now facing Isilemela Comprehensive School. Despite the erection of a fence and creation of a fire-break, the school is now in close proximity to a densely packed informal settlement. Moreover the playing field is now exposed to the electro-magnetic energy from the pylons.

5.2.3 Encourage community responsibility for managing the greenbelt

The initial greenbelt management process has been positively managed in a consultative way with the community. Recognising however, that the configured space in Zones 30, 31 and 32 is virtually full, one can anticipate increasing pressure to reoccupy the greenbelt.

Under these conditions, it is essential that community processes become increasingly independent of external agencies to protect the greenbelt, and are sufficiently robust to prevent reoccupation of this space.

5.2.4 Consolidate relevant information on ongoing mitigation measures in one organisation/office

The multi-sectoral of integrated mitigation programmes can lead to a range of agencies/partners carrying out different measures. Even if steps are taken to co-ordinate such measures operationally, critical information from the different initiatives is not necessarily recorded in a central place. This creates great difficulties in tracking operational developments over time across a multitude of partners (all with different record-keeping/filing systems), and costing the full value of measures taken.

Continued mitigation efforts ideally should be accompanied by the designation of a central coordinating organisation that consolidates key information related to the programme. This monitoring needs to be done on a continuous basis, possibly through a Fire Protection Association established within the community[56].

5.3 Strategies related to implementing the fire mitigation programme elsewhere

Many communities in the Western Cape are at risk from small, medium and large-scale fire risk. With respect to implementing the fire mitigation or similar programme elsewhere, it is recommended that:

- Baseline **risk and community research** is carried out before implementing an expensive mitigation initiative.
- Project **monitoring strategies are jointly developed** with the community to track the effectiveness of the intervention.
- A well-conceptualised and costed **business plan is developed** prior to commencing the intervention.
- Infrastructure **maintenance costs are carefully assessed** to ensure that recurrent financial obligations do not exceed the budget available.

5.3.1 Carry out baseline risk and community research before implementing the programme

Where possible, a risk assessment should be carried out jointly with the community. This is necessary to identify key fire vulnerability factors, as well as links between fire and other recurrent threats such as flooding and health risks.

The assessment should be carried out together with research to understand the community's social and political dynamics. The absence of knowledge about community social networks and process increases the likelihood that infrastructural interventions may unintentionally change community dynamics. These can have the adverse effect on a planned initiative by inadvertently disrupting established power

[56] For more detail on this, refer to the Fire Prevention Evaluation for Ukuvuka Operation Firestop

relationships within the community. Although this was not the case in Joe Slovo, it is a necessary consideration if the project is to be replicated.

In this context, careful attention should be given to the rate of in- and out-migration from an informal settlement. While a community is experiencing rapid expansion, there is inherent social instability, as illustrated in Joe Slovo between 1998-2000. Ironically, it is under conditions of rapid growth that fire risk increases. Yet, it is often in these instances of increased risk, that community structures are too dynamic to support mitigation initiatives that require social organisation and collective commitment.

5.3.2 Establish processes for monitoring progress

One of the challenges in carrying out an evaluation of the Joe Slovo Fire Mitigation Programme, was the absence of organised monitoring records, including those tracking specific fire occurrences. Whilst monitoring of fires was done through the monthly coordination meetings, they were not spatially referenced and only referred to a third of the fires to have occurred in Joe Slovo.

A critical element of future interventions is the joint development of a project monitoring component. This should include progress indicators and means of verifying/tracking these. There should be clear time-frames for consolidating interim monitoring reports, and clearly specified formats for different project partners to complete and submit.

5.3.3 Establish a business plan prior to the commencement of the intervention

A well-conceptualised business plan should be jointly developed, involving all key partners. The plan should be subjected to similar review processes to those required for other large projects. This is particularly important given the costs involved, and need for recurrent expenditures to be eventually absorbed by municipal authorities and the affected communities. Processes to phase over such recurrent costs to the City and communities involved should ideally be incorporated into the plan. These long-term commitments require careful consultation with key stake-holders to ensure that they are taken up later.

As is the case with development initiatives of similar scale, consideration should be given to an advance scoping exercise that aims, among other objectives, to identify the likely consequences of the project, including those that are unintended. The scoping exercise could be integrated with the risk and community assessments described in 5.3.1. In Joe Slovo, this took the form of the monthly coordination meetings run from 2000-2002.

5.3.4 Ensure recurrent infrastructure maintenance costs do not exceed available budget

Recurrent costs need to be considered carefully when initiating an intervention in communities such as Joe Slovo, especially given existing government policies concerning service provision to informal settlements.