Community Based Fire Risk Reduction

Case Study of Imizamo Yethu, Hout Bay

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Abstract

The destructive impact of disasters, man-made and natural, has been well studied in many contexts and a number of approaches for managing these disasters have been suggested. Much of the literature, however, has come out of the developing world with the focus on formal, well established communities. Informal communities are so inherently different from formal areas that they experience disasters very differently. Fires across Cape Town informal settlements have been well publicised following a number of devastating fires in recent years, but limited local research has been conducted in this and urban design for disaster risk reduction. Planning has the ability to fulfil a key role in acting as facilitator between communities and disaster management officials by developing detailed local plans focussed on reducing community vulnerability; something which is not often seen. This research therefore focussed on Community Based Disaster Risk Management for Fires in an informal Cape Town community. The need for increased community involvement in the planning and Disaster Management processes is the premise upon which this research is based, contrasted with the typical top-down approaches commonly used in Disaster Risk Reduction.

In order to study Disaster Risk Management at the community scale, case study research was conducted in Imizamo Yethu, Hout Bay; a dense settlement that has been plagued by numerous fires recently. Focus groups were run with community members and fire-fighters, using a physical 3D model of their community for interaction and analysis. To supplement these interactions, local authorities and disaster management officials were interviewed for their perspectives. The results of these discussions were analysed in conjunction with a socio-economic and bio-physical analysis of the community in order to draw conclusions and develop proposed interventions.

The key findings are encouraging for the reduction of disaster risk in informal communities. Residents are enthusiastic about reducing disaster risk on a personal and neighbourhood level and requested increased interaction with local authorities. Ideas discussed during the focus groups are further developed and interventions and guidelines are proposed for the community and the City respectively. These innovative, previously unthought of solutions to some of the problems present an opportunity to change how communities plan for, respond to and deal with disasters.

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Abbreviations

The following are commonly used abbreviations used throughout this research. For more information about the specific terms used in Disaster Management see the section on Terminology in the Literature Review chapter.

CBDRM	Community Based Disaster Risk Management
CBO	Community Based Organisation
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
GIS	Geographical Informal Systems
IY	Imizamo Yethu
MCRP	Masters of City and Regional Planning. The program at UCT in the Engineering and the Built Environment Faculty under which this research was conducted.
NGO	Non-Governmental Organisation
P3DM	Participatory Three Dimensional Modelling
PGIS	Participatory Geographical Informal Systems
UN	United Nations
ISDR	International Strategy for Disaster Reduction
HFA	Hyogo Framework for Action - An action plan adopted by the United Nations as part of their ISDR in January 2005 to reduce disaster risk from 2005 – 2015.

Chapter 2 - Introduction

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2 - Introduction

2.1 Overview

"Fire leaves two dead, 3000 homeless"

Cape Argus, 15th March 2013
Knoetze, 2013

"Cape Flats fires leave hundreds homeless"

SABC News, 19th February 2013

Headlines such as this are common throughout the year as Cape Town is forced to deal with disasters, both man made and natural, that cause untold damage to communities. For the approximately 21% of Cape Town residents living in informal conditions (StatsSA, 2001) these risks are more than a nuisance or inconvenience; they pose a hazard to daily survival. Flooding, storms, environmental risks and fires affect different areas of our cities in vastly different ways. Whilst the risk is the same in each case, the community's vulnerability to that risk is higher in certain areas which leads to worse consequences. Consequences vary but may range from destruction of property and financial hardships to loss of life or even complete restructuring of community structures. Generally, informal communities have limited resilience to risks leaving them more vulnerable and more likely to suffer very negative socio-economic and spatial consequences when a disaster occurs. The causes behind the limited resilience are numerous and will be investigated during the course of this research.

The decision to focus specifically on fires in informal communities was made due to the large amount of damage caused by each fire and the large number of informal communities affected by these disasters each year in Cape Town. From looking at the current literature and research around disasters, specifically in a South African informal context, there seems to be a lack of research into fires and the effect on informal communities. There would seem to be a need to investigate the relationships between community structure and fire risk, formal mitigation measures and impromptu solutions and the role that the different stakeholders can, or should, play in mitigating fires. Although some work has been done on the assessment of disaster risk, there is a

lack of local literature around community disaster preparation. The initial impression, and critique, of the formal Disaster Management policy is its abstract nature and the lack of spatial information contained within it. A lack of proactive planning for fires (and other disasters), and particularly the lack of community involvement in the planning process, is likely to increase a community's vulnerability when fires do occur.

2.2 Research Question

Due to the current situation alluded to above, this dissertation aims to research the causes and consequences of fire vulnerability in informal settlements in Cape Town and hopefully provide some guidelines for improvement. In order to begin formulating a research question the local governmental policy was studied to try and establish where weaknesses or gaps existed, and to choose an area where more research would be beneficial. Cape Town's Municipal Disaster Risk Management Plan (CoCT, 2012) aims "to establish the framework for implementation of the provisions of the Disaster Management Act, 57 of 2002, as well as the related provisions of the Municipal Systems Act, 32 of 2000." In an attempt to understand how the national act can be applied at the municipal level, the policy focuses heavily on stakeholders and the proposed coordination between different services during a disaster. It will be investigated further how well this local policy is being guided by the ideals and principles of the National Act and, more importantly, whether the local plan has been successfully implemented for previous disasters. The lack of available spatial, proactive DRM plans is a key problem, as is the lack of community involvement in the planning process. The current situation sees large numbers of fires in informal communities annually with large amounts of damage caused and lives lost each time. The need exists for improved DRM focussed planning to increase community resilience and limit the prevalence of fires and the damage they cause.

Due to unavailability of the municipal plans it was decided to focus the research question on planning for disaster risk at the community scale.

"How can communities' disaster risk be reduced by planning for disasters at a local scale?"

The initial question covered the intended areas of research (communities, disaster risk, local scale) but there were a number of problems that needed to be addressed. Planning for disasters implied that communities were the only stakeholder involved in the process which obviously isn't true. Disaster "risk" is something that cannot be reduced, but a community's "vulnerability" can. This led to the second iteration of the question:

"How can communities' vulnerability be reduced by involving communities in the disaster management planning?"

The second question replaces "risk" with "vulnerability" and is more inclusive as it implies that communities are just one of the role players but that their involvement is key. The question, however, is still too broad.

"How can communities' vulnerability be reduced by utilising a Community-Based Disaster Risk Management (CBDRM) approach?"

The third question attempts to narrow the focus to a specific approach for involving the community. The CBDRM approach will be discussed later in this paper, but is a technique that has been successfully used elsewhere and has been written about by the UN extensively. The question is still geographically vague as it looks at communities in general and it was decided to focus this on one specific community.

"How can the Imizamo Yethu community's vulnerability be reduced by utilising a Community-Based Disaster Risk Management (CBDRM) approach?"

At this stage in the process it was decided to use Imizamo Yethu (a predominantly informal community situated in Hout Bay) as it is vulnerable to the risks in question (fire and flooding) and is relatively small in physical size. This may be important as it will become difficult to apply the proposed participatory tools in a large community. It is possible that this case study may change before the research begins as it would be ideal to perform the research in an area where an NGO is already established in order to improve access and logistical issues. This question was still too broad on the topic of vulnerability, as this can apply to a large range of disasters.

"How can a Community-Based Disaster Risk Management (CBDRM) approach help Imizamo Yethu reduce their vulnerability to fires?"

The decision to focus on vulnerability to fire was made because this is the most prevalent risk facing the Imizamo Yethu settlement (based on anecdotal research and newspaper articles) and these risks are prevalent in many communities across Cape Town. This led to the final reworking of the primary research question which this dissertation intends to answer:

"***How can the community of Imizamo Yethu's resilience to fires be improved through the use of a Community Based Disaster Risk Management approach?***"

This question focusses the research specifically on the risk of fires in a specific informal settlement and the ways in which the CBDRM approach can be used to (hopefully) improve the situation with the involvement of the community.

The above primary research question has led to a number of secondary questions to be answered in the course of the research.

- To what extent does the municipality work with community members and community structures in dealing with and planning for fires?
- How can collaboration between community members and formal disaster management structures improve the current situation?
- How adequate is the city's disaster management plan / policy in addressing fires in informal communities?
- How does the community currently mitigate the impact of fires?

Figure 2.1: A Fire Fighter battles to contain the November 20 2008 Fire, limited by access issues and forced to work on top of shacks

2.3 Ethical Position

Coming to the decision to focus this research on fires in informal settlements was influenced by a number of factors. Initially the decision to focus on informal communities was guided by work that the MCRP class conducted in 2012 in the Langrug informal settlement, Franschhoek. This exposed the class to some of the realities which face residents of an informal community on a daily basis, and the ideas that can come about from working with, rather than for, residents. The second factor which engendered research into informal communities and then into disaster management was the author's work as a volunteer paramedic. Working in predominantly disadvantaged areas and meeting people who find ways to cope and flourish despite the circumstances provided the inspiration for choosing this topic when the time came.

As highlighted in the introduction to this research, one would struggle to live in Cape Town without having been exposed to disasters such as fires and floods. You either see the effects of a fire or flood whilst living, working or moving through the city or read about them in the next day's paper with headlines such "Two killed, 2500 left homeless as fire destroys 600 shacks in Kayamandi" (times Live, 2013). The consequences of these disasters are naturally exponentially greater for those living in the area directly affected and one cannot fully grasp the impact from a news article. Although one cannot claim to have felt any of the same consequences as those whose houses were destroyed, being directly involved on two scenes where fire destroyed shacks definitely highlighted the destructive power of the fire and its effect on the community.

The statistics quoted later in this research show that informal communities suffer a far greater

Figure 2.2: A devastating fire on 20 November 2008 destroyed "100s" of shacks (Kokhuis, 2008)

percentage of fires than formal areas and with much higher densities each fire will affect a large number of families. For those living in an informal community an acute disaster such as a fire or flood may be the breaking point in a livelihood already stretched by lacking services, poor infrastructure and limited socio-economic structures. Although a fire in a formal area is still

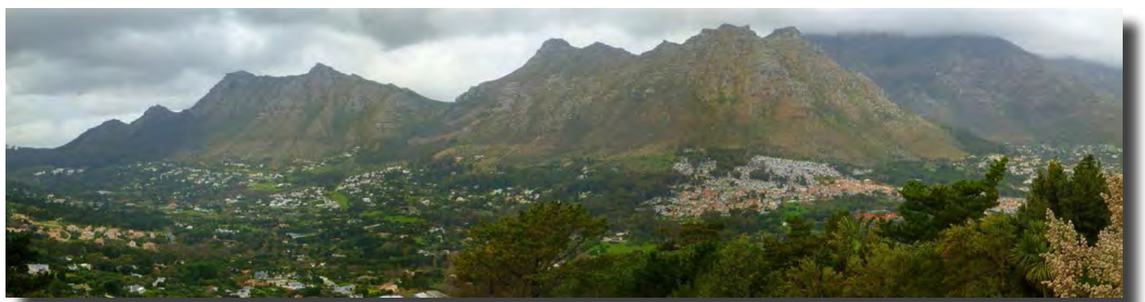

Figure 2.3: The IY Community is easily visible on the steep slopes of the Hout Bay Valley (Author, 2013)

destructive and may destroy houses, there are increased coping mechanisms such as insurance (Pillay, 2013) which allow a family to bounce back from a disaster more readily. It's unfair that those who are least able to cope are affected the most severely by more fires than those who are resilient to disasters. It's difficult to aim for a just city when this large disparity exists.

Lastly, from competing literature online and speaking to academics in this field there seems to be a lack of research around urban fires, specifically in a developing world and informal settlement context. A number of papers have been produced locally (and will be referred to elsewhere in this research, see Literature Review, pg13) but generally disaster management literature is limited in its coverage of fires in informal communities. Similarly whilst research has been conducted into the spread of vegetation fires using technology such as GIS, this research has not extended to urban informal areas.

Figure 2.4: IY is spread above the Main Rd with the informal areas on the steepest slopes (Anthony Allen, 2012)

2.4 Overview of Case Study Area

The research will be undertaken by using the case study method to study Imizamo Yethu (IY) with a specific focus on DRM and fires. Spatially the case study will use the informal settlement of IY as the unit of study. Temporally the focus will be on the current situation with recommendations made for the future, although it will be necessary to look at the recent past to see the impact that Fire has had on the settlement. The choice of case, particularly for this research, will have a large impact as there are many other areas where similar risks are faced and where new thinking and interventions will also be required.

The choice of IY has been made for a number of reasons. It has a clearly defined spatial boundary, which is often lacking in informal areas, but which is something that lends itself to the case study method. It is clearly vulnerable to the risks of fire and the community is small enough to be manageable for the application of the participatory tools I would like to use. There are a number of problems with using this community as the case for study, some of which are likely to be common to all cases and others which may be remedied through further research. Firstly there is the issue of language and culture barriers to be overcome, but in choosing to work in informal settlements in Cape Town, this is something that I am likely to encounter in most areas and which can be overcome through careful planning and the use of a translator where needed. Other logistical issues such as access to community members and the setting up of focus groups should be manageable through careful planning and the assistance of an existing NGO.

Figure 2.5: IY's location in the Cape Town Municipality within the suburb of Hout Bay (GIS Data, NGI, 2013)

The accompanying map of IY shows the entire settlement situated next to the Hout Bay Main Road with a number key facilities marked. Important to note is the Fire Station in the SW corner (5).

Figure 2.6: The Hout Bay Valley is enclosed by mountains with only 3 access routes to the North, South & East. IY is situated to the East on the mountain slopes (GIS Data, NGI, 2013)

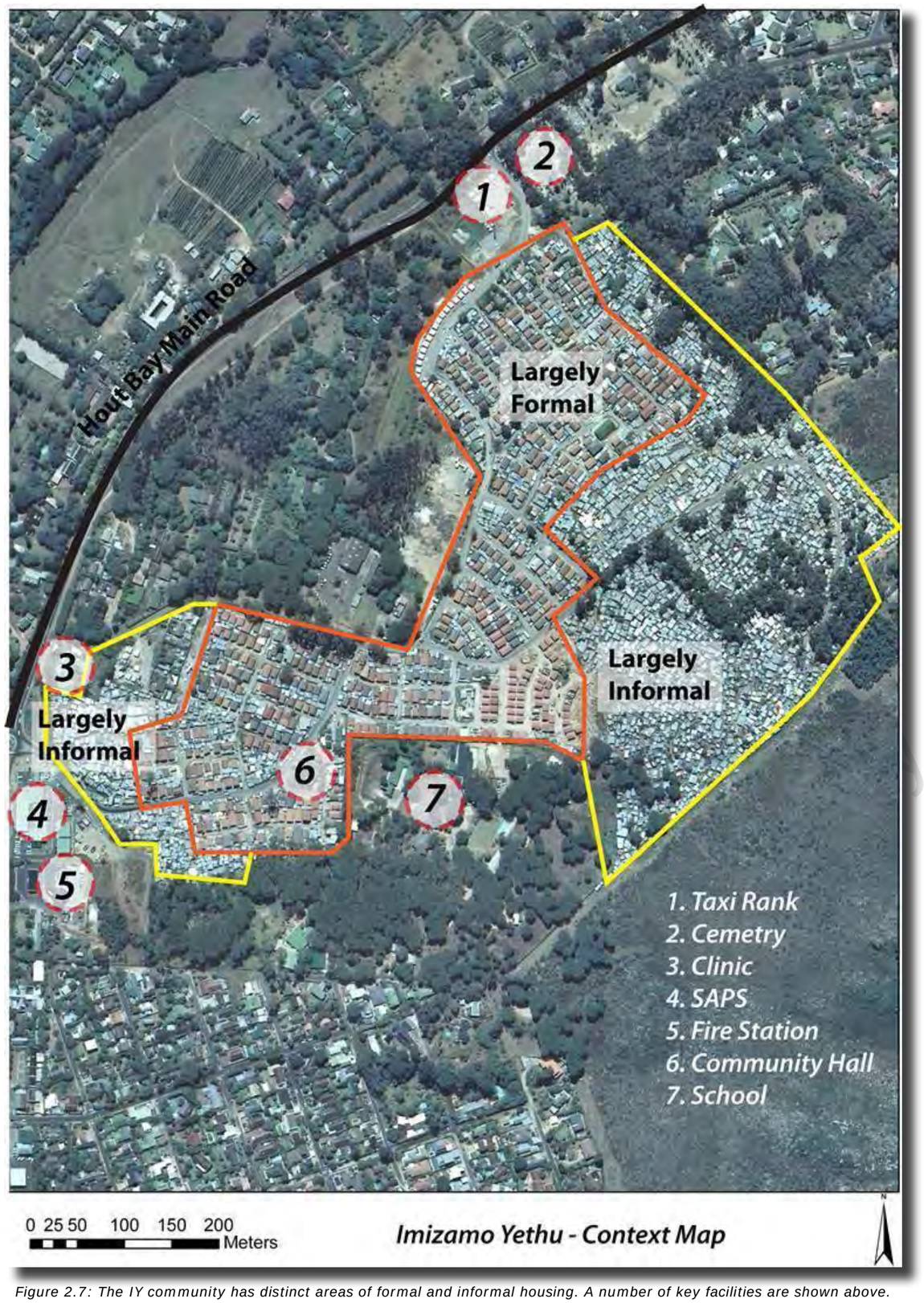

Figure 2.7: The IY community has distinct areas of formal and informal housing. A number of key facilities are shown above. (GIS Data, NGI, 2013)

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3 - Literature Review

3.1 Introduction

This review looks at applicable research related to Disaster Risk Management in the world wide, South African and Cape Town contexts. Individual settlements may faces specific risks due to local factors and characteristics, but it is important to understand the the current theories and practices being used in DRM worldwide to in order to better analyse and propose interventions for Imizamo Yethu.

Due to the focus on Imizamo Yethu, a specific informal community, and more generally informal communities' fire risk in Cape Town, this review starts by looking at informality on the global scale. The manifestations of informality often lead to increased vulnerability to all types of disasters and it is therefore important to understand the underlying causes of informality. The focus then shifts to informality in the South African context and the similarities and differences that exist between our country and elsewhere in the world.

Moving into the realm of Disaster Risk Management, the review starts by looking at the terminology commonly used in the literature. The definitions, based on those used by the UN's International Strategy for Disaster Reduction are important to understand as a number of the terms have similar meanings with nuances differentiating them. Once these have been explained, the history of disaster management is briefly discussed before looking at the current theories and approaches used.

The use of technology is a focus of the analysis section and therefore the review next looks at how technology is used, and could potentially be used, in reducing disaster risk. The current situation in informal areas is compared to the potential for further technology expansion by residents and officials.

The section concludes with a review of the current disaster management policy and its applicability to implement reduction strategies and and the ability to work closely with communities.

3.2 Informality

3.2.1 Global informality

"Almost 1 billion people, or 32 per cent of the world's urban population, live in slums, the majority of them in the developing world. Moreover, the locus of global poverty is moving to the cities, a process now recognized as the 'urbanization of poverty'. Without concerted action on the part of municipal authorities, national governments, civil society actors and the international community, the number of slum dwellers is likely to increase in most developing countries. And if no serious action is taken, the number of slum dwellers worldwide is projected to rise over the next 30 years to about 2 billion."

Kofi Annan

UN Habitat, The Challenge of Slums, (2003)

As our urban areas grow in the future, and many predict that the rates and scale of this growth will be unprecendented, urban informality is likely to increase greatly. In certain areas of the developing South, particularly in some African Countries, the percentage of the population living in slums is higher than those living in formal areas; close to 80% (Davis NPQ 2006). This section will look at informality on the global scale before dropping down to an African and South African context for the purposes of this research. As far as possible this review will focus on authors who are either from the South or who write from a Southern Perspective as one of the critiques is that planning approaches in a developing context have been based on theory from the Developed North (Watson, 2009. The decision to focus on informality in the larger context within disaster management research is three-fold. Firstly, by understandng the causes and problems associated with informality one can begin to understand the problems facing Imizamo Yethu and the possible causes behind its informality. Secondly, it is highly likely that the problems which can be found in South African informal settlements can also be found elsewhere, where they may have been tackled in innovative or different ways. Learning from these examples may provide ideas for tackling local problems. Lastly, vulnerability to disasters have an underlying causes (the specifics of which will be discussed later), many of which can be linked closely to informality.

The UN Habitat Report, "The Challenge of Slums" (UN Habitat, 2003) provides an in-depth study of informal communities across the world and the challenges faced in creating positive change for those living in slums. The notion of slums, and informal settlements, has different connotations in different countries and for different people. A family living in an informal community will view the settlement in which they live in a very different light to someone who drives past informal settlements on the way to work which will differ again from a researcher's perspective. Whilst attempting to define and describe slums in the The Challenge of Slums, UN Habitat (2003) acknowledges the difficulties in defining such multidimensional term and the difficulties this poses for those attempting to enumerate and work with slums. They provide a definition, albeit an admittedly basic and generic one, of slums as:

"…a contiguous settlement where the inhabitants are characterized as having inadequate housing and basic services. A slum is often not recognized and addressed by the public authorities as an integral or equal part of the city"

UN Habitat (2003)

Similarly, Watson (2009) describes slums in terms of their spatial location and form as peripheral areas which are, "almost entirely unserviced and unregulated" and, "are impossibly costly to plan and service in the conventional way, given the form of settlement, and even if that capacity did exist, few could afford to pay for such services." From these statements it is clear that a lack of planning forces these communities to the peripheral areas unsuited to habitation whilst also limiting the effectiveness of any infrastructure which is developed for them. The characteristics of each slum or informal settlement will, like the definition, vary depending on the country and context. A number of characteristics have, however, been identified as common in the majority of slums. UN Habitat (2006) characterises slums as having:

- Limited and inadequate services and infrastructure (sanitation, power, security, water etc.)
- Poor quality and often illegal housing structures (structures that do no meet the basic needs for shelter or building regulations)
- Very high structure and population densities (there are often over 5 people sharing a room)
- Health hazards (conditions leading to possbile health complications)
- Dangerous locations (Settled in disaster prone areas or with limited access)

These provide a starting point for understanding the problems facing those in informal settlements and, as mentioned, it must be realised as a context specific, multidimensional term.

In discussions on informality there is often a specific focus which relates to the definition of informality being used. One could talk about the informal economic sector, informal social networks or spatial informality (to name a few). However, an holistic approach is useful as informal settlements or communities, such as IY, are likely to experience informality in multiple ways. Spatial informality, with links to built urban form and housing, is often the most easily recognisable form of informality as, "Slums are a physical and spatial manifestation of urban poverty and intra-city inequality" (UN Habitat, 2003). Manifestations such as unplanned layout, poor infrastructure and informal dwellings are all visible signs of informality in an area. This understanding of spatial informality has its roots in Victorian times with the initial work on housing and informal settlements, "built on perspectives that initially emerged from studies of the Victorian industrial city. State responses then (as now) were embedded in public health and sanitation discourses, as well as in elite concerns about pathological behaviors, appropriate socialization, and public order." (Kudva, 2009). Post World War II a number of changes were forced to occur in the approach to dealing with spatial informality as cities saw a large influxes of rural residents. Whilst this may have occurred in predominantly developed countries in the 1950s, the response of the state to demolish illegal structures (Kudva, 2009) is not unlike the response of the South African government faced with rural-urban migration in the 1990s. Following on the trend seen in other countries, South Africa moved to providing in-situ settlement upgrading rather than outright eviction; driven in part by changing political powers and agendas in the country. This shift from evicting people from illegal occupation to providing limited services does appear to legitimise

the existence of slums, particularly as people have no choice but to live illegally (Fernandes, 2003 in Watson). Whilst some academics argue that this informality and exclusion is a consequence of government laws, others argue that it is an intended outcome of governments who wish to appear democratic whilst denying specific groups certain rights (Watson, 2009). For those living in informal settlements each day it may often feel like an intentional situation, particularly when little is seen to be done to change the situation.

3.2.2 South African Informality

Pharoah (2009) discusses how between 26% and 33% of of the South African urban population is thought to live in informal settlements, at higher risk of disaster consequences. Legally ambiguous, informal settlements in South Africa are home to the poorest and most marginalised and are often situated on the periphery of the city (Imizamo Yethu is a exception to this). Pharoah goes onto to list the specific characteristics that lead to communities highly vulnerable to disasters, particularly fires: poverty, marginality, overcrowding, limited formal housing and basic service delivery at best. Despite attempts by the post Apartheid government to work towards integrated, equal and just cities, it is felt that little has been done to address the inequalities of the past as Huchzermeyer (2003) in Pharoah (2009) observes,

"By and large, massive standardised housing projects have perpetuated segregation by income group, allocating the most disadvantaged urban/ peri-urban locations to the poorest sectors of society"

Backyard shacks present a housing typology unique to South Africa (Crankshaw, Gilbert, & Morris, 2000 in Lemanski, 2009) which constitute a large part of the informal housing sector. These dwellings, which are traditionally constructed out of waste materials and situated in the yards of formal houses, represent between 30% and 50% of township populations in South Africa (Bank, 2007), offering their occupants flexible accommodation in already dense urban areas. Overall this represents approximately 5.7% of all households in South Africa (by 2006 Census, Lemanski, 2009). Whilst they have become more prominent as urbanisation rates have increased, they have a longer history in South Africa.

Their origin is thought to lie in coloured communities in Cape Town in the 1960s where a lack of space and overcrowding caused families to build informal structures to house extended families in the yards. Payment was received in kind rather than through a formal contract (Lemanksi, 2009) which occurs today. These backyard dwellings were then found in the black African townships as the ban on the constructions of dwellings for Africans was implemented and backyard dwellings was one of the few options for people moving to the city and needing to live near employment opportunities. In contrast to the current situation where people have more choice on whether to live in backyard shacks or not, originally it was necessitated by the political conditions of the day. Landman (2010) describes self-help housing, of which backyard shacks are one form, as "In general, self-help housing is depicted as a cost-effective response to mass urbanisation and the inability of the state to house growing urban populations". Post 1994, with promises made to rectify the housing situation and provide adequate shelter for all, there was still a situation where self-help housing was the only option available. Core housing schemes, site and service and in-situ informal settlement upgrading were some of the options used by government

to roll out housing options, but with the large inherited backlog there was still a need for self-help housing (Landman, 2009) and backyard dwellings flourished. In the subsequent 20 years, despite efforts through the Reconstruction and Development Program (RDP) and Breaking New Ground (BNG) programs to diminish the housing backlog, 57% of all township backyards still host backyard dwellings (Lemanski, 2009).

Despite the challenges which have faced, and continue to face, the housing situation in South Africa, backyard shacks do provide a number of benefits to both landlords and their tenants. By renting out space on their property, landlords are able to earn, at a low cost to themselves, an additional income. Additional charges are levied on the tenant to cover the cost of the services supplied, such as electricity, water and sanitation, for which the landlord must (in theory) pay rates. This relationship between tenant and landlord is obviously critical to how successful the process will be. It would be natural to expect some form of exploitation to take place as the landlord holds the cards in terms of of the services. Morange (2002), however, sees the landlords rather as, "comrades in the everyday struggle for life, than unscrupulously exploiting the poor" and their payment for services as a way for the landlord to become free of the burden of paying for services. This positive view is, however, in contrast with some of the views of the community members who participated in the focus groups for this research. They stated that landlords would often cut off the electricity arbitrarily or demand payment just before the weekend for electricity which, participants claim, hadn't been used (Focus groups 1-3, 2013). Another reason for the landlord to rent out yard space is to lessen overcrowding in the formal house, which was the reasoning behind the initial establishment of backyard shacks in the 1960s. As opposed to squatting where people can choose to settle on any piece of vacant suitable land, landlords have the choice whether to rent our their yards for the additional income or whether to keep the space for personal use. The choice to have tenants may also be motivated by the additional safety that having others living on the property may bring. For the tenant living in the backyard dwelling the benefits include a safe location in which to build their shack and importantly, access to municipal services which might otherwise have been unavailable or of poorer quality in the informal settlements. Proximity to employment opportunities is also a big advantage to the potential tenants. Many may choose to pay rent to stay in a backyard shack closer to the CBD, rather than live rent free in an informal settlement situated far away on the periphery (Morange, 2002), thereby saving on transport time and costs. The final advantage is flexibility as tenants are able to leave and relocate to a new site with little notice, taking their belongings and building materials with them (Lemanski, 2009).

Figure 3.1: Shacks constructed out of flammable, recycled materials

A number of disadvantages do exist, however. For the landlord, the most important in terms of this research is the increased disaster risk of having another dwelling in their yard places on them

(Bank, 2007). Increased numbers of backyard dwellings lead to increased densities in formal areas and decreased spaces between dwellings. This, combined with the building materials used in the backyard shack construction being more flammable, leads to fires spreading to the formal houses and affecting more houses in the case of a fire. Because the tenant does not hold title on the land there is the possibility for eviction by the landlord, with little recourse possible and, as already mentioned, there is also the risk of exploitation by the landlord in terms of payment demanded and the cancelling of services without warning.

Understanding this type of housing in the context of disaster management of fires in IY is important as backyard shacks represent a transition from informal to formal dwellings. Despite the perception that tenants' occupation of backyard dwellings is temporary and they will make the transition to more formal forms of housing this has been found to be inaccurate in many cases (Bank, 2007). Backyarders can be seen to be transitional in another sense, however. This transitionality manifests itself in terms of the building methods used as well as the locality of the dwelling. In IY there is a distinct difference between location of formal and informal houses and the building methods for these housing typologies differs greatly. The lines are blurred, however, by the presence of backyard dwellings on many of the formal plots. These seem to occur more frequently in areas of older formal housing and in areas closer to the completely informal sections of IY.

3.3 Disaster Management

3.3.1 Introduction

Across the world, countries are affected by disasters and, although some are more prone to certain disasters than others, each country has a specific risk profile which needs careful planning and management. It is because of this that there are international efforts to improve disaster resilience on the global scale thereby lessening the impact of potential disasters. The United Nations (UN), as the largest international collection of countries, is tasked with this Disaster Risk Reduction and their role, and the role of other intergovernmental bodies, will be discussed shortly. The risks posed by disasters to the human population and our environment is clear. Couple the inherent risks that disasters pose with the vulnerabilities of informal communities living in poverty (as discussed, above) and you get a situation where collaborative work by all role players is essential.

"Disaster loss is on the rise with grave consequences for the survival, dignity and livelihood of individuals, particularly the poor, and hard-won development gains. Disaster risk is increasingly of global concern and its impact and actions in one region can have an impact on risks in another, and vice versa. This, compounded by increasing vulnerabilities... points to a future where disasters could increasingly threaten the world's economy, and its population and the sustainable development of developing countries." (UN/ISDR, 2007).

This section will look at some of the international Disaster Risk Management (DRM) theories and practices and their relevance in the context of a local community based disaster risk management (CBDRM) framework. In discussing disaster

management it is useful to understand the definitions of terms and ideas most commonly used. Whilst most authors use their own definitions, specific to the context within which they're working, the UN provides a document on the terminology used in Disaster Risk Reduction (UNISDR, 2009). This document, which forms part of the Hyogo Framework for Action, aims to, "promote common understanding and common usage of disasterrisk reduction concepts and to assist the disaster risk reduction efforts of authorities, practitioners and the public" (UNISDR, 2009). The document should be read in its entirety, but what follows is a selection of terms used in the following discussions.

3.3.2 Terminology

Adaptation: Changes made by a system in response to a potential or realised hazard in order to lessen the impact or realise possible benefits. Many suggested DRR strategies are based around adaptation measures as a way of increasing system resilience.

Capacity: The ability of a system to achieve its goals by using its strengths and resources. Gaps in capacity should be identified and addressed as these gaps may lead to lower levels of vulnerability. Contingency Planning: These are scenario specific courses of action which address potential risks by identifying measures which can be implemented to reduce impacts should such an event occur in the future.

Disaster: An event which, through losses and impacts, causes a significant disruption to the functioning of a system which no longer has the capacity to cope. A disaster can be thought of as a combination of the exposure to hazard of a vulnerable community which does not have the capacity to cope.

Disaster Risk Management (DRM): The process whereby plans and strategies are implemented in a system to reduce the potential impacts of a disaster and to increase the capacity of a system to withstand potential hazards. This can be achieved in multiple ways including strategies aimed at adaptation, mitigation, prevention and recovery.

Disaster Risk Reduction (DRR): The process of reducing the losses associated with disasters by limiting exposure to hazards and sustainable management of the environment in order to manage the causal effects of disasters.

Exposure: The presence of systems (people, environments etc) near to potential hazards, thereby placing them at risk.

Hazard: A situation, condition or activity that is dangerous for any reason that may cause losses or disruptions to a system. Hazards may be natural or human in origin and each specific hazard has a likelihood of occurrence. Fire is an example of a hazard.

Mitigation: Processes designed to limit the negative impacts a disaster has on a system. Mitigation is needed when the impacts cannot be prevented completely or adaptation alone is not sufficient.

Preparedness: The organisation of systems, communities and organisations etc. prior to a disaster to enable efficient anticipation, response and recovery to the disaster.

Prevention: The complete avoidance by a system of the impacts of a disaster. Preventative actions may take many forms but complete prevention is not always possible.

Recovery: The post disaster stage where the system is restored, and if possible improved, to the conditions prior to the disaster. Measures should be taken to limit the disaster risk factors for future disasters as part of the "Build Back Better" principle (UNISDR, 2009).

Resilience: This is the ability of a system to cope with a disaster and the associated hazards by resisting and absorbing the negative impacts to ensure the functioning of the system is not adversely affected. System with a high degree of resilience have greater capacity and are more capable of recovery post-disaster.

Risk: The chance of a negative event occurring and the intensity of the consequences of the event on the system.

Sustainable Development: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" This definition (used in the Brundtland report, cited in UNISDR, 2009) is commonly accepted but does not adequately cover all factors of Development. The idea proposed by the Sustainable Livelihoods Foundation of a sustainable livelihoods definition is more appropriate as human livelihoods are often the focus of DRM and Disaster Responses. Allen's (2009) 5 dimensions of sustainability are also useful in discussions on the sustainable development as they encompass the elements not addressed in the Brundtland definition.

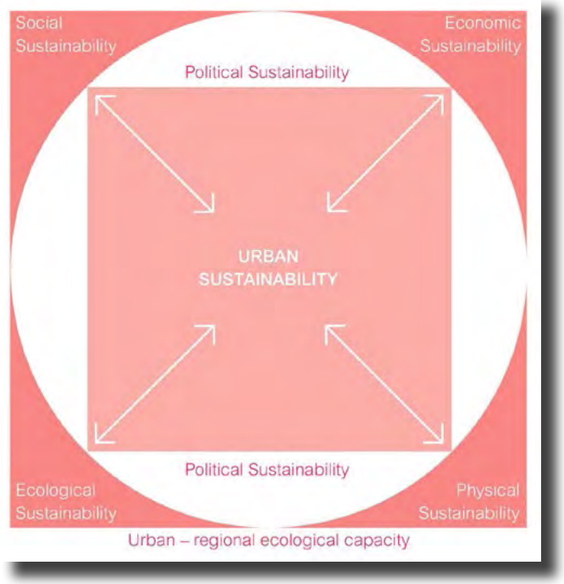

Figure 3.2: Allen's 5 dimensions of sustainability (Allen, 2009)

System: This is used as an all-encompassing term for those with the potential to be affected by a disaster. A system may be biophysical, anthropogenic or a combination; interaction of humans in their natural environment. For this research, a system may include a local human community or settlement (as in the case of IY), a country as a whole or specific area of the earth (such as an island) with particular characteristics.

Vulnerability: The intrinsic conditions and attributes of a system that make is susceptible to the negative impacts of a disaster. These may include the environmental, social, physical, political and economic characteristics.

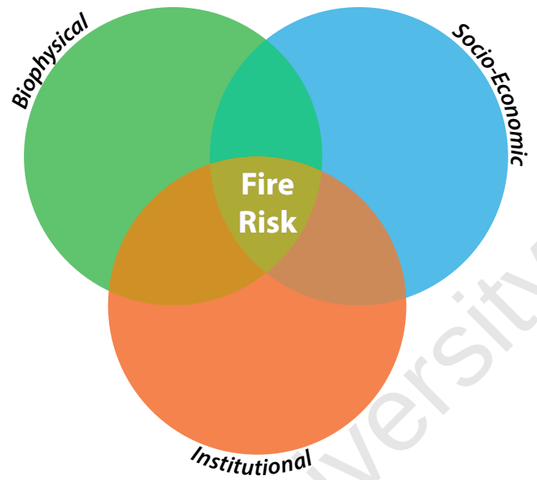

Figure 3.3: Biophysical, Socio-economic and Institutional factors all contribute to Fire Risk

3.3.3 Disaster Management Theory

Many different approaches to theorising Disaster Management exist across multiple fields and experts disagree on the most appropriate approach as well as the definitions used (Lettieri & Masella et. al. 2009). In their work, Lettieri et. al. performed a systematic review of Disaster Management literature over the years by looking at the, "state of the art of the discipline" (2009) as opposed to looking at the approach to a specific hazard. They found that the majority of the literature approached the topic in one of four ways: i) Seeing disaster management as a non-hazard-specific approach, ii) Using phases to approach the problem, i.e. pre-crisis, crisis and post-crisis, iii) highlighting the role of the relevant actors and their responsibilities, iv) investigating the role and importance of technology and information in achieving DRR. From their review they found that there was a recent decrease in the amount of research carried out on DRM and that the USA and Canada still dominated much of the thinking, followed by the EU and Asia. This lack of contributions from the developing world presents a number of issues as theories and approaches used in the first cannot, necessarily be used in the third world without assessing their relevance. There is also a lack of research, as identified by the authors, into the organisation of institutions and role players as well as the learning phase of DRM. Understanding the limitations and approaches used in the literature is important as it will influence the recommendations made during the implementation phase of this research.

Disaster Management is thought to have originated in the USA during the Cold War era in response to the threat of nuclear war on American soil (Pearce 2003). This military origin of DM can still be seen to influence the approaches used in many disaster situations, due in part to the common involvement of the military in relief efforts. The early approaches, however were criticised for their lack of public participation and the opinion that planning for disasters was, "...conducted for, not with, the community" (Ibid). Since the initial approach to DRR, many of the theories of how to best reduce disaster risk and limit the consequences have focussed on one of three stages. Some authors classify a disaster into 8 stages, moving from pre-disaster to impact to recovery (see figure__, opposite) but in essence each of these falls into either a pre-disaster, disaster, or post-disaster phase.

The diagram (Figure 3.4, below) is one representation of the stages that occur in a disaster process but does not show the cyclical nature of the process as is shown below. Stages 0-2 form the pre-disaster phase where a shift occurs from the system being in equilibrium to a threat being recognised as having the potential for disruption. The next stages from 3-6 represent

Stage 0: PRE-DISASTER State of social system preceding point of impact
Stage 1: WARNING Precautionary activity includes consultation with members of own social network
Stage 2: THREAT Perception of change of conditions that prompts survival action
Stage 3: IMPACT Stage of "holding on" where recognition shifts from individual to community affect and involvement
Stage 4: INVENTORY Individual takes stock, and begins to move into a collective inventory of what happened
Stage 5: RESCUE Spontaneous, local, unorganized extrication and first aid; some preventive measures
Stage 6: REMEDY Organized and professional relief arrive; medical care, preventive and security measures present
Stage 7: RECOVERY Individual rehabilitation and readjustment; community restoration of property; organizational preventive measures against recurrence; community evaluation

Figure 3.4: The 8 stages that occur in a disaster (Shklovski et. al. 2008)

the disaster phase as the disaster event occurs and the affected community takes stock of the situation and responds with short term measures. The final stage (7) represents, in this diagram the post-disaster phase where the community recovers from the impacts and rehabilitates, if possible, back to the equilibrium stage. Following from this stage, the community will then prepare for the next disaster event before going through these phases the next time.

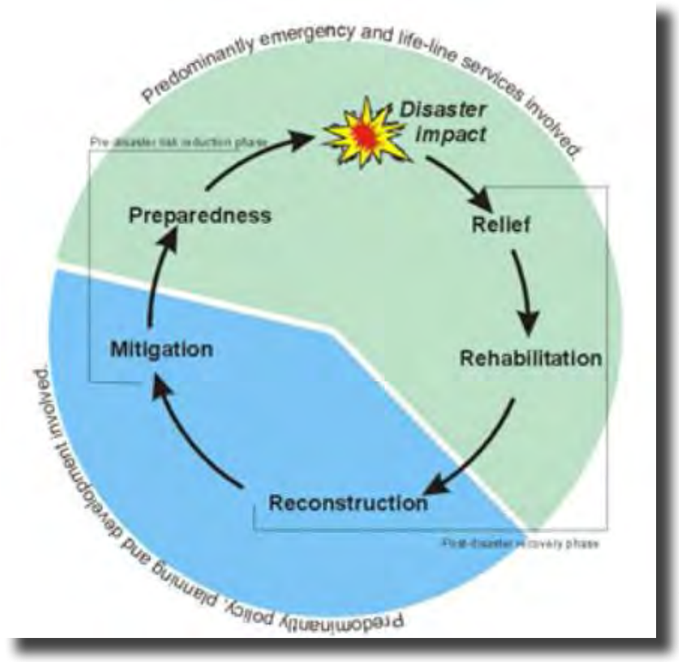

Figure 3.5: Cyclical representation of the Disaster Management process (Haigh and Amaratunga, 2010)

Simplifying the stages into only three phases should not detract from their inter-connectiveness as Haigh goes so far as to say that, "The process of disaster management is commonly visualised as a two-phase cycle, with post-disaster recovery informing pre-disaster risk reduction, and vice versa" (Haigh et. al. 2010). This iterative approach can be visually represented as a cyclical process where each process is informed by the process preceding it and in turn informs the next process (see figure 3.5, below). As disasters can be seen to be endless, it is therefore essential that the process of managing the disaster is also continuous (Haigh et. al. 2010 & Grieving et. al. 2006). Irrespective of which approach is chosen to manage the disaster, the overall goal should be the same; sustainable disaster risk reduction.

Pelling and Wisner (2009) highlight theat land use planning is, "perhaps the most fundamental tool for integrating disaster risk reduction with urban planning", but go on to highlight some of the challenges for urban planning:

- There is limited capacity for the design and implementation of local land use planning
- In large cities a large number of the population are excluded from the planning process, particularly those living in at risk, high dense slums.
- It is difficult to connect planning with larger ecological and environmental process, integration which is essential for reducing disaster risk.

Planning can, and should, play a critical role in reducing disaster risk, particularly in the pre-disaster stages and by setting up systems and infrastructure to allow efficient responses and recovery processes to occur. Many of the intrinsic responsibilities of a planner, whether at the national, municipal or community level, can change the specific disaster risk profile of an area. Planning can be policy based or spatial in nature and both have a crucial role to play in DRR. The function of spatial planning, at its core, is, "to prepare and make decisions about future land use" (Grieving et. al. 2006) and this is where its

attractiveness as a tool for DRR lies (Sutanta et. al. 2010). These decisions may manifest by deciding where to place development, where to place and how to connect infrastructure and which areas require special intervention to reduce disaster risk (Mirei, 2005). By regulating which of these processes need to occur spatially and temporally and which roleplayers hold responsibility for each, planning policies provide the backing for those involved in the decision making and can ensure that DRR is included in spatial planning. Planning is a discipline which cuts across multiple fields and whose decisions affects many sectors in society (such as human settlements, the environment, economic development etc). It therefore becomes necessary for spatial planning to take a "multi-hazard approach" (Grieving et. al. 2006) in order to combat the possible hazards which may arise from the multiple planning sectors. Decisions made by planners to limit a specific risk (i.e. fires) should also, in the way the decision is reached and in its implementation, reduce the risks posed by all disasters. Sutanta et. al. (2010) list 4 possible ways in which this multi-hazard approach can be implemented by planners: i) Identifying areas of higher disaster risk and limiting or prohibiting further developments in those areas or even removing existing developments which are in danger; ii) Matching land uses with specific disaster risk. As an example, agriculture may be an acceptable land use for a river floodplain whereas high density residential is not; iii) Developing and enforcing building regulations to limit the risk to land users decrease impacts as in the case of controlling building material in areas prone to earthquakes; iv) the promotion of technological and engineering approaches which can reduce hazardous impact such as promoting the use of intumescent paints in areas prone to fires. The successful implementation of many of these strategies requires strong collaboration between all spheres in Government to ensure community members benefit from them.

It is at the local level where planning can have the largest impact on communities and their DRM strategies, if backed by strong municipal and national policies. This idea is maintained by Wallace and Wallace (2008) who state that, "The neighborhood forms a critical level of organization between the individual or family level and the municipality and metropolitan region." This, in essence, is where many larger scale planning policies can be enacted through spatial land use planning in order to achieve DRR. A Community Based Disaster Risk Management (CBDRM) approach is one such way of involving communities in the process of DRR. This approach is relatively new and is being tested and researched in a number of disaster prone areas, notably in Asia. Whilst it is not a fire specific approach, it is, like the majority of DRM strategies able to be tailored to reduce a a specific risk. One of the large international bodies concerned with CBDRM is the Asian Disaster Preparedness Centre (ADPC), based in Bangkok, Thailand, which aims to, " promote safer communities and sustainable development through the reduction of the impact of disasters in response to the needs of countries and communities in Asia and the Pacific by raising awareness, helping to establish and strengthen sustainable institutional mechanisms, enhancing knowledge and skills, and facilitating the exchange of information, experience and expertise" (Kafle and Murshed, 2006). They define the process as one which, "is people and development oriented. It views disasters as a question of people's vulnerability. It empowers people to address the root causes of vulnerabilities by transforming

social, economic and political structures that generate inequality and underdevelopment". It looks at all stages of the cycle, with people being the focus throughout. In contrast to certain DRR approaches at the National and International scale ("top-down and command-and-control approaches"(Pandey & Okazaki, 2005)), CBDRM is focussed on the longer term, sustainable reduction of overall disaster risk for a specific community. Whilst international role-players focus their efforts on the response to a specific disaster, and are capable of reducing certain impacts in the short term, the projects they put in place are often not sustainable in the longer term. This idea of sustainability as being key to CBDRM is put forward by a number of authors (Kafle and Murshed, 2006; Pandey & Okazaki, 2005; Chen & Liu et al. 2006). As Pandey & Okazaki (2005) maintain, communities "first need to be empowered so that community members can cope with the adverse effects...This is the most effective approach to achieving sustainability". Community members will be involved in far more of the stages of the disaster cycle just by their living in the area and their desire to reduce their vulnerability to a future disaster. Achieving an effective CBDRM requires a number of steps to be undertaken and critically requires the open and transparent collaboration of all interest and affected parties. Kafle and Murshed's workbook which was produced through the ADPC (2006) as a resource for participants and local authorities as well as Pandey & Okzaki's work for the UN (2005) lists a number of steps necessary for the successful implementation of a grassroots approach:

- Communities should be allowed to initiate and sustain their own development as far as possible
- Local leadership should be primarily responsible for local development (although collaboration with government, NGOs and the private sector is essential)
- All activities should include broad based participation among community members
- Education and training of local residents must be tailored to local needs.
- Local resources, rather than external funding, should be utilised as far as possible.
- Due to the unpredictable nature of disasters, people's awareness must be maintained throughout the project.
- Strategies which were successful in other areas should be replicated as far as possible to motivate further successes.
- Differing community members and groups in a single community are likely to have differing perceptions of risk and priorities.

This last point is well summed up by Chen & Liu et. al. (2006) as they highlight the need for individualised, community based approaches.

> *"Only the residents of a community know what value they place on different aspects of their community. And no one but a community can really ensure that those values endure. The community-based disaster management will show communities how communities that carry out community-based disaster management thoughtfully can become safer, more disaster resistant, and more resilient, with stronger economies and a higher quality of life"*

South Africa has not yet seen specifically CBDRM strategies used extensively although NGOs working in specific communities may have taken similar approaches.

The following case study represents the implementation of CBDRM in a small scale community.

Shang-An Village, Taiwan is a small village in a peri-urban area with approximately 1500 residents. The area faces a number of risks including fires, earthquakes and flooding. Over the last 20 years there have been a number of community initiatives in the village to combat disaster risk. For the specific CBDRM approach a number of partners were included in building community partnerships. These included community leaders, experts in hazard mitigation, local emergency management agencies, local governments, public institutions and academic researchers. The process was started by doing a public participation process to motivate and involve the community. This focussed on the planning and assessment of risk in the community by collecting a history of disasters in the community to assess vulnerability and evaluate problems. This was followed by brainstorming ideas and problem solving. Once these steps had been completed an organisational framework was established for, "community-based hazard mitigation" based around new and existing organisational community structures. The final step of the participation process was allowing those involved in the participation process to report back to the rest of the community. Community members were also presented with certificates of completion as recognition for their involvement and the skills learnt.

In this case the project was taken further than the assessment phase, unlike many others, to include training of community members and a full disaster scenario. The training functioned to provide, "members of the community-based disaster management organization with the basic skills that they will need to respond to their community's immediate needs in the aftermath of a major disaster, when emergency services are not immediately available". Local emergency services were involved in the training, further improving the relationship between authorities and community members. The training included first-aid, search & rescue, and walkie-talkie operations. These skills were then put into practice during a disaster scenario exercise. Unfortunately the paper does not discuss in detail how successful the exercise was, but the running of it is positive as it takes the process further than other cases. The success of CBDRM in this case study would still need to be evaluated and established in the long term to fully understand its potential. However, in summary, the authors feel that for CBDRM to be replicated on a larger scale, "a sustainable mechanism for implementing community-based disaster management program and a long-term personnel training plan on both professional and community sides are needed in order to achieve a meaningful level of hazard mitigation throughout the entire country. In addition, sustained administrative and financial supports from local governments are also essential for sustainable community-based disaster management efforts".

Figure 3.6: Residents survey the damage caused by the January 26th 2009 Fire (Kokhuis, 2009)

3.4 Use of Technology in Disaster Management

3.4.1 Introduction

The technological revolution, which is still on-going and represents the rapid advances in the development and use of technology across all sectors, has great implications for the management of disasters of different magnitudes in different contexts. The discussion that follows will look at how technology has been used in the past, and could possibly be used in the future, to efficiently manage disasters. This section will look at the integration of societal factors with technology as it is essential that technology is seen as a tool to be utilised by those involved with and affected by disasters for the betterment of the situation. This integrative approach, "...acknowledges the central role of technology in creating and maintaining sustainable communities and considers the processes of risk reduction, disaster management, and security management as integrated through a socio-technical system." (Comfort, 2005). The section focusses specifically on cellphone usage and GIS in the community context for its relevance to this research.

Technology in Disaster Management may take many forms: Geographic Information Systems (GIS) may be used to map the spread of wildfires, early warning sensors may alert communities to possible tsunamis, individuals use cellphones to alert authorities and neighbours to an imminent disaster and satellites are used to monitor weather patterns and predict storm surges. It can be seen that the technology in question form a continuum of scale and capabilities. Cellphone use by individuals at the community level may be seen at the one end of the spectrum whilst intergovernmental agencies using multiple satellites can be seen at the other.

Different technologies will be appropriate in different contexts and, although this research focusses predominantly on the community scale of disaster management, it is important to understand the larger scale uses of technologies in disaster management efforts. In the Hyogo Framework for Action (HFA), one the Priorities for Action is the, "The transfer of knowledge, technology and expertise to enhance capacity building for disaster risk reduction" (UNISDR, 2013). This adds to the need for understanding the bigger picture so that lessons may be learnt from overseas experiences.

Satellite technology sits at the far right of the spectrum operating at the largest scale with the highest costs, the most complex infrastructure, but the least accessible to most people. Over 20 years ago Walter (1990) discussed the capabilities of satellites in DM and their future potential. At the time they were seen as useful tools in predicting storms and for search-and-rescue. It was thought that there was potential for them to be used for global communications and flood predictions, both of which are used extensively today along

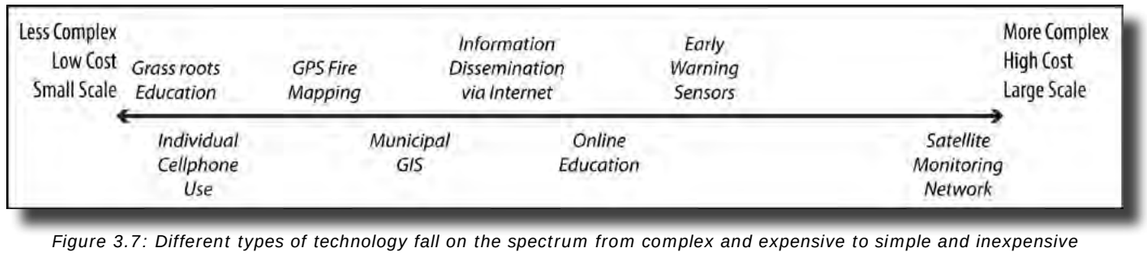

Figure 3.7: Different types of technology fall on the spectrum from complex and expensive to simple and inexpensive

with many other capabilities. His view that, "Close cooperation and communication between space technologists and disaster-management specialists will be needed in guiding research and designing and testing satellite systems" (1990) still holds true today. With all the recent advances in the technology of remote sensing and image acquisition it has become a reality that satellite imagery, "can contribute significantly to support the management of major technical and natural disasters, as well as humanitarian crisis situations" (Voigt et. al. 2007). It is the integration of this high-resolution aerial imagery combined with ground-truthed community data (roads, places of interest etc) that represents the full potential for increased technology use in community based DRM approaches. The limitations that currently constrain the widespread use of this integrated technology, particularly in the developing context, is the availability and access to temporarily relevant, high-resolution, spatially accurate data (Ibid).

The internet represents a technology that is very large in scale, but less complex than satellite use, that is able to reach and connect large number of people quickly and easily. Following the Hurricane Katrina disaster in the USA, the internet was used for a number of functions by DM officials as well as by those affected by the disaster. Shklovski & Palen et. al. (2008) report on a number of uses by community members that facilitated rehabilitation and recovery post disaster. These included the use of the internet as an information source, a way for people to bond emotionally and share with others affected by the disaster, and campaigning for organised relief efforts for their communities. Other advantages in using web-based services during and post-disaster include the ability for collaboration from multiple parties from different localities, knowledge and expertise transfer at a time when its needed most, and the dissemination of spatial information and decisions made (Köhler et. al., 2006). There are, however, a number of obstacles to overcome in order to realise the benefits of using the internet in a DM context. First is the requirement for specific hardware (ibid). These days this may be as simple as a web enabled cellphone, but for the more complexes uses a standalone computer with internet connection may be required. Training, of end civilian users and technicians, is the second requirement. Whilst having access to the appropriate technology is essential, training ensures that the information being disseminated will be received and understood by its target users. These two points are the key challenges facing communities in a developing world context (such as South Africa) as access to technology is limited and training is still behind the level of the developed world. Another obstacle which affects communities in most contexts is the need for the technological infrastructure to withstand the disaster and be able to function adequately during the recovery and rehabilitation stages. For example, if an earthquake were to strike a remote village community, which connects with the rest of the country through a single telephone connection, there may be a loss of communication if the telephone lines are destroyed. This highlights the potential of cellphone and other mobile, wireless technologies in these situations, provided the levels of cellphone ownership and usage are high enough.

A Geographic Information System (GIS) represents a platform for the integration of community acquired, small scale data with municipal, national and international data in order to analyse, inform

decision makers and disseminate information. GISs have multiple applications in many sectors, such as development layouts, 3D building modelling, transport/route calculations and many others. In the context of DM, a GIS can act to integrate multiple tools to allow decision makers to, "..not only reach information about the geographical, geophysical, and socio-economic characteristics of their county, but also to determine, visualize, and analyze the possible extent of disasters" (Gunes & Kovel, 2000). Whilst for most applications the value of a GIS is its ability to, "capture the data... store the data...manipulate the data...form data queries...analyse the data...and most importantly visualise the data" (Ibid), at the smaller scale when working with community members the value is in integrating non-technical community with external data sources and visually representing the results. This may take many forms and may be used in the pre-disaster, disaster, or post-disaster phases. Gunes and Kovel (2000) list some of the potential uses for a GIS in these situations in their paper on *Using GIS in Emergency Operations*. These include, forecasting, vulnerability assessments, damage assessments, locating personnel and resources, infrastructure layouts and conditions and the status of relief centres/accommodations. For emergency services it may also be useful to know vegetation types (and therefore combustion risk), water points and population densities. For the community access and evacuation routes can be planned, relief centres mapped out and areas of high risk identified and prioritised for improvement. The mapping of previous fire locations by community members using handheld GPS units is an example of how community acquired data can be integrated into a GIS. Community members would locate the physical location of the fire on the ground and record it with the GPS. This would be captured onto a GIS and overlaid on roads, aerial imagery and fire hydrants layers. By visually representingthe fire locations, hotspots can be identified and new hydrants placed there. This decision can be spatially represented and shown to community members for comment and accuracy checking. This process of community members using technology is a key part of a CBDRM approach which has been discussed more in chapter 4, pg 39. The community participation has also been discussed in the methods chapter where the integration of a physical 3D model and a GIS is discussed within the context of Participatory 3D Modelling (P3DM).

3.4.2 Cellphone usage

Cellphones represent a type of technology whose use is proportionally much higher in informal areas in comparison to other technologies. Their commonality is due in part to their function as the sole means of electronic communication in communities where wired telecommunications infrastructure (such as landline and internet) is limited. Despite their primary function as a means of communication, cellphones also offer great benefit to residents in times of disaster. Castell et. al. (2004) confirms that, "we know from the history of technology that people and organisations end up using the technology for purposes very different to those initially sought or conceived by the designers of the technology." The statistics on the use of cellphones across Africa and specifically in South Africa provide an easy justification for their increased use in DRR strategies as so many of those most at risk for disasters already have the technology at their fingertips. Scott et al's report on the Impact of Mobile Phones in Africa (2004) states that in 2001 7% of all the African population had access to a cellphone, more than

double those who had access to a landline, and this number was growing by 35% pa. In South Africa, these numbers are much higher, as is to be expected with a more developed population, and Kreuzter (2009) puts the number of cellphone owners at 60% for those 16 and above. This has rapidly increased from just 18% in 2001 and is likely to have increased even further by the present day. This high rate of expansion in the number of mobile phone users (more than double the rate of European in the period 2002-2007, Aker & Mbiti, 2010) is due to a number of reasons, cost and limited wired infrastructure being chief amongst them. In South Africa, however, the movement can also be linked to the, "silent revolution" of those who, during Apartheid, had limited communication options, but are now able to make a, "sharp departure from the past" (Kreutzer, 2009). Scott et. al. (2004) highlight some of the important functions a mobile phone can serve for the urban poor in developing countries:

- As an infrastructure service, by improving efficiency, promoting investment and through this decreasing disaster risk
- Increase the active portion of the economic sector by creating business opportunities through the selling of cellphones and their associated products as well as by allowing entrepreneurs to use cellphones to grow their businesses.
- As part of a development tool where information can be more easily disseminated and data collected by the community

It is the use of cellphones for the purposes of DRM and communication during disasters that is of particular interest to this research. Due to the high levels of mobile phone usage, specifically in developing informal communities, cellphones are well suited to be used in an emergency as they are already in place and require little in terms of additional resources. Underwood clearly sums up the advantages of using cellphone technology as she says, "During peaceful times, dual-use technology, such as a mobile phone, operates as a everyday personal communications device, but during an emergency it transforms into an information sensor and disseminator. This overcomes aversion to using different communications equipment during a crisis and eliminates the time lag caused by government agencies collecting, processing, and distributing crisis-related data" (Underwood, 2010). Cellphones also provide capabilities during the non-emergency stages of a disaster. During the pre-disaster phases (such as planning, mitigation, warning) community members are able to work with researchers, planners and DM officials in collecting data to inform DRM strategies. Due to the limited infrastructure in developing countries, which has been mentioned previously, it is difficult for researchers to use "first world" data collection methods as these often rely on expensive resources and developed infrastructure (Tomlinson et. al. 2009). Although these authors focussed on the use of cellphones for the collecting of health data, the methods they employed and the results they obtained suggest that it has merit for use in a disaster context too, especially as they worked in a informal community in South Africa. In their study they found it to be an efficient management option, preferable to paper based survey collection which, "has the potential to be scaled up in an extensive way for teams and studies of almost any size" (Ibid). Converting this to a fire scenario could mean using community researchers to interview residents about fire

activities, losses and ways in which the fires were combated. The questions answered would be similar to those covered in a questionnaire or a focus group (albeit more quantitative), but the great benefit is the greater number of participants which can be reached. Kaplan's (2006) work was similar in nature to Tomlinson et al's, also focussing on using mobile technology as a health intervention. His conclusions, however, are less optimistic as he feels there is not enough evidence to support using mobile technologies as healthcare interventions. He does acknowledge, though, that if the technology is to be used it should be based on a model developed in the the developing world and not merely a rehashing of developed world theory. Research in a specifically Disaster Management context seems limited and presents an opportunity for further research in the developing world.

Emergency use of cellphones during the disaster stages seem to be the most commonly used application of this technology, understandably so. For many residents living in informal communities with limited resources a cellphone may provide the only point of contact with emergency services and other community members. This use of cellphones by community residents is one of the more basic uses of a cellphone as it requires no additional input from authorities in times of emergency, although it does require the setting up in advance of call centres and response plans. Community members don't have to limit themselves to only reporting the occurrence of a disaster. By using them as "human sensors" Underwood (2010) feels that locals can be used to, "collect and relay information about events, such as wildfires and traffic accidents, to first responders and the general public using mobile phones". Particularly once a disaster has been declared, those living in the affected area may prove invaluable in providing up to date information about the extent and magnitude of the damage. On the flip side is the use of cellphones by emergency workers, relief agencies and other authorities. Underwood (2010) notes that, "Research organizations, relief agencies, and technology providers agree that technology can save lives in a disaster, but here consensus ends, with a rift between researchers pursuing the possibilities of Web 2.0 applications and field workers largely committed to their traditional toolkit of mobile and satellite phones". Whilst this rift is understandable, given the different advantages offered by each application, in a developing context where funds and technologies are limited it would seem more appropriate to focus development on mobile phones which can benefit the greater number role players. This is important as Fajardo et. al. agrees that the use of any technology for purposes other than what it was originally planned for will require education and training at some level (Underwood, 2010, Fajardo et. al. 2010, Kaplan, 2006). This may include education on the correct people to contact in an emergency, the right number to phone and what information is needed.

In the aftermath of a disaster, in the post disaster stages, the priority uses of cellphones changes to focus on recovery and rehabilitation. For those people displaced during a disaster, a common occurrence, cellphones provide a means of communication between family, community members and authorities, no matter their new location (Shklovski, 2008). It also allows communication to travel in the opposite direction by giving authorities a route to feedback information to communities. The cellphone

Consider the following example of the current use of technology in Imizamo Yethu (The case study is based on a summary of the points discussed during the three focus groups). Siya* is walking from the taxi stop to his house in IY, after a long days work, when he sees smoke up ahead. Thinking it might be a cooking fire, Siya continues up the steep hill. As he gets closer, however, he sees that it is coming from the windows of a shack just off from the tarred road. As he gets closer he sees a lady run out of the house shouting for help ("Umlilo! Khawuleza!"). She says that a paraffin stoves toppled over and the table caught fire. She tried to put it out but it was too big. The lady asks Siya to call for help as she must save her belongings. Siya quickly gets his cellphone out, but can't remember the right number to call. He shouts to others walking past and someone runs in the direction of the Hout Bay Fire Department. Siya phones 10111 as it is the one number he knows. He gets through but is transferred to the correct call centre which takes time. The person who ran to alert the Fire Department arrives before Siya can report the fire, but the Fire Department is on another call and needs to ask for assistance from Constantia Fire Station. The Constantia Fire Crews are alerted at the same time that Siya gets through and reports the fire. Although the Fire Department responds quickly there is a still a delay of 20min from when the fire started to when they arrive. They are unable to save the lady's home and, despite efforts from community members using buckets of water, five adjacent shacks are also damaged. The delay from not knowing the correct number, despite having a cellphone which could've alerted authorities quickly, results in a greater loss of homes and possessions. *Not his real name

technology also offers an opportunity for residents to become impromptu journalists, as has happened in numerous recent cases, especially when the technology includes web capabilities and the ability to blog or tweet pictures and events. Similar to the way in which cellphones could be used as a research tool pre-disaster, data can be collected post-disaster by community members to assess impacts, measure the success of mitigation measures and prioritise areas for investment and development. In all of the above examples of uses for cellphones it is likely that they will not function as standalone technology, but rather be a crucial part of an integrated system whereby the data collected is used with a GIS system and analysed before the results are represented and disseminated to the community.

Justifying an increase in the use of technology in the disaster situations is simple. As Yilmaz (2005) confirms, the need for the right data, available to the right people, at the right time is paramount to successful DRM. "No matter what we think of fire, whether as a natural phenomenon or a disaster, it is an emergency we must not leave unconfined. If right data is not provided, decisions will be made with inadequate information. This costs time, money, and in some cases lives" (Yilmaz, 2005). The recent rapid expanses in applicable technologies, which are likely to continue, make the increased use of technology in DRM an attractive option. As costs continue to decrease and the proportion of people with access to appropriate technologies increase, there is likely to be an increase in the use of cellphones and GIS amongst developing communities. When linked with existing, formal disaster-management structures the possibility of community driven Disaster Risk Reduction is real.

3.5 SA Disaster Management Policy

3.5.1 Introduction

South Africa's vulnerability to a wide variety of disasters, particularly in light of the high levels of informality, is well understood. Governing the response to these disasters of government, municipalities, emergency services and volunteers are a number of government policies and legislations. These policies outline the rights and responsibilities of each of the role players concerned with Disaster Risk Reduction (DRR) in South Africa. This section will outline some of the relevant DM legislation currently applicable in the South African context, particularly in light of DRR at the local community scale, as well as highlighting some of the limitations which currently exist.

3.5.2 Policy

Following the end of Apartheid, and with the advent of democracy in South Africa, there were numerous reforms of legislation and development management (International Foundation of Red Cross, undated). A central informant for many of these reforms is the South African Constitution and its Chapter 2, the Bill of Rights. Of the Rights enshrined in the constitution the following are applicable in the Disaster Management context.

"9. Equality
1. Everyone is equal before the law and has the right to equal protection and benefit of the law."
This is important as any DM response or DRR effort must include all people of South Afrca and must not discriminate on any basis. This is particularly relevant as previous discriminations based on race, gender and disability have led these population groups to have greater vulnerability to disasters.
"11. Life
Everyone has the right to life."

As numerous disasters (such as fires) have the potential to cause loss of life, there is a distinct need to focus DRM on the reduction of deaths. Loss of life due to fires have great potential for reduction through prevention strategies.
"24. Environment
Everyone has the right
a. to an environment that is not harmful to their health or well-being;"
This right should protect people from living in environments not suited to human occupation and as such DRM is required to either improve the environment for people living in dangerous areas or provide alternative arrangements for them. The second part of this right, "to have the environment protected, for the benefit of present and future generations" also has implications for DRM as it is essential that any strategies put into place are sustainable and aim to improve the situation for future generations as well as improving the current conditions.
"27. Health care, food, water and social security
1. Everyone has the right to have access to
a. health care services, including reproductive health care;
b. sufficient food and water; and
c. social security, including, if they are unable to support themselves and their dependants, appropriate social assistance.
3. No one may be refused emergency medical treatment."
In the event of a disaster occuring it is necessary for the authorities to provide assistance to those affected to ensure this right. Certain of the provisions are essential in securing the prevention of a disaster (such as healthcare to limit the spread of an epidemic) whilst others may be more applicable in the post disaster phase as communal loss requires the provision of social security.

29. Education

1. Everyone has the right

a. to a basic education, including adult basic education; and

b. to further education, which the state, through reasonable measures, must make progressively available and accessible."

Both these points should include education regarding disaster risk, but in speaking to community members this is an area severly lacking. This right forms the backbone upon which DRM education should be based.

"37. States of emergency

1. A state of emergency may be declared only in terms of an Act of Parliament, and only when

a. the life of the nation is threatened by war, invasion, general insurrection, disorder, natural disaster or other public emergency; and

b. the declaration is necessary to restore peace and order."

This lays the responsibility for declaring a state of emergency with the relevant authorities as they declare such a state if they feel they are not capable of handling the situation without assistance from Provincial or National Government. However, as will be seen from interviews with DM officials the understanding of this "capability" is more complex. These rights, in their application to all people of South Africa, provide the basis upon which the DM legislation must be based and implemented. The two main pieces of legislation at the National Government level are the National Disaster Management Act (DMA) no. 57 of 2002 and the National Disaster Management Framework (NDMF) of 2005. The DMA legislates the creation of bodies of National Government specifically catering to Disasters in the Republic. It mandates the establishment of an Intergovernmental Committee on Disaster Management and the National Disaster Management Advisory Forum and sets out who should sit on these committees. The members of these committees are mostly political figures and, although there are representatives of non-governmental role players (such as big business), there is an under-representation of municipal officials and grassroots organisations (IFRC, undated) which deal directly with communities affected by disasters. There have, however, been attempts to combat this by setting up similar structures at the Provincial level. In setting up the NDMF, which is aimed at providing more practical policy on dealing with disasters, the DMA states that, "The national disaster management framework must reflect a proportionate emphasis on disasters of different kinds, severity and magnitude that occur or may occur in southern Africa, place emphasis on measures that reduce the vulnerability of disaster-prone areas, communities and households" (RSA, 2002). It sets out to do this by placing the focus on prevention and mitigation as well as cooperative governance. The cooperative governance emphasis includes local interaction between governmental and non-governmental role players and interaction with international actors. The NDMF aims to achieve its goals through 4 Key Performance Areas (KPA) (www.ndmc.gov.za, 2009). KPA 1 addresses the necessity of cooperative governance in setting up the institutional arrangements necessary for efficient DM roleplayers, both nationally and internationally (PGWC, 2005). The second KPA focusses on the need for DM assessment and monitoring in South Africa. These assessments should be undertaken on an ongoing process by all spheres of Government. The need for integrating DM planning into existing programmes and initiatives is covered in KPA 3. It provides guidance for plans, projects and programmes that can reduce disaster risk. The 4th KPA highlights the need for efficient and organised response in the face of disasters and emphasises the need for those involved to understand their responsibilities. Post-disaster there is a need for an integrated approach to Recovery and Rehabilitation. In order to achieve these KPAs, the NDMF sets out three enablers to support these activities. Whilst the KPAs provide for the aspirations and ideals of the DMA, it is the enablers which are the practical methods of achieving these ideally. They are also where many of the problems limiting the effectiveness of DM in South Africa can be found. The first enabler centres on the need for an integrated information management and communication system. This has, however, been criticised by the IFRC as it, "does not appear to be adequately addressed in the policy or legislative framework pertaining to disaster management" (IFRC, undated). The second enabler focusses on prioritising education, training and a culture of risk avoidance within the country. This is essential for the overall goal of DRR in communities and will require a concerted effort at all levels of government to ensure that it is implemented. Enabler number three "sets out the mechanisms for the funding of disaster risk management in South Africa" (PGWC, 2005). As funding is required for all strategies to be implemented and for the recovery and rehabilitation of areas post-disaster, it is essential that adequate funds are assigned to DM and managed through an efficient and transparent funding model. The IFRC has two problems with this as it feels that funding (along with other issues) is limiting the effectiveness of the DM information system and that the document is too vague in its guidance of funding strategies (undated). Overall, the NDMF would seem to cover the key priority areas and fall in line with the DMA. The critique is in the implementation of these priorities which the IFRC confirms as it says, "While the NDMF identifies a broad array of actions within each of the KPAs and Enablers, these are formulated at a very general level and thus require more detailed elaboration in the provincial and local disaster management frameworks and plans for purposes of implementation at the community level" (Undated).

It is envisaged that the implementation of this framework is managed by the National Disaster Management Centre (NDMC) which is situated in Pretoria and headed by Mr Ken Terry. The Centre does seem to be more human focused with its vision aiming to enact the DMA by using, "well-trained, well-resourced and committed people" (NDMC, 2013). In the case of a disaster occurring, the NDMC will be seen as the human face of the legislation being enacted and it is essential that the Centre, and the people who work in it, accurately portray the legislation. The NDMC's aim is to, "promote an integrated and co-ordinated system of disaster management, with special emphasis on prevention and mitigation by national, provincial and municipal organs of state, statutory functionaries, other role players and communities." (RSA, 2002). The International Federation of Red Cross (IFRC) states, in its review of the legislation governing DM in South Africa, that a primary function of the NDMC is the dissemination of information although this has been limited by technical and capacity problems (Undated).

As can be seen in the diagram (figure 3.8, below) Disaster Management Centres also exist at the at Provincial and Municipal level whilst at ward and community levels other structures are in place to enact the DMA.

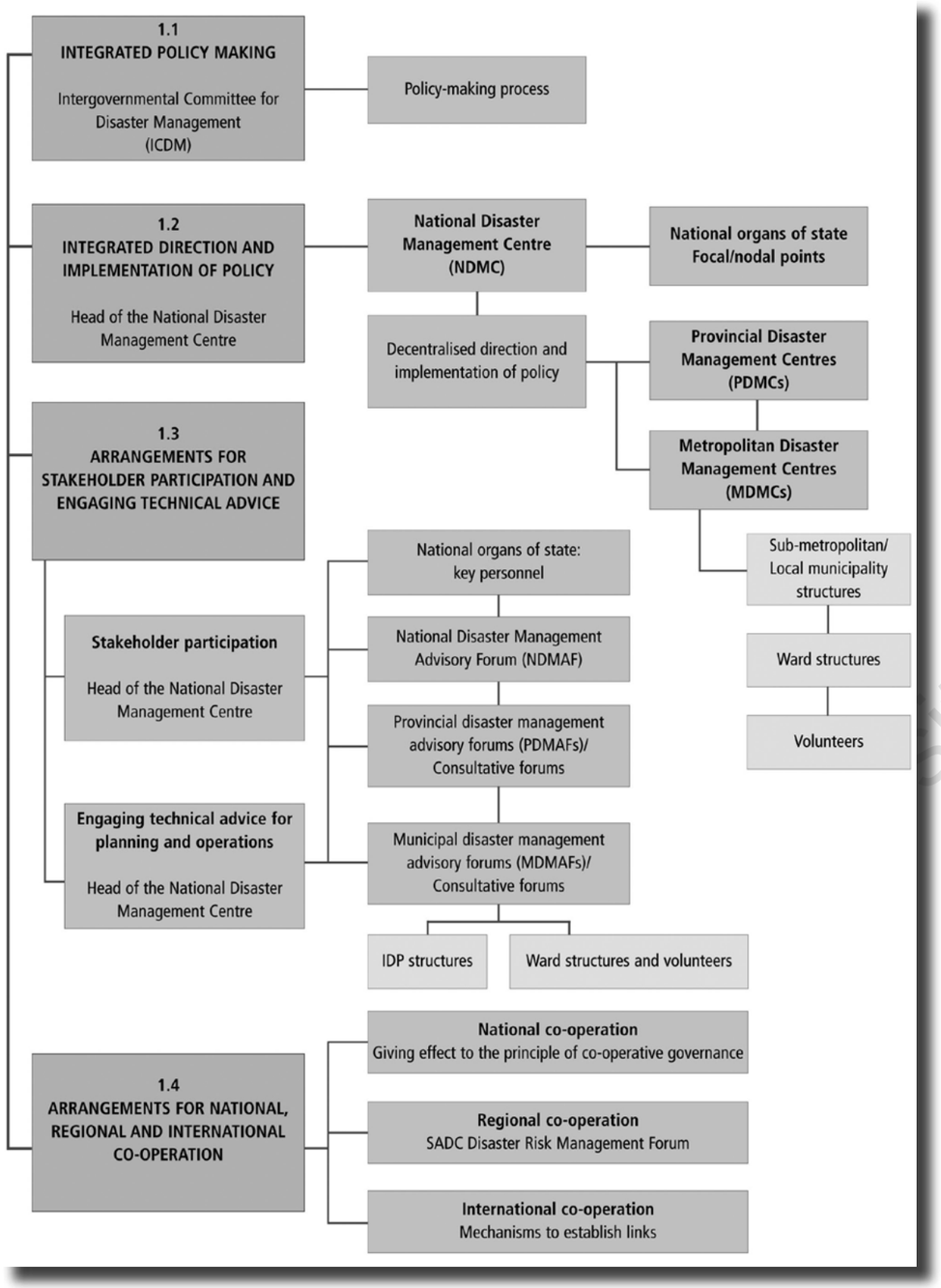

Figure 3.8: Integrated Institutional Capacity for Disaster Management (http://www.capetown.gov.za/, 2013)

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4 - Research Methodology

4.1 Introduction

This chapter begins by briefly outlining the process which has been followed throughout this research from initial ideas to data collection to the final product. The second section focusses on each specific method or technique used with an explanation of the process followed, the reason behind the choice of method and the advantages and disadvantages of using it.

The brief outlined that research projects need to build on ideas from previous planning courses and either need to be an interventively-oriented response to a particular planning issue or a planning project at a specific scale. The decision to work with research around disaster management was made early on in the process for the reasons outlined in the ethical position chapter. Once the general focus had been decided on it was necessary to narrow the focus to a specific research question and temporal and spatial location for the case study. Once the title of the research had been decided as "Increasing community resilience to fire: A Community Based Disaster Risk Management approach in Imizamo Yethu" and the question narrowed to "How can the community of Imizamo Yethu's resilience to fires be improved through the use of a Community Based Disaster Risk Management approach?" the next step was to gain approval from the UCT Ethics Committee as the research makes use of human subjects. In the initial stages of the research literature reviews were conducted on literature specifically focussed on disaster management planning and informal community fires as well as the more substantive planning topics such as collaborative planning and grassroots community development. Despite the large amount of literature available on the relevant issues, international research still seems to dominate the field with limited work being written by developing country authors. In parallel to the literature review a number of interviews were conducted with academics, government officials and others affected by or interested in disaster management. Conducting these interviews before the literature review had been completed, allowed those being interviewed to recommend additional resources, particularly relevant to the local context. During this stage the base maps and GIS data were prepared for use in the focus groups and analysis stage of the research. Raw GIS data

was sourced from the Chief Directorate: National Geo-spatial Information as well as the GIS lab at UCT and includes aerial imagery and infrastructure shapefiles. This data formed the basis for the creation of the physical 3D model used in the focus group discussions, the process for which is explained later in this chapter. With a grounding in the theory from interviews and the literature review and with the physical 3D model in place the focus groups were run in the community. Three Focus Groups with 22 community members and one with 6 fire-fighters were held over 3 weeks in and around Imizamo Yethu and all made extensive use of the physical community model. The findings from the focus groups were recorded along with the features identified and ideas proposed on the 3D model. These results were digitised immediately following the focus groups into GIS shapefiles for further analysis. Data on the prevalence of informal settlement fires in the Cape Town Municipal area were kindly provided by the Fire Department along with background information on the current Risk Reduction strategies. The primary community data was analysed along with the secondary information collected. A number of factors were studied including factors which cause the fires, factors which exacerbate them and ideas suggested by the community to reduce fire risk. The results of this analysis were used to establish recommended interventions for Imizamo Yethu, represented spatially and described, as well as generalised guidelines for Fire Disaster Risk Reduction in Cape Town informal settlements .

4.2 Research Methods & Tools

4.2.1 Case Study

The decision to use a case study as the main research tool was based on the focus of the research topic (namely disaster management planning in informal communities) and the characteristics of case study research. As Gerring (2004) says, "Regretfully, the term 'case study' is a definitional morass." He comes up with the following definition that is very similar to the Merriam-Webster definition proposed by Flyvbjerg (2011), which follows:

> *"…as an intensive study of a single unit for the purpose of understanding a larger class of (similar) units."*
>
> Gerring (2004

> *Case Study. An intensive analysis of an individual unit (as a person or community) stressing developmental factors in relation to environment.*
>
> Merriam-Webster (2009) in Flyvbjerg (2011)

There are a number of common features between these two definitions. Firstly they both stress that the study (or analysis) is intensive in nature. It is difficult and inadvisable to summarise a deep case study (Flyvbjerg, 2011) and a case that has been successfully analysed intensively should not be able to be summarised. Secondly, both definitions use the term "unit". More important than the definition alone, is Gerring's explanation of the term "unit". He defines the term as a phenomenon defined spatially which is studied at or over a certain time period. This fits the scope of the research as the the spatially defined community of Imizamo Yethu was studied for the recent past and the present. Naturally it is hoped that any findings from the

research can help to improve the situation for other communities' disaster risk. The viability of drawing general conclusions and the applicability of lessons learned will be discussed further below. The emphasis placed on developmental factors also fits with the research as the environment plays a large role in disaster risk as do other personal and infrastructural development factors.

Seawright et. al. (2008) discusses the rationale behind selecting the specific case for research. As they say, "…choosing cases and analysing those cases can scarcely be separated…" and the choice of case is important as it often represents a number of other cases, upon which lessons learnt may be applied. Particularly for this research, the choice of case will have a large impact as there are many other areas where similar risks are faced and where new thinking and interventions will also be required. Besides the issue of representativeness (Gerring, 2004) there are also the practical issues to be considered in the choice of case. As mentioned in the previous section, the Imizamo Yethu community has been chosen for a number of reasons. It has a clearly defined spatial boundary, which is often lacking in informal areas, but which is something that lends itself to the case study method, as per the above definition, and to other analytical tools which are still to be discussed. It is clearly vulnerable to the risks of fires and flooding and the community is small enough to be manageable for the application of the participatory tools. Personal familiarity with the area, and to some extent the dynamics of the community, are also factors which favour the choice of community. There are a number of problems with this using this community as the case for study, some of which are likely to be common to all cases and others which may be remedied through adjustments to the participatory tools. Firstly there is the issue of language and culture barriers to be overcome, but in choosing to work in informal settlements in Cape Town, this is likely to be encountered by researchers not fluent in the local language. Related to this is the limited activity of NGOs in the area and the desire to have the support of a well established organisation. The characteristics of the settlement that make it unique and interesting to study (closer to the city centre and formal areas than other informal settlements, situated on steep mountain slopes) may also mean that lessons drawn from this research may not be immediately applicable to other informal areas. This does not mean that the usefulness of the research will be limited, but it is important to understand the community within the greater context and to acknowledge the level of representativeness. Personal bias must also be acknowledged from the outset, in terms of selecting the case study area and in the choice of research topic. As this bias can be seen as part of fundamental human nature (Bacon as quoted in Flyvbjerg, 2011) it does not negate the research, but rather, once acknowledged, allows one to be aware of it and to ensure that research is still valid. Related to this is another issue that Flyvbjerg eludes to; the tendency of researchers to read too much into data where simple analysis may have sufficed. As he says, "It is easier to remember and make decisions on the basis of 'meaningful' stories than to remember strings of 'meaningless' data". In order to counter this it will be necessary to verify any findings or conclusions in the data with other sources through the process of triangulation. Once again, a consciousness of the necessity of data verification allows one to build this into the data collection process (Mathison, 1988), rather than attempting to verify

post collection. This will lead to a more rigorous process and thereby more trustworthy results (Leech et. al., 2007). In the case of Imizamo Yethu this data verification process will be achieved by involving as many stakeholders as possible. For example, in the research about the severity of fires in the settlement it will be necessary to speak to people about their personal experiences, disaster management personnel about what they have dealt with and compare these findings with applicable academic research to try to understand the whole picture. Resident bias in this process is expected and understandable; people are likely to be more vocal about processes which directly impact their lives and exaggeration may occur as a result; hence the need for data verification. As the case study is intensive by definition it lends itself to, "Dense narratives based on thick description[s]" (Flyvbjerg, 2011) and the collection of data is therefore likely to come from a number of sources.

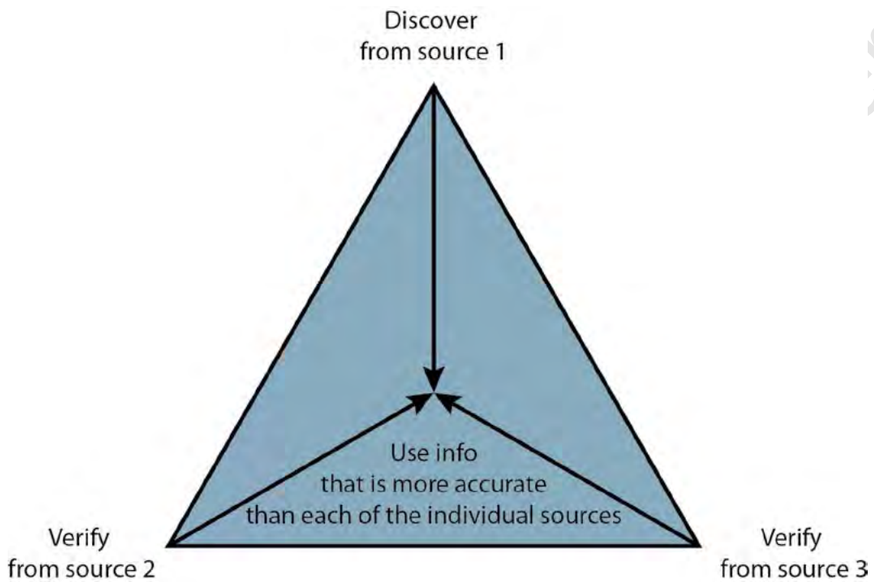


Figure 4.1: The process of triangulation to verify information

Whilst the case study represents the method of research it relies on a number of tools, or techniques, for the data collection and analysis processes, which will be discussed below. No two case studies will be the same and although they are often held in poor regard (Gerring, 2004) they have the ability to speak to a number of different role players, as Flyvbjerg sums up in the following quote:

> *The goal is not to make the case study be all things to all people. The goal is to allow the study to be different things to different people. Here it is useful to describe the case with so many facets—like life itself—that different readers may be attracted, or repelled, by different things in the case.*
>
> (Flyvbjerg, 2011)

4.3 Tools and Techniques

4.3.1 Participatory 3 Dimensional Modelling and GIS

Due to the focus of this research on the impact of fires and floods on people's lives and their response to these disasters, it will not be enough to merely study the phenomena and second hand data. Instead, research was facilitated that was participatory and inclusive in nature as far as possible within the community. The use of participatory 3D modelling (P3DM) is a practical tool that fits well with the case study method as well as with the other tools proposed below. By its participatory nature it fits well with the UN's proposed Community Based Disaster Risk Management approach (UN ISDR, 2005).

The method entailed the building of a scale model of the terrain in order to map and examine certain features or phenomena in relation to a specific theme. (Maceda, et. al., 2009). Using this 3 dimensional approach there are a number of benefits over traditional 2-dimensional mapping: More community members can get involved as it does not discriminate against literacy levels, it increases people's understanding of where they live, it is easy to set up and resource-efficient, and it is specifically focused on dealing with issues that have a specific spatial dimension. In particular where phenomena are more suited to being mapped in 3D rather than 2D, such as fires. This tool was well suited to the research because community residents may not have been used to traditional mapping and found this method easier to work with, the cost efficient nature was appealing, and fires need to be addressed spatially. Imizamo Yethu sits on steep mountain land with 130m height difference between the top and the bottom of the settlement, see map below. See below for information on the creation of the model.

Figure 4.2: The location of the case study area, a spatially defined unit. The steep terrain is visible from the contours (Data: NGI, 2013)

Model Creation Process

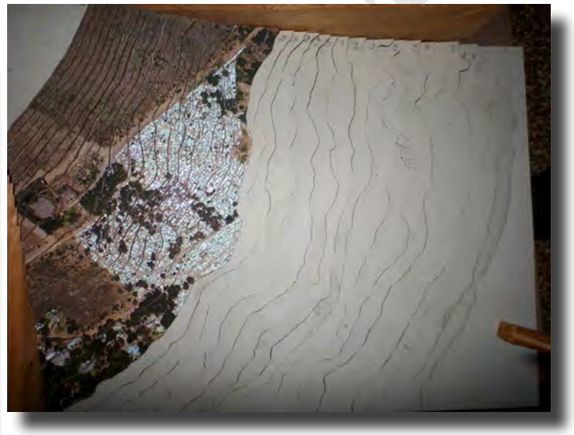
The GIS contour information was converted for use with the laser cutter and the contours cut out of 2mm thick board. (diytrade.com)

2 of each contour were created to increase the vertical exaggeration and these were glued together.

The finished contours glued together

The aerial photograph cut into contour strips

The photograph stuck to each contour to create a continuous aerial image



The view of the model from above

Hardwood base board ready to have the finished model attached to

The finished model ready for use with the participants. The steep upper parts of IY can easily be seen on the model.

Coloured pins were used in the focus groups to identify specific features

Dinivubo Precendent Study

The Maceda, et. al. article (2009) summarises a case study where P3DM was used as a tool in a CBDRM approach to reducing disaster risk on the island of Divinubo in the Philippines. This case study provided inspiration and information about the P3DM process used in Imizamo Yethu. The 3D model was built with residents as shown below, and with the assistance of the researchers the areas at higher risk as well as possible spatial mitigation measures were mapped.

The researchers found that overall the process was very successful and met many of their expectations. The project also highlighted a number of challenges that will need to be considered. The work is fairly researcher intensive, if only in terms of resources and logistics, highlighting the usefulness of a local NGO. Involved residents need some understanding of the concept of mapping and its purpose for the project, although this may be seen as a co-learning opportunity for the researchers and participants. As with all stages of the project it will be necessary to manage people's expectations and to ensure that all "All stakeholders of the project… work together towards the same agreed goals" (Maceda, et. al., 2009)

In taking the process of P3DM one step further than the Divinubo Project, the results from using the model in the focus groups were integrated with a Geographic Information System (GIS). Participatory GIS (PGIS) has been studied in a number of contexts, although there has been limited study on its use in DRM and the literature available is "…scattered over several years and range from a wide variety…" (Kienberger, et. al., 2005). One limitation of PGIS is that it the use of the GIS Software and Technology can limit its availability to those without the requisite skills (McCall, et. al., 2005). Although there can definitely be sharing of skills and knowledge (and hopefully this will occur) the use and integration of the P3DM physical model can help overcome this limitation. The integration of the data into a GIS allowed three other things to occur. Firstly the digitisation of the data helped to protect the data from being lost or damaged. Secondly, different analysis methods were applied in GIS, which added to the process of triangulating the information gained through the qualitative participation, and thirdly it allows the "CBDRM to integrate into the larger development framework" ((Maceda, et. al., 2009).

Figure 4.3: Community members in Dinivubo work on creating the 3D model (Maceda et. al., 2009)

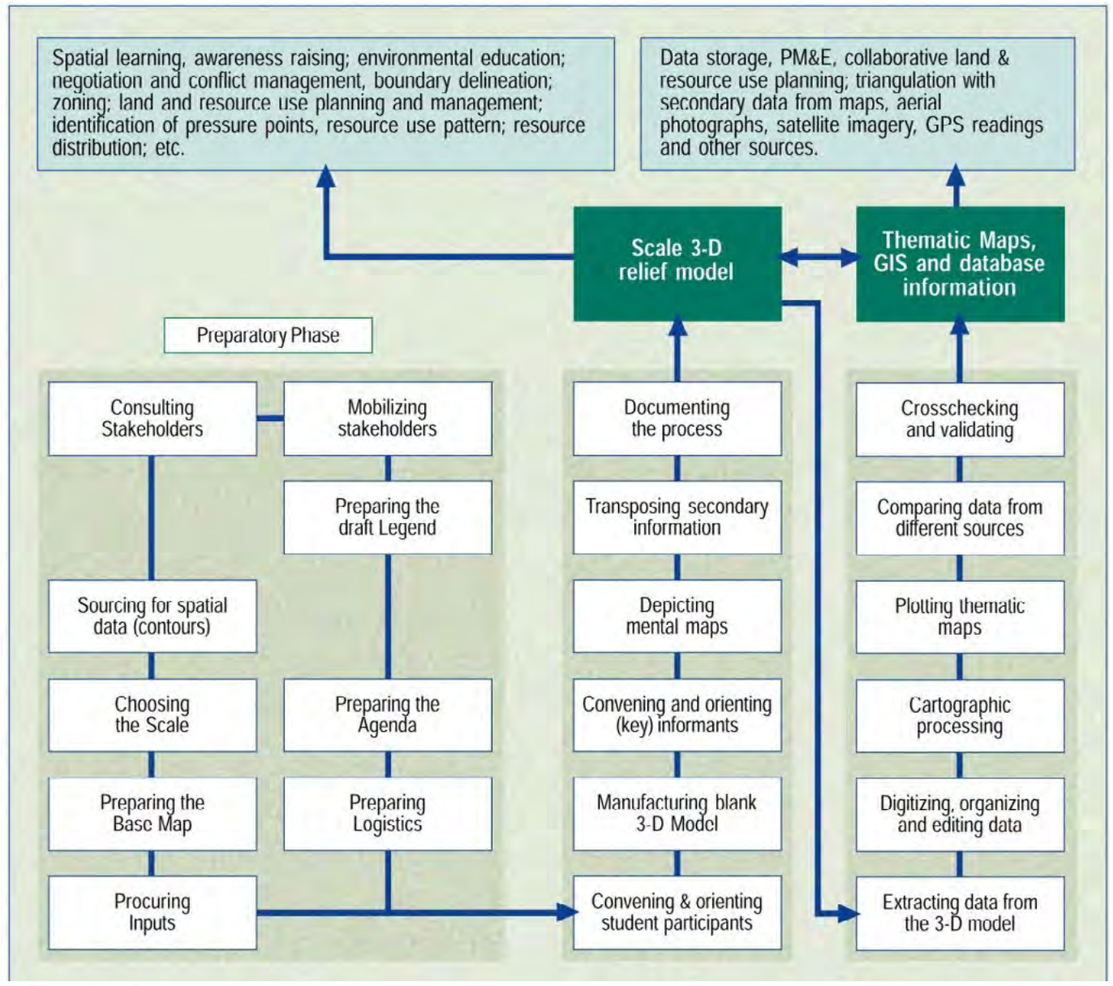


Figure 4.4: The parallel way in which this process can occur and the integration between the digital and the physical at a number of points. (Rambaldi & Callosa-Tarr, 2002)

4.3.2 Focus Groups & Interviews

In order to inform the preparatory phase, as outlined in the above, it was necessary to obtain information from the community members and other stakeholders. This information was qualitative in nature, although during the course of the interviews quantitative information was also gained to supplement the process. Halcomb et. al. (2006) see focus groups as, "…a means of listening to the perspective of key stakeholders and learning from their experiences of the phenomenon". This process of group interaction allows the researcher, as well as the participants, the opportunity to understand their points of view and how and why they have these views more naturally than in a one on one interview (Kitzinger, 1995). There are a number of advantages (Kitzinger, 1995) in using the focus group approach over the one-on-one interview and these also made it an applicable tool for use in the research. Focus groups don't require the participants to be able to read or write and are able to encourage reluctant participants to get involved by speaking to those they feel comfortable with. Particularly with sensitive topics (of which disaster risk may be considered one) it is possible to draw out subtle cultural values. However, whilst the method does allow for a consensus to be reached amongst representatives

of the community, the group dynamics may silence individuals who feel they cannot speak out against the group. The composition of the group will influence the type of information that can be gathered. Groups can either be made up of people who naturally associate (such as neighbours in the community or fire-fighters from a specific station) or they can be brought together specifically for the purpose of the study (this could include a diverse group of residents, officials and neighbouring communities) (Kitzinger, 1995). There does exist some form of "self-selection bias" (Halcomb et. al. 2006) as residents must be willing to be part of the study. In integrating qualitative and quantitative research the focus group can be used to design and test a questionnaire that will be distributed to the wider community. Particularly in areas where language barriers exist, it will be useful to do a trial run of the questionnaire to test the language and accessibility of the questions. In certain circumstances it may be possible to let the conversation flow and pick up on information from participation and body language. In others it may be necessary for the facilitator / researcher to be more involved in the conversation and steer it towards specific topics or questions (Halcomb et. al., 2006)

The one-on-one interviews were used to fulfil a different function to the focus groups. To gain a background to the DRM currently being practiced in Cape Town, it was necessary to interview certain key stakeholders. These included management officials at the DRM centre and the Fire Department, city council officials as well as academics who have written on the topic. Other interviewees included operational personnel who deal with the disasters at a local level, community leaders and people met whilst on site visits in the community. With the aim of interviewing people systematically so that findings can be generalised for the larger population, these people were either sought out as key informants or by "convenience design" (Warren, 2001).

The style of the interview – unstructured, semi-structured or structured – depended on the person being interviewed and the questions being asked. Due to the broad focus of DRM one question often led to a number of secondary questions and, because of this, the interviews were conducted in a semi-structured manner for the most part. Having a number of key questions to begin with ensured that the topic stayed on point, but there was the potential for either the interviewer or the interviewee to bring up new questions as they came about (DiCicco-Bloom, et. al., 2006, Britten, 1995). There are a number of ethical considerations (Bogdan, 1998) that needed to be taken into account before and during the interview, such as consent for the

Figure 4.5: P3DM set up and ready for the participants (Author, 2013)

interview to be conducted / recorded, privacy issues, remuneration and integrity of the data. Except for the informal interviews within the community, the semi-structured nature of the interviews required them to be conducted at a predetermined time and place. Warren (2001) stresses that one must expect a continuum of responses when requesting an interview from, "…outright refusal to welcoming agreement". To limit the number of outright refusals, the nature of the research and the benefits it may have were fully explained. Depending on when the interview took place in the research process, the questions asked were influenced by a number of factors. Early on in the process the literature played a large role in deciding which questions to ask. Later in the project the questions were influenced by experiences that were heard in the focus groups or by spatial data from the mapping process. In asking the questions themselves, Britten (1995) sets out a number of pitfalls that interviewers, especially novice ones, must beware of; the directness of the interviewer, how leading the questions are, whether cues (verbal and non-verbal) are being picked up and whether enough time is being given for the respondent to explain fully. Leading questions presented the greatest difficulty as it was very easy to slip from leading the conversation in the right direction to expecting a certain answer from a certain respondent .

There were a number of ethical issues that had to be considered during the research process. Managing the expectations of the community in terms of what they hope to get out of the project was a critical consideration. As previously mentioned, agreeing to certain goals at the start of the research was helpful in managing these expectations (Maceda, et. al., 2009). In looking at the disaster continuum, the interventions section of the research was decided to focus on the pre-disaster risk reduction phase as it was felt that this was where inputs of a planning nature could make a difference.

4.3.3 Reflection on the Focus Group Process

Deciding to work with a real community, rather than conducting the research based only on secondary data, was a necessary decision given the focus of the research, but one which resulted in a number of difficulties and apprehensions. Now that the research has been completed, this section provides a reflection on the process of conducting the focus groups and the ways in which the early apprehensions and difficulties were dealt with.

At the start of the research, when the focus had been decided upon and the need to work with community members established, it was immediately apparent that there would be difficulties in conducting this primary research that would not be present in other forms of research. One of the reasons that Imizamo Yethu was chosen as the site for the case study was its familiarity. This familiarity, it was hoped, would allow one to focus on the data collection without worries about getting lost in an unfamiliar area or working in an area without any understanding of the issues (see chapter 2.3 Ethical Position). To a large extent, this decision proved to be valid as it was easier to get around in the community and when talking to residents about their community it was helpful to be able to locate landmarks and roads in the area. During preliminary discussions with Development Action Group (DAG) the possibility was discussed of working in a different location, and BM section, Khayalitsha was suggested due to the recent devastating fires there. Whilst there would definitely have been advantages to focusing on such an area, from speaking to residents in IY

it is clear that the devastation that fires as far back as 2008 & 2004 caused are still fresh in the minds of those affected.

Figure 4.6: Community members using pins to indetify features (Author, 2013)

The next issue which was cause for concern before the start of the research was gaining access to interact with local residents. Thankfully through working with DAG, contact was made with Kenny Tokwe, a local community leader who has had experience working with researchers in IY in the past. A community leader such as Kenny is instrumental in the smooth running of focus groups in communities, particularly on the access and logistics side of things. From initial contact, via email and telephone, Kenny understood the purpose of the research and was willing to assist. A community leader provides, in these instances, three key functions which would otherwise be difficult to achieve. Firstly, due to his residence in and activity in the community he possesses intrinsic knowledge of the community. Such indigenous and traditional knowledge proved useful in cases such as finding locations to hold the focus groups and which areas had been affected by fires and therefore which residents to speak to. Initially it had been hoped to hold all the focus groups at the ambulance base as this was a central location with space and facilities for the focus groups. Kenny, however, preferred to organise the first group to be held at the Iziko Lobomi Community Centre as this was convenient for more people. Arriving an hour early for the session to find 8 community members already waiting was both intimidating and very positive as it showed the willingness of the community to be involved. Something else which occurred during the first focus group which only happened due to it being held at the Community Centre was the invitation to join the morning prayer session with participants and community leaders. Being included in something which was evidently very important to those participating was a moving experience. Another positive was the number of residents Kenny had spoken to and arranged to participate. Initially the plan was for 5 or 6 people to participate in each session but in the first focus group 10 people were present and in the second eight. Despite the participants not fitting the exact demographic breakdown planned for, the increased numbers were helpful in facilitating discussion and gaining a better understanding. The third focus group consisted of 4 younger members of the community (below 30) all of whom were fluent in English and very interactive during the session. This session had been organised through one of the participants of the first focus group but ran similarly to the first two groups. In comparison to the first three focus groups, the session with the Fire Department Crews was organised through

the one of the senior management officials in the City of Cape Town Fire Department. Station Commander Layne was interviewed earlier in the research process and was happy to organise the Hout Bay crews for a focus group session. There were less difficulties working with this focus group as the fire crews generally were more fluent in English and grasped the concept of the model more rapidly. Provision had to be made for the crews to be called out if and when the need arose, which thankfully they didn't.

Language barriers were another concern at the start of the research process as most IY residents' home language is not English and the focus groups relied on people being able to express themselves. Thankfully this was not a large issue and the language barriers that did exist were easily dealt with by other participants translating. In the first focus group 6 of the 8 participants were sufficiently fluent in English to explain themselves whilst the other two participants needed assistance from others in explaining themselves. Whilst every opportunity was made to include all participants in the session it was found that those who were more fluent were more willing to elaborate on their answers and were more descriptive in their discussion of ideas and events. In contrast to the first group, the second session's participants were predominantly Xhosa speaking and relied heavily on two or three of the group to translate ideas. Whilst this did allow others to get their views across, it also presented the opportunity for information and opinions to get lost in the translation. Often, longer discussions amongst participants would be translated as shorter answers by the translator. The younger participants in all the groups, and in particular the third focus group where all four participants were under 30, seemed to have a greater fluency in English and were more expressive in their answers. They were also the usual choice in the group when a translator was required. The focus group with the Fire Crews experienced very few language barriers.

Another difficulty which was expected, and encountered, during the focus group was that of managing the expectations of the participants. The consent form contained a summary of the research and its focus of fires in informal areas. This focus was also explained at the beginning of each session but required reiterating during the discussions. Certain of the participants were adamant that formal housing was the solution to all problems facing their community. Once it had been explained that this research didn't disagree with the fact that housing was needed for the community, but rather that the research was focussing on increasing resilience to fires before formal housing was built, community members seem to be more understanding.

Using the 3D topographical model of the settlement in the focus groups as part of the P3DM process provided a number of benefits, particularly to those less fluent in English. The model was used at the start of each session as an "ice-breaker" as participants were given the opportunity to find their homes. This allowed an informal, interactive start to the focus group as well as allowing people to orientate themselves with the model, which increased its effectiveness later in the discussions. Some participants were more adept than others at using the model, but this did not seem to be linked to fluency. Instead it gave them an opportunity to interact with the group in a non-vocal way. By the end of the first focus group all the participants seemed to be adept at orientating themselves

within the model and throughout the session participants kept jumping out of their seats to find places on the model or put pins in to mark locations. At the start of the second focus group, one of the participants was heard to exclaim "Yhu! Intaba enkulu" (Focus Group 2) which translates to, "Yoh! Big Mountain!". This really emphasised the impact the model could have in representing the settlement on a smaller scale. The second focus group made use of audio visual aids in addition to the 3D model. These were in the form of photographs of a previous fire in 2008 which had affected many of the residents at that focus group. It was again used as a tool for interaction and a way to spark discussion about the fires. Participants were able to point out specific building and locations in the photographs and then link them to locations on the map. This proved especially useful in identifying the starting point of the fire, both on the photo and then on the model from where it could be digitised. During the focus group with the fire crews the model was used extensively to locate events under discussion (such as fire locations, areas of difficult access etc) and to propose areas where interventions were needed. The younger participants in the third focus group were, again, the most interactive when it came to using the model. They grasped the concept from the outset and used it without prompting throughout discussions. This focus group also delivered the most in terms of intervention strategies suggested. The participants seemed eager to pinpoint spatial locations for interventions they had come up with such as signage board placement, strategies which could not have been as easily discussed without the use of the model. Their use of the model went as far as to identify areas of the informal section (Donstiyakhe) where geological features would make access difficult, despite these not appearing on the map. This was discussed specifically in terms of the proposed access roads they felt would assist the FD during fires.

Despite a number of logistical difficulties in terms of organising the participants (lacking communication resulted in the second focus group being cancelled without notice and participants arriving at different times) the process was overall a successful one. Participants of the first focus group were thankful for the opportunity to discuss the issues, despite their sensitive nature and seemed hopeful that changes could improve the fire situation. From a research point of view it was positive that so many residents were willing to be involved in the research and were vocal throughout the focus group about their ideas and feelings. The positive, practical changes suggested by participants were, as far as possible, included in the recommendations that this research makes.

Figure 4.7: A resident attempts to assist the Fire Department in saving his shack. November 20th 2008 (Kokhuis, 2008)

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5 - Results & Analysis

5.1 Introduction

The research conducted for this dissertation, as outlined in the methodology chapter (pg39), included primary and secondary data, both qualitative and quantitative in nature. This section will provide the results of the research as well as analysing the data to draw critical conclusions which can inform the recommendations in the next section. It will start by looking at the secondary data to get an overview of the current disaster risk profiles for fires in Cape Town and specifically Imizamo Yethu (IY). It will look at Fire Statistics captured by the City of Cape Town Fire and Rescue Services as well as previous research on fires. Building on the base-line socio-economic and biophysical information about IY a fire-specific risk profile of IY will be developed. Newspaper reports of recent fires in Imizamo Yethu will also be looked at to gain an additional perspective on the problem. Once this has been developed the focus will shift to looking at the primary data collected during the course of this research. The primary data collected included a number of interviews as well as four focus groups run with community members and the Fire Department. These focus groups made use of the physical 3D model as part of the Participatory 3-Dimensional Modelling (P3DM) process.

5.2 Secondary Data

5.2.1 Cape Town Fire Data

The City of Cape Town Fire & Rescue Services is the only emergency service specifically designated to respond to and deal with all fires in the great Cape Town Municipality. The municipality has 30 Fire Stations located in 3 Fire Districts (East, West, North) as shown on the map, figure 5.1, below. Fires can be reported through a number of channels (By phoning 107, 112 or individual Stations) and each incident is logged as the call comes in on a central computer system. These call statistics were kindly made available for this research at the City scale and specifically for IY.

As can be seen from the graph below (Figure 5.2) there is a high number of informal settlement fires across the municipality. As the title implies, the incidents recorded are supposed incidents and may include hoax or false calls which were called in but weren't in fact actual fires. In each of the years from 1999-2011 there were over 1000 fire incidents in informal settlements (with

Figure 5.1: Fire Districts & Stations (www.capetown.gov.za, 2013)

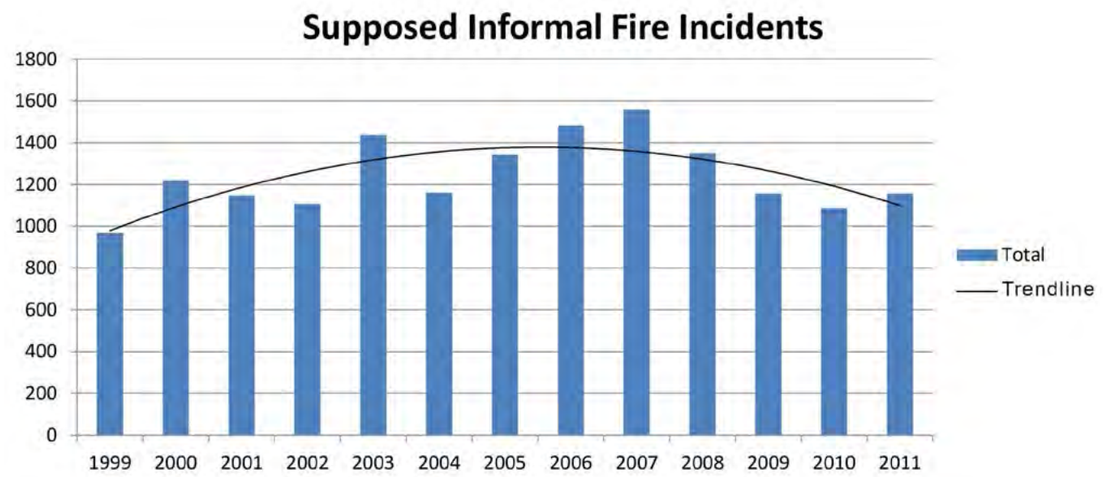


Figure 5.2: Supposed fire incidents in informal settlements (1999-2011)

the exception of 1999 where there were 967). The year with the highest number of fires in the recorded period was 2007 with 1560 supposed incidents. The mean of 1244.39 fires per year is worryingly high as it equates to nearly 3.5 call-outs per day, or over 41 calls per station per year. The magnitude of each incident is likely to vary greatly and the number of deaths and structures affected is dealt with next.

At the city scale the number of informal fire incidents varies greatly month by month with a range of 65 from a minimum of 87 incidents (April) on average each month to a maximum of 152 (December). These monthly differences can be attributed to a number of factors. These may include differences in rainfall and temperature averages across the months or changes in activities. The summer months have the highest average numbers of informal fire incidents which may be caused by:

- Higher monthly temperatures: this makes it more likely for grass fires to occur which can spread to shacks easily. Building materials are also more dry causing them to ignite and spread more quickly
- Less monthly rainfall: This also leads to drier building materials and vegetation. Less rainfall also limits the potential dampening effects of rain.
- More people are on holiday during the summer. As many people have mentioned, alcohol plays a large role in the negligence causes of fires, and when people have more time during holidays, alcohol use increases.

As the graph (Figure 5.3) shows, there has been an overall decreasing trend in the number of structures affected during fires in informal settlements from 2005 to 2011. Unfortunately data is not available for the same period as for the number of fires (1999-2011) so only the years of 2005-2011 can be compared. From looking at the data what can also be seen is the decrease in the average number of structures affected per fire. In 2005, the year with highest number of structures affected, but not the highest number of fires there was an average of 6.6 structures affected per fire. In comparison to this, in 2010 there were 300 less fires but nearly 6000 less structures affected for an average of 2.77 structures per fire. However, the data shows that January 2005 saw over 4300

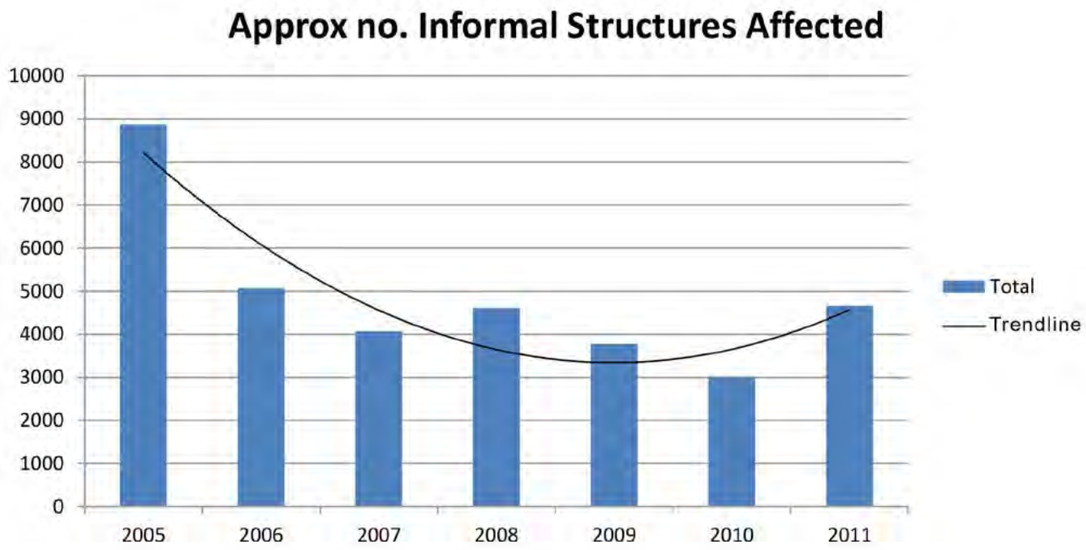


Figure 5.3: The number of informal structures affected from 2005 to 2011

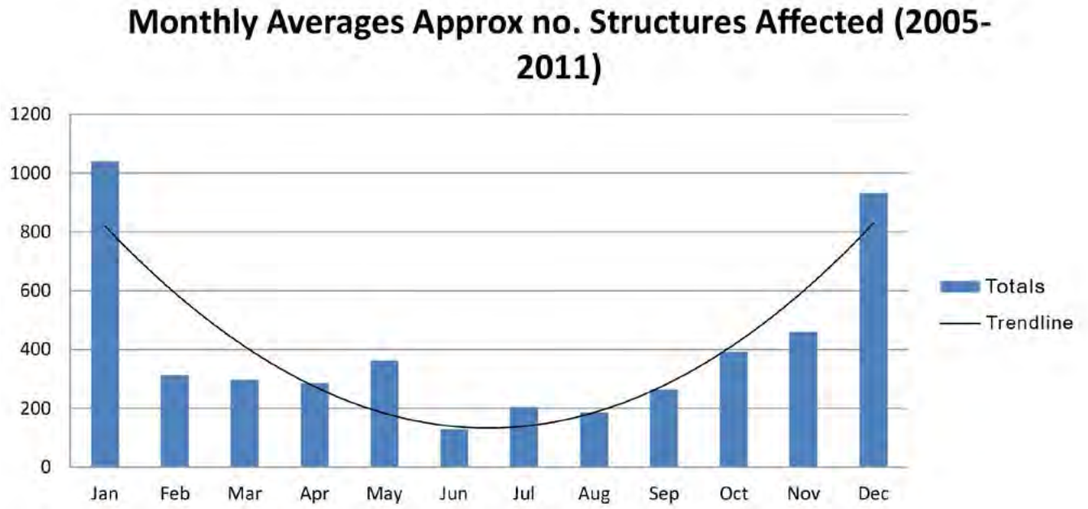


Figure 5.4: Monthly average numbers of structures affected. December and January have a much higher average.

structures affected in 138 fires, leading to the conclusion that one very large fire has skewed the data. This can be more clearly seen in the next graph (Figure 5.4) which shows the average number of structures affected monthly. From the graph a trend similar to the number of fires monthly can be seen, with an increased number of structures affected during the summer months.

The number of deaths caused by fires from 2005 to 2011 is unfortunately recorded for both informal and formal areas and one must therefore be careful when drawing conclusions from this data. However due to their vulnerability, it is likely that a large percentage of the deaths reported would be from fires in informal communities. The yearly average of deaths due to fire causes is 104 with a monthly average of 8.7. Whilst the graph does show a slight increase in the latter years, overall there is no trend as year to year the number of deaths changes. This is likely to be due to the fact that the number of deaths is directly related to the magnitude of each fire and one severe fire may account for a large proportion of the year's deaths.

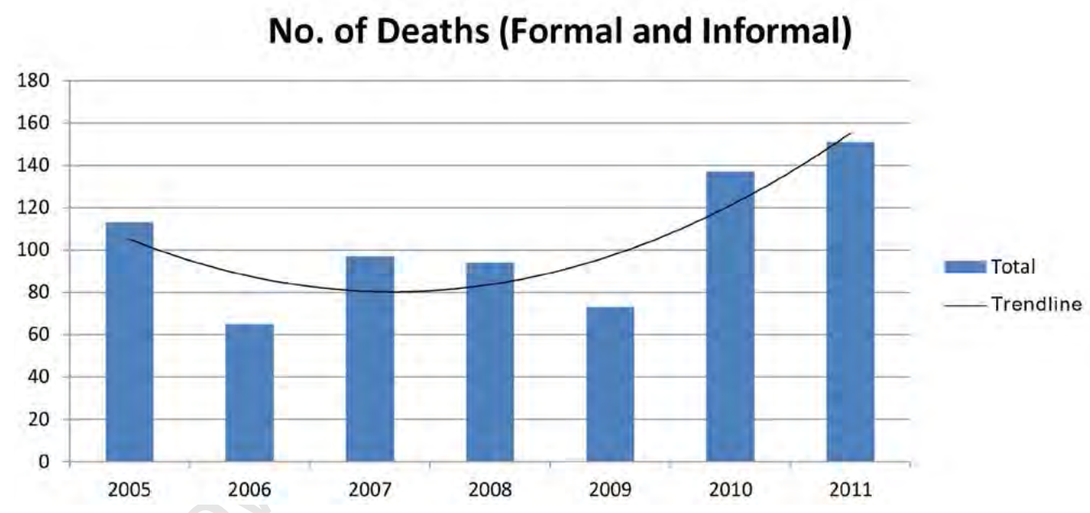


Figure 5.5: Number of deaths attributed to Fires in Cape Town 2005 - 2011

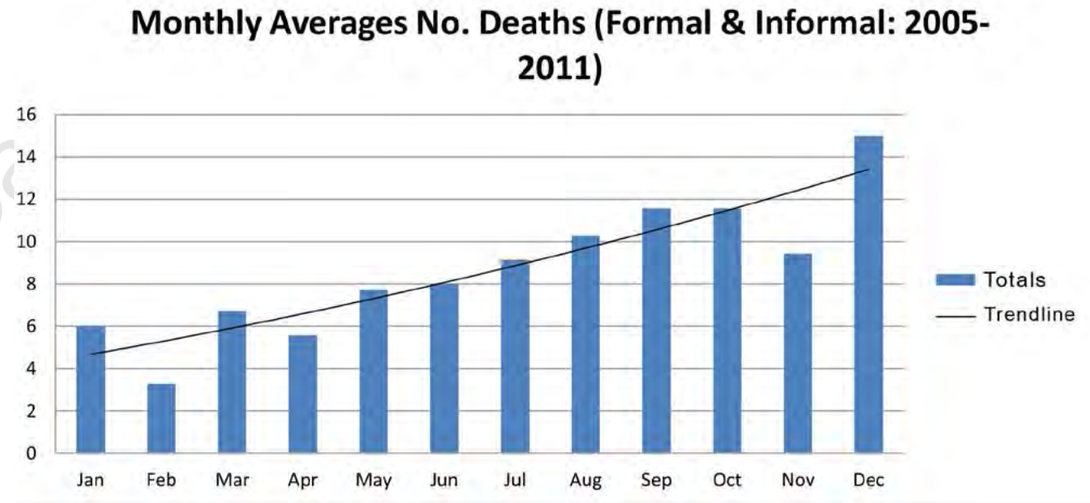


Figure 5.6: Monthly average number of deaths attributed to fires in Cape Town. December sees the highest average

In terms of the monthly breakdown, a definite increase from January to December can be seen. The increase in deaths during winter months may be attributed to colder temperatures lead people to use paraffin heaters and fires inside, increasing the risk to individual lives particularly due to smoke inhalation. The high number of deaths during December may be due to the increased use of alcohol during the holidays, but ultimately the study should be conducted over a longer period of time.

Summary

- 30 Fire Stations cover the greater City of Cape Town Municipality
- On average 1244.39 informal settlement fires occur per year which equates to nearly 3.5 call-outs per day
- More fires occur, on average, in the summer months than the rest of the year.
- 4866 informal settlement structures are affected on average each year with a similar monthly distribution to fire occurrence
- 104 people are killed on average each year by all fires in Cape Town.

5.2.2 IY Risk Profile

Each informal community has a specific risk profile and a vulnerability to hazards that is unique to the community. This section will look specifically at Imizamo Yethu (IY) and the characteristics of the community which influences, positively and negatively, the community's risk to fire hazards.

Biophysical Characteristics

One of the largest biophysical factors which sets IY apart from many of the other informal settlements in Cape Town is the steep slope upon which it is situated. Besides having an extensive impact on the housing options and the quality of life for those living in the steep sections of IY, it presents huge problems for access during fires. Lacking infrastructure, due in part to the steepness of the slope, limits the ability of the emergency services to reach the upper parts of the settlement. The slope also leads to a rapid deterioration of the roads that do exist in the settlement as erosion takes place. Due to the nature of fires which spread faster up the slope, there is greater risk when a fire starts lower in the settlement and spreads upwards.

The second factor which affects the fire risk is the vegetation present along the mountainous borders of the settlement. A number of fires in IY have reportedly started as bush fires and then spread down or along the slope to the settlement where the shacks catch fire. The opposite also occurs when fires near the edge of the settlement spread to the mountain, placing adjacent properties at risk.

Socio-economic Characteristics

The community's informality and its subsequent high levels of poverty has a large effect on the vulnerability of IY to fires. The informality presents a number of challenges, the most critical of which is the housing typologies used by necessity by those unable to acquire formal housing. These shacks are made from materials such as wood, cardboard and other recycled materials which

Figure 5.8: Mountain fires threaten the settlement and vice versa (29 March, Kokhuis, 2009)

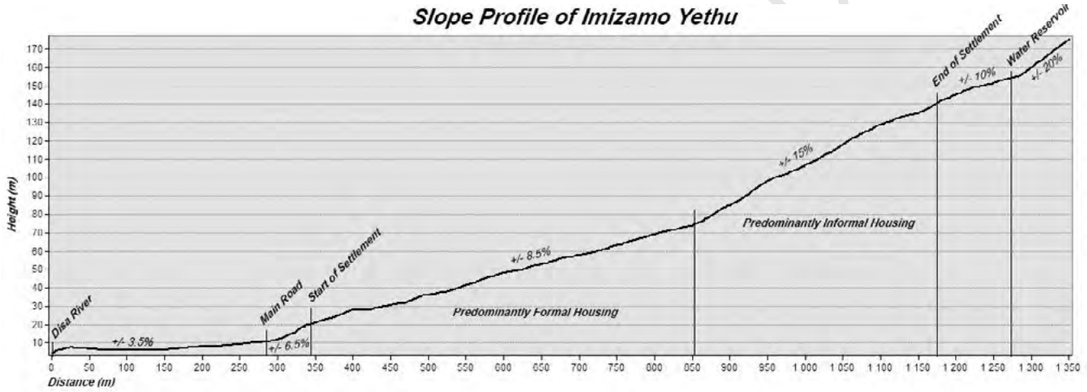


Figure 5.7: The steep slope upon which the settlement is built. The most at risk housing areas are built on the most unsuitable terrain. (Google Earth, 2013)

Figure 5.9: IY has the second highest density of all suburbs in Cape Town, nearly on par with the highest. This high density has negative consequences on the community's vulnerability to fires. (Data, NGI, 2013)

are highly flammable compared to formal housing materials such as bricks and cement. The lacking infrastructure, synonymous with informal communities, also presents challenges as lacking electricity leads to the increased use of high risk energy and lighting sources. Limited water connections amongst the shacks creates difficulties for community members, and fire crews, to fight fires when they break out. The combination of the steep slope, as mentioned above, with the poor quality roads further increases vulnerability. The high poverty levels evident amongst individual community members in IY is represented through high levels of unemployment, limited earning potential for those that are employed and low levels of education; all of which increase levels of community vulnerability. The following pages highlight the relevant findings from the recent 2011 census:

One characteristic which is positive and has the potential to reduce community vulnerability is the collective community organisation and spirit. Whilst one cannot say that the community is entirely homogeneous as rifts, both culturally and politically, have been reported by community members, there is definitely strong organisation amongst residents as evidenced by the street and block communities. This potentially can allow residents to organise themselves around specific fire reduction strategies, thereby reducing the risk.

5.2.3 IY Census Results

The following graphs summarise the results of the recent (2011) census conducted by StatsSA and compiled for Imizamo Yethu by the City of Cape Town's Strategic Development Information and GIS Department, City of Cape Town. Population is given by the city as 15 539. These results have, however, been widely contested by local community members and by Hout Bay residents. Informal surveys have been conducted using average occupancy rates and counting the number of dwellings placing the population totals between 40 000 and 60 000.

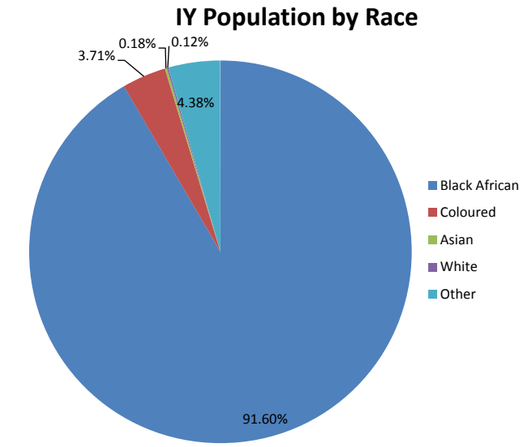


Figure 5.10: The community is predominantly African, although the graph doesn't show the high number of non-South African Nationalities.

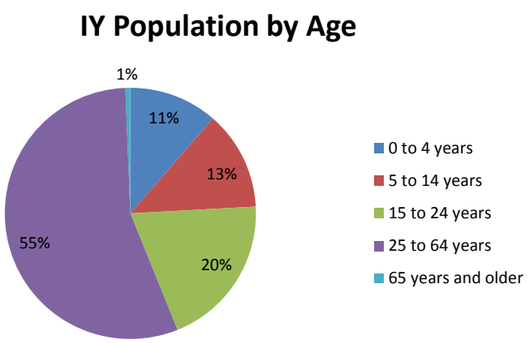


Figure 5.11: Over half the community is of economically active age, increasing the need for jobs and explaining the high unemployment rate.

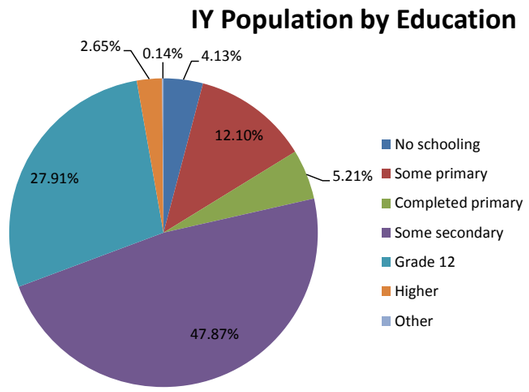


Figure 5.12: Approximately 70% of residents have not obtained a matric and are forced to rely on some secondary education, or less, to find work.

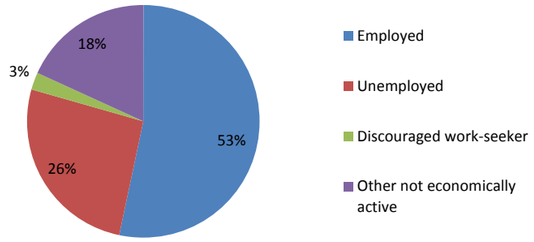


Figure 5.13: Nearly 33% of the community is unemployed, limiting Household income potential and furthering poverty in the community

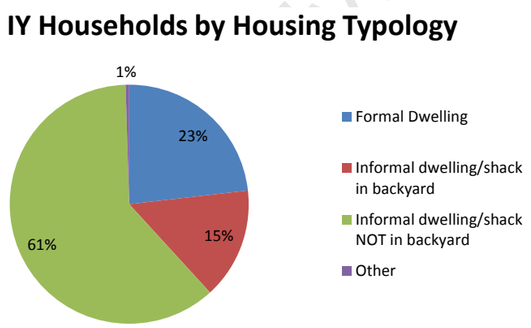


Figure 5.14: Over 75% of households in IY are living in informal dwellings either in the informal areas or in a backyard

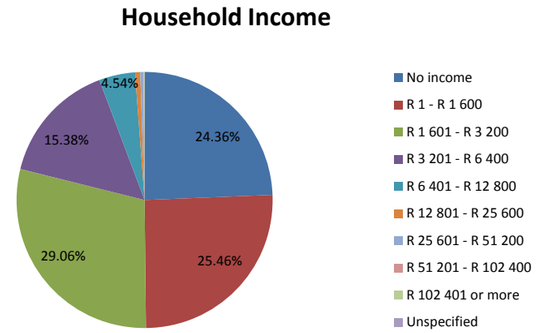


Figure 5.15: 75% of the community survives on a household income of less than R3200 per month. A quarter of these households have no reported income

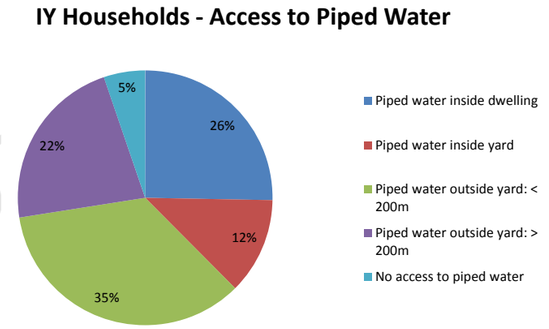


Figure 5.16: It is disturbing that over a quarter of IY households do not have access to water within 200m of their homes, limiting their quality of life and their ability to fight fire.

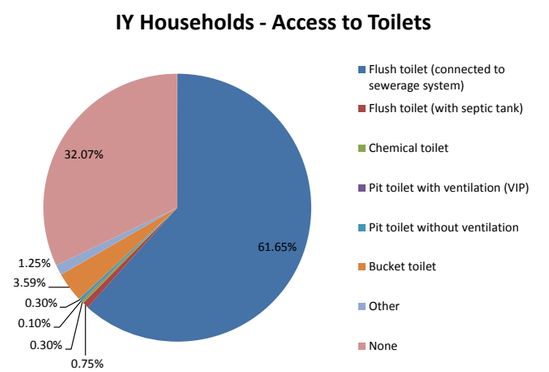


Figure 5.17: Whilst 60% of households have flush toilets, over 30% don't have any form of formal toilet reported. This may be the cause of many using the mountain vegetation as a toilet

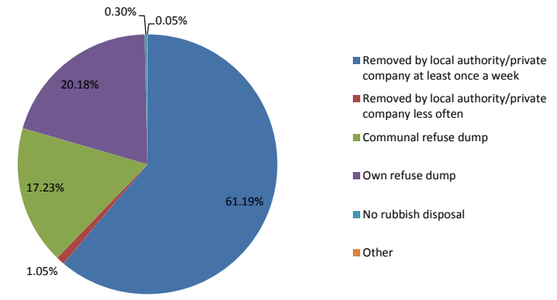


Figure 5.18: 60% may have their refuse formally collected, but nearly 40% use sites around the community to dump refuse leading to increase fire risk.

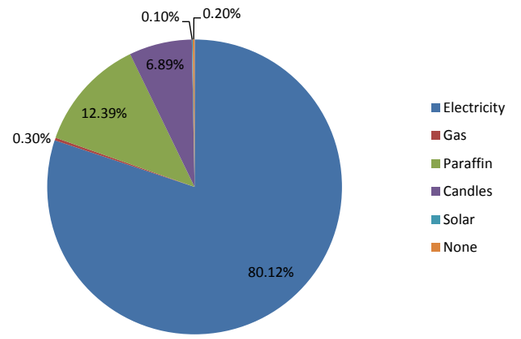


Figure 5.19: The reported figure of 80% of households having access to electricity for lighting is at odds with the reportedly high levels of other energy uses.

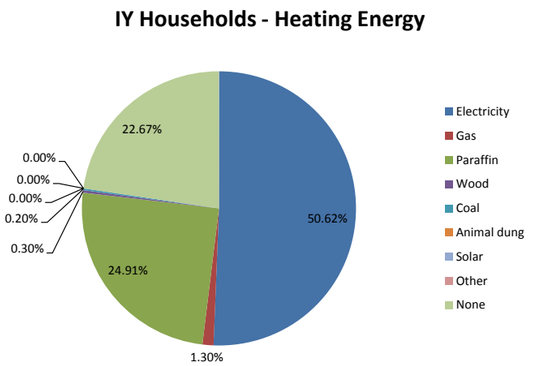


Figure 5.20: 50% of households are reported to be using electricity for cooking with paraffin still disturbingly high at nearly a quarter of households.

5.2.4 IY History

The community of Imizamo Yethu has been in existence for over 20 years since its establishment in 1991. Although the community has changed drastically and grown in that time, it is important to know its history to understand the current problems facing the community. A brief history of IY, based on Oelefse & Dodson's (1997) and Matibane's (2010) chapters on the establishment of IY as well as Heritage Hout Bay's timeline of the settlement's development, is summarised below.

During Apartheid, in the late 1970s and 1980s, there were a number of small informal settlements in Hout Bay which, despite their illegality, survived eviction due to their small size. (Oelefse & Dodson, 1997). As Apartheid began to be challenged in the late 80s and early 90s an increase in the number and size of informal settlements occurred as residents were unlikely to be evicted. By 1990 there were 5 settlements scattered throughout the Hout Bay valley comprising between 2000 and 3000 residents. Due to these increases in the informal community numbers in the area, pressure was placed on local government by Hout Bay residents to relocate the informal communities (Ibid). By early 1991 approximately 3000 people had been relocated to the area on the slopes of the mountain now known as Imizamo Yethu (or Mandela Park). The reason behind the relocation was questioned by some Hout Bay residents who suspected that the move was made, "in order to increase black voting numbers in white communities and cause general destabilisation" (Oelefse & Dodson, 1997). These residents were only provided with the most basic of building materials and a limited number of toilets and taps for the establishment of the community (Matibane, 2010). By 1993 a number of roads and electricity had been provided, but maintenance was limited, and in 1994 title deeds were provided to the residents who had been relocated originally (Ibid). 1995 saw the first large infrastructure project of the community, albeit one completed with funds raised by local organisations, not the local government. Fundraising allowed the development of the Community Centre with facilities for meetings, admin, training and a number of small businesses. The community centre is still a central meeting place for community and is well suited to provide relief accommodation in times of disaster.

With very limited control on the in-migration and settlement of new people into the area the number of dwellings in IY increased rapidly and by 1997 there were over 1800 structures established (Hout Bay Heritage, undated). From 1997 to 2002 an Irish NGO, the Niall Mellon Foundation raised funds and built 298 brick houses on serviced plots designated for the original residents. From 2002 to 2004 the City alternated between doing nothing to stop the increasing illegal occupation of land in IY and calling for eviction and demolition orders for the newcomers. Attempts at relocation were met with resistance throughout and were largely unsuccessful. Whilst the settlement continued to grow, with largely informal, un-serviced structures, minimal infrastructure was implemented or maintained by local government.
2004 saw the most devastating fire in IY's history destroy large parts of the settlement leaving approximately 5000 people homeless. The city took the opportunity following the fire to prepare formal plans for the township which included the servicing and road access for 250 erven (Hout Bay Heritage, undated). Late 2004 and early 2005 saw the local government entering debates with Province and National regarding the acquisition of

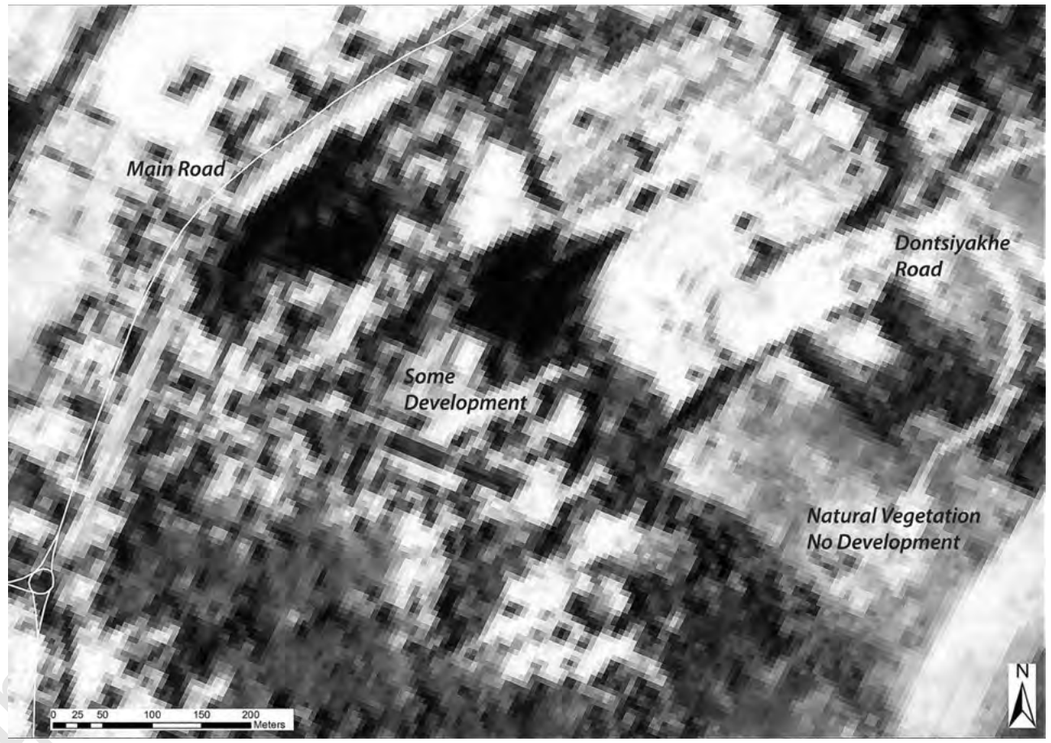
new land for the relocation of IY residents. Hout Bay Heritage's document *Timeline of Imizamo Yethu Planning and Development* (Undated) provides further detail about the political and legal processes which took place during this time, but in summary a number of options were discussed. An inventory of available land in the area was conducted but available land was either unsuitable or was found to be too expensive for purchase. By 2006 estimates put the population in the settlement at 30 000 people despite census figures being much lower. In 2006 local government appointed consultants to draw up possible plans for the settlement and in particular the 16ha forestry site, which included a public participation process. This process influenced the four options available by 2009 but not the 5th option proposed by the City. Resident groups altered this 5th proposal into their own, 6th, option which was largely neglected by City officials. During 2010 a number of applications were launched by the City for their proposal to be instituted and in turn residents and other representative groups launched appeal processes to have the City's proposal made null and void. In late 2011 the City again made an application for the eviction of residents in the Donste Yakhe section adjacent to the main water pipe. This was in line with the need for a service road to be developed through the community, but there was opposition as to the location of the road as well as to the identity of the residents to be evicted.
Currently the proposed development plans for IY have been sent to the Provincial Government for approval.

Oelefse & Dodson (1997) have written extensively about the feelings of the different community groups in Hout Bay regarding the development of IY. The perception of the new settlement was generally negative from the Hout Bay ratepayers (the term used for the formally settled, predominantly white households) and the Hout Bay Harbour community. The ratepayers resented the development for a number of reasons initially including "breaching of class barriers" while the Harbour community felt threatened by competition for the limited semi-skilled and unskilled jobs in the area. An interesting finding of Oelefse & Dodson's work was that much of the animosity to the development of IY was due to the lack of involvement of the existing communities in the planning process and that the most positive responses came from those who had been closely involved with the relocated community.

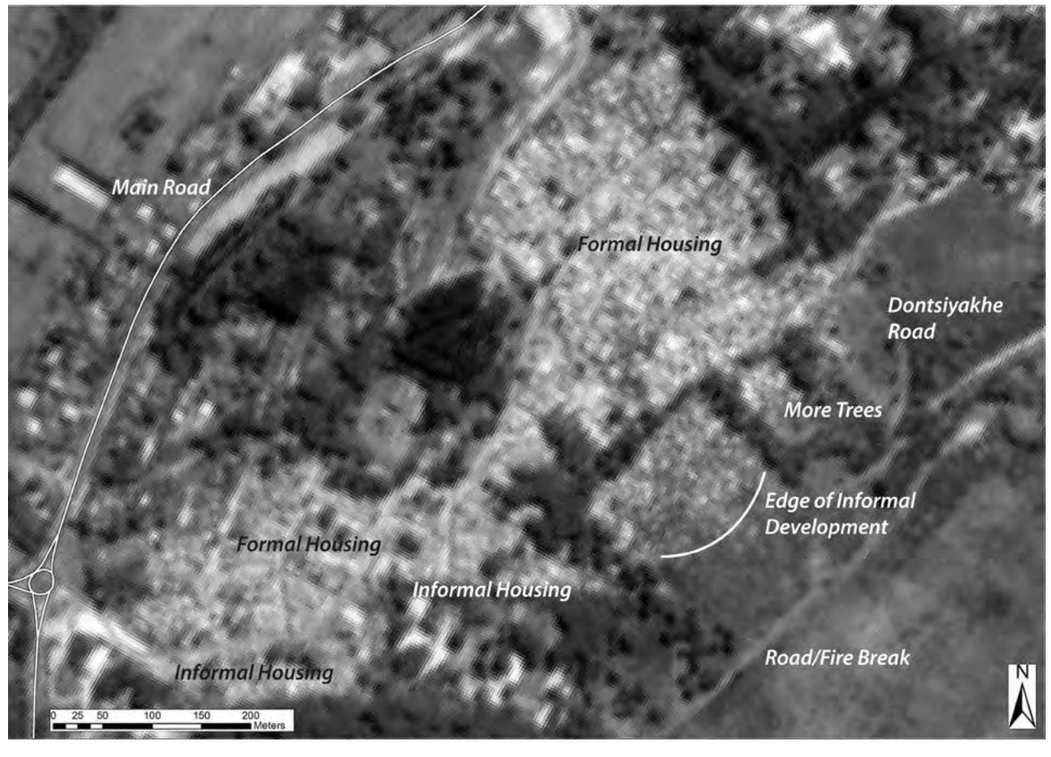
Imizamo Yethu has two very different housing typologies. The shacks are very informal dwellings constructed out of wood, corrugated iron sheeting and whatever other resources residents can find for building. Whilst most have electricity, some of these connections are illegal and create further risk. Others rely on non-electrical means of lighting, heating and cooking and most make use of communal toilets. The formal RDP-style houses are constructed of brick and mortar with interior plumbing and electricity but maintenance has been lacking and many are in a state of disrepair. The majority of these properties also house other residents in backyard shacks, with similar structures to the informal areas.

1958 - Farmland and natural vegetation dominate

1968 - Predominantly natural vegetation



1988 - Limited development, no formal housing, no informal settlement



2001 - Formal housing with large informal sections. Large amounts of natural vegetation, informal development lower down the slope

2001 - Settlement in its current form but less dense, areas of vacant land present

2010 - Some new formal houses built, less dense than present time

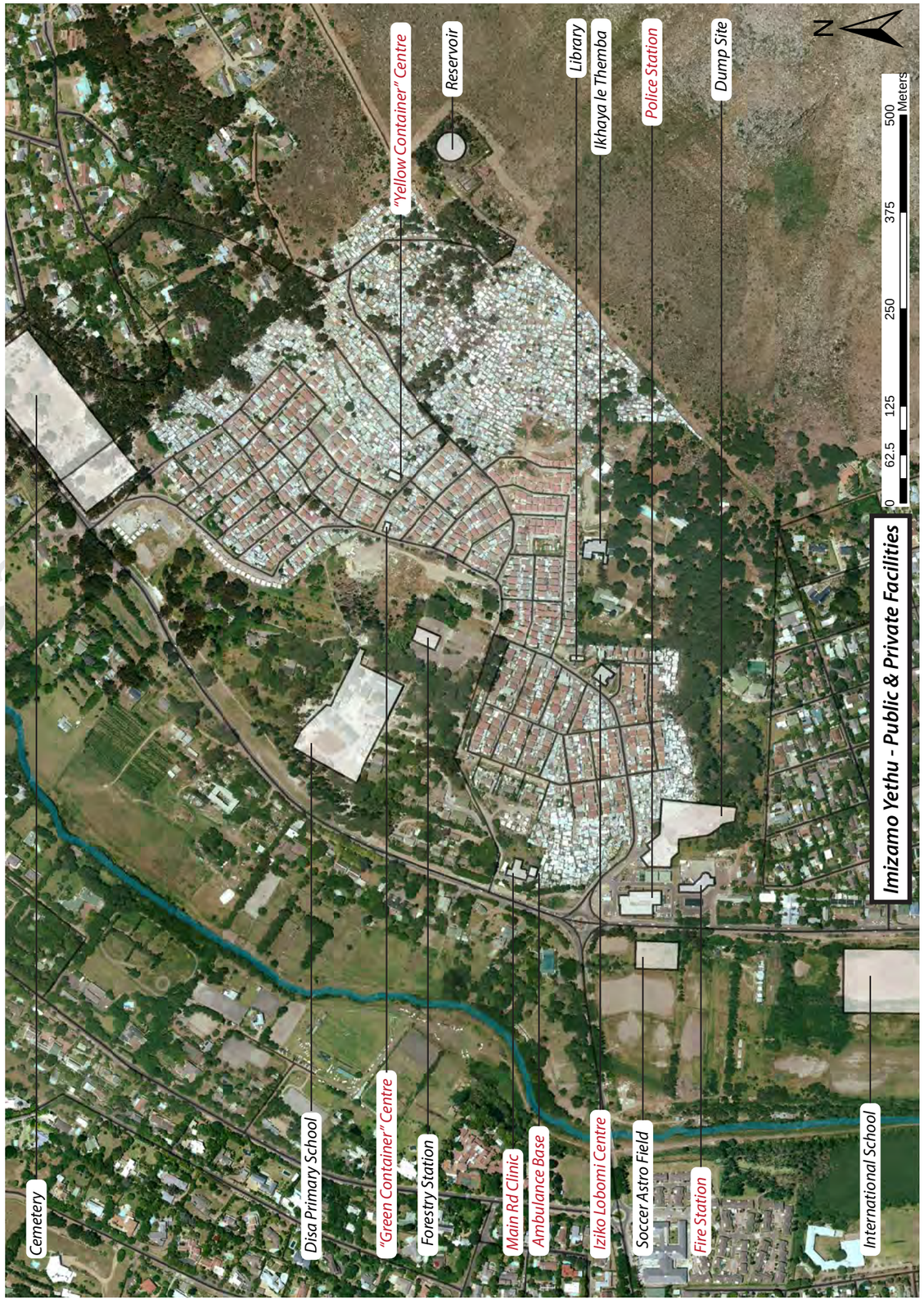


Figure: This 2011 Aerial image shows a number of facilities in and around the community. Those labelled in red are currently used in times of emergency, whilst the others have potential for further use.

5.3 Primary Data

5.3.1 Interviews

A number of interviews were conducted during the data collection phase of this research to gain information and insight from role-players connected to Disaster Management and IY. The methodology for the interview process has been discussed in the Methodology Chapter previously (pg40), but the following is a list of those interviewed, the form of the interview and the purpose for the interview.

Person Interviewed	Interview Form	Purpose for Interview
Greg Pillay Head of Cape Town Disaster Management & Mark Pluke Head: Area West Manager, Head of Fire Task Team	Semi-structured	To gain insight into the role of disaster management, to learn about current projects and views on community engagement
Theo Layne Station Commander: Media Liasion	Semi-structured	To get statistics on fires in CT and IY. To learn about education programmes and other initiatives To discuss his views on community engagement To set up the fire focus groups
Mike Kokhuis Ops Manager, Civil Emergency Response Team	Un-structured	To get information about IY To learn about community efforts during fires To get photos and stats of recent fires
Community Member (CL)	Semi-structured	To hear stories of personal experiences of fires Allow an opportunity for community ideas to be expressed
Various Academics	Structured	Clarity of information Sources of existing information on specific topics for literature review. Contact details for those with further information

5.3.2 Focus Groups Findings

To compliment the information obtained through the interviews the following focus groups were run, each with a specific focus. Due to the large overlap in the questions asked in the interviews and focus groups and the ideas which came about from the discussions, the analysis that follows will be undertaken thematically, with similarities and contrasts from the research highlighted. The following themes of discussion were identified and will be discussed below: The most common causes of fires, factors affecting the severity and spread of fires, coping strategies currently used by residents in dealing with fires both during the event and post-disaster and finally suggestions given by participants and interviewees which they feel could reduce community fire risk.

Participants	Demographics	Focus
FG1 Community members	8 Community members who have been affected by fires 4 Males, 4 Females, Ages ranging from mid twenties to 60s.	Fire Experiences Coping strategies Location: dispersed throughout IY
FG2 Community members	10 Community members who have been affected by fires 6 Males, 4 Females, Ages ranging from late twenties to 50s	Fire Experiences Coping strategies Possible solutions Location: Predominantly lower informal section near SAPS.
FG3 Community members	4 Community members who have been affected by fires 4 Males aged late 20s to early 30s	Coping strategies Possible solutions Use of Technology Location: dispersed throughout IY
FG4 Fire Department Crews and Management	6 Fire Fighters working at the Hout Bay station with experience in many other stations. Stat Comm. Layne also present and gave input.	Fire fighting strategies Proposed improvements

5.3.3 Causes of Fires in Informal Settlements

During the discussions one of the first factors to be discussed when participants talked about their experiences were the causes of fires. At times this was spoken about matter-of-factly, with participants merely listing what they thought had started the fire. At other times, particularly when the cause was anthropocentric (such as negligence) the participants were more emotionally vocal and even, at times, accusing in their description of events. This is understandable because when the community is able to link a fire to a specific person, rather than an inanimate object (such as faulty wiring), they have a target for their anger. It will be seen from the analysis below that a few of the listed causes dominate the list, but that the specific emphasis placed on each cause differs depending on who is asked. Another important, general observation that was noted was the assuredness and specificity with which participants listed the cause of a fire. Answers of, "We're not sure how it started" or, "It might have been this..." were not given during the focus groups. Instead, participants listed the where, when, how and sometimes even the why a fire had started.

The following table and graph (figure 5.21) provide a summary of the causes of fires in informal settlements as listed by participants in the interviews and focus groups:

Causes Identified by Community as Priorities	Causes Identified by Fire Dept as Priorities
Inappropriate energy use (candle, paraffin etc)	Inappropriate energy use (candle, paraffin etc)
Negligence	Alcohol
Alcohol	External Source (Mtn fires etc)
Electricity connections (illegal, blackouts etc)	Arson
"Muti" Fires	Chasing Snakes from Mtn

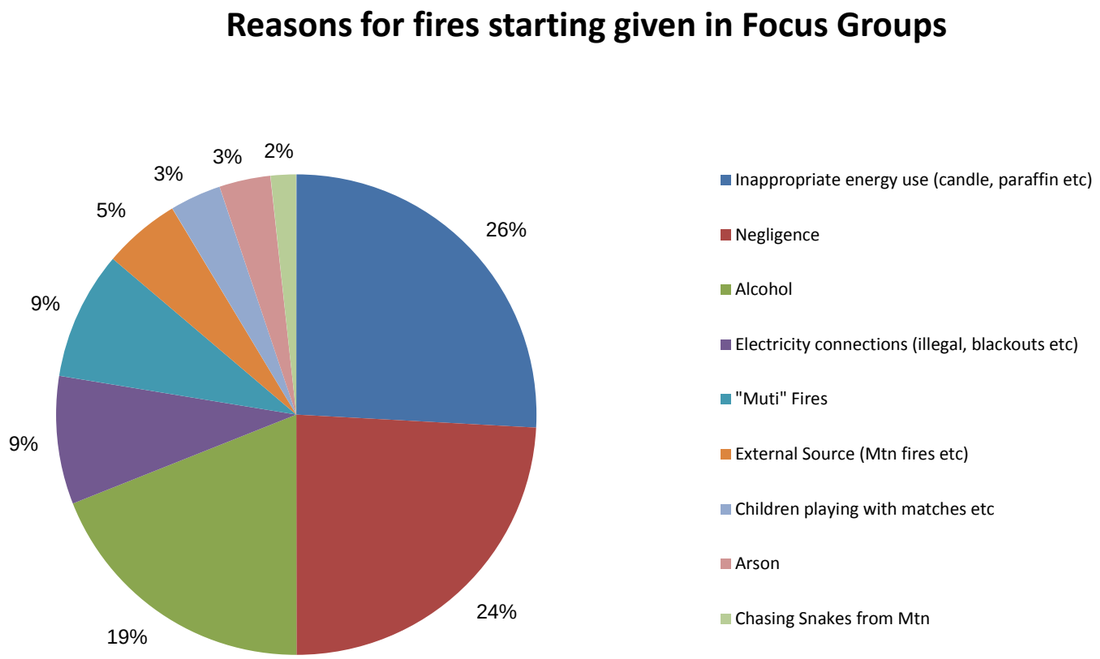


Figure 5.21: Two reasons for fires starting dominate the responses

Inappropriate energy use

This was discussed most often by the participants of the focus groups and the interviewees as the reason for a specific fire starting. "Inappropriate energy use" has been used as an all-encompassing term to include instances where the use of technology for cooking, heating or lighting in a home has led to a fire starting. This may present in a number of ways.

Where infrastructure is not adequate and formal electricity connections are not available in the house residents may be forced to use other forms of energy for their heating, cooking and lighting. Paraffin stoves have been notorious for the role they have played in starting informal settlement fires and are probably the most commonly recognised cause. Recent improvements in the delivery of electrical infrastructure has led, as evidenced by residents, to a decrease in the use of paraffin stoves.

"Paraffin stoves used to be a major cause of fires in the community, but there has been a shift away from it as electricity has become more available, but this has been through illegal connections"

Participant, FG1

Paraffin stoves do, however, still exist and present real dangers in informal communities. Despite the increased coverage of electricity in informal areas, participants reported that, "There has been an increase in the use of paraffin stoves as the electricity doesn't get fixed in time" (FG2). It was also reported that there was a distinct seasonality to paraffin use, with the majority of its use being in colder months (FG3). This was attributed to an increased need for heating indoors, something which a paraffin stove is able to do whereas a wood fire is not. This indoor use, combined with a lack of ventilation in winter, creates a high risk not only for fires but also gas and smoke inhalation. Paraffin, electric and gas stoves all present a fire risk if they are allowed to function unattended but this is a a risk in any setting, formal or informal.

"That person had left an electric stove unattended and left Cape Town to go the Eastern Cape" (FG3)

As will be seen with many of the causes, though, it is a combination of triggers which are responsible for and, "Unattended cooking stoves, both electricity and paraffin, were problematic as they burnt food and started fires whilst the occupant was drunk or our drinking." (FG2).

Candles present a similar risk to paraffin as they are also used more prominently indoors in winter, they can be made safer through the use of safety devices (safety holders etc) and are one of the few alternatives to electricity for lighting. The risk presented by a candle falling over was highlighted by all those interviewed and summed up through the story of one IY resident (CL Interview) who related the story of his neighbour losing her house: "I was working nightshift, but I heard that some lady left a candle burning and her child inside, people got her child out but then when one shack starts burning they all burn"

Negligence and Alcohol

These two fire triggers are discussed together as they are closely related, despite their being discussed as two distinct causes during the research. Some may argue that the use of alcohol leads to negligent behaviour whilst others argue that it is negligent to use alcohol in the first place. The reasons behind alcohol use and abuse and its cyclical relationship with negligence is beyond the scope of this research.

In speaking about alcohol use and negligence in relation to fires, participants became more emotionally charged and accusatory in their discussions. Some of the descriptions of these causes were:

" Most fires start when people are drinking, drinking is playing a big part in shack fires" (CL Interview)

"the common causes of fires are carelessness and alcohol abuse linked to cooking and heating" (FG 2).

It is, however, where a combination of alcohol (ab)use and other activities are combined that the negligence occurs and the risk is heightened. All of the inappropriate uses of technology discussed above were most often combined with alcohol use when fires were started:

"The cause of that fire, as with many others, was a combination of cooking whilst drunk and cooking stoves or candles left unattended" (FG1).

"These people come home drunk and get hungry and start cooking food, then they fall asleep or go back to the shebeen and the food burns and the fire starts" (FG2).

"The occupant of a house had been drinking and left a candle alone because there was no electricity for lighting" (FG3)

"Drinking and the use of candles and paraffin appliances left unattended is common" (FG4)

Disaster Management Head Greg Pillay also confirmed that one of the major contributing triggers to fires in informal areas is alcohol abuse. (GP Interview).

The high availability of alcohol in informal areas due to the unregulated nature of the shebeens seems to have a strong causal link to negligent behaviour which in turn is responsible for many of the fires discussed.

Electricity Connections

Despite electricity being seen as the gold standard energy source in a home it may still pose a fire risk. Formal connections may be overloaded or badly maintained causing a risk of electrical fires, but the largest danger occurs when illegal connections are created to join multiple homes off one formal connection. This sharing of electricity sources creates a risk as it, "results in overloading of plug points as many homes connect to one formal house" (FG2). Shorts may occur as these connections are often constructed from inappropriate materials which cover the shortest route between the shack and the connection point. These informal connections, which can be seen criss-crossing the road in all the informal sections, severely hamper the efforts of emergency services in gaining access to informal areas.

"you know how the wires are running likes spiderwebs! It can make a very quick short in your house!" (CL Interview, see figure 5.22).

One of the fire-fighters reported having to stand on top of the Fire Engine to lift wires as they travelled

Figure 5.22: A myriad of wires, legal and illegal, criss cross the settlement linking houses and shacks.

Figure 5.23: The overhanging wires present numerous challenges for emergency vehicles

up Dontsiyakhe Road (FG4), a dangerous and potentially lethal job working with live electrical wires (see figure 5.23, above for the area in question).

A problem connected to this, reported by residents, is the need for improved electricity reliability. Those living in backyard shacks are at the mercy of their landlords for electricity supply which can be cut off at any point (FG1). Residents are often left without power during blackouts and, despite these being scheduled at times, they are not informed of when the blackout will occur or how long it will last. "Power outages, which happen often, make people leave stoves unattended, thinking they are off. When the power comes back on the stove can cause a fire. The lack of communication between council and us (i.e. electricity) is a big problem. We need more transparency" (FG3).

Muti & Arson Fires

These fire causes are discussed together as both are intentionally started, though they have different methods and reasoning behind them. Muti fires were called "Vutha" by participants in FG2. During discussions the participants seemed surprised that a person not belonging to an African culture would know about the existence of these fires but were willing to discuss them (FG2). As CL describes in his interview, "Sometimes it happens, one guy tried to burn out his girlfriend. We call it Muti, it's a special for maybe boyfriend doesn't want girlfriend anymore so the boyfriend will go to place to get that muti. So without starting the fire in the house, the house will just burn. Because he went to the certain muti. Even if you're in the house and then suddenly the house will start firing up. (Whooosh!). That's happened near my house 3 times already. Other than that it's just jealousy sometimes." (2013).

In contrast to this, arson was only mentioned by the fire crews (FG4) and during the disaster management interview with Mr Pluke where he describes arson as an intentional trigger, "a big one, the disputes, the inter-personal disputes" (2013). Very few cases of arson were opened with the SAPS in recent years, although the cases attributed to vutha may not have been reported as such.

Arson:

2003-2004: 3
2004-2005: 3
2005-2006: 3
2006-2007: 1
2007-2008: 1
2008-2009: 1
2009-2010: 6
2010-2011: 1
2011-2012: 2

Mountain and other external fires

As mentioned, due to the community's position close to the mountain, a risk does exist for fires that originated in the mountains to spread to the settlement and vice versa. This has happened a number of times in recent years, creating additional challenges for fire fighters.

According to Fire Fighters interviewed (FG4) the majority of fires affecting IY occurred above the wholly informal Dontsiyakhe section towards the Southern end of the community bordering on the Penzance and YMCA sites. The Fire-Fighters report that, " Recent mountain fires there have threatened and burnt shacks and endangered formal dwellings and there is an access issue as the formal properties fence their plots, making access to the mountain difficult" (FG4, 2013). That area presents numerous challenges as access from IY is severely limited due to shacks being built along the road and the condition of the road limits vehicular movement. Access through Penzance and the YMCA is possible, but as mentioned most properties are fenced which delays access.

Figure 5.24: The fire break is currently overgrown and limited in its ability to slow and stop fires from spreading

During a visit to IY in the course of the research it was seen that the fire break along the edge of the settlement, aimed at protecting the mountain vegetation from shack fire and vice versa, was severely overgrown; limiting its effectiveness (see figure 5.24, above). Another of the reasons mentioned during for fires starting during the research, albeit it only once by the fire crews, was the use of fires to chase snakes away from the settlement. The fire-fighters reported at least one incident where the community had set the adjacent bush alight to scare snakes away from their homes but the fire had spread and required the services of the Fire Department to contain it.

Unsupervised Children, playing with matches etc.

"These careless parents send their children to go buy matches from the shop and leave them unsupervised. They play with them and this started a fire recently" (FG2 Participant, 2013).

From the discussions it would seem that often the lack of supervision of children and their exposure to matches is linked to the other causes of negligence and alcohol abuse. Whilst this was not seen as a common problem amongst those interviewed, it does point to a need for increased education programs around the dangers of matches and for an emphasis on parental supervision in the community.

Summary

- In most instances, a fire cannot be attributed to one cause alone. As an example, a candle may be the specific source of ignition in the shack, but this may have been precipitated by the occupant being intoxicated at the time and being negligent by not using a safe candle holder.
- Tackling the problem will require a multi-sectoral approach
- Different IAPs have different priorities and agendas when its comes to reducing fire risk
- It is important to understand the cultural aspects of these perceived causes (such as muti killings) to be able to tackle them.

5.3.4 Factors affecting the spread and severity of fires

A number of factors were discussed during the interviews and focus groups as affecting how quickly and to what extent a fire would spread and how much damage it would cause. Certain of these factors will have a negative effect and increase the consequences of a fire whilst others will limit the spread and severity of a fire. In a similar fashion to the discussion on causes, above, this section will list the factors in order of most discussed, explain the emphasis placed on certain of the factors by the different IAPs and finally discuss each of the factors.

It must be noted that this list is of the causes discussed by the participants and the most common cause according to them may not statistically be the most likely cause of a fire.

Also to note is the fact that this list is ordered only based on the number of times a specific cause was discussed in the interviews and focus groups. Different groups do, however, have different agendas and as such place more emphasis on certain of the causes. The following is an ordered list of the causes each group felt were the more important or common:

Factors Identified by Community as Priorities	Factors Identified by Fire Dept as Priorities
Access Issues (Narrow/Blocked Roads, low wires, complex routes etc)	Inappropriate energy use (candle, paraffin etc)
Informal Housing	Alcohol
High Density	External Source (Mtn fires etc)
Bucket Brigade, hoses, taps, breaking down shacks etc	Arson
	Chasing Snakes from Mtn
	Strong Winds
	Bucket Brigade, hoses, taps, breaking down shacks etc
	Education Programs

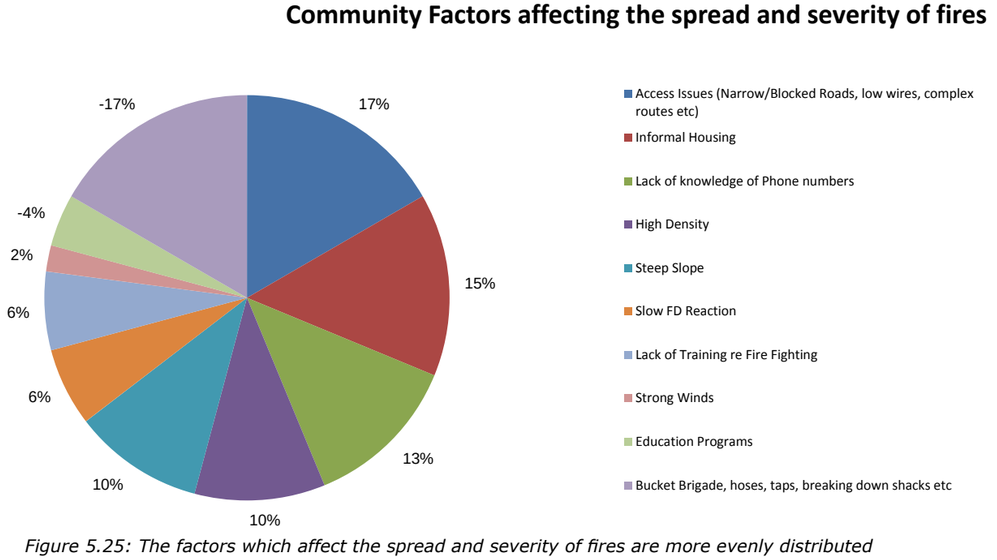


Figure 5.25: The factors which affect the spread and severity of fires are more evenly distributed

Negative Factors affecting the spread and severity of fires

Access Issues (Narrow/Blocked Roads, low wires, complex routes etc)

On site visits to IY this is one of the most obvious factors to first time visitors. It also a characteristic of informal settlements in many parts of the world where a lack of formal structure and planning in a community leads to roads being blocked by dwellings, limited straight routes to destinations and height restrictions from low over-hanging wires (see figure 5.26).

"Difficulties in fighting these types of fires are that there are no straight paths or access routes between the shacks. The Fire Department must travel away from the fire first and then come back and the fire breaks have been built over" (FG3, 2013).

Figure 5.26: Rocky terrain, narrow pathways and the steep slope limit access in the settlement.

In a discussion with Focus Group 2, participants reported that a large fire in 2008 broke our near SAPS fairly close to Mandela Rd and the Hout Bay Main Road, but that despite the proximity to these major roads it was still very difficult for the crews to gain access to the burning shacks as there are no interleading pathways or main access routes.

The low hanging wires, as described by one participant as a spiderweb, have been discussed previously as presenting dangerous challenges to the fire crews. These spiderwebs are common across many informal areas but, whilst their existence is understandable and the need for electricity essential for residents, there needs to be alternative ways of connecting the shacks. Community participants also highlighted another issue preventing efficient access to many parts of the community and that is the abandoned and badly parked cars and taxis that block many of the major access roads. The whole of Molekoane, Mandela and Madiba streets were highlighted as being particularly difficult for access with cars blocking them and one participant reported a IY resident who owned five broken cars and left them in the road (FG1, 2013). This may seem, on the surface to be a problem that could be solved simply by the removal of the cars and perhaps fines to bring about behavioural changes in those responsible, but Greg Pillay stressed that enforcement is the issue, a common theme throughout the interview with him.

Informal Housing

Housing was a difficult issue to tackle throughout the focus groups as the provision of housing was not the focus of this research (see Reflection on Focus Groups section 4.3.3. pg49). It is a common problem that emerged during the interview with the officials from Disaster Management Cape Town.

Mr Greg Pillay: "Many people don't understand also that it's not just up to us. Every winter there are accusations towards us that we do nothing in Disaster Management. That we are just dealing with soft issues in terms of relief, blankets and food etc. They don't understand that it takes billions and billions of Rands of infrastructure.

Land is a challenge as is lack of funds and I always remind people this is not a Cape Town problem, it is a national problem. This is where we are starting now, and this is where we're going to end in 30 years. It must be coming from national. Human Settlements is a national and a provincial competency, not a local Government competency. Therein comes the issue that we have to deal with."

MR: "You're then reacting to a problem which you don't have the competency to solve at the basic level, as you say. Your competency is not housing, but that is a big cause of a lot of the problems."

GP: "This is some of the bureaucracy you have to work through. There are political issues coming up and unfortunately sometimes it is used politically for elections. And that influences the way we do business. You need to be aware of that; that it's not an easy environment in which to function. That is a broad overview of where we are and we try to bring a sense of normality."

Participants in each of the focus groups were very quick to bring up housing as the solution to fix all problems. It was the most emotionally charged portion of each session and the portion of discussion where politics were most often discussed. Whilst some of the participants live in formal brick houses, the majority live in informal shacks as participants were requested as having first hand experience of fires. It is entirely understandable that these residents feel the need for formal housing, particularly given the factors and triggers related to informal housing (such as flammable building materials, limited infrastructure etc.). The current housing backlog in Cape Town and South Africa, though, makes the possibility of providing formal housing to everyone in IY an unlikely outcome in the short term. Unfortunately, fires and other disasters in the short term will continue. Other set backs which have made people all the more determined to get a formal house include corruption on the housing waiting list as reported by CL during the interview, although Mr Pillay said that the problem occurs when people settle in unsuitable areas specifically for the purpose of jumping the housing list.

A number of plans have been produced in recent times for the possible upgrading and development of IY with 2 and 3 floor flats being built on suitable, existing available land (see pg150). Certain residents knew about the possibility of these and all were positive that this would reduce disaster risk.

Lack of knowledge of Phone numbers

This factor was mentioned during most of the interviews and focus groups but was discussed in detail during Focus Group 3 where the focus was on technology and its use in DRM. As the coverage of landline infrastructure is fairly limited, Cellphone use was discussed to gain information about levels and types of use. A number of emergency number exist in the City of Cape Town and 107 is being pushed as the one central number to call for any emergency (Interview with Mr Layne, 2013). 107 is not used widely, however, as residents do not seem to have been informed about its purpose and existence or prefer to use other numbers. The ambulance or police numbers are often used or someone will be sent to run to the FD. Overall in the community there is a high instance of cellphone use, with most residents over 18 (over 15 one participant suggested) having a cellphone. The high usage, however, does not seem to extend to uses for emergencies. (FG3). Certain participants reported that it was much easier for them to run to the Fire Station or SAPS Station to report a fire

or emergency as they were guaranteed. People either phone the ambulance, the Fire Station directly, 10111 or WatchCon. Phoning WatchCon is acceptable as they are able to provide assistance and call the authorities but they often investigate first, delaying the response (FG4). Phoning the Fire Station directly will get a quick response, IF the crews are at the station. There is a delay in logging onto the central dispatch system and if resources are needed from elsewhere this will be delayed. StatCom Layne emphasised the need for all people to phone 107 in an emergency as this is a centralised system which can provide assistance in all emergencies. In Langa and Gugulethu Panic Pull devices (alarm buttons) have been tested as a way of alerting the FD quickly but a number of problems were identified. False alarms were common and as they alarm was built on a sturdy support pole this was used as a support for new dwellings. In terms of using cellphones to call 107 there is an issue with locating the caller. From landlines all calls can be traced, but cellphone providers have been unwilling to make the location information available. This is ongoing and the aim is to get to a system similar to USA where all calls can be tracked to an address.

High Density

It is important to recall at the start that IY has the second highest density of any urban area in Cape Town (based on the 2001 census). The problems that high densities in the community cause are similar to the reasons for community members wanting formal accommodation. Density is a contributing cause to many of the other factors that negatively impact on the spread and severity of fires (such as limiting access routes) but in itself it is a direct cause of a fire spreading quickly. The closer the buildings are to one another the quicker a fire will spread. A small ignition source in a freestanding shack may destroy that shack and, if left unattended could spread to nearby structures, but with space around the structure it is likely that the community and the authorities can intervene before this happens. This won't be the case, though, when 3 shacks are backed onto the shack with the ignition source. The fire will only be able to be fought from the front side of the shack and the building materials of the adjacent shacks will be in direct contact with the burning structure, resulting in a faster spread, a larger, hotter fire and more damage. The large 2008 fire discussed in Focus Group 2 was directly attributed by participants to the very high density of the area of the community.

Steep Slope

The steep slope has been discussed previously and is a factor that negatively impacts on many of the other triggers and factors already discussed above. It is a distinguishing characteristic of IY and is one of the factors that spatially differentiates risk in the community as the wholly informal Dontsiyakhe section has a greater vulnerability due to the slope than other, less steep areas. The Fire-fighters reported that for them the steepness of the terrain is one of the biggest impacts on their ability to respond and effectively fight the fires in IY (FG4). This is problematic for their vehicles and for gaining foot access between the shacks.

"In terms of our equipment, whilst much of it seems suited to fighting fires, it is not suited to the steep terrain. In particular the older vehicles (Even the UniMog style sometimes stationed here) battle with the terrain" (FG4, 2013)

Slow FD Reaction

Many of the participants discussed that the

Fire Department could respond more quickly to incidents when fires occur. Participants were split though with a few seemingly unhappy with the Fire Department, whilst the majority seemed understanding of the reasons behind the supposedly slow reaction. For the 2008 fire, those interviewed said that if the Fire-fighters had arrived earlier then less shacks would've been destroyed (FG2, 2013). From the photos of the fire, though, the response from the City seemed very comprehensive with multiple resources from the Fire Department and Disaster Management being sent. This does not negate the views of the residents that the response was slow, but unfortunately data is not available on the response times. Other focus groups were very understanding and realised that at times the crews may be busy with other fires or may have to get assistance from other stations. Many of the factors discussed above, such as access issues and limited communication between the community and the authorities, will effect the response times.

Lack of Community Fire Training

A lack of formal training was not often discussed during the interviews or focus groups as a factor causing increased spread and severity of fires. Training was discussed more often when community members were asked for their suggestions for the future. "Generally the majority of the community is cooperative in moving hoses, although sometimes different agendas clash and hoses are pulled in different directions...There is a need to mobilise the community!" (FG4).

Strong Winds

A recent fire's spread near Peterson Street (in a small area of informal dwellings) was attributed to the strong winds on the day. A candle had been left unattended when someone left the house and the shack caught fire. With strong winds it caused the loss of two shacks before it could be extinguished, including the home of the focus group participants who lost everything in the fire" (FG1, 2013). Wind was not mentioned by any of the other community members as a factor, although informal discussions with the fire-fighters highlighted the large factor that a strong wind can play in fighting a fire. It is something which is difficult to combat and prepare for, but which needs to be realised and expected.

Figure 5.27: This February 2011 Fire shows the intensity of fires in the heavily built up areas on the steep slopes of Dontsiyakhe

Positive Factors affecting the spread and severity of fires

Community efforts fighting the Fire (Bucket Brigade, hoses, taps, breaking down shacks etc)

Despite the lack of training of community members highlighted above, the efforts of IY residents in fighting fires in their community has been established as the most significant factor in reducing the severity and extent of fires.

'We immediately fight the fire however we can, by breaking down shacks to stop the fire spreading

and getting buckets and small hoses to fight with. But taps are limited and often far away in dense, informal areas" (FG2, 2013).

Although it is not completely effective in fighting fires, it is most useful in the early stages of a fire. When fires are in the early stages they can be contained or extinguished by handheld tools such as fire extinguishers, buckets of sand or water and domestic hoses. When a fire has spread beyond the initial ignition point these techniques become less effective and a more coordinated effort is required. The community's efforts in saving the life and home of a lady in a recent fire were discussed in Focus Group 1, "They had 10 people with buckets trying to get water onto the fire quickly but it was too late to save her or her house" (2013). Once the fire has gotten out of control there is often a larger effort by the community and, although this is not necessarily organised formally, it can be effective in limiting the fire until such time as the fire department arrives. The interview with CL summarised the community system well:

MR: When there's a fire how does the community react to the fire? What do they do?

CL: That is very serious. When the fire starts, 10min, 20min when you see smoke coming out of the houses. When it starts, women take the buckets and carry water for the men, and we men will start breaking the shacks down. So the fire don't spread too far. Just to let it all fall in one pile.

MR: I've seen them throwing rocks sometimes, is that the same thing?

CL: That is part of it, but that doesn't help, because if you take a stone and throw it the stone will kick back and the fire will go (Voosh!). Instead of taking a crowbar or an axe and pulling it then it will collapse. We men will take the buckets in with the water.

Education Programs

Unfortunately there was a lack of education programmes discussed during the focus groups, although the need for further education and training programmes was identified and well understood by the community members. Their suggested improvements and ideas for further education will be discussed later. The education programmes that residents did remember were focussed at the school level and were thought to be effective for children; there just needed to be more of them. MR Pluke and Mr Pillay from Disaster Management did discuss the existing programmes but it would seem unfortunately that these have not yet made it to IY extensively.

"MP: There's the one-on-one approach where officials talk to the community with the Fire Department. They have 5min talks to go through the pamphlet to identify various risk areas, such as a primus stove next to a curtain.

MR: So actual house visits then?

MP: Yes House visits, that's the one! An assessment of vulnerability.

The other thing then is the plays which are taking place in the community. It's a skit, industrial theatre it's called. A company has a play and they invite the community along. Invite the community leaders and get as many people to attend.

GP: Then they basically play act, how to make your house safe from fires. We pay these guys, on a tender. And the messaging we assist them with. The idea is that it becomes more like a story, to be creative and innovative than handing out pamphlets."

5.3.5 Coping Strategies

The following strategies were discussed as ways in which the community members dealt with the consequences of the fire in the post-disaster phase. Certain of these factors are initiated by the community themselves whereas others are based on resources from the authorities or NGOs. This section will list the factors in order of most discussed, explain the emphasis placed on certain of the factors by the different IAPs and finally discuss each of the factors.

The following table shows the emphasis that the different IAPs place on the different strategies and which they felt were more effective post-disaster.

Strategies Prioritised by Community	Strategies Prioritised by Authorities
Formal Housing Built	Use of Community Centres
Support from Neighbours/Friends/ Family	Support from Neighbours/Friends/ Family
	Receive aid from City/ NGO

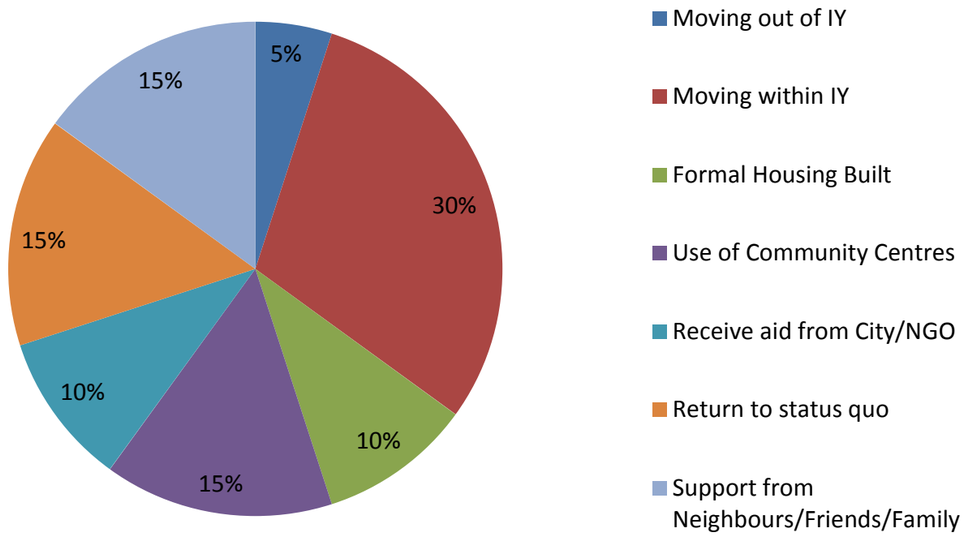


Figure 5.28: Most residents were found to move following a fire as a coping mechanism

Moving within IY

Following a fire where a resident has lost the entire shack and all their possessions most discussed that they would move to a new location within the settlement, even if this was proximal to their previous location. For some, if the opportunity arose, they would move to a formal house. This occurred more often in previous years when houses were being built on a more regular basis and when shacks were destroyed their occupants could be accommodated in the new houses. For those unable to get a formal house, they would move to another area of the settlement, perhaps for more space or to be nearer to friends or support systems (FG1, 2013). For many, the move into the backyard of a formal house was attractive as, despite the rent that would be paid to stay there, they gain access to services and reduce their fire risk by moving away from the densely populated informal areas. With the settlement at its current high density, though, there is very little opportunity for community members to move around and it is only in the immediate post-disaster phase when the fire has cleared an area that people are able to choose a new site. This process is hotly contested and rebuilding starts immediately leaving little opportunity for the authorities to intervene and provide structure or services (Mark Pluke, 2013).

Use of Community Centres

In times of fires or other disasters it was agreed that the Iziko Lobomi community centre and the community centre in the Harbour were the two main refuge sites along with the "Green Container" and "Yellow Container" community halls in IY. These are also sites for residents to collect supplies such as clothing following a fire, but there seemed to be mistrust of the system as it seems that people unaffected by the fires are the ones receiving the clothes (FG1, 2013). The centres have the potential to provide accommodation for those displaced by fires in the short term and, as they are already used for social welfare payments and administration, as a place for assistance from Home Affairs regarding documentation.

Figure 5.29: The Iziko Lobomi Community Centre is centrally located in the settlement and serves a number of social functions, including as a centre for relief aid post disaster.

Return to status quo

Unfortunately the majority of community members who are affected by fires simply return to the same situation they were in before the fire with no reduction in their vulnerability. In each of the focus groups at least one participant told of how they rebuilt their home, often in the same place, with no changes in the building materials or other factors which could reduce their risk of fires. This may not be seen as a coping strategy as the lack of change does not seem to imply a positive strategy, but for many living in poverty with limited resources it is the only choice they have. Rebuilding of their houses is not the only way this manifests as the lack of education and training is closely tied to this. All of the participants spoke of how the same negligent causes of fires keep

occurring and Mr Pillay emphasised the need for behavioural changes to occur to lessen the return to the same circumstances that were present pre-disaster, "What we are saying is that we are trying to bring about change that is intrinsic and not extrinsic. The change must come from within. You change the behaviour of the person in the process." (Pillay, 2013).

Support from Neighbours / Friends / Family

Although participants discussed using community centres for relief the same number of times, they felt that relying on the community support as a coping mechanism was far more effective. The strong sense of community and the organisation around street and block committees is important here as residents know that in an emergency there will be a support system available to them without having to explicitly arrange it. During the interview with CL, he described just one way in which this system is useful:

"2009 there was another very big one in the top side, a bit higher up from the trees there. I went to help there, because that one happened at night and I was very close to the fires. Someone knocked a candle over. A friend of mine stayed there but he was in Brackenfell and asked me to look after his house so I had to leave my family and go." (CL Interview, 2013).

Other participants reported that in the immediate post-disaster phase they would rather seek shelter with others in the community than the official relief centres (i.e. Iziko Lobomi) as this would allow them to be closer to their possessions. There was also mistrust of the official relief efforts as participants felt that sometimes people would lie about being affected by the fire to get additional resources for themselves. (FG1, 2013).

Formal Housing Built

This was brought up at the start of every focus group as the only solution to ending disasters in their communities, but once the research purpose had been explained again to them, the participants were willing to discuss and realise that other coping strategies were more realistic in the short term. For those residents who in the past were able to make the move from informal to formal housing after a fire, it will have resulted in a significant decrease in their vulnerability to fire. The unfortunate reality, however, is that relying on the provision of formal housing from the Government or NGOs is not appropriate in the short to medium term and other coping strategies are needed.

Receive aid from City / NGO

For some of the reasons mentioned above, such as mistrust of the system, the community does not perceive aid as a adequate coping strategy. In the longer term, the role of NGOs is likely to have more of an impact than in the short term post-disaster. Probably they largest impact that NGO aid has had on the community is the provision of formal housing through the Niall Mellon Foundation, which are larger and of a better quality than the typical RDP style housing. "They built houses there, about 3 years ago to replace those burnt ones. Some of them were built by the billionaire, the Mellon Foundation. Those houses have geysers, the other ones are government houses, they're smaller than the NGO ones." (CL Interview, 2013)

Moving out of IY

A complete relocation out of IY was only mentioned by one participant and they chose to move to Hangberg following the loss of their home and possessions in a recent fire. They didn't discuss

the reasons for the relocation, but it may have been due to family and friends living in Hangberg or the ability to move into a better, safer house.

5.3.6 Suggestions for Improvement

It was during these parts of the focus groups and the interviews that the most interesting interaction happened with the community and where the P3DM process was used most successfully (chapter 5.3.7 pg92). It was interesting to see which of the suggestions from the community matched with ideas or pilot projects that were being proposed by the authorities, as these are the most likely to succeed with buy-in from both sides.

Suggestions emphasised by the Community	Suggestions emphasised by the Authorities
Formal Housing & Infrastructure	Enforcement
Trained Community members (Marshalls/ educators)	Reblocking
Formal Firefighting equipment	Improving Access (clearing/building roads)
Increased Education Programmes	Change in building materials (Intumescent paint etc)
More taps	Increased Education Programmes
Transparency in Government	Trained Community members (Marshalls/ educators)
Improving Access (clearing/building roads)	Change in building materials (Intumescent paint etc)

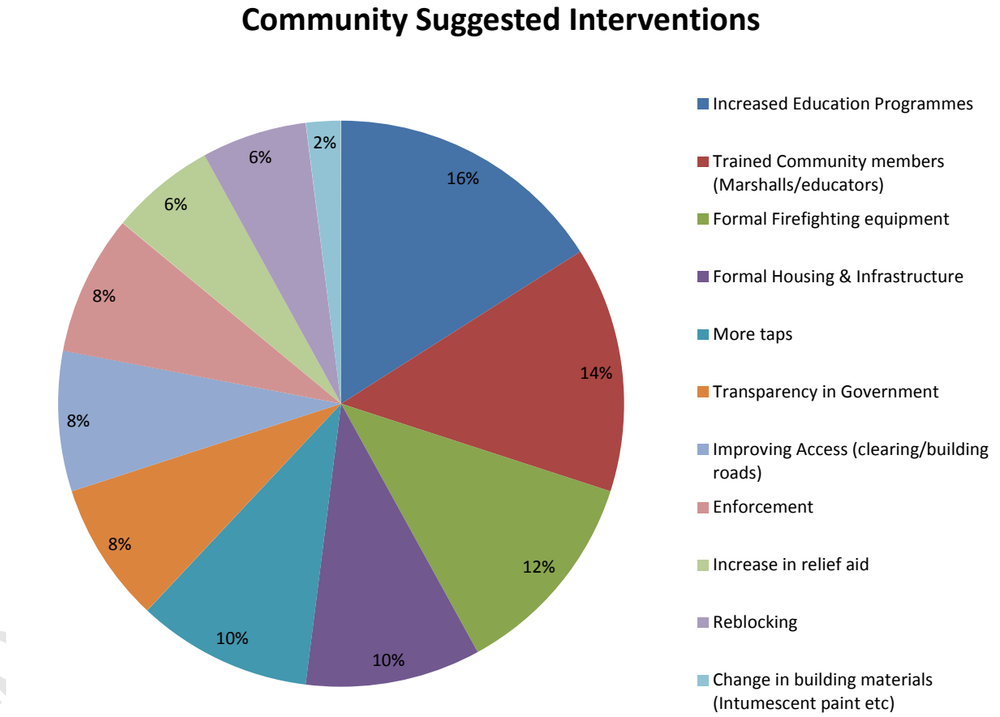


Figure 5.30: A number of reailstic, postive interventions were suggested and supported by numerous community members.

Increased Education Programmes

It was encouraging that the participants pushed strongly for increased education programs in their community, particularly given the lack of education and negligence based on poor fire safety recognised by the community in the previous section. They felt that particularly at the school level an increase in the education around fire and general disaster safety could be beneficial. There are a number of programs of this nature currently being implemented by Disaster Management and these will be looked at more in the next section. An expansion of the types of programs discussed by the Disaster Management officials in the previous section could be appropriate in the IY context. Further expansion of these education programmes was suggested to occur through the use of trained and employed community members which was, thankfully, supported by Mr Pluke during the interview:

"It's been intensified. Education and awareness is probably where you can get the most bang for your buck. We are trying to ensure that every person in an informal settlement is exposed to some kind of awareness program related to fire

There are obviously more things that one can do, you could have a permanent person employed, on a stipend. A few people who stay there and give them a job. All they do on a permanent basis is education and awareness and they drive that. That's our intention, long term."

Trained Community members (Marshalls/ Educators)

As mentioned above, it has been suggested by a number of the participants and the authorities that more community members should be trained to assist their community. One way which was suggested was to have residents trained as first responders to deal with fires before they became unmanageable. A program through the Extended Public Works Program (EPWP) was suggested as an incentive to residents. The participants thought of this system being run in a similar fashion to the street committees already active in the community. Each area of the community would have a trained "Fire Officer/marshall" responsible for a certain area. This desire for training is understandable in light of the lack of organisation reflected by the community (CL Interview, 2013). "MR: Is there any kind of organisation around this or does it just happen? Everyone just knows what to do or does someone take charge?

CL: No, there is no one taking charge. I've told Mr Mike, that I want to go and be a firefighter and I'd like the fire people to come up there and train some of us men to fight the fire in a better way, because at the moment we are going wild. We don't have the experience how to go in, we might burn ourselves or a shack might fall on us, or asbestos – You know asbestos? When it burns it fumes and explodes and it might stab you in the neck or the heart. It's a problem you see. That's why I'd like it if the people from the fire station like from Newlands or Cape Town, I'd be very interested.

MR: So you want the training just to help yourself and the community? Its not because you want a job?

CL: No, no. Even if there are like bush fires they can come and I'll be on standby. The one fire recently was on the side of IY and ran up the side of the mountain. I went there myself."

There are a number of ways to incentivise residents to become involved in this type of program. The ideal, but probably the most difficult way, is for residents to want to become involved for their own sake, such as CL wants to have the training to be able to help. Another, as mentioned, is to formally organise the system through the Fire department and Disaster Management as part of a Extended Public Works Program whereby those involved are trained and compensated for their time, thereby upskilling and lowering unemployment. The spatial distribution of this will be discussed in the next section.

Formal Firefighting equipment

Closely related to the Fire Marshalls suggestion was the desire for the provision of fire fighting equipment in the community. One participant highlighted the recent installation of the washing station in Madiba Square by UCT staff and students. Although useful as a meeting place and for washing he questioned the usefulness of spending that money in a community with more pressing needs. He also wished that they had included fire fighting equipment with the installation such as hoses or hydrants as he feels these could have limited the recent fire (FG1, 2013). It makes sense that the equipment is provided in line with the training of fire marshals so that someone can be held responsible for the maintenance of the equipment. It was discussed whether equipment should be kept in public locations in the public eye to ensure it wasn't stolen and to increase community ownership of the idea or whether it should be kept at the home of the Fire Officer. If the latter occurred, the equipment would have to be available 24/7. It was also suggested

that residents be provided with whistles to alert fellow residents of emergency to muster support. Practical suggestions such as having an alarm go off when the equipment was used or having to break a glass to gain access were suggested (FG3, 2013). The community felt that fire hoses distributed in the community, and increased tap locations, would benefit the fire fighting and that each house should have an extinguisher (FG2, 2013). The firefighters were supportive of this idea at both the crew and management level:

"As one FF said, "There is a need to mobilise the community!". He cited one example from Groendal in Franschoek where community fire officials were trained and provided with equipment to act as first responders in an emergency. There were 10-12 officials in each group and this seemed to lessen the tension between community and the FD by bridging the gap. In response to this Station Commander Layne discussed the issues facing this type of project which has been piloted in a number of settlements. Primarily was the fact that equipment was stolen and there was a need for increased enforcement. He did however discuss a new pilot project whereby a group of neighbouring houses would "own a hydrant" and take responsibility for that hydrant. The incentive was fire safety with a strong educational component. This is still in the pilot stage." (FG4, 2013).

Formal Housing & Infrastructure

The desire for increased housing has been discussed previously and, while not the focus of the research, the suggestions that are currently available will be discussed in the next section.

More taps

Taps provide the most basic level of infrastructure for community members to fight the fires , but taps are limited and often far away in dense, informal areas (figure 5.32, below). As a basic human right the provision of taps, if only for access to drinking water should be a priority and the community explained how they have linked toilets with taps to those without, at personal expense to create more water points.

Figure 5.31: Current tap conditions with one tap serving multiple informal dwellings with residents forced to walk long distances

Transparency in Government

It was during the first focus group that the participants first highlighted the need for housing and the problems facing the community in terms of corruption and lack of transparency. Community leaders are felt to lose their initiative to work for the commnity once they get what they want, i.e. a house. There is also tension between local community leaders who are predominantly ANC and the ward councillor who is DA. The DA councillor is felt to ignore the community as she doesn't meet the community on their territory. This feeling of a lack of trust between the community and the government is likely to unfortunately filter down to affect all residents of IY and taint their relationship with all the authorities such as disaster management and the fire department.

Improving Access (clearing/building roads)

This suggestion was strongly emphasised by the Fire Department and certain residents, although their approach to the problem was different. The whole of Molekoane, Mandela and Madiba streets were highlighted as being particularly difficult for access with cars blocking them. This is problematic as these are the major access roads for the formal and informal parts of the settlement. Participants didn't feel that roads could be built in the very dense section and ideas around reblocking to make space were entertained. They did feel, however, that the tarring of the mountain road would be helpful. During the interview with CL he was strongly in favour of enforcement of clearing the roads and building new ones:

"MR: What do you think would benefit the Fire Dept when they do come?

CL: What would benefit the Fire Dept is the building of more roads. If they can clean the Skorre-skorre's away from the roads. All the taxis in IY. Then they can come up much much better. I'm telling you now, in one road in IY there is a man who has 6 cars in Donstiyakhe. 5 of them don't work and they just stand there. If the Fire guys want to come up and a taxi is coming down then there's no space. There's space for one vehicle. They need to send the traffic dept or whatever up there. MR: So would more roads help then?

CL: Yes, more roads would definitely help. From Donstiyakhe upwards there is a little gravel road there that would help them get access and go straight up. You can't go in there, you can't turn. If they could make a decent road it would be much better and the fire guys would have access. They could build a t-junction halfway up for them to turn around because at the moment they can't use it at all."

Enforcement

This was an issue addressed predominantly by the authorities and not, unfortunately, by the participants. Mr Pluke highlighted that across the board there was a need for enforcement and Mr Pillay stated that enforcement was needed for building regulations too, "One thing that we always find problematic is the building regulations. The standards don't apply in informal settlements". Enforcement is likely to play a significant part in achieving any of the proposed suggestions, but not if buy-in from the community is not gained.

Increase in relief aid

A few of the participants felt that there needed to be more supplies provided by the authorities following a fire to allow the community to rebuild their homes. The authorities said that supplies are always available in the form of building materials, food and blankets but residents seemed distrustful of the whole system due to corruption.

Reblocking

This is an approach used by the city and championed by NGOs such as CORC, SDI and ISN whereby an informal settlement is redesigned into a more formalised pattern to improve safety, efficiency and reduce disaster risk. It has been used in a number of settlements across Cape Town, both and pre- and post-disaster, and while there have been success stories, there are a number of challenges which need to be overcome. Mr Pluke from Disaster Management discusses the City's view on the problem.

"There is an approach by our Human Settlements Department and which we are also encouraging. It consists of reblocking of the Informal settlement in such a way that you get the community involved and they take ownership of the structure. They sign an agreement to say it's their structure. The actual structures are created in a manner which is fire resistant in a horse shoe approach.

MR: We looked at reblocking and community mapping in that approach when I worked out in Langrug for our first project.

MP: Ok so you know about it!

So the city has approved the approach proposed by ISN. Its city land so anything any NGO wants to do needs approval by the municipality. We're still in the pilot phase but it's been very encouraging. There'll be an impetus to continue this.

MR: Do you like the approach to be done before the fire? I think the Joe Slovo one… once there'd been a fire then they come in and reblock before the structures are rebuilt.

MP: That's a good question, but what you're talking about is not a true reblocking, it's more just a redesign. It's not the same courtyard concept. That's more long term, it's planned. Whereas this approach post-fire is more redesign. The homes get spread further apart with roads in there etc."

Mr Layne from the Fire Department was also in favour of this approach as it increased access for the fire trucks, but highlighted the difficulties facing this approach in IY. It has been used in BM Section, Khayalitsha following the recent fires, but in IY the community is unwilling and this is an ongoing problem. There are enforcement issues surrounding this and it needs community buy-in. The slope again poses a problem with this as it would need to be terraced and is very rocky in patches. In terms of post-fire reblocking it has been met with limited success as the enforcement issues once again pose a problem (FG4, 2013). Whilst some residents proposed new roads to be built in informal areas in IY (FG3, CL Interview), which would require a reblocking to some extent, others were forceful in their opposition to reblocking saying that, "People aren't going to move unless they get a new, better home!" (FG1, 2013). Unfortunately, despite the process being designed as bottom-up , there often isn't enough community buy-in and authorities resort to a top down, enforcement driven approach to the problem.

Change in building materials – use of intumescent paint

This idea was only brought up during the interview with the Disaster Management Officials and unfortunately not by any of the residents spoken to. The focus was on the use of intumescent paint to be applied to the existing shack material as a flame retardant. Whilst not stopping the causes of fires, this should have a significant effect on the spread.

"MP: We're also very excited to use this paint. In the past this paint, this intumescent paint which is a fire resistant paint, was always discard ed because of cost. It used to be R100/m2 almost, which was not worth looking at. But now the latest technology which is manufactured in SA, our product is just as good if not better and it comes in at R27/m2 approx. That is affordable; you can get a lot of bang for your buck there. We're hoping to roll a pilot out there with that too. There's big discussion on whether to paint on the inside or the outside. But it will help stop the spread. Where one shack burns down, the replacement value for Government is, say R1000. Or for two shacks R2000. But where it becomes 200 or 400 or 1000 shacks, the replacement value is not R1000, it's now R5000 to R12000 per shack. Because of the damage and the long term effects such as relocation and infrastructure. Feeding sheltering, all the relief costs. It goes up exponentially. We are really trying to prevent the spread".

5.3.7 Participatory 3D Modelling

The interactive process of working through the issues of fire risk with the community members by using a physical three-dimensional model of Imizamo Yethu formed an integral part of the focus groups. The ideas and theory behind the approach have been discussed in the methods section (Pg43). This section will discuss the results of this process and graphically represent them in connection with the primary research data discussed above. Finally it will show how the information of each individual focus group forms part of the greater picture and the trends that can be drawn from the collective results.

Focus Group 1

The first focus group provided information on a number of different areas of the settlement. 3 recent fires were located in the settlement with information about their spread and severity included. The participants also located 4 community centres in IY which act as sites of relief and aid distribution post-disaster. These are, in descending order of resident preference and use: Iziko Lobomi Community Centre, Main Road Clinic, Green Container, Yellow Container. The container sound like informal structures but are in fact formal, local government community centres. The last piece of information given was the location of taps (water sources) in and around the informal Dontsiyakhe section. This spatial distribution of these taps along the Molekoane and Dontsiyakhe roads and not in the interior of the shacks highlights the difficulties communities face in fighting fires themselves. The map shows that the distance from the centre of Dontsiyakhe to any of the taps identified can be over 50m, an unacceptable distance for daily use and in an emergency.

Figure 5.32: Participants in the first focus group use the model to find their homes as an ice breaker to the focus group

Figure 5.33: Different coloured pins represent different locations on the map, fires in red, taps in blue etc.

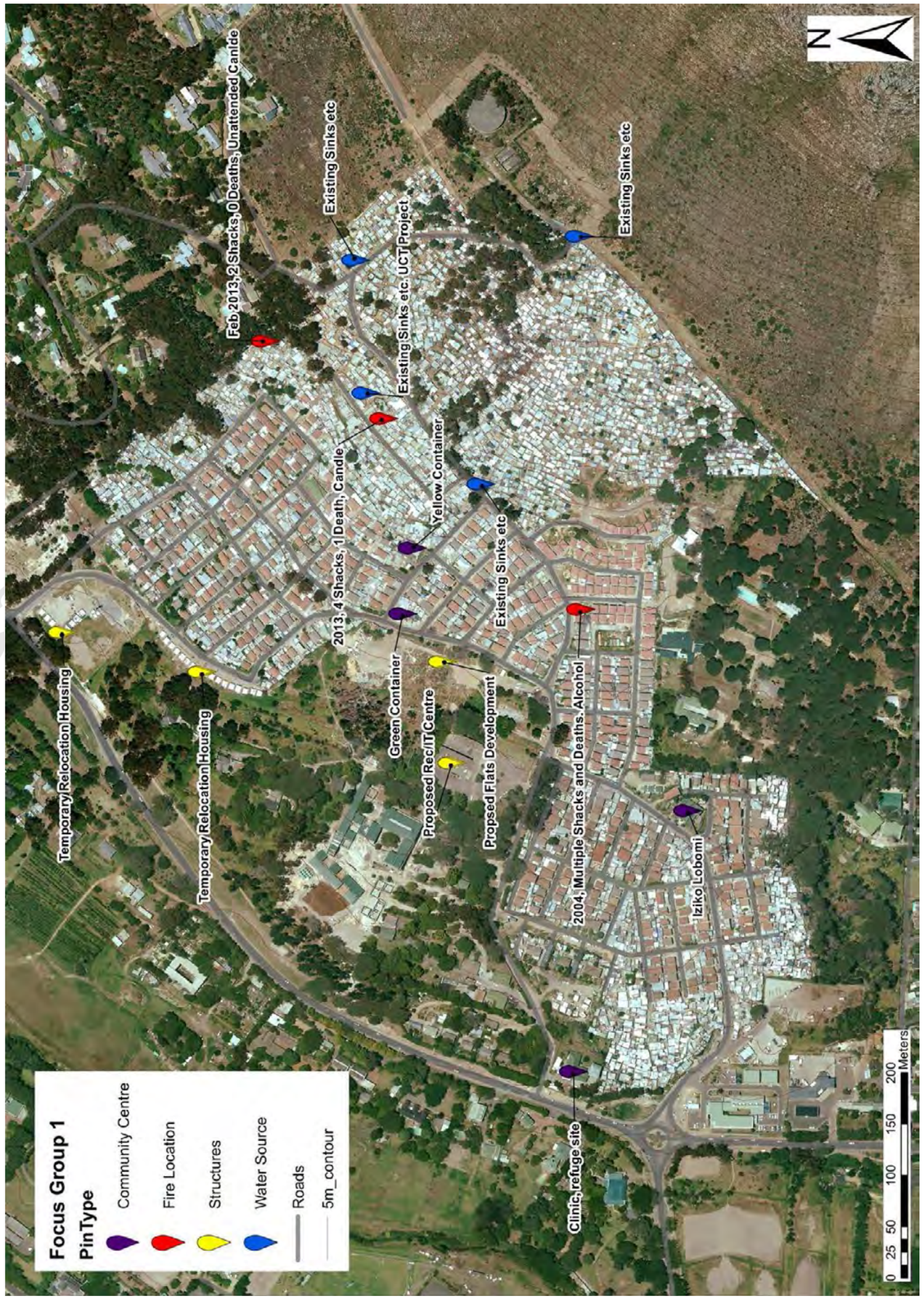


Figure 5.34: Spatial responses from the first focus group showing Community Centres, Fires, Structures and Taps

Focus Group 2

This second session had a very different spatial distribution as the participants all came from the bottom of the settlement and hence provided information about where they lived. Despite only discussing one fire during the focus group, they provided lots of information about it as it was the fire that affected all of them. The 3D model proved especially effective in this case as the full extent of the fire could be shown, as indicated by additional red pins (right). The same community centres were highlighted as points of aid in an emergency, providing confirmation of the first group. The final spatial information provided was the location of toilets and water sources in this section of IY, showing once again how most are located in the formal housing areas.

Figure 5.35: The P3DM model is set up for the second focus group with pins, aerial photos and pens and paper. (Author, 2013)

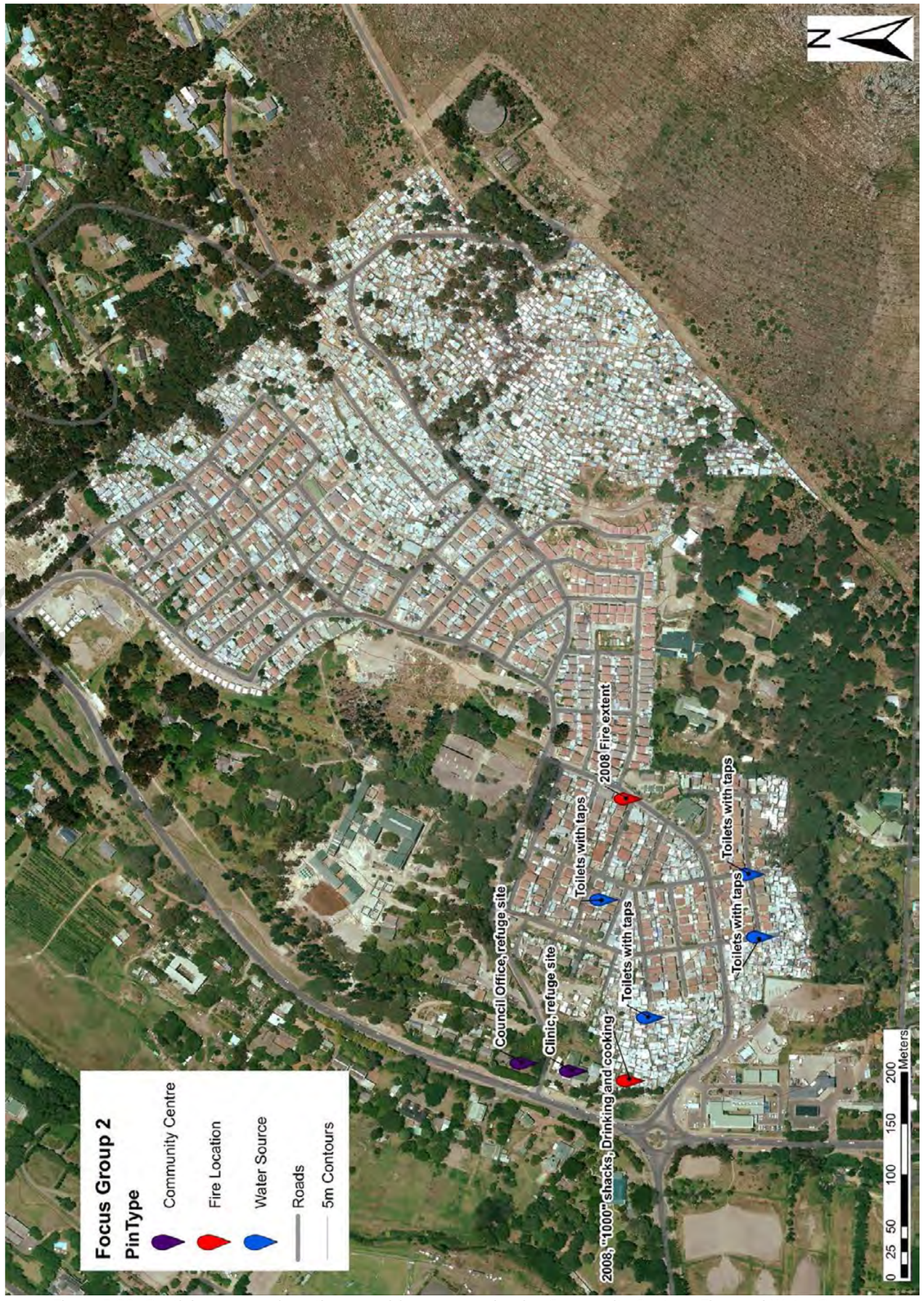


Figure 5.36: Spatial responses from the second focus group showing Community Centres, Fires and Water Sources

Focus Group 3

It was encouraging that this focus group took the use of the model to the next level as participants used the model to locate their suggestions for improvement. The group began by locating recent fires and once again the model was useful in showing the entire extent of the fire. The participants were able to easily locate this area, despite the fact that since the fire it has been upgraded with formal housing. The other three issues discussed all related to suggestions by the group as ways to reduce fire risk. The first was a need for information signage boards to be placed at strategic locations around the community to educate residents about what to do in an emergency and the numbers to call. Their local knowledge was used to identify locations that had the most pedestrian traffic so that the signage would provide maximum exposure, locations that an outside researcher would not have identified as priorities. These included taxi stops, shortcut routes and shebeen gathering points. The second proposed intervention was the establishment of community fire marshals. As discussed above, these would be local residents trained in education and fire safety who would take charge of a specific geographical area and be responsible for fire safety there. The participants identified locations where fire risk was higher and where the need for marshals was the greatest, as well as ensuring there was overall coverage for the settlement. The final suggestion was for a network of new roads to be established in the upper reaches of Dontsiyakhe to allow faster access by the fire department. The participants used pins to locate the intersections and thread to delineate the routes. The choice of routes was made to take into account the steepness of the slope and the obstacles such as boulders etc. The suggestions were practical, sensible ones which highlight the power of working with the model.

Figure 5.37: String was used to delineate linear features such as proposed roads

Figure 5.38: Pins differentiating different features

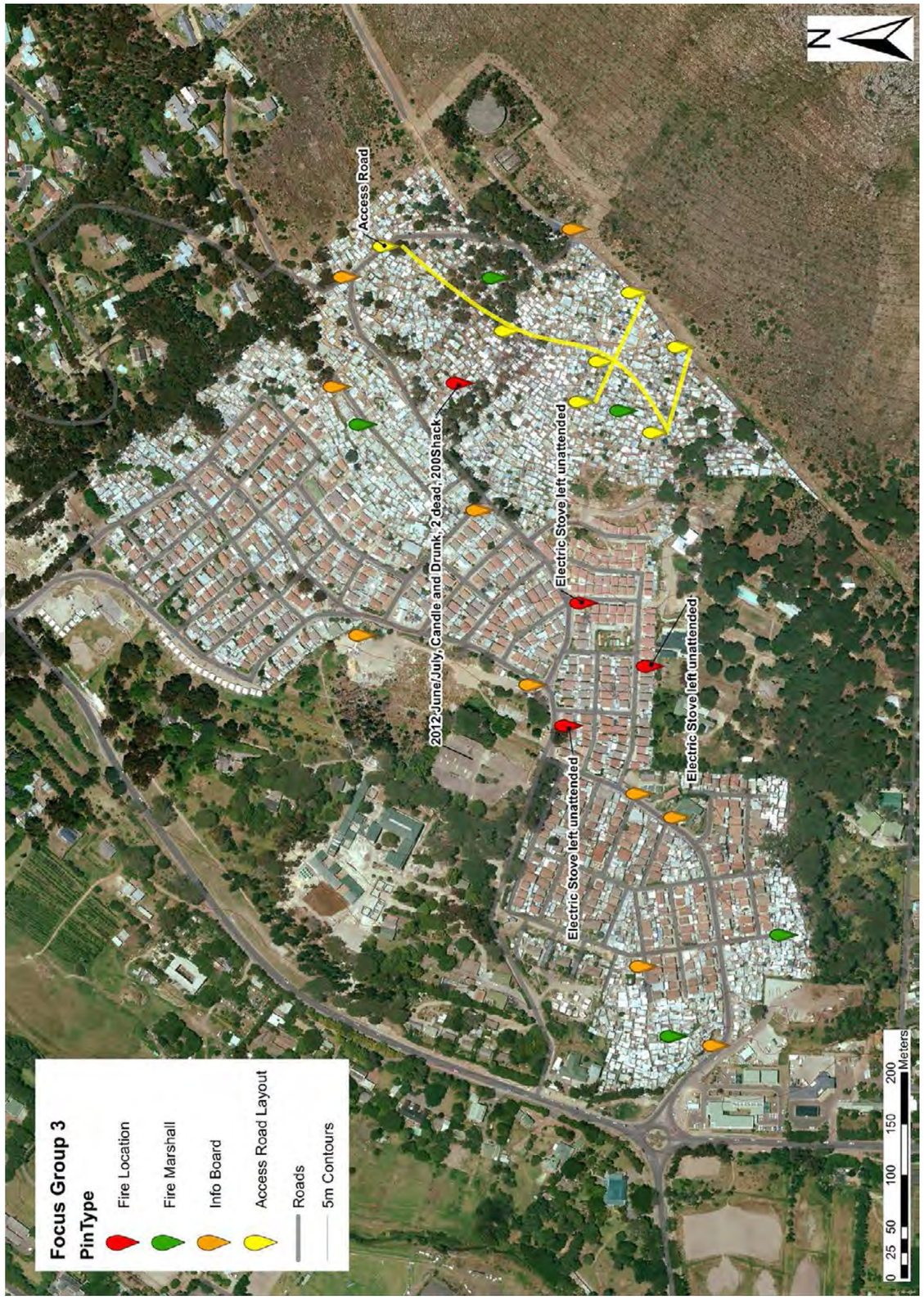


Figure 5.39: Spatial responses from the third focus group showing Fires and the proposals for Fire Marshals, Info Boards & New Roads

Focus Group 4

This focus group with the fire-fighters had a different focus and as such provided different kinds of spatial information. It did also, however, provide confirmatory information on previous fires identified by the community such as the one discussed in Focus Group 3. The danger and location of mountain fires encroaching into IY was also discussed, which were not identified by community members. Besides the fires, the fire-fighters located on the model areas where access was limited for various reasons. Their perspective and experience in the area provided information of a nature that would otherwise have not been available. Roads where access had been identified as acceptable or just limited by those driving there in cars were no go areas for the fire crews with their much larger fire trucks.

Figure 5.40: Fire fighters highlight hotspots from recent fires (Author, 2013)

Figure 5.41: One of the fire engines that Hout Bay is fortunate enough to have located at Hout Bay Fire Station (Author, 2013)

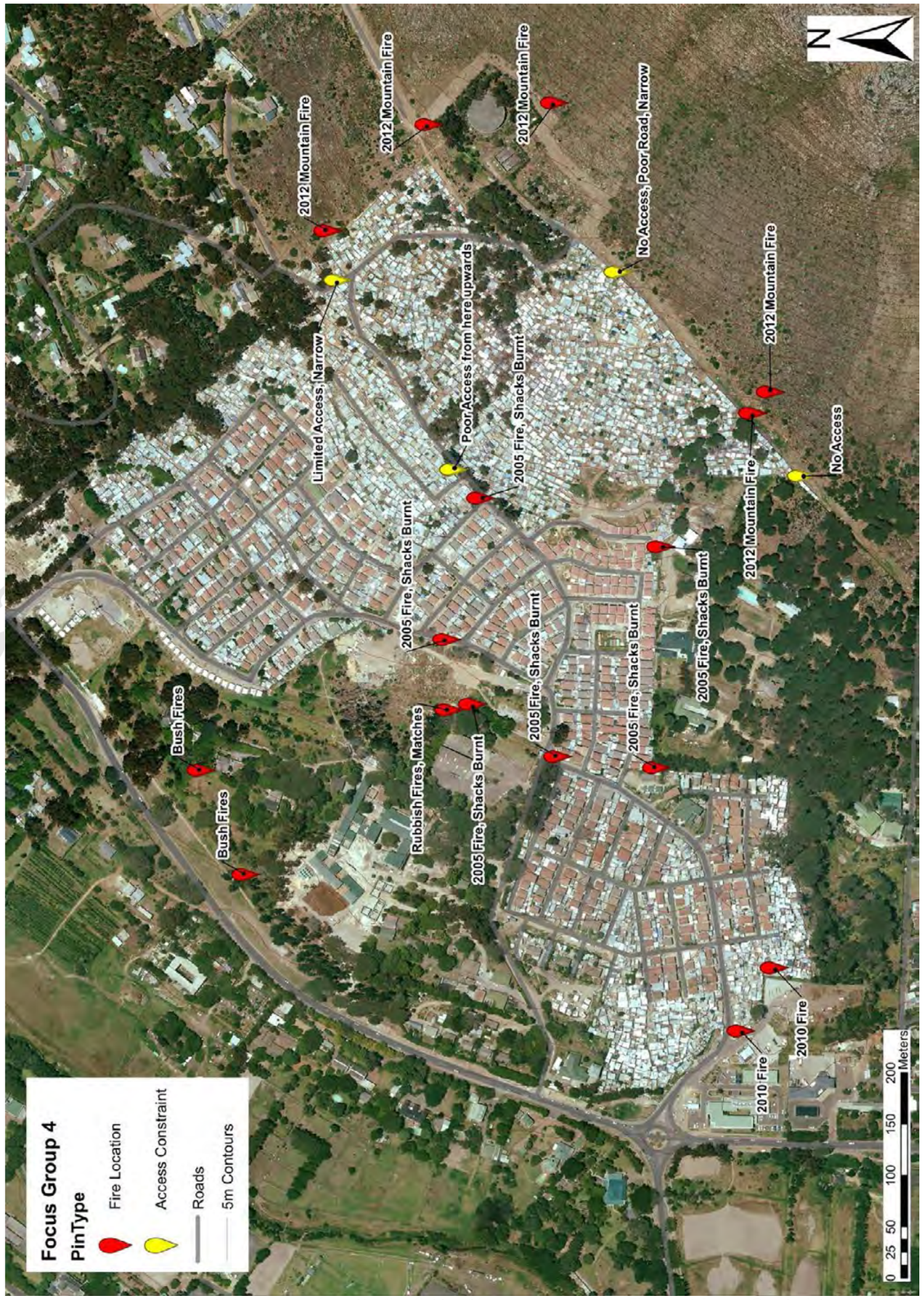


Figure 5.42: Spatial responses from the fire-fighters' focus group showing Fires and Access Constraints

Overall P3DM Analysis

Individually each of the focus groups provided interesting spatial information and discussion but compiling the information together allows for the identification of trends, hot spot priority areas and the interaction between problem areas and the suggested community interventions.

The areas identified during the focus groups are (See Map, figure 5.45, opposite):

- **Fire Hot Spot:** The informal section next to Mandela Road near the Circle and SAPS. This area is one of the densest in IY with parts of it being very steep and with very limited access by road, and on foot. The area has experienced a number of fires in recent years, including one in 2009 where "1000s" of shacks were destroyed.
- **Fire Hot Spot:** Area along the line of trees moving from Molekoane to Dontsiyakhe. For similar reasons to those above this area is seen as high risk by the community members. The number of trees presents and increased risk to the intensity and extent of fires there. The area is the furthest from the road of any area in IY with very few formal public taps.
- **Fire Hot Spot:** Southern Mountain Border. This is the area where most of the recent mountain fires have affected IY. This area has a large number of pine trees which burn freely and access for vehicles is severely limited by the lack and condition of the roads.
- **Fire Hot Spot**: This area of IY used to have a high fire risk and was destroyed by numerous fires. It now, however, has a reduced risk due to the provision of formal housing.
- **Lacking Infrastructure:** There are no public facilities, access roads or water points identified in this area. The community's suggested road infrastructure represents a great opportunity for improvement.
- **Limited Access:** Molekoane and Donstiyakhe Roads are the only way to access the upper reaches of IY and are also limited by low hanging wires, steep slope, poor road quality, narrow parts and parked cars. As the only access route, interventions are needed for improvement here.

Figure 5.43: Large areas of informal houses were destroyed and a number of formal houses threatened in the November 20th 2008 Fire (Kokhuis, 2008)

Figure 5.44: Residents evacuate their belongings before the 2008 fire destroyed their homes (Kokhuis, 2008)

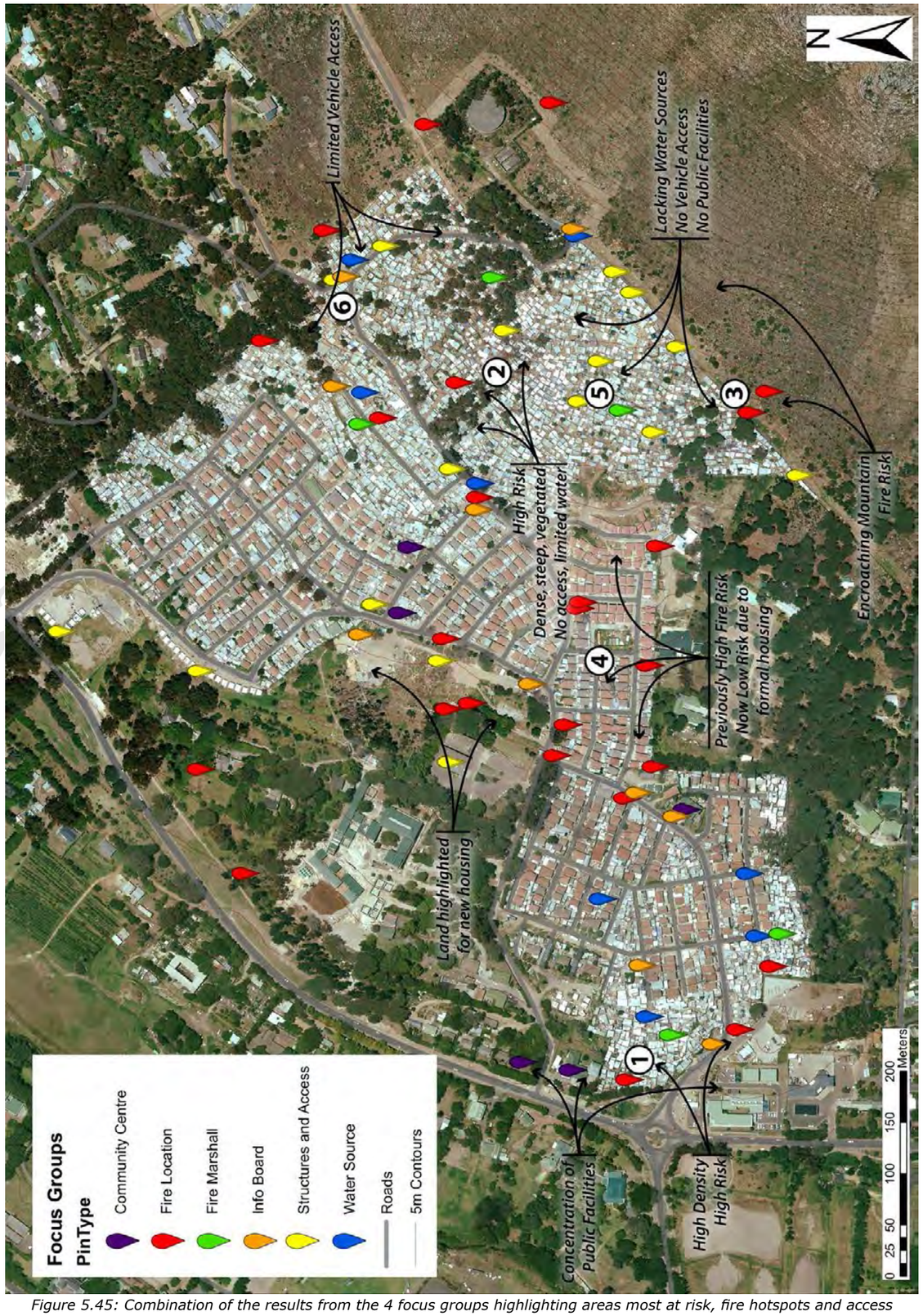


Figure 5.45: Combination of the results from the 4 focus groups highlighting areas most at risk, fire hotspots and access obstacles to be removed

5.3.8 Fire Spread Modelling

From the discussions and findings around the rapid spread of fires in the dense informal areas, the following simulation was run to examine the spread of fires in dense informal housing. The simulation was run using GIS on a select part of the Dontsiyakhe section of IY. It is important to note that this process was used for demonstration purposes only as it does not take into account wind, fuel types and mitigation measures. Further studies including these factors in informal areas should be completed

The process was conducted as follows:

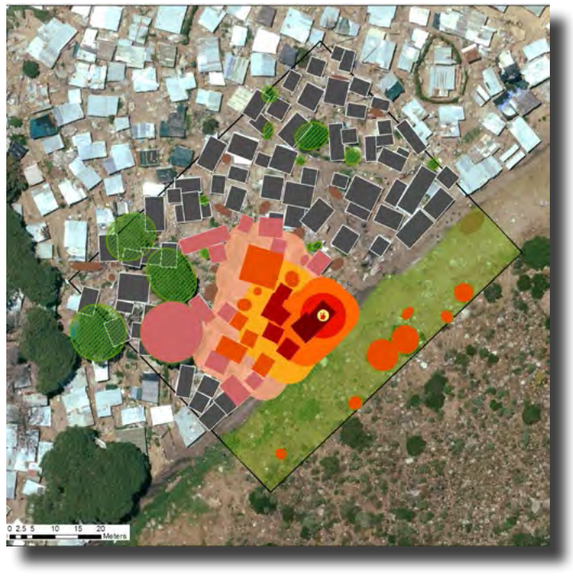
- Digitisation of features in study area: Shacks, vegetation, rocks etc and locating fire source.

- 5m Buffer applied to fire source; as buffer extends, affected buildings and vegetation become fuel and sources for expanded fire

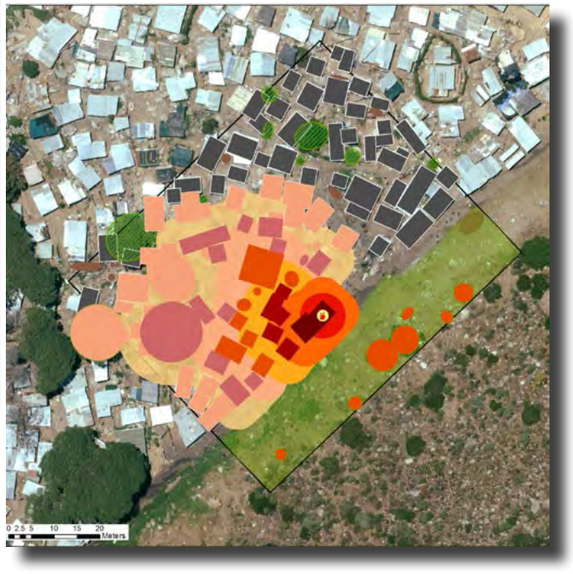
- Adjacent buildings spread the fire in the direction of the closest structures. Higher densities spread faster

- Each time the buffer is extended by 5m, based on those features (buildings and vegetation) ignited by the previous fire expansion

- By the fourth iteration there are already over 20 shacks affected by a fire that started accidentally in one shack



- From the initial fire source it can be seen that the fire spreads in the direction of the highest density and grows exponentially as time progresses. The longer it takes the fire to be controlled / extinguished the larger and more difficult to manage it becomes.



Compare and contrast this to the spread of a fire in the same area if certain shacks were relocated for the proposed roads as outlined in the Interventions Chapter (Page___)

6 - Interventions

6.1 Introduction

This research was conducted with the ultimate aim of providing recommendations and possible interventions which could assist the community, and Cape Town, in reducing fire risk in informal communities. By beginning with a literature review of the current debates and thoughts on Disaster Risk Management, these recommendations will be grounded in the theory thereby providing a connection with the accepted approaches at the larger scale, nationally and internationally. The research used both primary and secondary sources of data as the basis for the analysis and recommendations given herein. The secondary data focussed largely on information provided by the Fire Department on the number of fires in informal settlements in Cape Town in the recent past and fires which occurred specifically in IY. It also made use of newspaper reports to highlight the extent and significance of recent IY fires as these provided more detailed, qualitative information than the statistics. The primary data was obtained during focus groups and interviews with relevant role-players and community members. The interviews with officials from the Fire Department and Disaster Management provided an insight into the functioning of the authorities tasked with preventing and fighting fires and the problems they face in executing their duties. The focus groups run with community members were heavily focussed on the use of a physical model of the settlement as part of the Participatory 3D Modelling approach. These focus groups allowed residents to explain their experiences of fires and provided invaluable information as to the causes, factors affecting the spread and severity of the fires and the current coping solutions at play. Most importantly the participants voiced their opinions on the interventions needed in their community and these form the basis for this recommendations chapter.

The findings from the analysis of the primary and secondary data reveal a number of findings, some of which were expected and serve to confirm existing ideas whilst others were more surprising and challenged common thinking. The following is a summary of the key findings from the previous analysis chapter that serve to inform the proposed interventions and recommendations that follow:

Key Finding	Data Source	Issues to be addressed
There has been a downward trend in the number of fires in Cape Town informal settlements	Secondary	The reasons behind this decrease need to be understood and, if possible, improved upon to further decrease fires
The most common cause of fires is a combination of alcohol abuse, negligence and inappropriate technology use.	Primary	Education, engineering innovations and enforcement are all needed to reduce fire risk
The community does not rely on authorities for relief aid post-disaster	Primary	The reasons why need to be understood and the relief options made attractive to the community.
Lacking equipment and training is limiting the ability of the community to reduce their own fire risk.	Primary and secondary	The community has requested training to provided in connection with the authorities along with equipment for fighting small fires.
Enforcement proves the biggest challenge to the authorities in implementing and maintaining projects	Primary	Responsibility needs to be given to individuals in charge of projects with facilitation and monitoring from authorities.
The location of IY on steep, rough terrain makes it unique among many informal settlements and is responsible for a number of the challenges facing the community	Primary and Secondary	Proposed solutions should be context appropriate and informed by the bio-physical analysis of the settlement.
The provision of formal housing is seen by the residents as the ultimate solution to most of the issues facing the settlement.	Primary	Residents need to be involved in all interventions to get buy-in and to educate them on the need for interim DRR measures.
Participants are able to visualise their community on the 3D model and develop practical spatially suitable proposals for the problems.	Primary	Proposed interventions should be tested with the community using the 3D model. Other communities should be encouraged to use similar models in their disaster risk assessments.

This section starts at the smaller scale with IY specific proposals before moving up in scale to provide proposed guidelines for informal settlements in the context of the City of Cape Town. The disaster risk management proposals aimed at community fire risk reduction in IY are presented as spatial and non-spatial recommendations. Of these spatial recommendations, certain of them are located in very specific locations identified as requiring intervention whilst others can be applied to the community as a whole. Integrated with the spatial recommendations are non-spatial guidelines for the community which are concerned with the organisation of community structures and functioning and the interaction between the community and the authorities. As discussed by Mr Pluke during the interview with the Disaster Management officials, interventions proposed by Disaster Management fall under one of the 5Es of: Engineering, Enforcement, Education, Economic Incentives, & Emergency Preparedness. To continue with this flow the recommendations are categorised under one or more these Es. Moving from the specific case study of IY to the whole of Cape Town, guidelines are given as to how the lessons learnt through this research can be applied in in other informal communities. These guidelines are presented with the hope that there can be a communal reduction to fire risk from a grassroots level in all communities across Cape Town. Finally, this section will reflect on the research process undertaken and discuss ways in which the research could be taken further as well as any changes that should occur should a similar process be repeated elsewhere.

Figure 6.1: Fire Engines, including smaller skid units able to access more difficult terrain, standby in Hughendon for a fire in 2009 (Kokhuis, 2009)

Figure 6.2: Multiple Fire Engines from different stations standby at the bottom of Mandela Road for a fire in 2008 (Kokhuis, 2008)

6.2 Imizamo Yethu Interventions

Map #	Title	Type of Intervention	Aim		Description	Location / Scale	Timeframe	Responsible Roleplayers
1	Community Fire Marshals	Emergency Preparedness	Increase awareness & education Take responsibility for their neighbourhood Coordinate community DRM strategies		This programme aims to address the lack of organisation around community fire-fighting cited by participants. Marshals would be provided with training and be located strategically for high risk areas. Responsibilities include community education, maintenance of equipment, command of community fire-fighters during a disaster.	Selected locations throughout IY to effect whole community	Short Term <1 Year	Community Leadership and residents Fire Department Disaster Management
NA	Training of community fire fighters	Emergency Preparedness	Provide basic training of residents Allows residents to be involved in fighting fires in their own community Upskill residents to create further employment opportunities Allow residents to earn a stipend		The Fire Department and other relevant authorities will train members of the community who are interested in gaining skills to benefit themselves and their community. They will work closely, once trained, with the Fire Marshals and Fire Department to quickly combat fires. The skills gained will allow the residents to seek employment and improve their own lives. The programme may be run under the Expanded Public Works Programme.	Community wide	Medium Term 1 – 3 Years	Fire Department Residents VWS
8	Identify Disaster Relief Locations	Emergency Preparedness	Identify and formalise all structures which can be used in an emergency		A number of community centres are used for disaster relief, but are used only intermittently. By formalising these structures with the DRM organisations there will be increased accessibility to community members. A new disaster centre is proposed near the reservoir on Dontsiyakhe Rd as there is a lack of community facilities in this area and the area has the highest fire risk.	Select locations in the community	Medium Term 1 – 3 Years	Fire Department / Disaster Management City Council departments
1	"Own a Hydrant" neighbourhood fire equipment	Engineering	Expand current network of hydrant locations Ensure equipment is maintained Give ownership back to community Bridge gap between authorities and community		Closely tied to the trained marshals, equipment would be provided to allow trained residents to fight the fire as soon as it starts. Ideally the equipment will be located with, or near to, the fire marshal. The marshal and neighbours take ownership of the equipment and hydrant to limit vandalism and increase community involvement.	Selected locations throughout IY	Medium Term 1 – 3 Years	Neighbours Fire Department
3	New access roads	Engineering	Provide vehicular and pedestrian access to areas currently inaccessible Allow Fire Department access to areas most at risk		Certain areas in IY have no road access, thereby limiting the ability of the Authorities to react efficiently to disasters. New Roads are required to improve access to key areas. These will not provide access to each property but will allow, for instance, fire trucks to get much closer.	Dontsiyakhe Section	Medium Term 1 – 3 Years	City of Cape Town Dept. of Roads

NA	Change in building materials / Structure design	Engineering	Decrease structural fire risk Limit fire spread Improve housing quality Create entrepreneurial opportunities		A number of options are available for decreasing a building's fire risk. Some, like the application of intumescent paint, can be applied to existing formal and informal structures, whilst others such as the e-Khaya fire-proof shack replacement are designed to replace traditional informal dwellings with improved structures. All of these options could be linked with existing businesses or residents given the opportunity to provide them through entrepreneurial programmes.	All informal housing	Medium Term 1 – 3 Years	Private business Entrepreneurs City of Cape Town Residents Academics
5	Formal Housing	Engineering	Improve quality of life Grant residents security of tenure		This intervention was included as it is the focus of most of the residents in IY and seen as a fix-all solution. A number of other proposals have identified land to be used for housing, the most recent of which was conducted by CNDV Africa for the City of Cape Town.	Shown on Map as per previous proposals	Long Term >3 Years	City of Cape Town NGOs
4	Clearing and improving access roads	Enforcement	Increase vehicular and pedestrian access to areas currently inaccessible Allow Fire Department access to areas most at risk		Areas which are serviced by formal roads are sometimes denied access due to poor quality roads, low hanging obstructions, abandoned vehicles or encroaching structures.	As shown on Map	Short Term <1 Year	City of Cape Town Dept. of Roads Residents
6	Clear Fire breaks	Enforcement	Limit the spread of mountain fires to the settlement and vice versa		There are fire breaks in existence along the mountain edge and these can be clearly seen on the aerial photograph. However, during site visits the area, the fire breaks along the upper edge of the settlement are overgrown and would provide fuel for the fire to spread as as happened in the recent past. Clearing these breaks is a simple task to benefit the mountain vegetation and the community.	IY Mountain borders	Short Term <1 Year	Community Fire Department NGOs
2	Fire info signage boards	Education	Passive education of fire safety Focus on informing the community on the correct numbers to use		Knowledge of the correct phone numbers to use in an emergency limits the effectiveness of the authorities to respond. These signs will inform the community, in their own language, as to the proper procedure and numbers to phone for each emergency, i.e. 107.	Selected locations throughout IY to effect whole community	Short Term <1 Year	Fire Department / Disaster Management Community Leadership
NA	Increased education programs	Education	Increase exposure to existing programmes Focus on school children		Education programmes already exist in the Fire Department and Disaster Management, but not all community members have been exposed to them. Working with the trained Marshals as educators these programmes will be expanded and run to benefit more of the community. The focus on school children is appropriate and should continue to engender a focus on DRR from an early age.	Community wide	Medium Term 1 – 3 Years	Education Department Local Emergency services Disaster Management

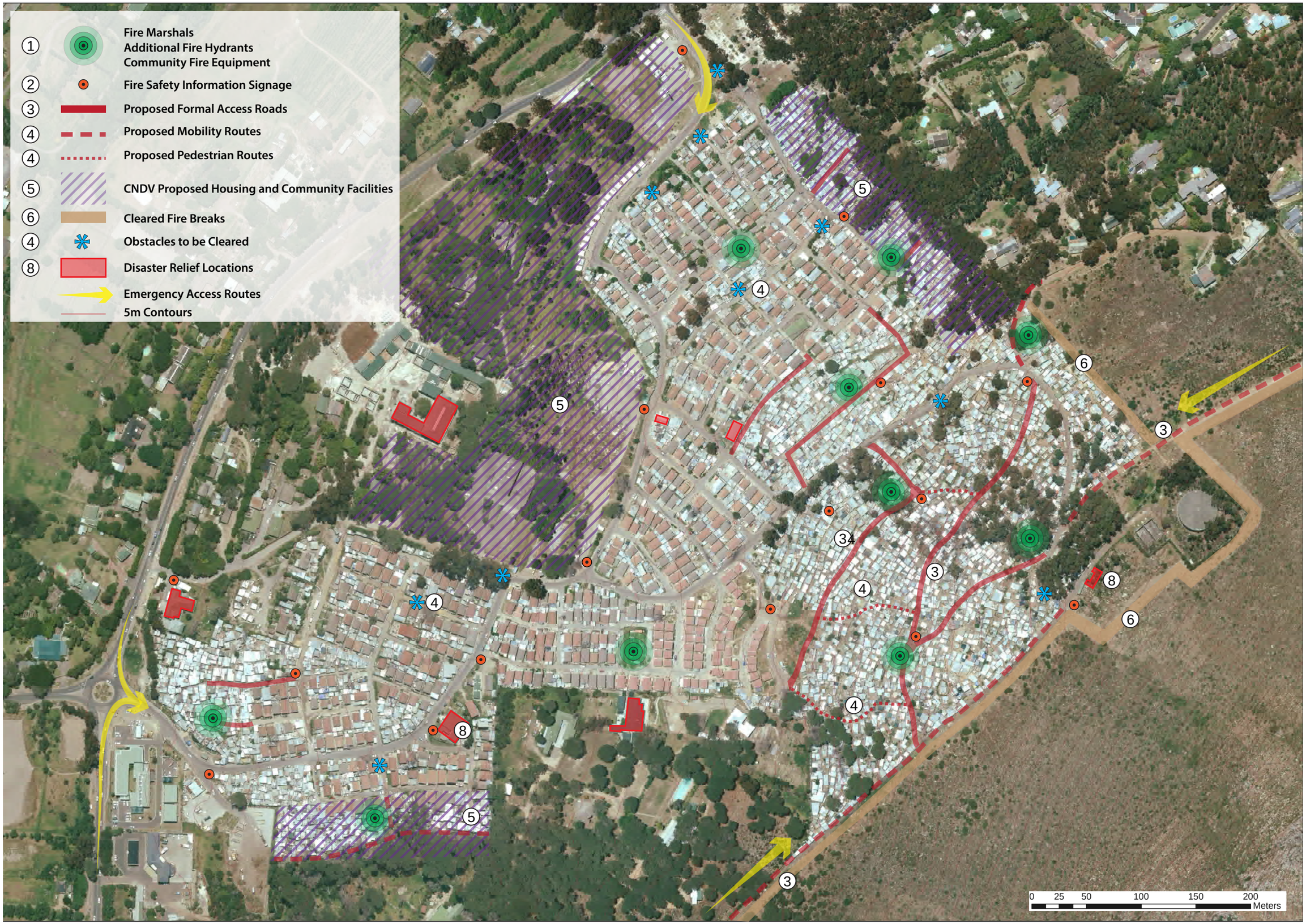


Figure 6.3: Proposed local interventions for Imizamo Yethu

6.2.1 Community Fire Marshals

Training and involvement of community members in the disaster risk reduction process for IY is an essential component of the Community Based Disaster Risk Management (CBDRM) approach proposed by this research. A number of findings from the analysis of the research has highlighted the need for further community training and involvement in IY. Limited knowledge of emergency procedures, lacking exposure to fire safety education and uncoordinated efforts when fighting fires points to the need for responsibility to be transferred to key members of the community and Community Fire Marshals will have a number of roles to play in this regard. During the focus groups the participants were strongly in favour of this idea and were quick to point out places in the community where fire marshals were most needed. Ten locations were identified from the P3DM process and from the analysis stage of the research with the majority placed in the informal areas of the community most at risk of fires. A program run through the Expanded Public Works Program (EPWP) was suggested as an incentive to residents. The participants of Focus Group 3 thought of this system being run in a similar fashion to the street committees already active in the community with each area of the community having a trained "Fire Officer/marshal" responsible for a certain area. The specific roles and responsibilities of the Community Fire Marshals will differ depending on the phase of the disaster cycle.

In the pre-disaster phase these community members will be responsible for continuing community fire education, supplementing the formal efforts of the Disaster Management education teams. The marshals are particularly suited to conducting home visits to advise their neighbours about risk reduction measures for fire and other potential risks. They will also have the opportunity to conduct small scale risk assessments in their immediate neighbourhoods and report any pressing issues to the authorities before disasters occur; aiming for prevention being better than cure. By living in the neighbourhoods they are assessing they are more likely to identify risks that would be overlooked by outsiders.

When a fire, or another disaster occurs, the marshals' primary responsibility will be the coordination of community efforts. This may include organising bucket and hose brigades, demolition efforts and importantly communicating with the Fire Department. The marshals will be the point of contact for the small brigades of community fire-fighters (see later description) as well as being responsible for the equipment stored under the proposed "Own a hydrant" scheme.

Figure 6.4: Working on Fire recruits run education programmes for communities (http://www.workingonfire.org/, 2013)

Post disaster the marshals' transition into a supportive role by providing coordination between residents affected by the fire, local community leaders and the authorities. This may take the form of assisting with the distribution of relief aid, identifying those affected for assistance from home affairs or enforcing reblocking or other strategies. For this to be successful there will need to be considerate collaboration between the community residents, local leaders, the Fire Department and Disaster Management. The latter two role players will need to be closely involved in the recruitment, training and monitoring of the process.

6.2.2 Training of Community Fire Fighters

From discussions with both the authorities and community participants it is clear that formal fire-fighting training is desired for the community of IY and other informal communities in Cape Town. The need for this training has been highlighted by the lack of organisation around community fire fighting efforts, the limited cooperation between residents and the fire-fighters and the limited education and skill levels present in the community. The desire for the training for their own sake and that of the community was discussed during the interview with one resident who summed up the argument perfectly:

"CL: No, there is no one taking charge. I've told Mr Mike, that I want to go and be a firefighter and I'd like the fire people to come up there and train some of us men to fight the fire in a better way, because at the moment we are going wild. We don't have the experience how to go in, we might burn ourselves or a shack might fall on us, or asbestos – You know asbestos? When it burns it fumes and explodes and it might stab you in the neck or the heart. It's a problem you see. That's why I'd like it if the people from the fire station like from Newlands or Cape Town, I'd be very interested.

MR: So you want the training just to help yourself and the community? Its not because you want a job?

CL: No, no. Even if there are like bush fires they can come and I'll be on standby. Just to help, not to say I want money…just volunteering!" (CL Interview, 2013).

The basis for this type of programme could be similar to that of the government's Working on Fire programme. This programme, run under the auspices of the Expanded Public Works Programme (EPWP) employs over 5000 people at 200 bases country wide who are trained in education, prevention and fire suppression skills with the aim of forming, "veld and forest fire fighting ground crews, stationed at bases around the country to help stop the scourge of wildfire which costs the South African economy billions of rands annually" (www.workingonfire.org, 2013) The participants in this programme are recruited from marginalised communities and provided with training on issues other than fire-fighting such as life skills and entrepreneurship. Through this programme the participants are able to make a significant difference to the areas where they live, gain knowledge and skills and earn an income. There is nothing stopping a similar programme being set up for urban communities.

There have been efforts by the Fire Department to run similar programmes, but never at the scale of Working on Fire. During the Focus Group one fire-fighter said that, "There is a need to mobilise the community!" and cited one example from Groendal in Franschoek where community fire officials were

trained and provided with equipment to act as first responders in an emergency. There were 10-12 officials in each group and this seemed to lessen the tension between community and the Fire Department by bridging the gap. Imizamo Yethu provides a good opportunity for a pilot project to be run as it is a relatively small community with a high fire risk and an engaged community wanting to do more. If successful this could then be run in other informal areas in Cape Town and South Africa. It is envisaged that the programme be run as a partnership between the Fire Department, Disaster Management, IY community and private business under the Expanded Public Works Programme which allows for work opportunities to be created in the sectors of Infrastructure, Non-State, Environment & Culture and Social by employing, "workers on a temporary or on-going basis either by government, by contractors, or by other non-governmental organisations" (Dept. of Public Works, 2013). In line with this the following is proposed:

- Setting up of a Community Fire Organisation with the aim of fire risk reduction in IY and the immediate surrounds within the medium term of one to three years.
- Work closely with the Fire Department, Disaster Management and other NGOs such as Volunteer Wildfire Services
- Recruitment and training of local IY residents at the rate of 25 people per year
    - Training to be run by the Fire Department and Disaster Management jointly
- Funding to be provided jointly by the Department of Public Works Expanded Public Works Programme and key local business partnership
    - The EPWP will be responsible for the payment of the community fire-fighters whilst private business will be approached for additional equipment costs.
- Work with the existing community structures in IY such as street and block committees as well as with the newly proposed Fire Marshals.

Figure 6.5: Working on Fire crews conduct controlled stack burns to limit fire risk http://www.workingonfire.org/, 2013

6.2.3 Disaster Relief Centres

The participants highlighted that although a number of facilities are made available in the post-disaster phase, they are not often used with community members preferring to rely on neighbours, friends and family. The informal Dontsiyakhe section of IY is once again under resourced in this regard with the Iziko Lobomi Centre and the Green and Yellow containers all being situated near the entrance to the community. Community centres and other relief sites do have a function to play and more engagement with the community will be required to discover the reasons behind the limited use of these facilities. It is proposed that the Community Fire Marshals play a large role in this engagement and that they are key in organising relief efforts at these locations post-disaster.

To increase community access to public facilities in Dontsiyakhe, a new community centre needs to be constructed along the pipe track road (as shown on the map, figure 6.3). This centre may serve a number of functions such as:

- Disaster advice office: Residents can get advice from the Community Fire Marshals
- Education programmes: This may provide a space for the "Industrial skit" fire safety shows and other community education and training programmes.
- Temporary housing post-disaster: Those who have lost houses can be accommodated at the centre whilst more formal housing is arranged.
- Storage of supplies and equipment: The centre may serve as an additional point for community fire fighter equipment and building supplies.

6.2.4 Provision of Fire Equipment - "Own a Hydrant"

Another desire expressed by the community was for the provision of basic fire fighting equipment allowing them to fight small fires and assist the fire department in times of need. In all of the focus groups the participants were quick to point out the lack of taps and suggested that hoses would assist the community in stopping fires before they got out of hand. A number of ideas have been piloted by the authorities in the past and these have included the provision of handheld fire extinguishers, but the successfulness of these projects has not been assessed. In other areas, such as the Franschhoek example mentioned previously, equipment was provided to trained members of the community. In response to this Station Commander Layne (during the focus group) discussed the issues facing this type of project which has been piloted in a number of settlements. Primarily was the fact that equipment was stolen and increased enforcement was needed. He did, however, discuss a new pilot project whereby a group of neighbouring houses would "own a hydrant" and take responsibility for that hydrant. The incentive was fire safety with a strong educational component. Despite still being in the pilot stages, this has potential and it is recommended that a similar project is initiated in IY. It was discussed whether equipment should be kept in public locations in the public eye to ensure it wasn't stolen and to increase community ownership of the idea or whether it should be kept at the home of the Fire Officer. If the latter occurred, the equipment would have to be available 24/7. By taking ownership of the hydrant and fire equipment, both of which are essential to ensuring the safety of their neighbourhood, it is hoped that residents will be responsible in ensuring the safety and maintenance of the equipment. The layout

of the settlement, and a characteristic of many informal areas, presents a number of challenges for this type of approach to work as many homes have little or no engagement with the street. This lack of "eyes on the street" (for more information on this concept see Jane Jacob's work) limits the responsibility of individual homes and allows vandalism and theft to occur more easily. The implementation of this proposal is therefore aimed at improving this sense of ownership as illustrated and discussed below:

- Trained Fire Marshals should be located at or near the location of the hydrant and fire equipment if at all possible as they are responsible for the neighbourhood that the fire equipment should serve.
    - Trained Community Fire-fighters must know where the equipment is and be trained in its use
    - The Fire Department must know where the equipment is and who is responsible for it
    - The Fire Department should conduct regular checks of the equipment
- The equipment and hydrant should be positioned as close to an access road as possible.
- The area immediately surrounding the hydrant should be cleared and kept clear to allow easy access by residents and the authorities
- Residents living adjacent to the equipment location should be engaged with and their cooperation gained to ensure responsibility.
- The safety and responsibility of fire risk reduction and protection of livelihoods should be a joint effort between residents and the authorities.
- Residents' shacks should, if possible, be turned inwards to face the equipment store, therefore ensuring eyes on the street.
    - Additional community facilities such as wash basins and lighting should be provided in the same area as an incentive to residents and to improve public facility access.

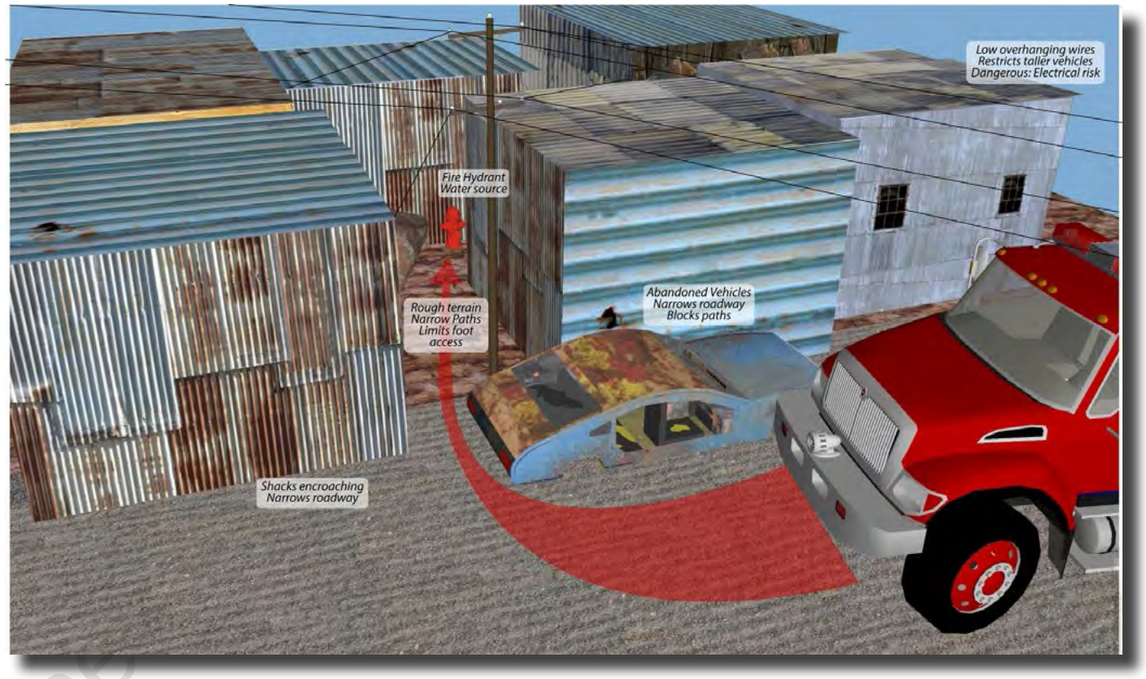


Figure 6.6: The current situation, where access to fire hydrants is limited by a number of factors, severly hampers efforts by Fire Crews to fight fires

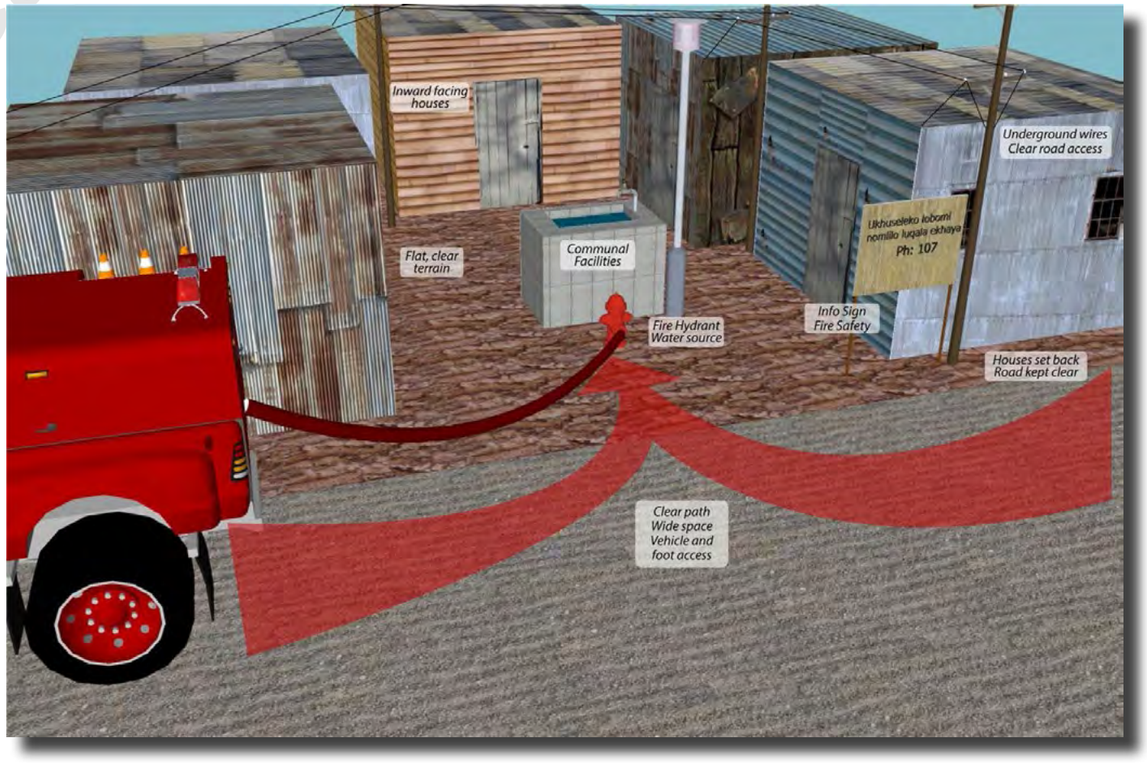


Figure 6.7: It is proposed that areas around fire hydrants are made open and accessible for residents and fire crews by creating space, improving public facilities and increasing "eyes on the street"

6.2.5 New Access Roads

The large informal, Dontsiyakhe section has been highlighted as problematic for a number of reasons, the lack of access chief amongst them. Access roads are needed to allow residents, the authorities and the emergency services access to all the areas, but a number of challenges will exist in the implementation of these projects. Gaining buy in from the residents in the areas where the roads are proposed is one challenge which cannot be overcome with an engineering solution. Engagement with the residents will be essential if the new roads are to have their support and the first step of this process was undertaken during the focus groups where it was the participants themselves who proposed the new roads and suggested possible routes. The interventions map (figure 6.3, pg112) clearly shows the locations for new roads; one extending upwards from Molekoane Street into Dontsiyakhe ("Yes, more roads would definitely help. From Donstiyakhe upwards there is a little gravel road there that would help them get access and go straight up" (CL Interview, 2013); a collection of roads running parallel to the mountain edge and connecting to the top mountain pipe track ("The top section its possible to put in a road, its not as steep as lower down there" (FG3, 2013)); an extension and formalisation of the pipe track along the mountain border of the settlement, thereby giving access from the Hughendon and Penzance (North and South) sides of the settlement ("it will help them [the fire-fighters] if that top road was better, tarred" (FG1, 2013)). The latter will not be public access roads, but are necessary for access by the authorities and emergency services.

The following is proposed for the new roads:

- Community engagement is key as residents may need to be relocated to make space for the roads.
    - As far as possible the roads should follow the existing terrain and be built along contours or shallow slopes to minimise costs.
- 3 Types of roads proposed:
    - Formal access roads to be built as shown within informal areas.
    - Mobility routes established for improved access to IY from adjacent areas.
    - Formal pedestrian routes established along existing desire lines for access between roads
- Formal access roads to be built of a size to allow fire trucks to use them
- All electrical cables to be routed underground to limit height obstructions.
- Bulk infrastructure to be put in place beneath the road for current and future service delivery expansion (water, sewerage etc).
    - Trained Fire Marshals, community fire equipment stores and hydrants should be located near to these roads for ease of access in an emergency.

Figure 6.8: The current situation in many streets where numerous obstacles limit access for emergency vehicles. (Google Earth & Sketchup, 2013)

Figure 6.9: Proposed clearing of existing roads and construction of new roads to improve access (Google Earth & Sketchup, 2013)

In contrast to the Fire Spread Modelling shown on page 102, the following simulation, conducted in the same way, shows the benefit of formal access roads in the settlement as fire breaks and a way of containing a small fire.

- Features are digitised as before, but in this instance roads have been constructed and certain shacks moved to accommodate them. The Fire source is the same.

- The same 5m buffer is applied to the source and affected features become fuel for the fire

- In the early stages the fire spreads as quickly, with a 5m buffer being applied each time again

- However, the road width shows that the fire cannot jump across to shacks in neighbouring blocks.

- By the 4th iteration, only 10 shacks are affected, half of those affected by the same time period in the simulation without roads. Roads are acting as barriers to fire spread and, although the fire may eventually jump the gap if the wind is strong enough or the fire hot enough, it is slowed enough for authorities to respond in time.

6.2.6 Change in Building Materials & Structure Design

The materials and conventional construction style used in building most informal dwellings in South Africa have a direct contribution to high fire risk in informal areas. A number of options are available which, either by modifying the existing structure or a complete redesign and upgrade, have the potential to reduce shack-specific fire risk and improve the quality of the dwelling. Whilst these are not seen as replacements for formal housing, the delay in acquiring housing for the whole settlement is such that in-situ upgrades are needed, in IY and other informal settlements.

The first proposed intervention is the use of intumescent paints which, when applied to the existing shack materials can decrease their combustibility, thereby limiting the spread and severity of fires. They work by expanding quickly in volume when heated, creating a thick layer of charred carbon on the surface of the material and drawing oxygen out of the material to stop a fire spreading to adjacent or neighbouring materials. Mr Pluke, of Disaster Management, spoke about plans to run a pilot study using locally produced, affordable intumescent paints in an informal area to test fire resistance,

"We're also very excited to use this paint. That is affordable; you can get a lot of bang for your buck there. We're hoping to roll a pilot out there with that too"

In South Africa a number of intumescent coatings are available, but most of these are designed for industrial applications and would need to be tested for this specific context. A section of IY should be used to test the cost effectiveness and applicability of the paints.

The second proposed intervention tackles the problem through a redesign and rebuild of informal structures. Hout Bay based business E-Khaya has designed an alternative to the traditional shack, which is seen as an affordable, high quality interim solution until such time as formal housing is provided. The basis for the construction is the use of sandbags stacked in a frame to form the supporting walls with features such as, "very high fire resistance, thermal and acoustic insulated walls and roof, modular for future additions, daylighting, solar lighting" (E-Khaya, 2013).

Fire tests conducted on the demo units showed the ability of the materials and structure to withstand extreme fire heat with little damage being observed with a large fire built directly against the outer wall. (E-Khaya, 2013).

E-Khaya envisages that the construction of the dwellings is run by the community for the community, with individuals getting involved as entrepreneurs. Their motto of " See one, do one, teach one" embodies this and the homeowner/ residents are required to provide the labour, only paying for the material. Founder, Dr Johnny Anderton, says that the cost is approximately R10 000 for a 14m2 dwelling with the potential for expansion (email conversation). It is proposed that a pilot project is set up to be run by a group of entrepreneurs in Imizamo Yethu to see the feasibility of expanding to more of the informal areas in IY. Ideally this should be conducted in line with the building of the proposed access roads, as shacks required to be moved could be replaced with the e-khaya dwelling.

Figure 6.10: Sandbags are used around a wooden frame to build insulated, sturdy walls (http://e-khaya.com/, 2013)

Figure 6.11: The finished structure before the exterior is coated. The design and materials have a much higher fire resistance (http://e-khaya.com/, 2013)

6.2.7 Clearing and Improving Access Roads

As the picture (figure 6.13, opposite) shows, many of the roads in Imizamo Yethu have very limited access either due to the quality of the road itself or obstacles which limit the width or height of the road. This is an issue which has been realised by community members and the authorities and the underlying cause identified as lacking enforcement. Thankfully many of the problems are fairly simple to solve and can be achieved in the short term. Improving access will allow residents better access to their homes and public facilities, improve public transport options as well as the essential function of allowing the emergency services to gain access to scenes when necessary. The following is suggested:

- Where roads are tarred but the surface is deteriorating, with potholes and cracked edges, the City Council should be approached to fix these, ideally before the next winter rains as flooding makes many areas of the settlement inaccessible.
- Existing roads with only a gravel surface or where the existing tar has been eroded away should be replaced with a tar or another suitable surface.
- Motor vehicle obstructions: Numerous parts of Molekoane and Dontsiyakhe roads are limited to one way traffic due to the abandoned or broken cars parked along the road side. One interviewee reported that one resident has 5 cars outside his house. Whilst space is limited and residents are not afforded the space for their cars, those that are abandoned or not functioning for long periods of time should be removed. This falls within the jurisdiction of the Metro Police and Traffic Department who should be approached to rectify this.
- Low hanging wires present a more difficult challenge but the dangers presented by these obstructions means that an intervention is definitely needed. Because the use of alternative technologies for cooking and lighting such as paraffin are still used too frequently and are the cause of many fires, the electricity supply for the community should be increased not diminished. To facilitate this whilst still allowing vehicles access through the settlement it is suggested that the power supply is routed underground, below the road surface where it needs to cross and then redistributed on the other side.

6.2.8 Clearing of Fire Breaks

In the short term it is necessary to clear the existing fire breaks along the mountain border of IY. These are overgrown and present a risk of fires spreading to and from the settlement. As the land belongs to SAN Parks this will need to be conducted in collaboration with them and representatives from the local Fire Department. A controlled burn of the land is one common method of clearing vegetation and in recent months a number of these have been conducted by the Volunteer Wildfire Services (http://www.vws.org.za/) but the fire breaks could be maintained and controledl burns run by the Community Fire Teams in the future.

Figure 6.12: The fire break is currently overgrown (Author, 2013)

Figure 6.13: Current Road between IY and the Mountain. Poor quality, steep, inaccessible. (Author, 2013)

Figure 6.14: Improved Road surface; smooth, less steep, accessible (edited Photograph)

6.2.9 Fire Safety Information Signs

The major communication issue facing the IY community is not a lack of the technology (as most residents over 16 are reported to have cellphones) but rather a lack of knowledge about what to do in an emergency, who to phone, the relevant emergency numbers and what to tell them. The proposed intervention is the creation of information signage boards to be placed at strategic locations throughout the community. The specific locations were chosen based on the Focus Group 3 interviews, where the idea for signage boards was first proposed by community members. Some of the locations were immediately obvious, such as along major walking routes, whilst others would not have been suggested if it were not for the participants' input, i.e. near to communal dumping sites and popular shebeens. The implementation of these signs is envisaged as follows:

- Permanent signs to be installed in the 15 strategic locations shown on the map
    - The signs should be sturdily constructed and securely installed to prevent theft or vandalism.
    - Large enough for those walking past to easily see them
- Information must include how to reach the authorities, what to do in an emergency and the numbers to call.
    - The information must be provided in the community's language, or multiple languages if applicable.

A possible design is shown below, figure 6.15 (English version only)

Figure 6.15: An example of a sign to educate community members about emergency procedures and fire safety. The sign would be produced in multiple languages

6.2.10 Increased Education Programmes

A number of education programmes are run by Disaster Management and the Fire Department throughout Cape Town in formal and informal areas. Disaster Management officials Mr Pillay and Mr Pluke spoke in depth about the education programmes they run and which they feel are essential in DRR.

"Then there's the on-going education type movement. There's the one-on-one approach where officials talk to the community with the Fire Department. They have 5min talks to go through the pamphlet to identify various risk areas, The other thing then is the plays which are taking place in the community. It's a skit, industrial theatre it's called.

GP: Then they basically play act, how to make your house safe from fires. We pay these guys, on a tender. And the messaging we assist them with. The idea is that it becomes more like a story, to be creative and innovative than handing out pamphlets"

Their aim with this is to bring about change that is "intrinsic and not extrinsic" by changing the behaviour of the person in the process. However, whilst the aims are admirable, from speaking to the participants it seems that many of the educational approaches are yet to reach Imizamo Yethu. Of the 3 focus groups and interviews with community members, only one of the participants could remember a education programme in their community and this was aimed primarily at children. The Fire Department's education initiatives also include a number of multi-lingual pamphlets that have been developed to assist households and businesses with risk assessment and fire safety (see appendix, pg 146,147), but it was not clear from the participants whether they had been exposed to these or not. The UN, in collaboration with Disaster Management, has made a schools work and information pack available which focusses on disaster risk reduction for scholars.

Whilst a lack of programmes is not the major problem, a need for increased exposure to these programmes and a tailoring of these to the local community is evident. With this in mind the following is proposed for Imizamo Yethu:

- Mandatory disaster risk education programmes to be run in all local schools, starting at the primary school level and being integrated into the Life Orientation curriculum. To be run with the support of the local emergency services and disaster management.
- Use of the Community Fire Marshals to conduct neighbourhood scale vulnerability assessments.
- Existing pamphlets and checklists to be used as assessment tools
- Community meetings with Disaster Management officials and local emergency services to highlight specific risks and mitigation measures.
    - Imbizo style; similar to what has been run by the police and Community Police Forums in other areas
- As far as possible the education and training programme should be run by local residents with experience/interest in Disaster Management; with the support of the authorities.
    - Once residents have been trained they can then pass on knowledge to other residents and communities, thereby spreading the knowledge and increasing exposure.

6.3 Cape Town Scale Proposals

Moving from the small scale of the IY case study to tackle the problem of fires in all informal settlements in Cape Town, and elsewhere, is not as simple as replicating the interventions used in IY. Due to the community characteristics (socio-economic, biophysical and disaster risk), interventions which are suitable in one area will be ineffective or negatively impact the community in another. As an example, the proposed rerouting of electricity cables underground to increase overhead access in IY makes sense and solves a real issue. However, if one were to implement this in another, low-lying area, on the basis that it worked in IY, there may be issues such as water seepage into the cables thereby posing an increased risk. This is not to say that all interventions cannot be used, but rather that each should be looked at in the context in which it will be implemented and adjusted accordingly.

6.3.1 City Wide Review of Existing DRR Measures

From the discussions with City and Disaster Management officials it emerged that a number of ideas aimed at disaster risk reduction have been piloted in settlements across the city. These include:

- The provision of fire extinguishers to two separate communities with the aim of allowing residents to fight small fires before they spread.
- Installation of trial e-khaya homes in Blue Downs; installed by residents to test techniques.
- Provision of Temporary Relocation and Incremental Development Areas in such as Khayalitsha and Blikkiesdorp
- Wakawaka solar lighting pilot project aimed at replacing candles and lowering risk.
- Use of intumescent paint on existing shack structures
- Reblocking of areas post-disaster such as Joe Slovo
- Fire safety shows & Pamphlets

Before new interventions are proposed or implemented, it is essential that a review is conducted of these existing pilot projects. This will allow the responsible authorities to ascertain where to focus investment as certain of these may be able be able to be rolled out with little adjustment whilst others may need reworking or may be found to be ineffective at reducing disaster risk. During this review process it will be beneficial to look at the spatial distribution of the interventions at the city and community scale. At the city scale mapping the interventions will allow the city to identify which settlements are yet to benefit from any pilot studies whilst mapping the interventions at the smaller community scale will allow the effect of settlement layout and terrain to be assessed.

6.3.2 Increase Use of Community Based Disaster Risk Management

From this research it is clear that there is a desire amongst community members to be more involved in their community's disaster risk reduction. To confirm whether this desire is the same for other communities it is proposed that a similar CBDRM process to the one conducted for this research is run in another settlement. This will confirm the validity of the findings and allow another community to undertake a fire risk assessment. Ideally this should be facilitated by an NGO, such as Development Action Group (DAG), who works with the community, running focus groups and conducting the P3DM process. To further involve the community members, those who are trained as community marshals and community fire-fighters in IY can become involved in the next community. Taking this to the next level and rolling it out to more informal settlements in Cape Town and elsewhere will require a change in policy to further involve communities in DRM. The current policy does not provide for community interaction, rather focussing on the roles and responsibilities of authorities in a top down approach often favoured in DRR. Starting at the Cape Town Municipal level will allow the policy to be tested and refined before being proposed at the national level.

6.3.3 Application of Intumescent Paint

With the decreased cost for intumescent paint being manufactured locally in South Africa, an opportunity exists for the widespread application of this paint on shack materials in all informal settlements. This engineering project is attractive for a number of reasons as it can be applied to any existing structures in their current positions and if the shack is relocated or the materials re-purposed the fire resistant properties will remain. This also represents an opportunity for community entrepreneurs to run a business selling and applying the paints in their communities.

6.3.4 Spatial Mapping of Informal Community Disaster Risk.

One of the original criticisms of the Cape Town disaster management policy was the limited spatialisation of the policy and the lack of spatial plans for Disaster Risk Management. It is therefore proposed that the City authorities (Disaster Management, City Fire Department), in connection with relevant Government Departments and NGOs, complete a comprehensive spatial mapping and risk assessment of all informal settlements across the City. Whilst this research has been focussed specifically on fire risk, this proposal should look at all disasters and overall risk for a community as many of the spatial factors (such as location and terrain) will affect vulnerability to more than one disaster. Data already exists in different government departments such as aerial imagery with National Geo-spatial Information or housing information with the Department of human settlements. This data needs to be brought together in a user-friendly, available package that can be used by officials at the smaller scale as well as by communities and NGOs as part of the CBDRM and P3DM processes. The more available the data is, the more useful it can be, and forms an important way of bridging between data and ideas collected by community members and formal disaster strategies (see the work of Musungu, Motala & Smit).

The case study of IY also showed the importance of expanding the use of mapping and GIS from two- to three-dimensions. Whilst not all settlements have the large heigh variations seen in IY (something which makes it perfect

for P3DM), many other communities are at risk due to their topography and would benefit from a greater understanding of their settlement. As an example, low lying communities who are at risk of flooding each year from rising water tables can be analysed and the sections of the settlement most at risk targeted for rapid intervention.

6.4 Reflection and Further Work Needed

Despite this research forming part of an academic dissertation, it allowed interaction with a real community and residents, dealing with a real and ever present danger to their livelihoods. This interaction gave an insight into the difficulties facing communities, which would not have been found had the research been conducted as a desktop study alone. This positive was key in making the research process overall an enjoyable and productive one. A number of other positives and benefits of the research included the building and use of the 3D model as part of the focus groups, the enthusiastic response of participants and the willingness of officials to share their views. The focus groups have already been reflected on in an earlier section (see chapter 4.3.3 pg49) but the community's enthusiasm was found everywhere that people were engaged with. From getting contacts and advice from Hout Bay residents in "The Valley" to informal chats with residents whilst on site visits to being invited to the morning's prayer session at Iziko Lobomi, all were welcoming and enthusiastic about the research. It was also greatly appreciated that top management officials in the Fire Department (Mr Layne) and Disaster Management (Mr Pillay & Mr Pluke) were willing to meet and made time in their busy schedules to discuss the pressing issues. Despite all the positives there were a number of challenges during the project and areas where further work is needed. The first, which has been spoken about previously, was understanding and managing the participants expectations during the focus groups. As an intermediary (Kenny Tokwe) was used to find willing participants it was essential that they were fully informed of the purposes of the research before signing the consent forms. The purpose was often reiterated during the focus groups, especially when the desire for formal housing was brought up, but thankfully once it had been explained the participants understood the focus and limitations of the research. Initially language barriers were also a concern as IY is a predominantly non-english first language community, but in each focus group there were thankfully enough participants who were fluent in english and who could translate. Time constraints proved to be the biggest limitation in terms of taking the research to the next level. With more time it may have been possible to compare and contrast two informal settlements to increase the community input and further workshop ideas. This would also have highlighted the site specific fire causes and aggravating factors (such as the steep slope in IY). There is nothing stopping this comparison happening after this research has been completed, though, and the results from a second and third settlement compared with the initial findings contained herein. Ideally the ideas proposed by the participants and further refined during this research would be taken back to the focus groups for feedback, comment and further refinement, using the community model once again. With these improved proposals, further community meetings would be needed to showcase the ideas to the community leadership and other residents before presenting them to Disaster Management and the Fire Department for feasibility assessment and, hopefully, implementation.

The following figures (6.16, 6.17, 6.18) show the proposed interventions mapped onto the P3DM model for review by the community participants and authorities. It is hoped that the model can be donated to a suitable NGO or the local fire department for further use in DRR in Imizamo Yethu.

Figure 6.16: Proposed interventions are spatially mapped on the P3DM model

Figure 6.17: Housing areas are shown in purple demarcations, proposed road in red thread, and point features such as info boards and fire marshals in yellow and green respectively

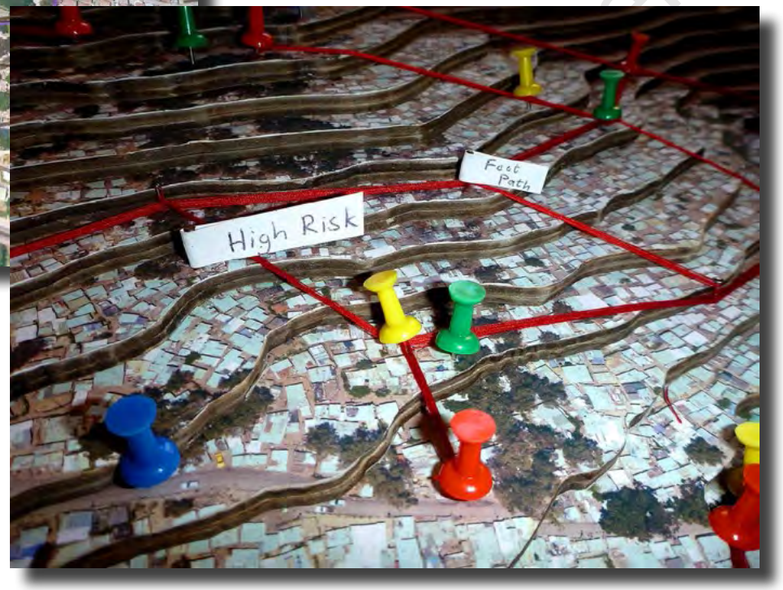


Figure 6.18: Labels provide further information as to specific risks and the type of interventions proposed

The research question upon which is this research is based is, "***How can the community of Imizamo Yethu's resilience to fires be improved through the use of a Community Based Disaster Risk Management approach?".*** The key finding from the research conducted was that communities at risk of disasters need to be as fully involved as possible in the process of planning for, dealing with and recovering from specific disasters. Imizamo Yethu's vulnerability to fires is affected by certain characteristics that are specific due to its location and by factors that are universal to all informal settlements. These specific risk factors need to be managed by implementing the interventions proposed by the community members and refined during the research, whilst the general factors need to be addressed at an organisational and policy level. It is at this level, by providing facilitation between communities, local leaders and the government bodies that planners and the planning profession as a whole has the ability to make a difference. A need is evident for spatial planning to be conducted for disaster risk reduction at the community scale (similarly to this research) and at the city wide scale to identify areas most at risk of disasters. What has emerged from the research, and which is most encouraging, is the willingness of community members and disaster management officials to work collaboratively. The understanding that grassroots involvement is essential for disaster risk reduction in informal settlements provides the basis for planning interventions.

It is unrealistic and impractical to think that a community's disaster risk can be managed to the point of zero disaster probability. This is the case in even the most well resourced, technologically advanced communities in first world countries as disasters are inherently unpredictable. What is possible, however, is Disaster Risk Reduction through engagement of community members in the Disaster Risk Management process and a grassroots, collaborative approach built on indigenous community knowledge and ideas. This community driven approach is the only way of achieving sustainable, needs orientated change in informal communities where each day is a livelihood struggle for residents and disasters form the breaking point for many.

Figure 6.19: Imizami Yethu faces a number of challenges but opportunities also exist for a community to be developed that is safe, integrated with the rest of Hout Bay with change driven by those living there

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7 - Appendices

The following appendices provide additional information as background to the research or provide more information than given in a section. They are:

- References
- Research Ethics Approval from UCT's Ethics Committee
- Consent form for speaking to Disaster Management Officials
- Consent Form: Mr Pillay
- Consent Form: Mr Pluke
- Questions used in the Community Focus Grouo
- Questions used in the Fire Fighters Focus Groups
- Fire Safety Information Pamphlets currently used by the Fire Department and Disaster Management.
- Press release for E-Khaya providing information about the project in Blue Downs.

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Research Ethics Approval

EBE Faculty: Assessment of Ethics in Research Projects (Rev2)

Any person planning to undertake research in the Faculty of Engineering and the Built Environment at the University of Cape Town is required to complete this form before collecting or analysing data. When completed it should be submitted to the supervisor (where applicable) and from there to the Head of Department. If any of the questions below have been answered YES, and the applicant is NOT a fourth year student, the Head should forward this form for approval by the Faculty EIR committee: submit to Ms Zulpha Geyer (Zulpha.Geyer@uct.ac.za; Chem Eng Building, Ph 021 650 4791). **NB: A copy of this signed form must be included with the thesis/dissertation/report when it is submitted for examination**

This form must only be completed once the most recent revision EBE EiR Handbook has been read.

Name of Principal Researcher/Student: **MATTHEW ROSENBERG** Department: **MCRP EBE**

Preferred email address of the applicant: matthewrosenbergems@gmail.com

If a Student: Degree: **MCRP** Supervisor: **Dr Nancy Odendaal**

If a Research Contract indicate source of funding/sponsorship:

Research Project Title: ***Increasing Community Resilience to Fire: A Community Based Disaster Risk Management approach in Imizamo Yethu.***

Overview of ethics issues in your research project:

Question 1: Is there a possibility that your research could cause harm to a third party (i.e. a person not involved in your project)?		NO
Question 2: Is your research making use of human subjects as sources of data? If your answer is YES, please complete Addendum 2.	YES	
Question 3: Does your research involve the participation of or provision of services to communities? If your answer is YES, please complete Addendum 3.	YES	
Question 4: If your research is sponsored, is there any potential for conflicts of interest? If your answer is YES, please complete Addendum 4.		NO

If you have answered YES to any of the above questions, please append a copy of your research proposal, as well as any interview schedules or questionnaires (Addendum 1) and please complete further addenda as appropriate. Ensure that you refer to the EiR Handbook to assist you in completing the documentation requirements for this form.

I hereby undertake to carry out my research in such a way that

- there is no apparent legal objection to the nature or the method of research; and
- the research will not compromise staff or students or the other responsibilities of the University;
- the stated objective will be achieved, and the findings will have a high degree of validity;
- limitations and alternative interpretations will be considered;
- the findings could be subject to peer review and publicly available; and
- I will comply with the conventions of copyright and avoid any practice that would constitute plagiarism.

Signed by:

	Full name and signature	Date
Principal Researcher/Student:	Matthew Rosenberg	18/06/2013
This application is approved by:		
Supervisor (if applicable):	Dr Nancy Odendaal	18 June 2013
HOD (or delegated nominee): *Final authority for all assessments with NO to all questions and for all undergraduate research.*		
Chair : Faculty EIR Committee For applicants other than undergraduate students who have answered YES to any of the above questions.		26/08/2013

DISASTER MANAGEMENT STUDENT RESEARCH

NAME: MATTHEW ROSENBERG

CONTACT NO: 083 658 3912
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ADDRESS: 46 1ST AVE, CLAREMONT, CAPE TOWN

INSTITUTION: UCT

DEGREE: Master of City and Regional Planning

FOCUS AREA: Fires in informal settlements in Cape Town

NAME OF THESIS/DISSERTATION Increasing community resilience to fire: A Community Based Disaster Risk Management approach in Imizamo Yethu.

PROMOTER/SUPERVISOR: Dr Nancy Odendaal

CONTACT NO: nancy.odendaal@uct.ac.za

LETTER OF CONFIRMATION

Please see attached proof of enrolment in the MCRP Course at UCT

* = Student requested to provide copy of thesis before publication/approval to ensure correctness.
Greg Pillay + Mark Pluke conducted interview with aforesaid student at DM HQ, Goodwood on Wed. 3 July 2013 at 11.00 – 12.30 a.m.

3/7/2013

03 July 2013

Interview: Informed Consent Form

UCT MCRP Dissertation

Researcher: Matthew Rosenberg
Contact: matthewrosenbergems@gmail.com, 083 658 3912
Title: *Increasing community resilience to fire: A Community Based Disaster Risk Management approach in Imizamo Yethu.*

Supervisor: Dr Nancy Odendaal, UCT MCRP Dept.
Contact: nancy.odendaal@uct.ac.za

I, the undersigned:

1. Agree to be interviewed for the above research
2. Understand the purpose of the research and have been given the opportunity to ask questions.
3. Understand I can withdraw at any time without giving reasons and that I will not be penalised for withdrawing nor will I be questioned on why I have withdrawn.
4. Agree that the use of the data in research, publications, sharing and archiving has been explained to me.
5. Select only one of the following:
   a. Would like my name used and understand what I have said or written as part of this study will be used in reports, publications and other research outputs so that anything I have contributed to this project can be recognised.
   b. Do not want my name used in this project.
6. Select only one of the following:
   a. I agree to the audio recording of this interview for research purposes (the recording will not be made public)
   b. I do not want this interview to be recorded

Participant: G J Illem Signature: _____ Place: Goodwood Date: 3 July 2013
Researcher: M Rosenberg Signature: _____ Place: Goodwood Date: 3/07/2013

Thank you

03 July 2013

Interview: Informed Consent Form

UCT MCRP Dissertation

Researcher: Matthew Rosenberg
Contact: matthewrosenbergems@gmail.com, 083 658 3912
Title: *Increasing community resilience to fire: A Community Based Disaster Risk Management approach in Imizamo Yethu.*

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6. Select only one of the following:
   a. I agree to the audio recording of this interview for research purposes (the recording will not be made public)
   b. I do not want this interview to be recorded

Participant: Mark Pluke Signature: _____ Place: Goodwood Date: 3/7/2013.
Researcher: M Rosenberg Signature: _____ Place: Goodwood Date: 3/07/2013.

Thank you

Focus Groups - Informed Consent

Focus Group 1

13 August 2013

Focus Group: Informed Consent Form

UCT Master of City and Regional Planning: Dissertation

Researcher: Matthew Rosenberg
Contact: matthewrosenbergems@gmail.com, 083 658 3912
Title: ***Increasing community resilience to fire: A Community Based Disaster Risk Management approach in Imizamo Yethu.***

Supervisor: Dr Nancy Odendaal, UCT MCRP Department
Contact: nancy.odendaal@uct.ac.za

This research focusses on fires in informal settlements and uses Imizamo Yethu, Hout Bay as a case study area. The research aims to investigate ways in which communities can be involved in preparing for and reacting to fires in their communities, thereby increasing their own resilience to fires.

These focus groups allow community members to discuss their experiences of fire in their community and to give their input on possible solutions or innovations which could increase their resilience. These focus group sessions aim to be interactive between the researcher and community participants. They will involve discussions regarding the research topic and the use of photographs and a physical 3D model of the settlement. The sessions will be recorded to ensure the accuracy the data, but the participation will be kept anonymous.

I, the undersigned:

1. Agree to be interviewed for the above research
2. Understand the purpose of the research and have been given the opportunity to ask questions.
3. May see the results of this research, once complete, by contacting the researcher.
4. Can withdraw at any time without giving reasons and that I will not be penalised for withdrawing nor will I be questioned on why I have withdrawn.
5. Understand that ideas communicated or discussed during the course of this research does not guarantee that these ideas will be implemented or taken further.
6. Agree that this interview/focus group will be audio recorded for research purposes but that my involvement will be kept anonymous. I will not be identified in any way during the writing of this research.
7. Will not be paid for this research

Participant: [redacted] Signature: [redacted] Place: Imizamo Yethu Date: 14/08/13
Researcher: M Rosenberg Signature: [signature] Place: IY Date: 14/08/13

Thank you

Resident Focus Groups

Have you personally been affected by a fire in the community?

- If so, can you tell us about it?
- Where was it?
- When was it?
- What caused it?
- What was the outcome?

Did the community fight the fire?

- How did they fight it?
- Did they work with the Fire Department?

What worsened the fire?

- Access issues, building materials etc

What limited the spread of the fire?

Is the community organised to fight a fire when it breaks out?

- How do you get help?

What makes it difficult for the Fire Dept to fight the fires?

- Spatial access? Densities? Use model as prompt.

What do you think would make a difference in fighting the fires?

How does the community prepare for a fire beforehand?

Is there any training provided or available to the community?

- Would you be interested in being trained in fire fighting to help your community?
- Any education?

Who assists the community after the fire?

Does it help using the model to visualise problems in the community?

- Is the model easier to use than the paper map?

Fire Department Focus Group

Have you personally fought fires in informal communities?

How are they different to other fires?

- Urban vs. Wildfire

What are some of the challenges facing you in fighting informal settlement fires?

- Generally?
- In IY specifically

Does the Fire Department engage in community interaction / training in preparation for fires?

Is there some level of interaction between community members and your team when fires break out?

- How do you feel the community views you?
- To what extent do you help or hinder each other?

Would it help you if the community knew some basic skills?

- Would you like to see community members volunteering when fires break out?

What would improve the fighting of fires in informal settlements?

- Institutionally?
- Resources?
- Social interaction?
- Spatial changes?

Does it help using the model to visualise problems in the community?

- Is the model easier to use than the paper map?

Would it help to have more technology available such as GIS maps of the area, accurately updated etc?

Existing Fire Safety Pamphlets

FIRE SAFETY CHECKLIST FOR YOUR WORKPLACE

Well managed and safe workplaces have fewer fires.

PREVENTING THE FIRE — GOOD HOUSEKEEPING PRACTICES	Yes	No
Does everybody keep their workplace tidy?	☐	☐
Is the workplace kept clear of combustible waste and rubbish on a daily basis?	☐	☐
Is waste put in a safe, secure place awaiting collection (ie. not accessible to the public)?	☐	☐
Is the burning of rubbish on the site prohibited?	☐	☐
In production areas, are benches, gratings, conveyer belts and similar places kept clear of dust and rubbish?	☐	☐
Likewise, are pipes, ducts, beams, trusses and electrical light fittings kept clean?	☐	☐
Are areas outside buildings kept clear of waste material & combustible items (ie. timber pallets, cardboard boxes, etc)?	☐	☐
ESCAPING FROM A FIRE		
Are all doors unlocked/openable from the inside during working hours?	☐	☐
Are all escape routes clearly marked with exit signs incorporating the 'running man' symbol and directional arrows?	☐	☐
Are all escape routes unobstructed both inside and out?	☐	☐
Are 'Fire Action' notices clearly displayed throughout the workplace?	☐	☐
Has a safe assembly point for employees, outside the building, been identified?	☐	☐
Do employees know what to do on discovering a fire or when the fire alarm sounds?	☐	☐
Are all employees instructed in fire procedures on a continual & regular basis?	☐	☐
Have Fire Marshalls/Teams been appointed and trained in their duties and are regular fire drills held?	☐	☐
FIRE DETECTION AND ALARM SYSTEMS		
Is there an automatic fire/smoke detection and alarm system?	☐	☐
Is the fire alarm tested and maintained on a regular basis?	☐	☐
Is there a procedure for contacting the Fire Brigade: - during the working day? - when the premises are closed?	☐ ☐	☐ ☐
Do all staff know the emergency 107 number?	☐	☐
Is the fire alarm system connected directly to the Fire Brigade?	☐	☐
Is the fire alarm system, and all its components, continuously monitored?	☐	☐
Does your fire alarm have a different tone than the burglar alarm?	☐	☐

FIRE AND LIFE SAFETY
HOME CHECKLIST

How safe is your home and family?

This fire and life safety checklist will help you identify potential hazards in your home. It also introduces good housekeeping practices that will significantly improve the fire safety of your home.

1. Answer the questions honestly
2. If you answered "NO" to any of the questions, take action before someone gets hurt.

For more information, contact your local fire station or our Fire and Life Safety Education Officers on (021) 703 3184 or email: *lifesafety@capetown.gov.za*.

LET'S WORK TOGETHER TO PROTECT THE ONES WE LOVE

e-khaya
see one do one teach one

SEEBO

abantu bathethile - people have spoken - mense het gepraat

Press release - 27 August 2013

Intolerable living conditions in Faure Informal Settlement, Blue Downs, are addressed by the community itself
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The community living at the Faure informal settlement in Blue Downs is estimated to number approximately 50. It came into being following the closure of the Blue Downs waste disposal site more than a decade ago, where most had both lived and derived an income. Some individuals say that they have lived on the greater waste-disposal site for more than 2 decades and that the current location was temporarily allocated to them by the Oostenberg Municipality until permanent housing could be arranged. The majority are unemployed or continue to scrape an existence through the collection and sale of waste.

Living conditions are dire. Shacks are dilapidated. The ground is visibly polluted and appears to be a still accessible extension of the adjacent waste site, now unused and surrounded by razor wire. There have been a number of shacks destroyed and injuries caused by recent fires and the presence of a high concentration of waste may be a factor in propagating these fires. The health of the inhabitants has been acknowledged by relevant authorities to be very poor. It is very apparent to the casual visitor that the majority have severe and chronic health problems. Due to the extremely polluted environment, many children are apparently now living with relatives elsewhere. Most inhabitants have no identity documents and can therefore not access grants, apply for employment or a housing subsidy - recent attempts to provide them with documentation have not as yet been successful. They are situated far from health and other services and cannot afford transport. Some toilet facilities have been provided but there is just a single functioning water tap. That fellow citizens of our city continue to live in such appalling circumstances and in some cases have done so for over 2 decades is an indictment on all. This is truly the epitome of a forgotten and disenfranchised community.

Forgotten but not helpless. With the assistance of SEEBO community trust and its director, Mr Raymond Mtati, they have started to dramatically improve their lot by 'thinking out-of-the-box'. SEEBO encouraged the idea that they could replace their shacks with something safer, insulated, dry and fireproof. Mr Mtati introduced the 'e-khaya Project' to them, which aims to help communities to rebuild their shacks with a fireproof, floodproof, insulated, quiet, attractive and durable, and cost effective small house, designed to be a transitional or interim solution until permanent housing is available. e-khaya managed to raise enough funding for the community to build 2 adjacent e-khaya units for 2 disabled and partially sighted of their members.

e-khaya homes have 3 features that are uniquely able to provide these qualities in a shack replacement situation

- a re-usable building jig or frame meaning that almost no building skills are required
- an arched, extremely strong, insulated, self supporting but low cost roof, that is easy and quick to make, and means the footprint of the home is doubled and can be used for income generating activities such as secure storage, food growing, rearing of chickens and sale of eggs, secure locating of solar panels for an internet cafe or a quiet homework centre etc.
- narrow sandbag walls that are thermally and acoustically insulating, durable, totally fireproof, inexpensive and easy to build

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The e-khaya initiative is designed to not only provide transitional homes, but to create micro-business opportunities, through upskilling township entrepreneurs to own and rent out building frames and their own expertise, instructing people on how to self-build their homes. Income can be derived from renting out the roof space which, subject to further research, may support a second living level. This will mean that the e-khaya can be self-funded, and paid for in as little as 3 years, with no requirement for donor funding or government housing subsidies. This is a radical departure from the current status quo.

The goal is a home that improves health, quality of life, comfort, security, education, whilst reducing living costs, environmental impact and social dysfunction and violence.

Not all residents in informal settlements across Cape Town will have such an urgent and deserving need for a solution to their current circumstances as those of Faure. But there will be many who do. And the ripples of what is learned together with the people of this forgotten Blue Downs waste site will travel across our city and beyond.

Construction by the community of the first joint SEEBO / e-khaya home commenced on Monday 20 May 2013 at the above GPS location, on the Old Faure Road. Sandbags were filled on the Monday, the re-usable frame was erected on Tuesday morning, and the sandbag walls for the entire 28m^2 home were in place by Thursday afternoon. Unfortunately, the project was threatened with demolition by the Department of Human Settlements on the Friday, and it has taken over 2 months and intervention by the Premier to resolve this.

This project has raised a lot of questions around what shack-dwellers in informal settlements are permitted to do to improve their own living conditions. Some of these relate to land tenure, the definition of temporary v. permanent structures, types of materials that may be used, among other issues. The reality is that there are currently not many options to make a *quantum leap* in improving living conditions in informal settlements, at a cost that is realistic and that can perhaps even be self-financed. Various proposals have been put forward for *small incremental* improvements to shacks, but even these carry a high cost/benefit ratio.

The SEEBO / e-khaya shack replacement project is a radical departure from the current situation of *shack or RDP house and nothing 'in-between'*. It aims to address the urgent and critical social crisis of urban slums, by empowering people to help themselves to improve their own living circumstances in the communities in which they currently live. It is morally unacceptable that people are prevented from doing so.

And to guage community acceptance of this type of home and construction, one only has to see and hear the reaction of passersby to the e-khaya exhibit, at the OpenDesign expo at the Cape Town City Hall until Tuesday 2 August, located in the shadow of Madiba's famous balcony. Not "When is the government going to give me one?" But "Fireproof and so solid. And as little as R10 000. I paid that for my wendy-house which burned down a year later. Where can *I buy* an e-khaya?" Now, *that's* a mindshift of note!

Madiba said in 1996 "The majority of the urban population live in appalling conditions far from their places of work". SEEBO and e-khaya are striving together to change that.

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CnDV Proposals for Housing & Community Development in IY

Figure 5.1 Development Concept / Proposal