

A Risk-Based Methodology to Assess Social Vulnerability in the Context of Water Infrastructure

Report to the
Water Research Commission

by

Rowena Hay, Paula Hay, Andiswa Mlisa, Dylan Blake, Sheila Imrie and Karen Goldberg
of
Umvoto Africa

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Water Research Commission
Private Bag X03
Gezina, 0031

orders@wrc.org.za or download from www.wrc.org.za

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EXECUTIVE SUMMARY

Through case study investigation in Cala, Kayamandi and Wonderfonteinspruit this study aims to develop methodology for analysis of social vulnerability and resilience to natural and man-made hazards in relation to potable water supply.

Intensive efforts to mainstream Disaster Risk Reduction into development have been underway, internationally, since 2005. These efforts arose from the Hyogo Framework of Action (HFA) 2005-2015, which is a ten-year plan to substantially reduce losses following disaster and to improve upon coping capacity before, during and following hazard or disaster. It was adopted at the World Conference on Disaster Reduction in Kobe, Hyogo, Japan (18 to 22 January 2005) to which South Africa is a signatory.

The focus of this study is a meeting between Water Resource Management (WRM) and Disaster Risk Reduction (DRR) at the local level. The first aim of the study was to propose a straightforward methodology for understanding vulnerability and resilience to hazards that negatively impact the supply of potable water at the community-level. The second aim was to identify opportunities to mainstream DRR into aspects of water services, thereby improving the sustainability of all water service provision and increasing the resilience of communities to water-related hazards.

METHODOLOGY

During case study research and development of the methodology for Risk Assessment at a community level, problems were identified regarding the lack of proactive risk reduction approaches in relation to water infrastructure.

In relation to these problems the team developed a method for incorporating a risk management approach for implementation of water infrastructure. This approach provides the context and roadmap for Water Service Authorities (WSAs) to integrate a human element that contributes to lessening risk in all aspects of water services delivery. This includes conception, planning, financing, implementation, monitoring, evaluation, operations and maintenance of operations. It identifies gaps within existing approaches and adds value by applying a “risk” as opposed to a “service delivery” lens.

The result is a conceptual framework for action to integrate risk management into water service delivery operations and maintenance, with an emphasis on the psycho-social-political dimensions. The study explored:

- Methods and metrics for analysing social vulnerability in a data scarce environment;*
- The interaction between risk, service delivery, and community expectations;*
- The nexus between water resource management and DRR;*
- How people respond to water-related hazards; and*
- How water and water-related infrastructure is used.*

Measurement of vulnerability and risk at a local scale is paradoxically an important tool for improving understanding of the capacity of communities to overcome disasters. Working towards improving this understanding, a community level risk index was developed through the identification of indicators for Social Vulnerability (SV) and Coping Capacity (CC). Social Vulnerability indicators illustrate variation in the preparedness and response capacities of different communities and use various socio-economic variables, such as community level of education and dependency ratio. The CC indicators encompass aspects of infrastructural and institutional preparedness, for example Early Warning (EW) and Disaster Management.

The concepts of SV and CC are contained in the mathematical expression for Risk used by the UN/ISDR in the Hyogo Framework for Action (HFA) (UN/ISDR, 2005):

$$R = H \times (V/C)$$

where,

R = the level of **Risk** impact from a particular Hazard event in a particular area

H = the probability for the **Hazard** event occurring

V = **Vulnerability** of receiving environment and people

C = **Coping Capacity** of receiving community

In the study, these Risk Assessment components are calculated in the following way:

- Evaluate the probability of each selected Hazard event occurring in each study domain (*H*);
- Develop Key Outcomes (KO) based on the HFA Priorities for Action adapted to community-level risk assessment;
- Develop Statements of Intent as goals to achieve the KOs;
- Select a comprehensive set of indicators to measure the achievement of these goals;
- Score each vulnerability and coping capacity indicator (*V* and *C*); and
- Calculate the Risk Index using the equation $R = H \times (V/C)$ and prepare a Risk Map.

Risk Assessment components included:

1. Hazard identification and hazard assessment, based on likelihood and impact of a hazard occurring at a particular location.
2. Development of Key Outcomes (KO) that contribute to Disaster Risk Reduction (through decreasing Vulnerability and/or increasing Coping Capacity of a particular community). This is also based on the HFA Priorities for Action, but adapted to community-level risk assessment with the SLF in mind. These are:
 - a. KO1: Assess Vulnerability to Hazards
 - b. KO2: Reduce Vulnerability through Infrastructure
 - c. KO3: Reduce Vulnerability and Increase Coping Capacity through Social Elements
 - d. KO4: Improve Communication
3. Statements of Intent developed as important goals to realise the Key Outcomes. These Statements of Intent can vary depending on the social, physical, political and economic context of a community.
4. Selection of a comprehensive set of possible Indicators for measuring the achievement of the individual goals within each Statement of Intent.
5. Scoring system for evaluating the data of each Vulnerability and Coping Capacity Indicator.
6. Final calculation of a Risk Index, and further application through Risk Mapping.
7. Review and analysis of results as required.

In this study we focussed on the intersection between water resource infrastructure and management and DRR. Vulnerability at the community level was examined in the context of

hazards that have a negative impact on the quality of, or access to, water services. Water related hazards could be natural (e.g. floods, droughts, storms) or induced by human processes (e.g. pollution, climate change, dewatering of aquifers, mismanagement of water resources and water-related infrastructure, leading to long term degradation of supply in terms of both quality and quantity, amongst other consequences).

FINDINGS

The Risk-Based Approach was applied to three case study areas, namely the rural town of Cala and selected surrounding villages in the Eastern Cape, the township of Kayamandi in the Western Cape and the mining town of Carletonville in the Wonderfontein spruit catchment in Gauteng. Data collection and desktop research was conducted for each case study. Case study fieldwork was conducted in Cala and nearby Tsengiwe village, and Kayamandi.

Cala is a rural town and settlement situated approximately 100 km west of Umtata in the Eastern Cape province of South Africa. It has a temperate inland climate. The Tsomo River runs through the area just to the west of the town. Seasonal water scarcity and drought, a lack of water services, food security issues and social problems are experienced in Cala. Ineffective governance by local and regional leaders and limited service delivery in general also contribute to the problems experienced by the community. One of the main key issues identified by the local municipality is the dispersed settlement pattern of developed centres surrounded by scattered, underdeveloped rural villages, which makes providing access to basic infrastructure and services more costly, resulting in fragmented development. Many people in the area live in poverty as a result of the high illiteracy (90%) and unemployment (80%) rates. This has led to many social problems including crime (such as theft, murder and rape), drug abuse, alcoholism, youth suicide, gender inequality and the rapid spread of HIV/AIDS. The Cala area was selected as a case study because of the presence of the Masiphile Project, which is a community and church supported, multi-disciplinary social upliftment project. The project was founded by community member Nomfundo Lily-Rose Mlisa, a former nurse and trained clinical psychologist who is currently the Director of Counselling Services at Fort Hare University and a church leader in Tsengiwe Village. The project is currently run by a small group of women from Tsengiwe Village, overseen by Nomfundo Lily-Rose Mlisa. The project focuses on the support and upliftment of people infected and affected by HIV/AIDS (Mlisa, 2009).

During the study, the Cala community was found to have little initiative for income generation, little drought preparation (focusing mainly on quick onset disasters), and minimal municipal coordination and a lack of strong leadership. However the community also has solid community-based organizations with multi-pronged and coordinated activities which increase the coping capacity of the community.

Kayamandi is an informal settlement on the banks of the Plankenburg River on the outskirts of Stellenbosch in the Western Cape Province. The population is approximately 22 000 with a large percentage living below the poverty line. Water sampling along the Plankenburg River, in the vicinity of Kayamandi, have shown greatly elevated levels of *E. coli* Streptococcus, Staphylococcus and Enterobacter bacteria that cause serious disease and illness in both humans and animals. The majority of the community of Kayamandi have impaired immune systems, and there is a high prevalence of tuberculosis and HIV/AIDS. Contact crimes such as murder, rape, assaults and robberies are prevalent.

During the study it was found that Kayamandi suffers from poor service delivery and service maintenance coupled with a lack of respect for infrastructure. Women are vulnerable to violence and rape and primary education enrolment is low. Kayamandi high school provides a high standard of education and has relatively high pass rates but few students go into tertiary education. There are many NGOs in Kayamandi with a diverse focus, however their

activities are uncoordinated and the benefits not significant to the overall risk faced by Kayamandi residents.

The Wonderfonteinspruit Catchment Area (WCA) forms the eastern catchment of the Mooi River, and straddles both the Gauteng (upper catchment) and North West (lower catchment) provinces over a distance of approximately 100 km. Approximately 400,000 people live within the WCA, with the Wonderfonteinspruit passing many towns, formal townships and informal settlements. A large percentage of these towns and settlements are related to mining activities within the catchment. Rand Water supplies most of the towns with domestic water. Carletonville lies within the WCA and is the largest gold-mining complex in South Africa, employing approximately 75 000 workers. Carletonville was selected as the urban centre of an LM which is representative of the challenges and hazards faced in the WCA. Gold mining in the WCA affects water resources in two ways, namely water availability (quantity hazard) and water pollution (quality hazard). The HIV infection rates in the Wonderfonteinspruit area are among the highest in the world. There are also high rates of tuberculosis and other sexually transmitted diseases. Poor water and sanitation service delivery in the area compound the vulnerability.

The study revealed an extreme lack of data and monitoring information from the Department of Water Affairs on the Wonderfonteinspruit, there is little to no data available regarding exposed populations, and the data for formal areas tends to hide the risks faced by informal areas. Poor communities such as Khutsong Township are vulnerable to mining-related pollution and sinkholes.

The case study research informed the selection of a list of indicators and associated scoring system, based on available data and relevant contextual information. Individual scores were calculated, and averaged (with weighting) across the indicators. Scores were calculated per main hazard and per case study for hazard risk, vulnerability and coping capacity. These were subsequently input to the Risk Index Equation. The final scores could range in value from 0.1 (very low risk) to 25+ (very high risk). The final results of the risk index scoring for the case studies are presented in **Table 1** below.

Table 1 Summary Results of Risk Assessment for priority hazard in each case study

Hazard				Risk Index
	Hazard Score	Vulnerability Score	Coping Capacity Score	H X (V/C)
Drought (Cala)	4	3.9	0.8	19.5
Biological (Kayamandi)	5	3.6	0.7	24
Technological (Carletonville)	5	3.6	0.4	44

The concepts of the methodology were also applied, using Expert Risk Assessment at Local Municipality (LM) level in the Western Cape, to prepare a risk map, based on the results of the Department of Water Affairs (DWA) study "Development of Reconciliation Strategies for selected Towns in the Southern Planning Region" (July 2008-30 June 2011) currently nearing completion (DWA, 2010a, b).

During the case study research and the development of the methodology for Risk Assessment at community level, problems were identified regarding the lack of proactive risk reduction approaches in relation to water infrastructure. Some of the issues identified included:

- Lack of vision for long-term sustainability and relationship to Disaster Risk Reduction;
- Public participation is a case of ticking boxes;

- *The funding system and cycle supports new infrastructure rather than the maintenance and operation of existing infrastructure; and*
- *General institutional failure and a lack responsibility as long as Key Performance Areas (KPA) can be seen to be met.*

An SV index, using the approach developed, can help local decision-makers and policy implementers to improve DRR and resilience at the community level by considering the social, as well as the built and natural environment.

*The team has also developed an approach, expanded in **Section 5**, for incorporating a risk management approach into implementation of water infrastructure. The approach provides the context and roadmap for Water Service Authorities (WSAs) to integrate the human element that contributes to increased risk into all aspects of water services delivery: from conception, planning, financing and implementation, monitoring and evaluation to operations and maintenance. It picks up on gaps in existing approaches and adds value by applying a “risk” as opposed to “service delivery” lens.*

It proposes a multidisciplinary and collaborative way to mitigate risks and maximize opportunity in the water services sector, building on the HFA and the municipal processes for planning, implementing and funding infrastructure projects. It draws on the principles and practice of cooperative governance and community participation outlined in relevant legislation and the best practice of constructive dialogue and adaptive management established in the water sector.

The result is a conceptual framework for action for integrating risk management into water service delivery operations and maintenance, with an emphasis on the psycho-social-political dimensions.

CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations of the study are summarised as follows:

- *During future studies, the risk assessment methodology should be disaggregated to groups within sub areas of a community, e.g. gender and age specific groups/data within formal and informal settlements within Kayamandi. These can be defined after initial data survey and field work. Thereafter indicator definition and selection to best reflect the complex realities on the ground (i.e. establish a conceptual model of this reality indicating variations in and between sub groups/genders) to establish whether further field work, data collection at village and or household level and scoring approach is decided upon. Careful note of power and rank relationships, levels of competence and adequacy of governance in institutional layers within communities and groups are important when defining indicators that reflect the efficacy of these and can evaluate increase in coping capacity from grass roots levels up. Furthermore, regular application of monitoring and evaluation using the risk assessment methodology developed in this study is required in order to help us realise our goals, and tells us, as unequivocally as is possible, whether we have realised them.*
- *The application of the risk management approach to the implementation of water infrastructure (as outlined in Section 5) should be piloted in order to develop rigorous guidelines and facilitate mainstreaming of psycho-socio-political risk into water infrastructure development, operations and maintenance.*
- *Prepare a Tool Box to support the guidelines and training of WSA/WSP project managers in risk reduction approaches and participatory local government using guidelines and Tool Box.*

- *Mainstreaming DRR into water infrastructure development, operations and maintenance in rural and informal areas within the context of climate change.*
- *Development of Guidelines for other target audiences, including community leaders, councillors and politicians.*
- *Development of education material aimed at community level to educate and build awareness on water demand management, water and health related matters as well social vulnerability and what communities can do for themselves to improve coping capacity in relation to hazards related to water and its infrastructure. Such material needs also to be less generic and more relevant to the circumstances of the communities.*

The deliverables produced in this study included an article submitted for the July/August 2012 Water Wheel and a final report (this document), containing:

- *Methodology for measuring risk at the community level;*
- *Application of method on selected case studies;*
- *Risk maps at the LM scale for the Western Cape;*
- *Conceptual Approach to Mainstreaming Risk Management into Water Services.*

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<i>Mr J Bhagwan</i>	Water Research Commission
<i>Ms D. Cousins</i>	Cape Peninsula University of Technology, CWSS Unit
<i>Mr T Gounden</i>	eThekweni Municipality: Water and Sanitation Department
<i>Mr K Winter</i>	University of Cape Town
<i>Ms J Wilson</i>	Environmental Monitoring Group (EMG)
<i>Ms B Tapela</i>	African Centre for Water Research (ACWR)
<i>Dr E Louw</i>	Aurecon
<i>Ms J Goldin</i>	University of Western Cape, IWRM Unit
<i>Mr V Munnik</i>	Mvula Trust

The project team comprised

<i>Rowena Hay</i>	Umvoto Africa
<i>Paula Hay</i>	Umvoto Africa/MA Student, UCT, RSA
<i>Andiswa Mlisa</i>	Umvoto Africa
<i>Dylan Blake</i>	Umvoto Africa
<i>Sheila Imrie</i>	Umvoto Africa
<i>Nwabisa Beba</i>	Umvoto Africa
<i>Erin Bosenberg</i>	Umvoto Africa
<i>Karen Goldberg</i>	MSc Student, Cambridge, UK
<i>Winston Harris</i>	MA Student, UWC, RSA

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LIST OF ABBREVIATIONS

AMD	Acid Mine Drainage
CBI	Community-Based Index
CBO	Community-Based Organisation
CC	Coping Capacity
DM	District Municipality
DRI	Disaster Risk Index
DRR	Disaster Risk Reduction
DWA	Department of Water Affairs
DWI	Drinking Water Inspectorate
EIA	Environmental Impact Assessment
EW	Early Warning
GDP	Gross Domestic Product
GIS	Geographic Information System
GNP	Gross Domestic Product
HFA	Hyogo Framework for Action
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
IDP	Integrated Development Plans
ISDR	International Strategy for Disaster Reduction
ISP	Internal Strategic Perspectives
IWRM	Integrated Water Resource Management
KPA	Key Performance Area
KO	Key Outcome
LDI	Local Disaster Index
LM	Local Municipality
NDMC	National Disaster Management Centre
NWRP	National Water Resource Planning
NWRS	National Water Resource Strategy
O&M	Operations and Maintenance
RA	Risk Assessment
RDM	Resource Directed Measures
RMI	Risk Management Index
SLF	Sustainable Livelihoods Framework
SMME	Small Medium Micro Enterprise
SV	Social Vulnerability
UK	United Kingdom
UN	United Nations
WCA	Wonderfonteinspruit Catchment Area
WCDM	Water Conservation and Demand Management
WfGD	Water for Growth and Development
WSDP	Water Services Development Plans
WRM	Water Resource Management
WSA	Water Services Act/Water Service Authority
WSP	Water Services Provider
WUA	Water User Association
WTW	Water treatment Works
WWTW	Waste Water Treatment Works

1 INTRODUCTION

“Development may cause disaster risk; development may reduce disaster risk and disaster may limit development.”

~ World Conference on Disaster Reduction (2004).

1.1 AIMS AND OBJECTIVES OF THE STUDY

The study aims to establish the dynamic interaction between risk perception/assessment, expectations/aspirations for services delivery, and actual services delivery in three selected case studies. It has two main aims:

- 1) to propose a straightforward methodology for understanding vulnerability and resilience to hazards that negatively impact the supply of potable water at the community-level;
- 2) to identify opportunities to mainstream DRR into aspects of water services, thereby improving the sustainability of all water service provision and increasing the resilience of communities to water-related hazards.

The data available for these case studies will be evaluated with respect to:

- Methods and metrics for analysing social vulnerability in a data scarce environment;
- The interaction between risk, service delivery, and community expectations;
- The nexus between water resource management and DRR;
- How people respond to water-related hazards;
- How water and water-related infrastructure is used;
- Expectations, needs and behaviour of communities and how they are supported/limited by water services, its operation and maintenance and risk management in relation to existing or emerging hazards.

Study objectives include:

- Development of a method and metrics for analysing social vulnerability and resilience to selected natural and man-made hazards that negatively impact the assured supply of potable water at community level;
- Application of the method on each three selected case studies (Cala, Kayamandi, and Wonderfonteinspruit);
- Use of the method to map Risk at a District Municipality scale for the Western Cape Province; and
- Development of an approach that aims to improve the implementation of water infrastructure projects and increase the resilience of vulnerable populations to failure in water services delivery.

This study was part of a wider analysis of issues related to water and society with an emphasis on a social perspective in water research. This report should be read in conjunction with the WRC Project K5/1940//3 entitled Social Water Scarcity and Water Use (ACWR, 2011).

1.2 CONCEPTS AND DEFINITION

The WRC research strategy for the impact area by Munnik and Wilson (2009) aims to understand the social aspects of water related to social transformation in line with the delivery of water services and sustainable development, addressing climate change, poverty, participation, and HIV/AIDS as contextual realities. Ultimately sustainable development cannot be achieved without Disaster Risk Reduction (DRR) being mainstreamed into different sectors such as water and health, and incorporated in a way that takes into account the risk posed by social and individual behaviours as well as natural and man-made hazards to infrastructure and to people.

It is generally accepted among environmental geographers that there is no such thing as a natural disaster (Smith, 2006). Disasters are defined by the impact on human beings and the environment (built or natural) that they depend on. The impact of a disaster is largely constrained by exposure to a specific hazard and people's ability to overcome the impact of that hazard. Thus, aside from the probability of a natural hazard occurring and the severity or otherwise of this impact on the built (including water infrastructure) and natural environment, the impact on people and communities depends on their vulnerability in relation to the hazard and as well as their resilience (i.e. coping capacity) to deal with the impacts of the hazard.

The UN/ISDR (2005) have defined vulnerability as the conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the negative impacts of natural events. In global environmental change discourse, vulnerability not only incorporates susceptibility and coping capacity, but also adaptive capacity (or resilience) and interaction with stresses; vulnerability is the differential exposure of individuals and social groups to stresses experienced or anticipated by different people (Nygatan, 2005). A summary of various definitions of vulnerability, the associated conceptual approaches and ways to measure vulnerability are summarized in Appendix 1. For the purpose of our study we have used the term *Social Vulnerability* (SV). According to Johnson (2006), *"Social vulnerability is a fluid concept, which denotes a population or sub-population's ability to mitigate risk. It is neither static nor uni-directional. A population that is highly vulnerable to one risk may be less vulnerable to another, depending upon its resources, perception of risk, and agency."* See Section 2.2 for further details on social vulnerability.

"The definition of vulnerability shifts across disciplines and research areas. It is used to describe anything from risk that is the probability of an event occurring, to serving as a proxy for socio-economic status."

~ Johnson, 2006

Differential vulnerability, the approach used by Blaikie and Nygatan stipulate that not all individuals and groups exposed to a hazard are equally vulnerable. Vulnerability to a hazard depends on the system traits, livelihood assets and coping capacity of those affected (Wu *et al.*, 2002 and Nygatan, 2005). This definition is based on the idea that vulnerability is a social condition; it measures differential social resilience to hazards.

Capacities may be considered separately to vulnerability in that a group's capacities may be dependent on a particular group or social organization while vulnerabilities are based mainly on individual and household features rather than socially determined characteristics. On a community level, however, those mechanisms, or a lack of them, can also indicate the general vulnerability of a community.

These concepts are integrated into the mathematical expression of Risk used by the UN/ISDR (2005):

$$R = H \times (V/C)$$

where,

R = the level of **R**isk impact from a particular Hazard event in a particular area

H = the probability for the **H**azard event occurring

V = **V**ulnerability of receiving environment and people

C = **C**oping **C**apacity of receiving community

Risk is a measure of the impact of a particular hazard or event occurring, whether the event is natural or man-made. Hazard potential is limited or increased by geographic situation as well as the social and institutional characteristics (social fabric) of a place that influence mitigation strategies and societal resilience to a hazard (Cutter *et al*, 2003). This social fabric comprises the inherent vulnerability of the environment as well as that of the society and the economy, mitigated by the resilience of the affected community.

The Risk equation illustrates why, to lessen the impact of disasters, there is a need to reduce vulnerability and increase community resilience with improvements in the social conditions and living standards (Cutter, 2007). The challenge to do so effectively lies in understanding what comprises vulnerability and how to build resilience.

- Disaster Risk Reduction and Disaster Management refer to how societies both prepare for and absorb events perceived as hazards or threats, and how they can best reconstruct afterward. Disaster Management encompasses all aspects of planning for and responding to disasters, including both pre-and post-disaster activities. It is an overarching process that encompasses the socio-cultural, economic, political, and environmental policies and practices necessary for development and DRR. Disaster Risk Reduction focuses on what activities can be undertaken before a disaster strikes by better understanding the risks a community faces and how to minimize the potential impact of those risks. It also aims to avoid past problems by building back and improving upon systems/infrastructure following a disaster.
- The measurement of vulnerability and risk at a local scale is an important tool for identifying the capacities of communities to overcome disasters. Vulnerability analysis recognizes and identifies vulnerability as well as the positive coping capabilities of an individual/group to survive and recover from a hazard impact of a given severity. In this study, vulnerability was defined in terms of location (for example, physical geography, environmental attributes and degradation, socio-economic status (generally captured by GDP), demographic factors, and the socio-cultural aspects of the population, social networks, and political environment (Johnson, 2006).
- The relationship between coping capacity, social vulnerability and biophysical risk was unpacked through adaptation of the DRR Priorities for Action as detailed in the HFA for specific use in the water services sector at the community level.

In this study, water infrastructure broadly encompasses water resources, services, supply, and institutional capacity with regards to water management and service provision. Water resources are sources of water that are useful or potentially useful for agricultural, industrial, household, recreational and environmental activities. According to the National Water Act, 1998, water resource includes a watercourse, surface water, estuary, or aquifer. Water services refer to the provision of services ranging from potable water, waste water disposal, and treatment of effluent.

1.3 STRUCTURE OF THIS REPORT

This report presents the deliverables and outcomes relating to the objectives listed above. It is recommended that the report is read together with supporting material in the appendices as outlined in Table 1-1 below.

Table 1-1: Sections of the report, cross-referenced with the Appendices

Sections	Sub-sections	Appendix Number	Appendix Details
Section 1 & 2 Supporting Frameworks		1	Summary table of conceptual approaches, definitions and assessment tools of Social Vulnerability
		2 (A-C)	Summary information about the Hyogo Framework of Action (UN/ISDR, 2005)
		3 (A, B)	Reconciliation of Requirements for and availability of water
Section 3 Risk Assessment Methodology		4 (A-D)	Disaster Risk Reduction and Social Protection measures for water related Hazards at the International, National and Provincial level and in the Eastern Cape, Western Cape, and Gauteng.
		5	Comprehensive list of Key Outcomes, Statements of Intent, Indicators, and Data
Section 4 Application of Methodology to Case Studies and Findings	Sections 4.2.1-4.2.3: (Identify and describe assessment area; identify and assess hazard(s); collect data)	6 (A-C)	Cala case study: overview, data collection and availability, and source details
		7 (A-C)	Kayamandi case study: results, data collection: contacts made and summary of data availability
		8 (A-C)	Wonderfonteinspruit case study: results, data collection: contacts made and summary of data availability
		9	Data collection: telephone and email correspondence
	Sections 4.2.4-4.2.6 (Select and score final indicators; apply the Risk Equation)	10 (A-C)	Criteria for Scoring Social Vulnerability and Coping Capacity using the Statements of Intent in Key Outcomes 1-3
		11 (A-C)	Sources of scoring: international and national targets, Blue and Green Drop requirements
Section 5 Conceptual Approach to Mainstreaming Risk Management into Water Infrastructure			
Section 6 Conclusions and Recommendations			

2 BACKGROUND LITERATURE REVIEW

2.1 WATER SITUATION ASSESSMENT

The National Water Resource Strategy (NWRS) gives an overall indication of the country's resources. By 2025 the situation deteriorates unless interventions are successful. A brief overview of the current water resource situation analysis is relevant, as is a summary assessment of those factors that could negatively impact the secure supply of potable water to all South Africans. It contextualises a more detailed summary literature review on social vulnerability and approaches to quantifying it given in section 2.2 (presented in the Inception report of this study and in Appendix 1). Lack of water of a suitable quality clearly impacts on the quality of life at individual, household and community level.

2.1.1 Water Resource Situation Analysis

Van Rooyen and Versfeld (2009) describe the roles of water in the Department of Water Affairs (DWA) National Water Resources Planning (NWRP) document (Report No: P RSA 000/00/7809) titled "Strategic Planning for Water Resources in South Africa: A Situation Analysis", as important in:

- Providing for domestic and social needs
- Supporting the development that will bring about economic growth,
- Maintaining the environment (with domestic and social objectives), and
- Improving overall quality of life

South Africa's water resources are scarce and limited in extent simply because it is a semi-arid country with an average rainfall of about 860mm/year (National Water Resource Strategy (NWRS), 2004). Water scarcity is also looming for a number of social, historical and political reasons (Herold, 2009). The National Water Resource Strategy (NWRS, 2004) stated that measures would be introduced to ensure the most beneficial social and economic utilisation of water in the country. This would include the "re-allocation of some water from low-benefit uses to higher benefit uses over time."

The water balance (reconciliation between supply and demand) paints a grave picture with many WMAs being in water deficit in 2000 already, and more projected to be in deficit by 2025. The water requirements for year 2000 are shown in Figure 2-1 below. The total available yield per WMA is given in the tables for the year 2000 (see Appendix 3a) and projected to 2025 (see Appendix 3b). The information is based on both surface water and groundwater resources, and takes into account the Reserve (NWRS, 2004). Groundwater could play a pivotal role for rural water supplies in the country, but the widespread exploitation and use of the resource has historically been limited, hampered by the widely held view that "few major groundwater aquifers exist that can be utilised on a large scale", a view also noted in the NWRS (2004). This view is now changing but local government and community resistance remains a factor that diminishes their resilience and access to sustainable water supply.

Both Herold (2009) and Turton (2009) have referred to the current 'water crisis' facing South African water resources, remarking that action to overcome it is somewhat slow or non-effective. Van Rooyen and Versfeld (2009) identify "immediate actions" that are necessary to "stave off imminent shortages" of water and suggest that the "concerted implementation of water conservation and demand management (WCDM) measures" are a priority action, along with the need to ensure that long term water *supply* interventions are implemented to meet the demands of the major metropolitan areas and other fast growing development centres in South Africa. The challenge is to realise that this may be more demanding and require more social discipline than society has been able to muster to date.

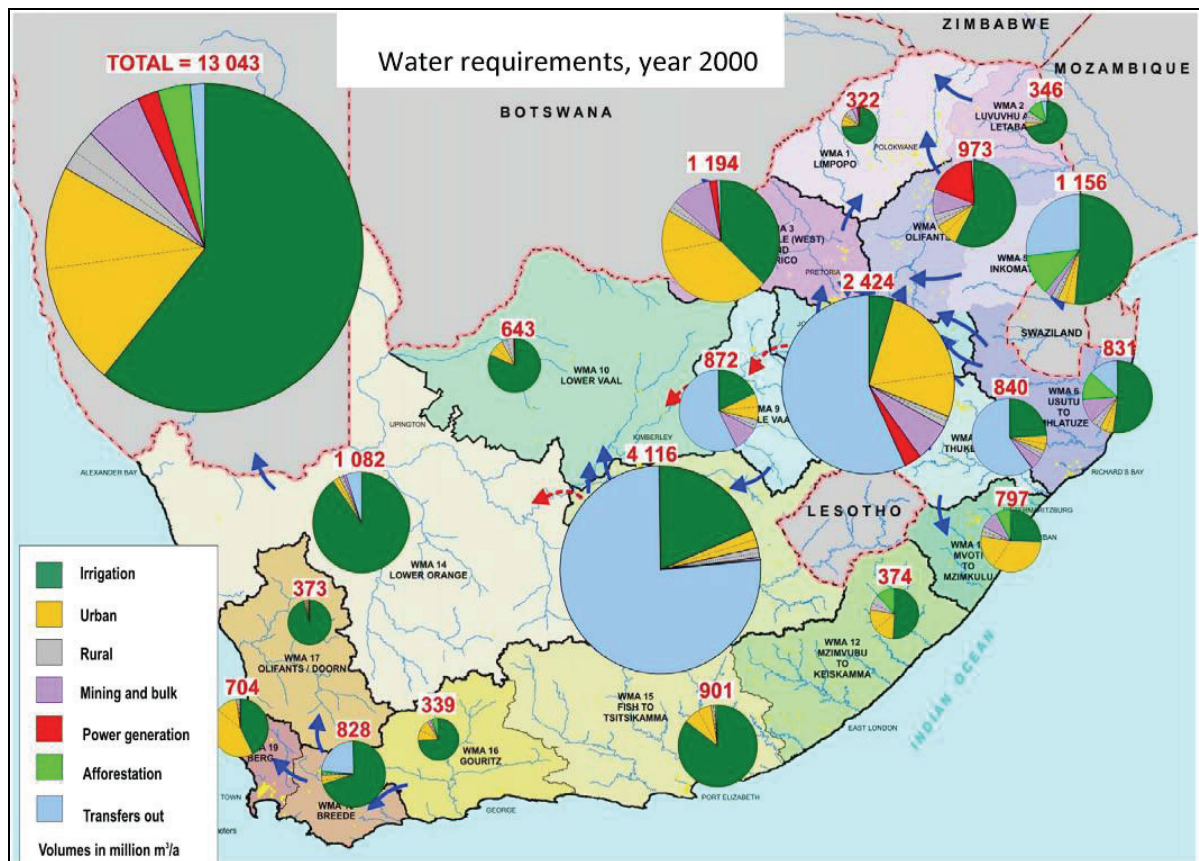


Figure 2-1: Water requirements for year 2000 per Water Management Area (Van Rooyen and Versfeld, 2009)

The looming deficit (mismatch between supply and demand) in the Vaal and Mgeni River Systems are illustrated in Figure 2-2 and Figure 2-3 respectively. As C. E. Herold eloquently states in the Des Midgley Memorial Lecture (2009), the looming deficit in the Vaal River System and the long deficit in the Mgeni River System arises as much because of “failure to achieve the demand savings,” which underpinned the original planning, as it does due to the time taken to bring large schemes on line. The failure to achieve water conservation and demand targets is particularly illustrated in Figure 2-2.

The water demand in the Vaal River System was based on achieving a 15% saving in raw water demand, which has not yet been realised, but will have to be very soon because current figures predict a shortfall by 2013 (Herold, 2009). A shortage of water in this region, responsible for supporting half of the Gross National Product (GNP) of the country, will have significant economic impact throughout the country from the national to household level. The situation will be the test case for the view that “water is not the resource that drives development, but the resource that provides for the needs of development.” (Van Rooyen and Versfeld (2009)).

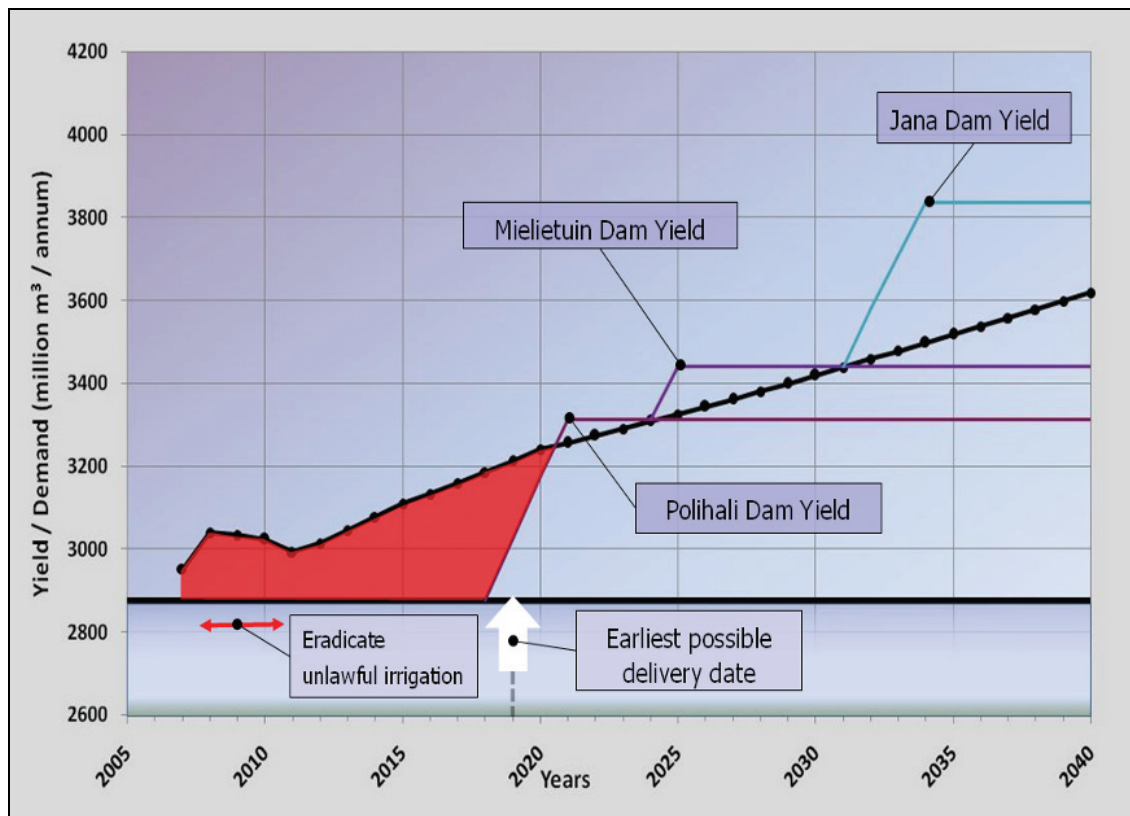


Figure 2-2: Consequences of not achieving demand reduction in the Vaal River System (information provided by DWA, January 2009, quoted in Herold, 2009)

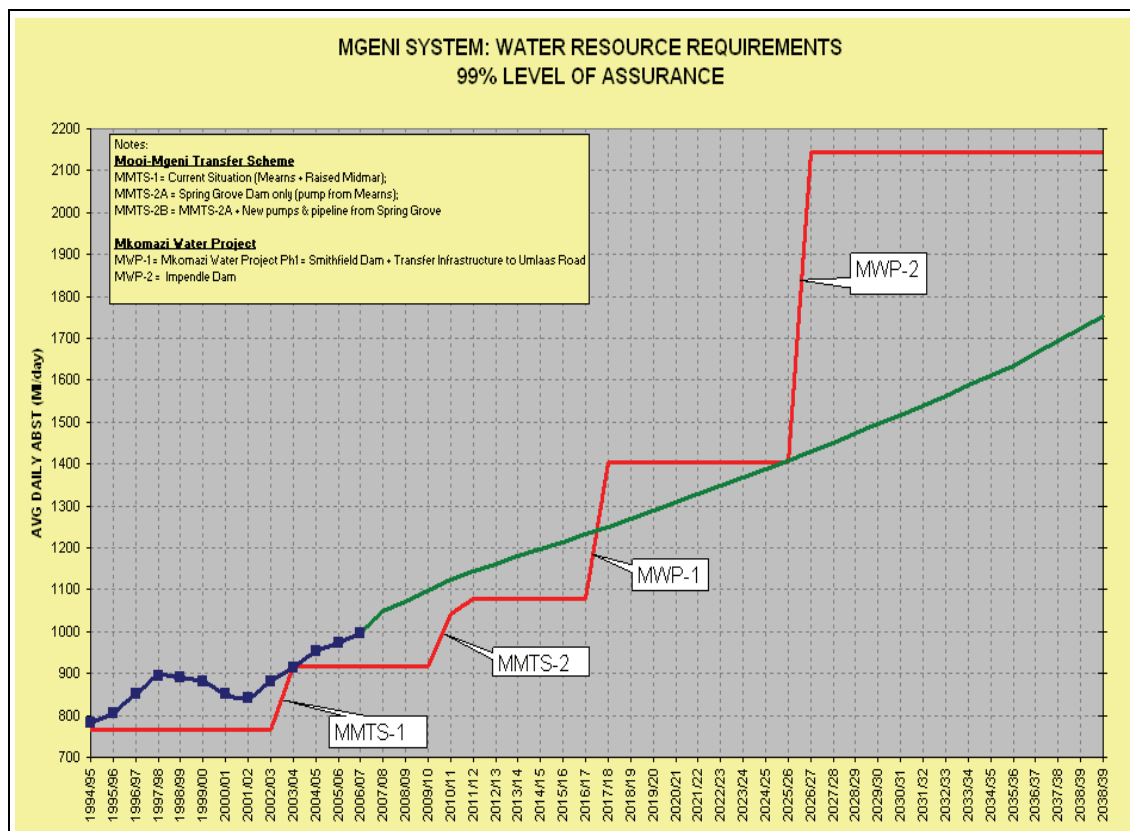


Figure 2-3: Demand-supply curves for Mgeni River System (diagram provided by the eThekweni Municipality (October 2009), quoted in Herold, 2009)

The re-use of water is also identified as an “immediate and practical supply intervention”. However re-use calculations suppose that wastewater treatment plants are reliably and ably managed and maintained. A number of concurrent studies by DWA to establish reconciliation and supply strategies for urban supply centres throughout the country, suggest that most municipalities lack the skills and financial capacity to undertake the necessary Operations and Maintenance of their towns’ water supply and sanitation infrastructure (Van Zyl, 2009). This view is supported by Herold (2009), who states that in the past 15 years the “municipal sector has lost six-sevenths of its engineers and technicians”. His view is that this loss of technical and managerial capacity is also “starting to unravel the bigger institutions” responsible for water services; a situation that is not likely to be remedied in the near future given the shortage of technical, scientific and engineering skills.

A measure of our social vulnerability in this regard is illustrated by the results of the recently developed Blue Drop (Drinking Water Quality) and Green Drop (Effluent Water Quality) systems to check and certify the compliance of municipalities with water quality regulations.

The Blue Drop Certification is an incentive-based programme, which commenced in 2008 as a mechanism for improving South African drinking water-quality management. The 2010 Blue Drop assessments were conducted in all municipalities in the country, overseen by a specialised unit, which monitors municipal drinking water quality management performance under the South African water sector regulator, DWA. The unit established a twinning arrangement with the Drinking Water Inspectorate (DWI) that serves as regulator of tap water quality in the United Kingdom (UK).

Water treatment works (WTWs) are scored on the basis of:

- Water Safety Plan;
- Process Control and Maintenance Competency;
- Efficiency of Drinking Water Quality Monitoring Programme;
- Credibility of Drinking Water Sample Analysis;
- Regular Submission of Drinking Water Quality Results to DWA;
- Drinking Water Compliance with the South African National Standard (SANS 241);
- Drinking Water Quality Failure Response Management;
- Responsible Publication of DWQ Management Performance; and
- Efficacy of basic DWQ Asset Management.

The drinking water quality (Blue Drop) status information for each province is summarised in Table 2-1 below.

Table 2-1: Blue Drop summaries at Provincial level (DWA, 2009).

Province	% of WSAs assessed	Average Blue Drop Score	Average DWQ compliance
Eastern Cape	65.0%	54.3%	91.6%
Free State	65.0%	40.0%	95.5%
Gauteng	75.0%	74.4%	96.2%
KwaZulu Natal	93.0%	73.0%	82.0%
Limpopo	54.5%	40.8%	<85.6%
Mpumalanga	38.1%	51.0%	84.6%
Northern Cape	70.3%	28.3%	<92.9%
North West	61.5%	39.9%	71.5%
Western Cape	90.6%	60.3%	91.0%

The Green Drop Certification process was introduced as an incentive-driven initiative to address gaps and raise the performance levels of municipal wastewater services. The First Order Assessment process is an action research methodology aimed at problem solving and in line with the DWA enactment of the Enforcement protocol. It provides a scientific status of municipal wastewater treatment. The First Order Assessment indicates a number of high-risk wastewater treatment plants across the country.

A risk-based regulatory approach provides early warning signs of water treatment plants that contain a certain measure of risk and then directs the type of intervention required to manage and mitigate the identified risk. Assessments were done within political and provincial borders, instead of water catchment boundaries, as it was acknowledged that cooperation between DWA and provincial local government will be necessary to address the situation properly.

The report scores for country on basis of:

- Adequacy of process control
- Efficiency of waste water quality monitoring and credibility of drinking water sample analysis
- Waste water compliance with license conditions/general authorizations or special limits
- Waste water quality failure response management
- Waste water treatment works capacity
- Regular submission of waste water quality results to DWA

"Hardly any portion of the country (except the least populated areas) is immune to health threats arising from biological contamination of essential water resources. The poorest communities are the most compromised. These communities also contain disproportionately high proportions of citizens whose health is compromised by HIV and AIDS. Infants and children are highly vulnerable to water borne disease, as witnessed by recent alarming press and TV reports. Outbreaks of cholera are also a serious threat. Much of this problem is the direct result of the collapse of existing sanitation systems and difficulties encountered in the siting of informal settlements and the provision and maintenance of essential services. This is already a major crisis in rural communities. In some areas short-sighted planning has resulted in new bucket eradication schemes actually causing a sharp deterioration in service provision. For example, in some Free State settlements replacement of bucket sanitation systems with ambitious sophisticated flush sewer systems has left residents with no sanitation at all since the water supply is insufficient to flush their toilets. In other instances the large increases in sewage inflow volume has led to the overloading of inadequate sewage works and dangerous pollution of downstream river systems. Larger metros are also showing strain, the main saving grace being the fact that these areas are largely provided with good potable water supplies and hence the poor generally do not need to drink the polluted river water."

~ Herold, 2009

Initial results for the Western Cape indicate that a significant number of Waste Water Treatment Works (Green Drop) do not comply and failed the assessment with a provincial average score of only 47.7%. The Green Drop status report for the rest of the country is not yet published.

Water is not the only ingredient for development. Other factors (skills, energy, institutional capacity, leadership, capital inter alia) must be in place for development to occur. But, water must be seen as the *essential* ingredient for development. Without it, development cannot happen or will cease. As such scarcity of potable water is a scale independent indicator for social vulnerability and the impact will cascade from national to household scale.

2.1.2 Water Sector

There are various tools, strategies, management plans and project specific initiatives in place to address shortfalls in water service provision by various responsible parties, for example municipal Integrated Development Plans (IDP) and Water Services Development Plans (WSDP), the National Water Act, the NWRS, the DWA Internal Strategic Perspectives (ISP), the Water for Growth and Development (WfGD) initiative and “Working for Water”, reconciliation studies and more recently an initiative to upgrade the Operations and Maintenance protocols of all small scale supply schemes, including groundwater supply. The water resource reconciliation strategies developed for the metropolitan areas, and those currently underway for all other towns, villages or groups of villages in the country, will contribute to the upgrading of municipal IDPs.

The Water Services Act 1997 is the legislative framework for the provision of water supply and sanitation services consistent with water resources management. The Act sets out the role of DWA in event of non-performance by provinces or local governments and establishes water services institutions. The Act establishes that the district (or authorised local) municipality is the Water Services Authority (WSA). The Municipal Structures Act, Section 84, also sets out that the responsibility for providing water services rests with district and metropolitan municipalities. The Minister of Provincial and Local Government Affairs can authorise a local municipality to perform these functions.

Water Services Authorities (WSA) duties include:

- Realise the right to basic water services;
- Prepare Water Services Development Plans (WSDPs);
- Regulate and monitor water service provision;
- Consumer education and communication; and
- Select Water Services Providers and perform duties of contract regulation, monitoring, performance management and ensuring by-laws are met.

There are two water services provision mechanisms:

1. Internal Mechanism: provide water services (manage and account separately for two functions); and
2. External Mechanism: Contract a water services provider (Regulate provider according to contract).

Water Service Providers (WSPs) have the duty to provide water services in accordance with the Constitution, Water Services Act, and by-laws of water services authority, and to publish a consumer charter that is consistent with regulations, has been approved by the WSA, and contains duties of WSP and consumer (conditions of supply of water services and payment).

There are several types of water services providers, including municipalities, municipal entities, water boards, community-based organizations (CBOs), and private operators (see Table 2-2.)

Table 2-2: Types of Water Services Providers

Municipalities	WSA can also be WSP within its own area or by contract with another WSA or WSP.
Municipal Entities	Municipal-owned and controlled public providers set up in terms of by-law or Companies Act, 1973.
Water Boards	Provision of water services to other water services institutions.
CBOs	Non-profit organization with a specific community providing a municipal service with the mandate of the receiving community where the organization acts in the overall interest of the community.
Private Operators	SMMEs to more established larger private enterprises. Can be local or foreign owned and can include multi-national corporations.
Other types of WSAs	Water User Associations (WUA's), industries and mines are WSPs on behalf of municipalities in some cases. Water services is not the main business of the organization. Provision of water services undertaken for purpose of assisting municipalities who have limited alternatives. Relationship between the WSP and WSA must be defined in terms of an appropriate contract.

The Water Services Act encourages cooperative governance and capacity building. Along with the requirements for the WSA, the act emphasizes working towards Integrated Water Resource Management (IWRM). The South African DWA describes IWRM as “a philosophy of co-ordinated management of an area’s water, land and other resources to maximize economic and social welfare in an equitable manner without compromising the sustainability of the resource and vital ecosystems”. Protection from natural hazards, climate change and related disasters is, of course, an important element of social welfare and protection and the DWA interfaces with the National Disaster Management Centre (NDMC). These elements of Social Protection in relation to water are summarized in Appendix 4.

These institutions and mechanisms in place in South Africa are meant to be part of the solution for dealing with water-related hazards. However, when dysfunctional, institutions can exacerbate the impact of hazards, and when it can be shown to be a direct cause of hazards, e.g. biological or industrial contamination of water, it is reasonable to rank them as a new example of a man-made hazard. It is a moot point when a poorly functional institution is reducing coping capacity and when it has become a threat to social well-being.

Herold (2009) reports that too many personnel in the DWA and in the Water Services Sector “lack the necessary experience and are often too mobile to acquire the necessary skills” while “experienced staff are stretched to the point of near ineffectiveness and cannot find the time to train staff.” There is growing consensus that the attrition of skills at national and municipal level is certainly a factor that increases the risk of contamination and reduces the assurance of supply. Other factors to be considered are decaying infrastructure and lack of monitoring and information management systems to support early warning and timely remediation measures as well as social and political behaviours.

2.1.3 Water Infrastructure

The extent and state of water infrastructure in South Africa varies widely across the country. Vast rural areas are still without access to a safe water supply or proper sanitation and there is an urgent need for service delivery to address this backlog. The existing infrastructure in municipalities is under strain and can often not cope with the increasing demand.

The DWA assessment of the need for water services infrastructure is summarised in Figure 2-4 below.

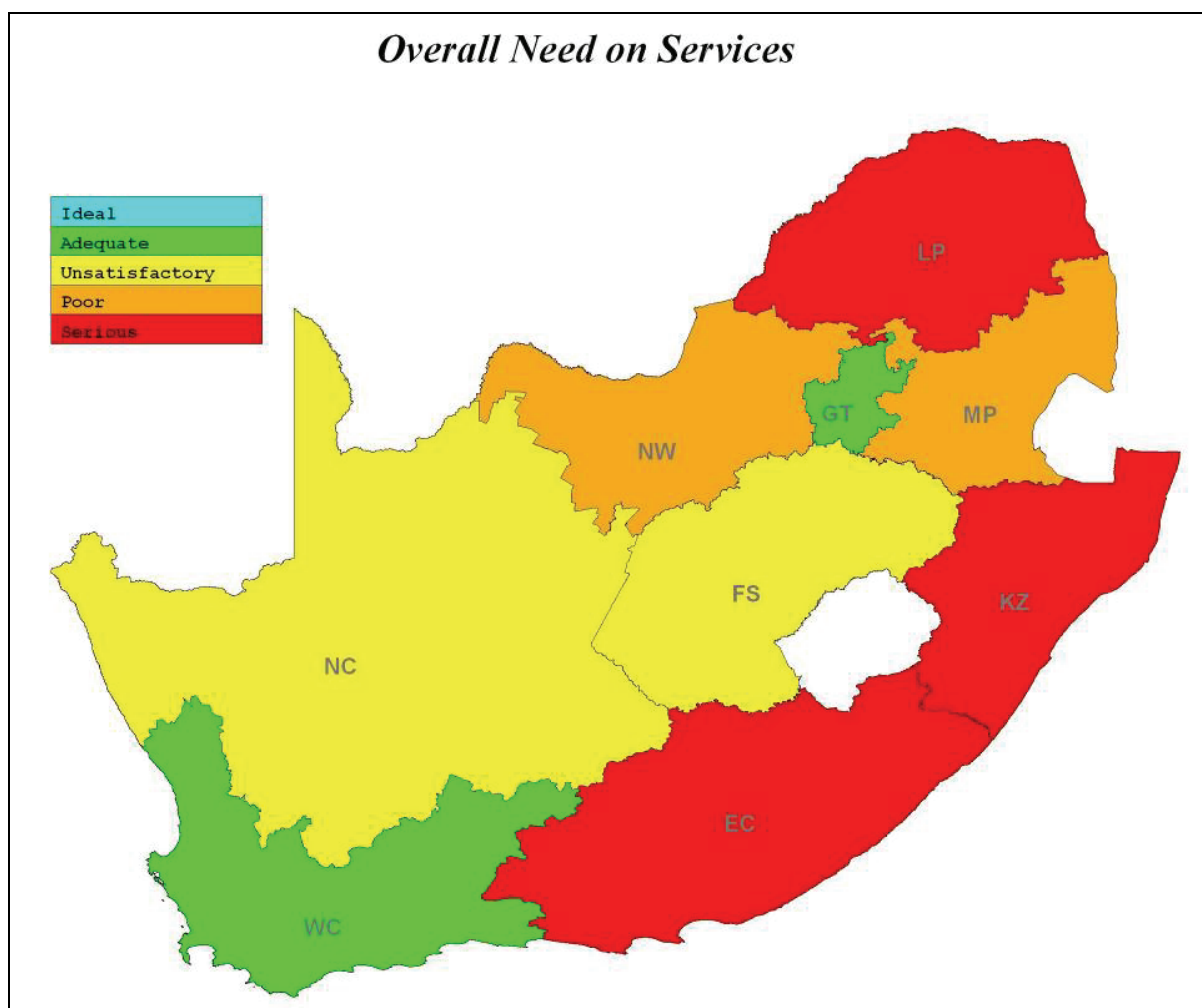


Figure 2-4: DWA overall need on services

Ageing infrastructure affects both local authorities and the DWA with significant impacts on people, the environment and the economy (Herold, 2009). This situation is compounded by a funding system that supports grants and loans for the construction of new water supply and sanitation infrastructure but ignores the need of most municipalities for financial support for the maintenance and repair of existing infrastructure. Specific examples are given in the text box at the end of this section. More generally, and relating to livelihoods and food security, shortage of water and or poor condition of irrigation canals can impact optimal utilisation of land, whether for domestic, commercial or subsistence livelihood purposes.

In addition to poor operations and maintenance of infrastructure, growing gaps are evident in both flow and water quality-monitoring networks. The capacity to run associated information systems is also declining, with the result that threatening trends are not being identified and the DWA is unable to enforce regulations and allocations. It is likely that there are other as

yet undetected problems due to inadequate monitoring and lack of capacity to interpret the information and take appropriate remedial action. The impact of this social malfunction is felt most keenly at local level.

- The DWA's Strategic Framework on Water for Sustainable Growth and Development discussion document (April 2008) cites numerous cases where major water resources infrastructure is in serious need of maintenance and refurbishment. This includes *"160 out of 294 dams owned and operated by the department (54%) require maintenance to meet current safety standards"* and 17 canal schemes that require major rehabilitation work.
- The outlet canal from Grootdraai Dam, which feeds water to the highly strategic Sasol/Secunda complex and to some Eskom power stations, is in a dangerous state and urgently in need of refurbishment. The work has been held up by delays in the appointment of Professional Service Providers.
- Some of the feeder canals to the foot of the Tugela-Vaal water transfer scheme are also in a state of disrepair, reportedly with trees growing through them, and have apparently been partially abandoned.
- The Alfred Nzo District Municipality claims that the current water resources for the town of Matatiele are not sufficient, but it has seven unused boreholes that once refurbished would deliver sufficient water to the town.

2.2 SOCIAL VULNERABILITY AND COPING CAPACITY

The process of vulnerability assessment started with determining which conceptual framework of vulnerability to use. It was necessary to establish the conceptual framework to be used in the study and thereafter consider different methodologies, as there are many approaches to measuring risk and vulnerability to hazards using indicators and indices. The distinction between a conceptual approach and methodology is supported by Alwang *et al.* (2001) who showed that vulnerability indicators chosen for one context might not be appropriate for assessing vulnerability in other circumstances.

There are three main conceptual frameworks of vulnerability in the literature, namely that:

- Vulnerability is the potential exposure to a physical hazard;
- Not all individuals and groups are equally vulnerable to a hazard; and
- Vulnerability is a combination of biophysical processes, threat, and social response.

See Appendix 1 for a summary of conceptual approaches and definitions of Social Vulnerability and the methodologies that utilise these conceptual approaches for index development and vulnerability assessment.

"Social vulnerability is partially the product of social inequalities – those social factors that influence or shape the susceptibility of various groups to harm and that also govern their ability to respond. However it also includes place inequalities – those characteristics of communities and the built environment, such as the level of urbanization, growth rates, and economic vitality, that contribute to the social vulnerability of place."
~Cutter *et al.*, 2003

This study expands on the third of these conceptual frameworks, focusing on the concept of Social Vulnerability comprising the following five elements (Cannon, 2000):

1. **Initial Well-Being:** Nutritional status, physical and mental health, morale;
2. **Self Protection:** The degree of protection afforded by capability and willingness to build a safe home and use a safe site and the capacity of an individual or household to reinstate their earning or livelihood pattern after a hazard;
3. **Social Protection:** Provision by social and political structures above individual level of protection against hazards (societal hazard preparedness such as building codes, mitigation measures, shelters);
4. **Livelihood and Resilience:** Asset pattern and capitals, income and exchange options, qualifications; and
5. **Social Capital:** Group or community support networks that may, depending on degree cohesion, provide security or assistance after a hazard and the degree to which people are able to express their needs, access preparedness.

These elements place a person or group in a spectrum of vulnerability from highly secure (having coping capacity) to extremely vulnerable.

A person's placement is based on a complex mix and integration of different factors such as individual characteristics (gender, age, employment, etc.), social and economic factors (income distribution, livelihood resources, facing discrimination in getting assistance) and political processes (technical intervention such as warning systems and physical structures for protection such as shelters), and the type of hazard they are potentially exposed to.

Determining the extent to which a person or group is to be considered vulnerable or secure in relation to these elements requires that these components are cross-related to a series of social factors and political characteristics, or indicators, having either a positive or negative impact. This generates different levels of vulnerability.

The elements of social vulnerability, other than social protection, largely encompass the skills, capacity and resources at the individual, household and community level. Social protection on the other hand relates to mitigation measures, preparedness, and relief and response mechanisms available to vulnerable communities, households and individuals from local, national, and international structures as well as from relevant organizations, community-based or otherwise.

The vulnerability of water users at the local level is the outcome of their own status, and also of the decisions at the regional, national, provincial and local level concerning allocation and investment by other actors in planning water supply and demand (Nygatan, 2005). Social vulnerability persists or improves in the context of social protection which functions (or not) at the national, provincial, district municipal, local municipal, and community levels.

The case studies focus on the elements of vulnerability that are relevant at the household and community level and which constitute different aspects of social, economic, and natural capital. See Appendix 4 for the tabular summary of Social Protection Elements either in place and functioning, or not, at the National, Provincial, District Municipal (DM), Local Municipal (LM), and community levels. The tables detail the mechanisms (policies, strategies, protocols, and organizations) that aim to improve pre- and post-disaster coping capacity.

The inextricable link between coping capacity and vulnerability was addressed in this study by differentiating between hazard related coping capacity (mechanisms specific to hazards such as early warning systems and disaster risk management plans) and community coping capacity viz. those mechanisms that reduce social vulnerability to hazards in particular such as WTWs and accessible health care facilities. If access to a hospital is difficult or there are

low literacy rates, vulnerability will generally be higher. Social vulnerability refers to those aspects of the community that would make them less able to recover from a disaster at the individual level (such as being a single parent or a pregnant teenager).

The perception of risk was also incorporated into this study, as vulnerability is rooted in the behaviour of actors and the social networks that drive and bound them. Poverty and vulnerability are closely related, but attitudes towards disaster are also a major determinant of the actions and adaptations of actors who are constrained or empowered by their use of a resource to reduce the risks they face (Nygatan, 2005). Human exposure to risk and coping capacity therefore varies, as it is mitigated by people's strengths, resilience and attitude. Agency in the event of a hazard and people's own preparedness precludes the victim mentality and is important in determining vulnerability (Wu *et al*, 2002; Nygatan, 2005).

In order to determine the social vulnerability of people to hazards and how this impacts their relationship with water infrastructure, one must understand the dynamic interplay between the different factors that contribute to coping capacity and to *social vulnerability* and that negatively or positively impact on the supply of safe water for drinking, domestic and subsistence agriculture in poor communities.

2.3 THE HYOGO FRAMEWORK FOR ACTION AND THE SUSTAINABLE LIVELIHOODS FRAMEWORK

The HFA combined with the Sustainable Livelihoods Framework (SLF) was used to explore various risk reduction strategies that could reduce social vulnerability and increase coping capacity and thereby likely improve livelihoods.

Implicit in the approach of this study was the identification of opportunities to mainstream DRR into the water services, thereby increasing resilience of communities and infrastructure. The study explored the water services and disaster management sectors and interaction between these institutions and elements of social vulnerability at the local level within the context of hazards potentially impacting vulnerability and livelihoods. The development of a social vulnerability index will help local decision makers and policy implementers to improve risk reduction and resilience at the community level by targeting the social as well as the built environment.

While the HFA is acknowledged internationally and South Africa is a signatory, it is not routinely used as a planning or guiding document of the municipal or provincial level in water resource and water service management, strategic policy development or in the disaster management sector in this country. In fact it is quite a challenge to make the HFA hazard specific and sector relevant. Despite this, it provides a robust framework for mapping of coping capacities and identifying critical vulnerabilities in the water, environmental and health sectors.

The HFA has several priorities related to each of the five social assets, mapped in the Sustainable Livelihoods Framework (SLF) (Benson and Twigg, 2007) (See Figure 2-5 below).

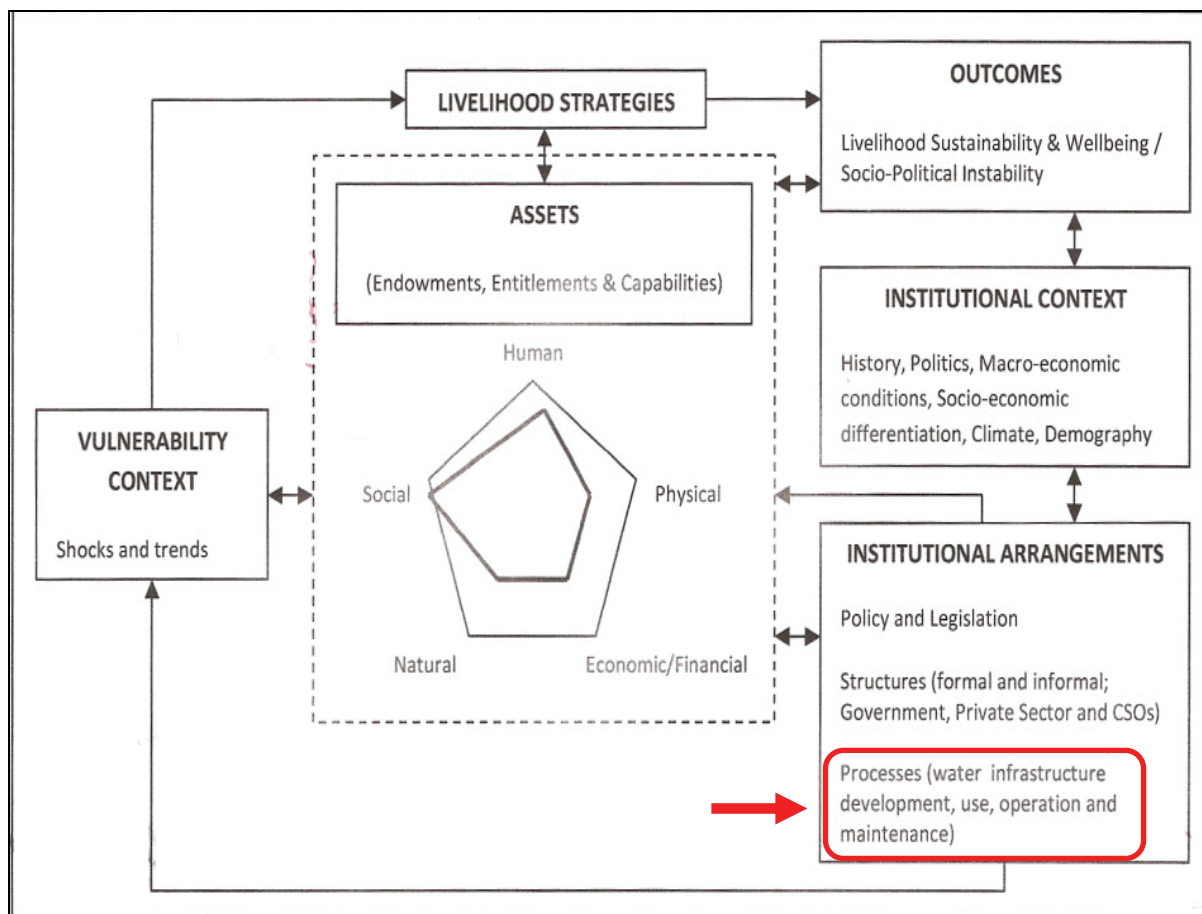


Figure 2-5: Sustainable Livelihoods Framework (After Benson and Twigg, 2007 and amended by Tapela, et al., 2009). This study concentrated on the processes pertaining to water infrastructure development, use, operations and maintenance as highlighted in red.

As outlined by the SLF, the five social assets refer to the endowments, entitlements, and capabilities that a person holds, including Human, Social, Physical, Natural, and Economic or financial. A description of each of these assets is provided in Table2-3 below.

Table 2-3: Description of the five social assets defined by the Sustainable Livelihoods Framework (Twigg, 2001; Benson and Twigg, 2007).

Human Capital	Consists of the skills, health and education of individuals that contribute to the productivity of land, water and biological resources
Social Capital	Consists of the networks, relationships and structure of social interaction. Societies where family relationships are stable and communities function in ways that increase the general well-being of men and women, would be considered to have high Social Capital and are more resilient
Physical Capital	Consists of infrastructure, equipment and improvements in genetic resources (crops, livestock)
Natural Capital	Consists of all the goods provided by the earth such as soil, water, plants, forests, wildlife, fish, minerals, oil and gas. Natural Capital also includes the many services provided by the natural environment such as forests providing oxygen, wetlands filtering water, and dunes providing wind shelter and flood protection. Also concerns the productivity of land and actions to sustain productivity of land, water and biological resources. (Adapted from Ellis, 2000)
Economic/Financial Capital	Consists of the built infrastructure (buildings, roads, roads, ports, railways, wastewater treatment works, etc.) as well as the Financial Capital (money) available to the community.

All of these assets can define a person's degree of vulnerability and coping capacity. They are an indication of the individual's ability to survive and thrive in general, as well as their ability to cope in the case of a shock in the context of seasonality and environmental trends. These shocks, seasonality, and trends and changes in hazards interact with vulnerability in the context of the Sustainable Livelihoods Framework.

Individual, household and community vulnerability has an institutional context and there is an interaction between institutional structures, policies, and processes and sustainable livelihood strategies. Policies and processes of government, NGOs, international and legislative bodies, political parties, and commercial enterprises such as decision-making, social norms, gender, caste, class, and language all have an influence on social capital and vulnerability.

Different livelihood strategies combine and use the accessible assets and will either support or obstruct policies, institutions and processes. In some instances livelihood strategies can increase resilience or increase vulnerability. This has often to do with the individual perception of risk and choice and time frames for action.

The elements of social vulnerability are interwoven into the different elements of the HFA, which focuses on national and local implementation with bilateral, multilateral, regional and international cooperation in the field of Disaster Risk Reduction (DRR). This facilitates its application in the water sector, both from the resource and the services perspective. Its three strategic goals include the:

- Integration of Disaster Risk Reduction into sustainable development policies and planning
- Development and strengthening of institutions, mechanisms and capacities to build resilience to hazards
- Systematic incorporation of risk reduction approaches into the implementation of emergency preparedness, response and recovery programmes

There are five HFA Priorities for Action. These are summarised in Table 2-4 and adapted to the focus of the study on Disaster Risk Reduction (DRR) in the water services sector.

The HFA indicators for disaster risk reduction are primarily written as national level measures. In principle it is possible to develop similarly worded indicators for administrators and communities, which is important in achieving risk reduction at the local level (Twigg, 2006). In this study the HFA was applied to local disaster risk reduction strategies at the community level based on the recommendations by Twigg (2006) that national level indicators must be tested and built up by aggregating local progress. Based on the HFA, the study asked if:

- The water supply infrastructure most exposed to selected hazards are also the most vulnerable
- The elements of social vulnerability at a community level significantly increase or decrease the risks of not receiving an assured supply of potable water

Table 2-4: The relevance of the HFA Priorities for Action to this study.

HFA Priority	Description	Applicability
HFA 1: Ensure that DRR is a national and a local priority with a strong institutional basis for implementation.	In South Africa water services have been decentralized. The institutional mechanisms and human resources and capacities of the country in terms of DRR are outlined in Appendix 4.	The indicators developed for coping capacity in this study do not incorporate networks for social protection. These are highlighted contextually in tables and therefore incorporated into overall measurements of vulnerability and coping capacity.
HFA 2: Identification, assessment and monitoring of disaster risks and enhancement of early warning	This priority calls for the development of early warning through risk assessments and maps; the development of indicators on DRR and vulnerability; collecting data and statistical information; and the development of Early Warning (EW) systems.	This is achieved through the identification of hazards and associated risks in each of the three case study areas and the development of indicators related to the existence and communication of EW.
HFA 3, 4, 5: integration of DRR into local knowledge and education in order to build a culture of safety and resilience	The focus of these priorities is to raise awareness, education communities, reduce underlying risk factors and strengthen disaster preparedness for effective responses at all levels.	An approach to enhance the public participation process during water infrastructure implementation projects based on the evaluation of SV in relation to water infrastructure is proposed.

The study focused on the natural and man-made hazards that have the greatest impact on the assurance of potable water supply at a local level. Coping capacity related to hazard risk reduction (i.e. early warning systems, risk reduction plans, and community involvement) is assessed in terms of implementation of the Hyogo Framework for Action 2005-2015 (HFA) by these authorities responsible for Disaster Management and water supply.

3 ADAPTING HFA FOR SOCIAL VULNERABILITY AND COPING CAPACITY

The HFA approach was adapted for this study because it supports a robust and systematic evaluation of social vulnerability and coping capacity in terms of the definitions of capital (see Table 2-3) at all levels of government and community, and facilitates the evaluation of the risk related to water infrastructure. The relationship between social vulnerability and biophysical risk was assessed by adapting the HFA Priorities for Action for Disaster Risk Reduction (DRR) to the water sector services sector. The SLF and HFA are examined together in order to highlight the holistic and multi-sectoral approach of the HFA to dealing with vulnerability.

The components of risk assessment (hazard, vulnerability and coping capacity), as integrated into the mathematical expression for Risk Assessment used by the UN/ISDR (2005) (see Section 1), can be applied to a selected case study. They are detailed in Figure 3-1 below and further described in the text that follows.

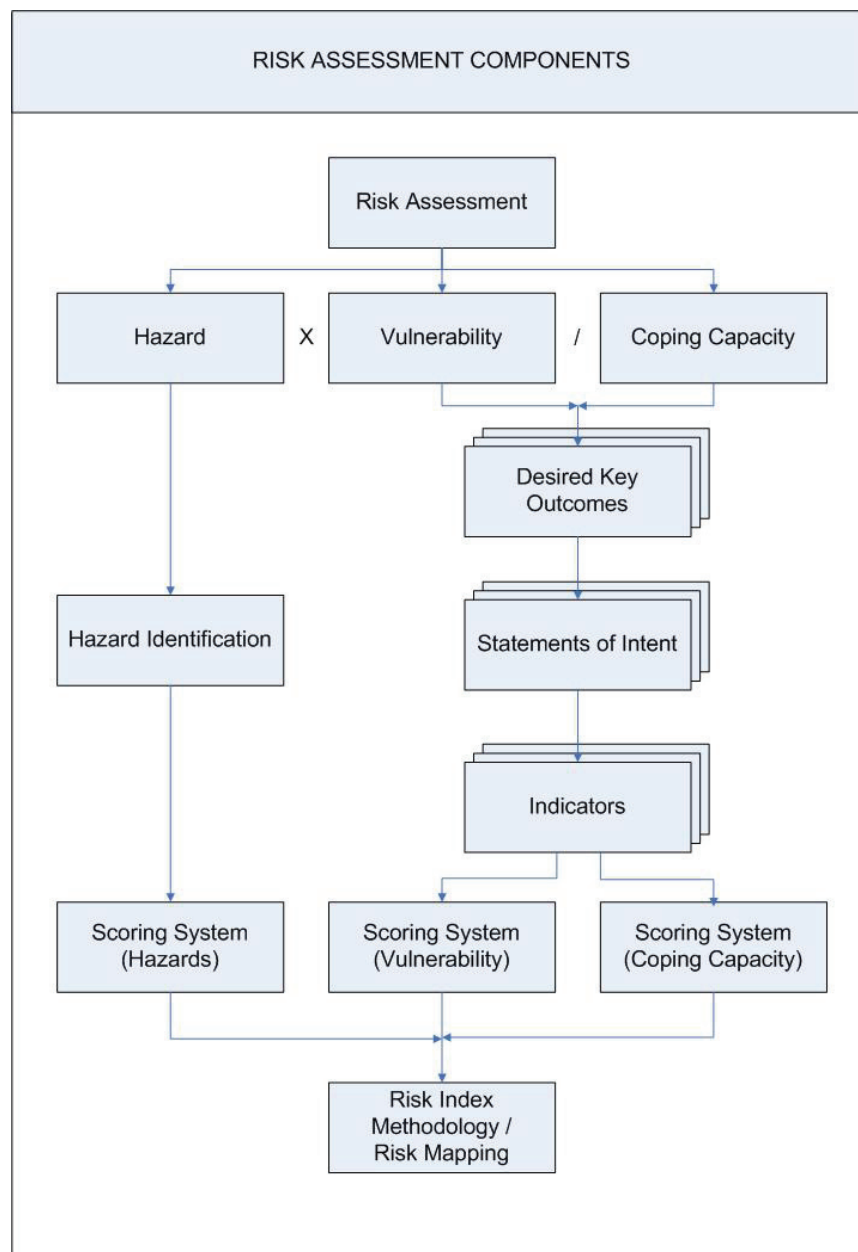


Figure 3-1: Components of the Risk Assessment to be followed by analysis of results

The components of the Risk Assessment are listed below:

1. Hazard identification and hazard assessment, based on likelihood and impact of a hazard occurring at a particular location.
2. Development of Key Outcomes that contribute to Disaster Risk Reduction (through decreasing Vulnerability and/or increasing Coping Capacity of a particular community), based on the HFA Priorities for Action, but adapted to community-level risk assessment with the SLF in mind.
3. Statements of Intent developed as important goals to realise the Key Outcomes. These Statements of Intent can vary depending on the social, physical, political and economic context of a community.
4. Selection of a comprehensive set of possible Indicators for measuring the achievement of the individual goals of each Statement of Intent.
5. Scoring system for evaluating the data of each Vulnerability and Coping Capacity Indicator.
6. Final calculation of a Risk Index, and further application through Risk Mapping.
7. Review and analysis of results as required.

3.1 HAZARD IDENTIFICATION AND ASSESSMENT

Hazard identification is a process whereby all hazards that may occur at a particular location are listed. Hazards can be either natural or man-made. In the context of Water Supply and Infrastructure related hazards, the following list was considered for this study:

- Flood;
- Drought;
- Biological Hazards (particularly hazards related to poor sanitation and/or resulting in water-borne diseases);
- Technological Hazards (particularly hazards resulting in poor water quality such as acid mine drainage or industrial effluent, as well as physical hazards related to poor infrastructure development and maintenance); and
- Institutional Hazards.

Hazard assessment was calculated using the following equation:

$$H = L \times I$$

Where:

L = the Likelihood/probability of a particular event which is related to the probability and/or frequency of a hazard (for example, a 1 in 50 year flood event)

I = the Impact of that event on the area (for example, a rise in water level by 2m, flooding an area of 20m wider than the average width of the river)

Note that hazard assessment is based on the likelihood of a particular hazard event happening in a particular place, which often cannot be directly controlled (such as the rise of water levels during a 1 in 100 year flood event). Vulnerability and Coping Capacity scores, however, (which are discussed in more detail in Section 3.3) can usually be decreased or increased respectively through mitigation measures or changing behaviours. The UN/ISDR Risk Equation (UN/ISDR, 2005) should be calculated for each identified hazard event and associated impact individually.

3.2 KEY OUTCOMES AND STATEMENTS OF INTENT

The HFA Priorities for Action are summarised Key Outcomes (KO) specific to the water services sector (see Table 3-2 on the following page).

Statements of Intent (Sol) are important goals or groups of activities that together are necessary to achieve these Key Outcomes. In this study indicators to measure to what extent the various Sol have been realised or not were built around the characteristics of social Vulnerability (gender, age, human settlements, built environment) and Coping Capacity (such as social, physical, and natural capital) but were related to the Key Outcomes, which would contribute to Disaster Risk Reduction.

The Key Outcomes, Statements of Intent and Indicators thus reflect the shift in Disaster Risk Reduction from a focus on Vulnerability to political, economic, infrastructural, and socio-cultural resilience or Coping Capacity.

The Key Outcomes also deal with the Risk Cycle (Twigg, 2006), which addresses the need for coping capacity at all stages of a disaster: impact, response, recovery, development, prevention, and mitigation and preparedness (see Table 3-1 below).

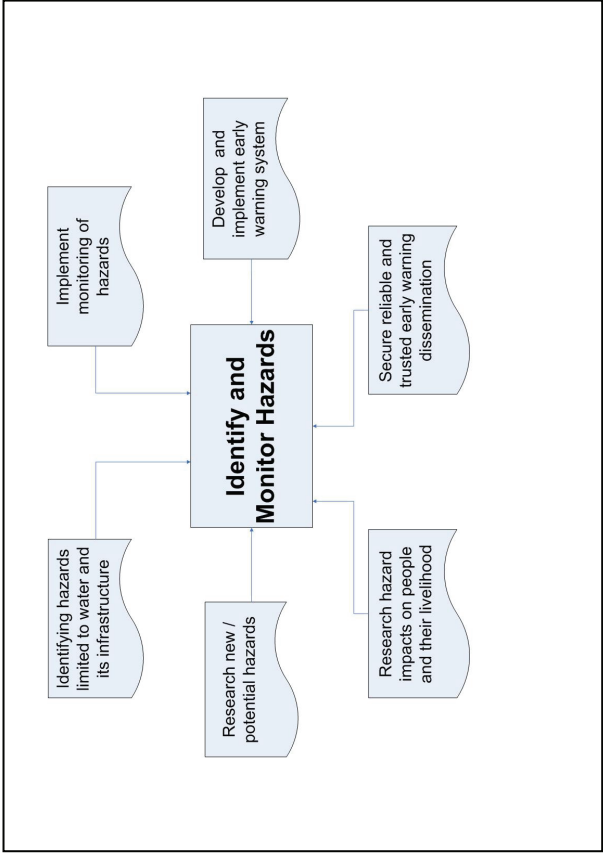
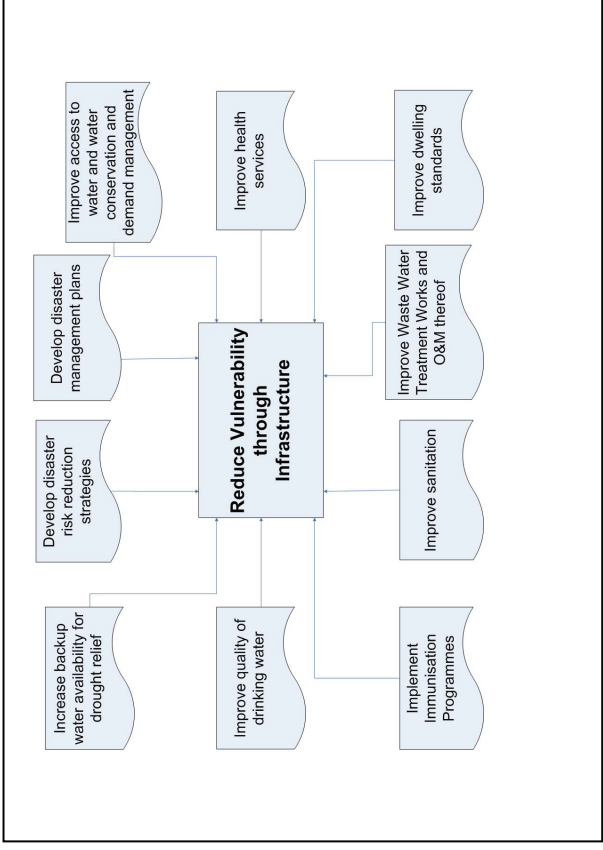
Table 3-1: Link between the Risk Cycle and Key Outcomes

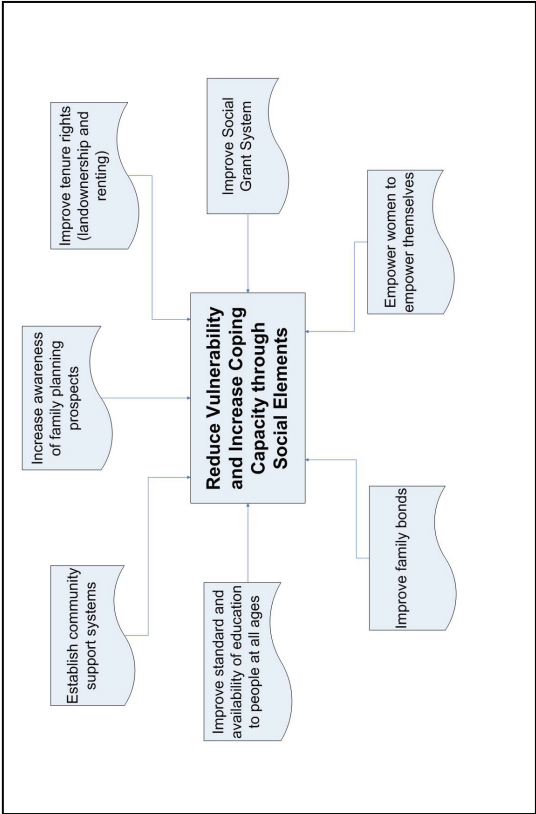
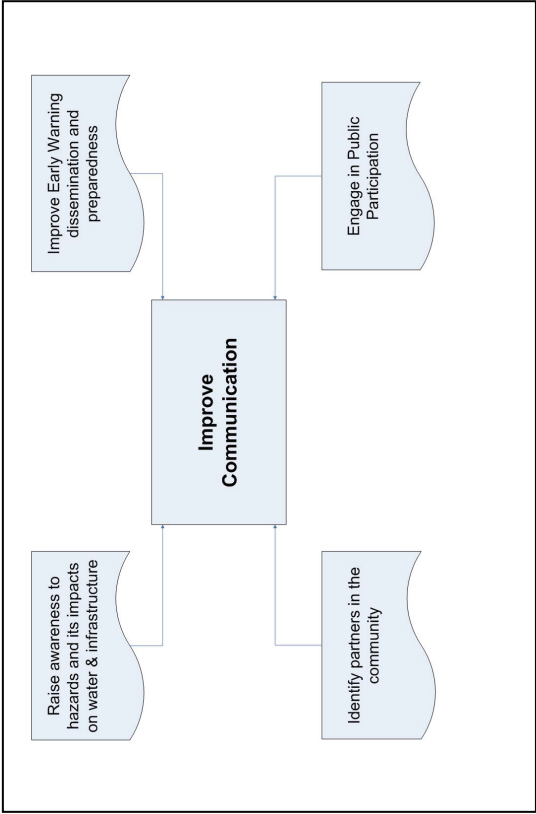
Aspect of Risk Cycle	Key Outcome	Main Aspects
Hazard identification and monitoring and early warning.	Key Outcome 1: Identify and monitor hazards	Pre-emergency phase in which measures should be taken to avoid disaster for settlements, infrastructure, and economies through hazard monitoring and early warning.
Mitigation	Key Outcome 2: Reduce Vulnerability through infrastructure	The mitigation aspect of this cycle should limit adverse impacts of natural and related environmental and technological hazards.
Preparedness	Key Outcome 4: Improve Communication Key Outcome 2.	The activities and preparedness for response in the event of an emergency. Disaster response involves evacuation plans, early warning, pre-stocking relief items all being part of national disaster relief plan.
Emergency phase and response	Key Outcome 4	Effective emergency response depends on the extent to which everyone prepares and cooperates in a coordinated and timely manner, avoiding duplication of effort and optimising available resources.
Recovery process	Key Outcome 2: (aims to lessen the recovery process in the long term)	Communities are assisted in restoring essential services and putting in place long term measures.
Development	Key Outcome 3: Reduce Vulnerability and Increase Coping Capacity through Social Elements	Deals with social vulnerability and implies agency on the part of people, government, institutions, organizations, etc.

The four Key Outcomes and Statements of Intent are illustrated graphically in Figure 3-2- Figure 3-5 and described below. Note that they and the indicators chosen to reflect them may change for other studies as appropriate. See Appendix 5 for a comprehensive summary of the Key Outcomes, Statements of Intent, and associated indicators in table format.

Table 3-2: Key Social Vulnerability and Coping Capacity Factors Related to the HFA and Key Outcomes

HFA Priorities for Action	Key Outcomes	Statement of Intent	Key Social Vulnerability and Coping Capacity Factors
HFA 3. Building a culture of safety and resilience HFA 4. Reducing the Risks in Key Sectors	Key Outcome 3: Reduce vulnerability and increase coping capacity through social elements. Key Outcome 3	-Improve social grant system	Economic situation
HFA 3. Building a culture of safety and resilience HFA 4. Reducing the Risks in Key Sectors	Key Outcome 3	-Improve availability and accessibility of education to people of all ages	Education
HFA 1. Making Disaster Risk a Priority HFA 4. Reducing the Risks in Key Sectors	Key Outcome 2: Reduce vulnerability through infrastructure	-Increase quality of drinking water -Improve health services -Develop waste management -Implement immunisation programmes	Health
HFA 1. Making Disaster Risk a Priority HFA 4. Reducing the Risks in Key Sectors	Key Outcome 2	-Improve dwelling standards	Exposure
HFA 3. Building a culture of safety and resilience HFA 4. Reducing the Risks in Key Sectors	Key Outcome 3	-Establish community support systems -Improve family bonds	Safety and Security
HFA 3. Building a culture of safety and resilience HFA 4. Reducing the Risks in Key Sectors	Key Outcome 3	-Empower women to empower themselves	Gender
HFA 1. Making Disaster Risk a Priority HFA 2. Improving Risk Information and Early Warning	Key Outcome 1: Identify and Monitor Hazards	-Identify hazards linked to water and its infrastructure -Research new and potential hazards -Research hazard impacts on people and their livelihood -Implement monitoring of hazards	Disaster Risk Planning
HFA 1. Making Disaster Risk a Priority HFA 2. Improving Risk Information and Early Warning HFA 3. Building a culture of safety and resilience HFA 5. Strengthen Preparedness for Response	Key Outcome 1 and Key Outcome 4	-Develop and improve early warning systems	
HFA 1. Making Disaster Risk a Priority HFA 4. Reducing the Risks in Key Sectors	Key Outcome 2	-Improve water conservation and demand management (drought and water supply) -Develop DRR strategies -Develop Disaster Management plans	
HFA 3. Building a culture of safety and resilience HFA 5. Strengthen Preparedness for Response	Key Outcome 4	-Raise awareness to hazards and its impact on water infrastructure	

Key Outcome 1: Vulnerability to Hazards The intentions for Key Outcome 1 are in line with the HFA 1 and HFA 2 emphasis that the starting point for reducing disaster risk and promoting a culture of disaster resilience lies in the knowledge of the hazards that societies face, knowing the way in which the vulnerability to impact of the hazard is changing, followed by action taken on the basis of that knowledge.	Key Outcome 2: Reduce Vulnerability through Infrastructure Key Outcome 2 is in line with HFA 3 and HFA 5 to educate people of all ages and build capacity, protect, strengthen, and make resilient to hazards, critical public facilities and physical infrastructure (such as schools, clinics, water and power plants, disaster warning and management infrastructure) through rebuilding and design.
Figure 3-2: Key Outcome 1 and its associated Indicators  <pre> graph TD A[Identify and Monitor Hazards] --> B[Identifying hazards limited to water and its infrastructure] A --> C[Research new / potential hazards] A --> D[Research hazard impacts on people and their livelihood] A --> E[Develop and implement early warning system] E --> F[Implement monitoring of hazards] E --> G[Secure reliable and trusted early warning dissemination] </pre>	Figure 3-3: Key Outcome 2 and its associated Indicators  <pre> graph TD A[Reduce Vulnerability through Infrastructure] --> B[Increase backup water availability for drought relief] A --> C[Develop disaster risk reduction strategies] A --> D[Develop disaster management plans] A --> E[Improve access to water and water conservation and demand management] A --> F[Improve quality of drinking water] A --> G[Implement Immunisation Programmes] A --> H[Improve sanitation] A --> I[Improve Waste Water Treatment Works and O&M thereof] A --> J[Improve health services] A --> K[Improve dwelling standards] </pre>

Key Outcome 3: Reduce Vulnerability and Increase Coping Capacity through Social Elements Key Outcome 3 is in line with the HFA 4 to reduce the underlying risk factors through socio-economic and development practises, emphasizing safety-net mechanisms to assist those most vulnerable in society and reduce recovery time through social support systems.	Key Outcome 4: Improve Communication Key Outcome 4 is in line with the HFA 3 and HFA 4 to build a culture of safety and resilience and reduce underlying risk factors through education and use of media, community involvement and community-based initiatives.
	
Figure 3-4: Key Outcome 3 and its associated Indicators	Figure 3-5: Key Outcome 4 and its associated Indicators

3.3 INDICATORS AND SCORING SYSTEM

Vulnerability cannot entirely be measured, as it is an interpretation of a complex and transient reality (Nygatan, 2005). Rather, the “measure” is taken using an agreed upon methodology and the use of indicators. The aim is to identify population characteristics that influence risk and vulnerability and how those factors further affect the distribution of losses and risks in the context of a disaster.

Indicators are an important basis for discussion on the root causes of weaknesses in coping capacity at the individual, household, and community level. Indicators can be used as a basis for discussion to choose targets for risk reduction. They provide a tool to highlight the root causes of risk and vulnerability, facilitated by frameworks such as the SLF and the HFA.

Indicators are used in the social sciences to measure data that reflects the status of a particular reality and examine changes in the condition of people and communities’ over time (Dwyer et al., 2004). Broader concepts and processes such as poverty or social vulnerability can only be measured indirectly with factors that signify these broader concepts (i.e. income, type of housing) and can also indicate a change over time (Dwyer et al., 2004).

In summary, indicators can be measurements, facts, opinions or perceptions that point to a specific condition or situation and measure/reflect changes in that condition or situation over time.

Indicators:

- Allow the assessment of changes over time about a given condition or situation;
- Facilitate close observation of results of initiatives or actions; and
- Are important tools to evaluate and follow up on Disaster Risk Reduction processes.

Indicators of vulnerability preferably have a predictive element. They are a means of modelling a population influenced and impacted by certain hazards, knowledge of which can help direct aid and development policy and projects. Indicators assist in planning, implementing, coordinating and evaluating policies, programmes and projects and can assist in determining the most effective use of resources.

Indicators, to be useful in this way, must be:

- Measurable;
- Indicate progress in implementation;
- Benchmarks or baseline information exist; and
- Unambiguous interpretation.

Some broad indicators appear repeatedly in social vulnerability analyses, including poverty (socio-economic status), gender, race and ethnicity, age and disability. It is possible to choose different proxies for each indicator. Some of the main factors that influence social vulnerability include:

- Lack of access to resources (including information, knowledge, technology)
- Limited access to political power and representation
- Social capital (networks)
- Beliefs and customs

- Building stock, lifelines and type and density of infrastructure
- Number of disabled people
- Type and density of infrastructure and lifelines (Cutter, 2003, Blaikie et al., 1994)

Certain indicators may become redundant during a project, while others become more relevant. In selecting indicators, it is important to ensure that they measure what is intended. However, it is inevitable that there will be some features excluded (Dwyer, et al., 2004) or that the measure must depend on expert opinion. There are many possible indicators that can be used to represent social vulnerability and coping capacity and it is necessary to prioritise those most relevant to the study domain.

Indicators were selected as a means of measuring the degree to which the individual Goals or Statements of Intent relates to each Key Outcomes identified above have been met. Key Outcome 4 was not used to select indicators but was considered a general outcome for the study and informed the approach proposed for the implementation of water related infrastructure (See Appendix 12). A comprehensive list of possible Indicators based on the Key Outcomes and Statements of Intents is presented in Appendix 5.

Table 3-3: One Statement of Intent of Key Outcome 2 and suggested Indicators

Key Outcome 2: Reduce Vulnerability through Infrastructure	
Statement of Intent	Key Indicators
Improve dwelling standards	Decrease in the number of homeless people and shack dwellers and homeless people.
	Building codes in place at national level and a protocol for monitoring dwelling standards in place at LM level with effective implementation at the community/settlement level.

The aim of this study was that a methodology for assessing vulnerability is developed which is easily applicable to a variety of communities facing different hazards. Indicators in this study are thus not ranked against one another but are contextualized with case study information. Scoring indicators on the basis of their importance is highly subjective. Furthermore, indicator scoring is likely to change depending on the particular hazard to which a community is vulnerable.

For simplicity and because of limited data and resources, the indicators are used to monitor progress towards achieving the Key Outcomes, thereby signifying the level of vulnerability of a particular community to an identified hazard.

Most risk indices are comparative; a particular area is vulnerable in relation to another. As this study was concerned with community level risk assessment, indicators were scored using national and international targets and standards (i.e. targets for primary school enrolment) or pre-determined requirements (i.e. blue and green drop requirements) and best practices as detailed in the HFA and related documents.

Many of the important factors for which indicators are required are qualitative. Indicators referring to the existence of a policy or strategy can be defined by 'yes' or 'no', however the nature and effectiveness of the platform is not illustrated using this binary classification. A

country with 95% compliance with a particular requirement would still fall under the 'no' categorisation. Therefore, a graduated 5-point scale (see Table 3-4 below) of 'no -minor progress' to 'full -substantial achievement' was used. Quantitative factors such as the 'number of children enrolled in primary school' can also be scored using a 5-point scale of 'no -0% enrolment' to 'full -100% enrolment'. In defining the score it was assumed that a 1 indicated that some coping capacity was implied. A zero was scored if the minimum required to score a 1 was not in place. This does not impact the total score but does reflect in the average. In event that all indicators scored zero a one would be nominally given.

Table 3-4: Scoring of Risk Components:

Hazard Scoring			Vulnerability Scoring		
1	Very Low	Negligible	1	Very Low	Negligible
2	Low	Low probability and impact	2	Low	Low vulnerability
3	Moderate	Medium probability and impact	3	Moderate	Moderate vulnerability
4	High	High probability and impact	4	High	High vulnerability
5	Very High	Certain	5	Very High	Very high vulnerability
Coping Capacity Scoring			Risk Ranking (H x [V/C])		
1	Very Low	Negligible	0.1-1.5	Very Low	Very low risk
2	Low	Low coping capacity	1.6-3	Low	Low risk
3	Moderate	Moderate coping capacity	3.1-6	Moderate	Moderate risk
4	High	High coping capacity	6.1-15	High	High risk
5	Very High	Very high coping capacity	15.1-25+	Very High	Very high risk

The scoring methodology was adapted for the study area to ensure that scoring criteria is reasonable and suited to the particular context of the case studies. Progress can be measured against a benchmark based on an understanding of the initial situation and analysis of available data.

The Risk Assessment Methodology used in this study highlights the split between social vulnerability and coping capacity in terms of the calculation of the risk index. The scoring criteria for each indicator for Key Outcome 1-3 is outlined in this section and displayed in detail in Appendix 10. How the scoring methodology was applied is illustrated in Section 4.

3.4 FINAL RISK INDEX AND RISK MAPPING

The final risk score was hazard specific and was calculated by taking the score for the particular hazard and multiplying it by the average score of all vulnerability indicators divided by the average score of all coping capacity indicators. The final score ranged in value from <0.1 (very low risk) to 25 (very high risk) and outlying risk of up to 250, in cases where there is no coping capacity whatsoever.

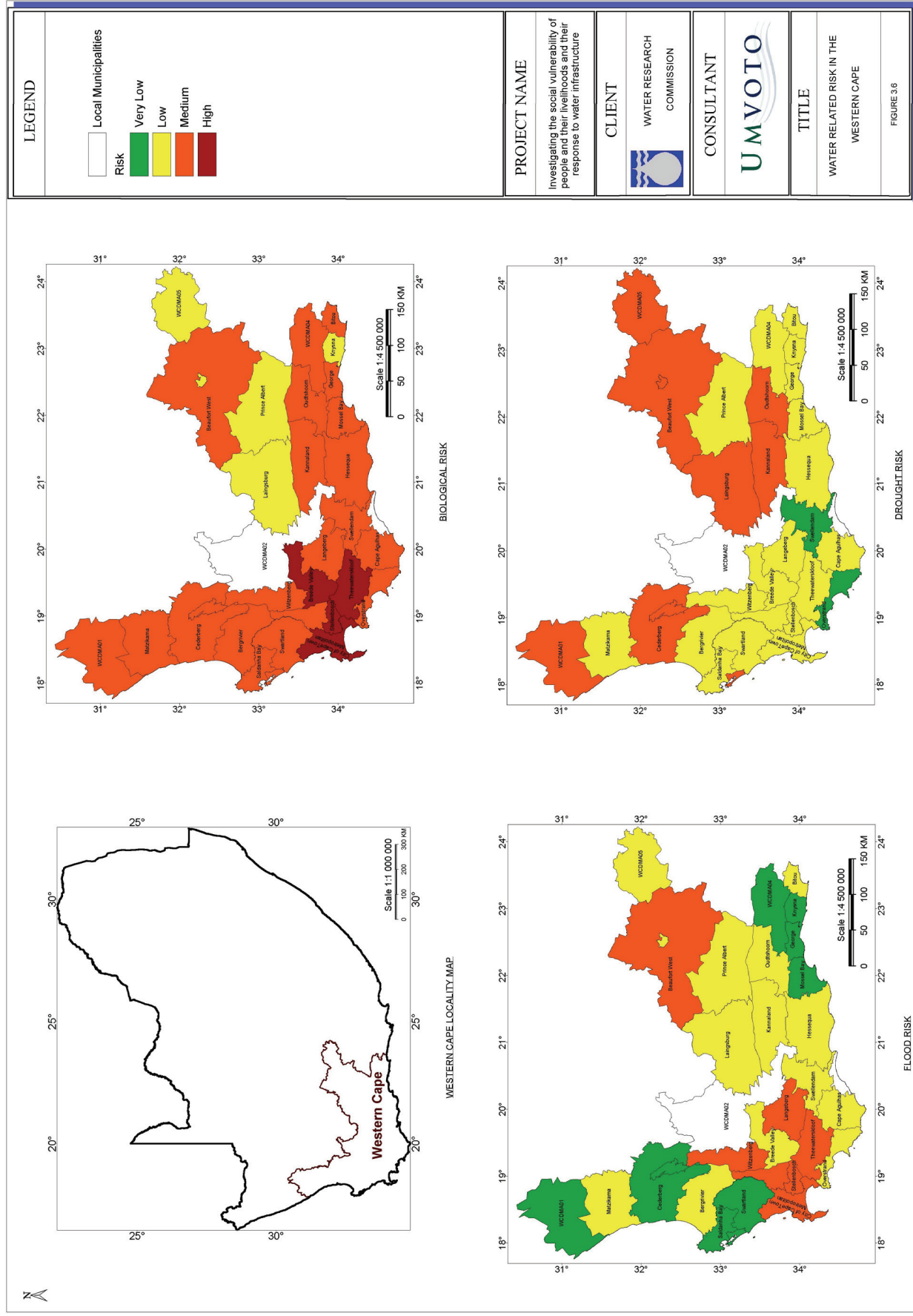
The risk maps were derived from data obtained the DWA Development of Reconciliation Strategies for selected Towns in the Southern Planning Region. (DWA 2010 a,b).

This study was tasked to evaluate the:

- Water resource availability;
- The state of infrastructure (operations and maintenance);
- Human capital (vacancies and qualifications); and

Water Conservation and Demand Management Strategy and Programme in all the towns outside metropolis areas in the Western and Easter Cape.

The information was summarized for each LM, based on expert opinion. The risk was evaluated in the context of failure of assured supply and does not relate only to hydro-meteorological drought.



4 APPLICATION OF THE RISK-BASED APPROACH AND FINDINGS

4.1 OVERVIEW

The methodology outlined in **Section 3** was applied to three case studies:

1. Cala, a rural town in the Eastern Cape
2. Kayamandi Township in the Western Cape
3. Carletonville, a mining town in the Wonderfonteinspruit Catchment in Gauteng

This section illustrates the application of the risk assessment methodology using summary results and examples from these case studies. This section must be read in conjunction with Appendices 6a, b, c; 7a, b, c and 8a, b, c for Cala, Kayamandi and Carletonville in the Wonderfonteinspruit Catchment, respectively. This section also details the key findings from the application of the methodology and recommendations derived from field work and the risk assessment process.

4.2 STEPS FOR IMPLEMENTATION OF RISK ASSESSMENT

Table 4-1 lists the steps involved in the practical implementation of the risk assessment methodology along with a brief description of each step. Further details and examples of each step are then described in the sections that follow.

4.2.1 Identify and Describe Assessment Area

The study was concerned with those behaviours and factors that influence the ability of socially vulnerable communities to make good risk management decisions in relation to water resources and infrastructure. The purpose was to explore communities' strengths and weaknesses. These factors, the geographic location and the hazards faced by the communities, the likely ease of obtaining readily available data and information as well as logistic issues related to fieldwork and associated costs influenced the final case study selection.

From the potential case studies (see **Table 4-2**), three were chosen, namely Tsengiwe (Cala), Kayamandi, and Carletonville in the Wonderfonteinspruit Catchment Area (WCA).

Table 4-1: Steps for Practical Implementation of Risk Assessment

Step No.	Step	Description	Section	Appendix
1	Identify and describe assessment area	Select the appropriate area and assess the relevance in terms of risk assessment and possible interventions.	4.2	Appendices 6-8
2	Identify and assess hazards	Identify the hazard events in the area and assess the probability and impact.	4.3	Appendices 6-8
3	Collect data	Collect, collate and summarize data via interviews and statistical databases, based on comprehensive list of indicators.	4.4	Appendices 6b, c – 8b, c and 9
4	Select final indicators	Use the available data and information gathered during data collection, and consider the appropriateness of indicators to a particular site, to select the indicators to be used in the risk assessment.	4.5	Appendix 10
5	Score the indicators and apply risk equation	Develop a scoring method for vulnerability and coping capacity indicators, essentially defining a 1 to 5 scale based on the HFA and relevant international and national standards and targets. Use the scoring method to apply to the data. Average the scores for social vulnerability and average the scores for coping capacity to achieve a final score for each, taking into account any weighting considered appropriate during development of the scoring system for this case study base on available data. Incorporate the scores for hazards, coping capacity and vulnerability into the Risk Equation for a final Risk Index. Determine what level of risk is implied by this risk index.	4.6	Appendices 10 and 11
6	Analyse results	Compare the data initially collected and any experience in the field with the final risk index. Comment on the validity of this index. Are there any flaws in the data, which may have skewed the final index, particularly in terms of the averaging process?	4.7	
7	Improve communications	Recommendations to reduce Social Vulnerability and associated risks to sustainable implementation and O&M of water-related infrastructure	5	

Cala's population is especially vulnerable due to the widespread nature of the HIV/AIDS epidemic, drought and a lack of water services and the presence of social protection mechanisms for issues related to drought. Kayamandi was selected because of poor water and sanitation service delivery, flood potential and a highly vulnerable population due to impaired immune systems exposed to a biological hazard of water contaminated by human and domestic waste. The situation is further relevant to populations outside of Kayamandi as the contamination of the river may have downstream impacts on the fruit industry, which could lose significant markets if the biological contamination is transmitted to export fruits. Carletonville was selected as a typical mining town with associated informal settlements and economic township expansion in the Wonderfonteinpruit Catchment dominated by the risks associated with acid mine drainage, which affects water quality and availability. The considerations related to the Wonderfonteinpruit Catchment could also have wider impacts socially and economically if mining of gold and the dumps were to halt or if water services to

informal and (sub)-economic areas continue to be of poor quality. In terms of the legislation environment of South Africa the regulations regarding the radionuclide and heavy metal AMD hazard have not been enforced.

Table 4-2: Overview of potential case studies (selected three are highlighted in grey).

Case study	Province	Local Municipality	Climatic region (summarised)	Reason/Vulnerability	
				Hazard	
Bushbuckridge	Mpumalanga	Bushbuckridge	Northern Highveld	Biological/Institutional	Water and sanitation services
Khayelitsha	Western Cape	City of Cape Town	Mediterranean	Flood	Flood vulnerability; water quality
Khayamandi	Western Cape	Stellenbosch	Mediterranean	Biological/Flood	Flood vulnerability; water quality
Ulundi	KwaZulu- Natal	Ulundi	Sub-tropical Coastal/ Lowveld	Biological	Water quality (cholera)
Tsengiwe (Cala)	Eastern Cape	Sakhisizwe	Temperate Inland	Drought/Biological	Water services; HIV; food security; drought
Moshaweng LM	Northern Cape	Moshaweng	Semi-Arid – Arid	Drought	Drought; water and sanitation services
Wonderfontein-spruit	Gauteng/North West	Randfontein/ Westonaria/ Merafong City (Carletonville)	Highveld	Technological Institutional	Contamination (uranium and AMD); water services
Delmas	Gauteng	Delmas	Highveld	Biological/Institutional	Contamination; water services
Kei Mouth	Eastern Cape	Great Kei	Temperate Coastal	Drought	Drought; water supply

The three case studies and the data collected for each are presented in detail in Appendices 6 to 8. The reader is advised to read these appendices in parallel with the report as they support and complement sections that follow. A brief overview of each of the selected case studies follows in the text boxes below.

Table 4-3: Comparison of Case Studies based on SLF Social Assets (after Twigg, 2001; Benson and Twigg, 2007)

Type of Capital	Key issues	Cala	Kayamandi	Wonderfonteinspruit
Human	Low education levels	Low education levels	Good schools in the area but few get far; NGOs after school programmes, etc.	Low education
Social	Fractured communities	Small communities: people know each other → can lead to disputes People come together in community meetings and at church → High spiritual coping capacity Mainly elderly women and children: husbands and mothers go elsewhere for work (e.g. mines, Western Cape) → community fracturing	Many NGOs Community somewhat fractured as people come from Eastern Cape so view it as a temporary home/not part of old group Some locals run soup kitchens voluntarily through churches and are socially pro-active. Political corruption high	Few NGOs People come from different parts of the country and continent (many are illegal workers) Many sex workers Fractured communities
Physical	Poor infrastructure	Limited infrastructure No fencing for farming Few businesses in villages IDP aims to improve infrastructure in Cala	Limited infrastructure. Poor O&M of existing infrastructure	Unknown
Natural	Pollution, Poor use of resources Limited resources	Fertile land Seasonal access to river water for irrigation	Limited natural resources Very polluted water source	Very polluted environment
Economic/ financial	High unemployment Dependency on social grants	High unemployment Mainly unskilled labour available Dependence on social grants Some remittances from family members working elsewhere	High unemployment Access to higher education limited Access to employment on farms and in Stellenbosch	Mines provide work but dependency on mines

Cala Case Study

Context:

Cala is a rural town and settlement situated approximately 100 km west of Umtata in the Eastern Cape province of South Africa. It has a temperate inland climate. The Tsomo River runs through the area just to the west of the town.

Hazards and Vulnerability:

Seasonal water scarcity and drought, a lack of water services, food security issues and social problems are experienced in Cala. Ineffective governance by local and regional leaders and limited service delivery in general also contribute to the problems experienced by the community.

One of the main key issues identified by the local municipality is the dispersed settlement pattern of developed centres surrounded by scattered, underdeveloped rural villages, which makes providing access to basic infrastructure and services more costly, resulting in fragmented development.

Many people in the area live in poverty as a result of the high illiteracy (90%) and unemployment (80%) rates. There is no nearby industrial area, and a large percentage of men that did work in mines in Gauteng have been retrenched since 1999. This has led to many social problems including crime (such as theft, murder and rape), drug abuse, alcoholism, youth suicide, gender inequality and the rapid spread of HIV/AIDS.

The population has a high percentage of youth and the most productive group (age 20 to 45) is only 30% of the population. There is a high unemployment rate among those of economically active age.

The Cala area was selected as a case study because of the presence of the Masiphile Project, which is a community and church supported, multi-disciplinary social upliftment project. The project was founded by community member Nomfundo Lily-Rose Mlisa, a former nurse and trained clinical psychologist who is currently the Director of Counselling Services at Fort Hare University and a church leader in Tsengiwe Village. The project is currently run by a small group of women from Tsengiwe Village, overseen by Nomfundo Lily-Rose Mlisa.

The project focuses on the support and upliftment of people infected and affected by HIV/AIDS (Mlisa, 2009). See Appendix 6 for further information.



Kayamandi case study

Context:

Kayamandi is an informal settlement on the banks of the Plankenburg River on the outskirts of Stellenbosch in the Western Cape Province. The population is approximately 22 000. The majority of households have incomes of R3500/month or less, 92% having R1500/month or less (DAG, 2003).

Hazards and Vulnerability:

Water sampling along the Plankenburg River, in the vicinity of Kayamandi, have shown greatly elevated levels of *E. coli* bacteria in the past 10 years, with samples downstream of Kayamandi exceeding the drinking water standard of 2000 *E. coli* per 100 ml of water 90% of the time, and *E. coli* levels reaching 16 million per 100 ml in some instances (Barnes *et al.*, 2004). High levels of *Streptococcus*, *Staphylococcus* and *Enterobacter* bacteria are also present, and these cause serious disease and illness in both humans and animals.

The majority of the community of Kayamandi have impaired immune systems, and there is a high prevalence of tuberculosis and HIV/AIDS (Barnes *et al.*, 2004). A large percentage of the community lives below the poverty line, and cannot afford basic health care. Shack dwellings do not provide adequate protection against damp, which can lead to chronic diseases such as rheumatism and arthritis, and respiratory illnesses such as pneumonia and bronchitis (Barnes *et al.*, 2004). Due to the informal nature of the housing, and the climate of the southwestern Cape, the area is also prone to flooding during winter cold fronts and spring cut-off lows, compounding risks.

According to the Crime Analysis Centre in Stellenbosch (CIACS) (2004), crimes in the residential area of Kayamandi are mainly contact crimes such as murder, rape, assaults and robberies (including attempted robberies) against individuals. The majority of these crimes are liquor-related and occur at weekends and at night in dense informal settlement areas (Business Intelligence Menu, 2004).

Service provision with respect to clean water and sanitation is severely lacking in Kayamandi, with street taps and communal bus toilets being used (Barnes *et al.*, 2004). The communal toilets are often far distances from the housing units, and hence some people use buckets and leave their waste on the streets. See Appendix 7 for further information.

Wonderfonteinspruit case study

Context:

The **Wonderfonteinspruit Catchment Area (WCA)** forms the eastern catchment of the Mooi River, and straddles both the Gauteng (upper catchment) and North West (lower catchment) provinces over a distance of approximately 100 km. Approximately 400,000 people live within the WCA, with the Wonderfonteinspruit passing many towns, formal townships and informal settlements. A large percentage of these towns and settlements are related to mining activities within the catchment. Rand Water supplies most of the towns with domestic water. Carletonville lies within the WCA and is the largest gold-mining complex in South Africa, employing approximately 75 000 workers. The Carletonville district includes the town of Carletonville, Khutsong Township and 12 mine shafts as well as some smaller residential areas. Khutsong Township has a range of housing types, including private and council houses, site and service points and squatter settlements. The gold miners in Carletonville are predominantly workers from rural areas in South Africa or neighbouring countries (Botswana, Mozambique and Lesotho). Remittances from mineworkers are important to the economies of the labour source areas. Carletonville was selected as the urban centre of an LM which is representative of the challenges and hazards faced in the WCA.

Hazards and Vulnerability

Gold mining in the WCA affects water resources in two ways, namely water availability (quantity hazard) and water pollution (quality hazard) (Coetzee *et al.*, 2006). With respects to water availability, gold mining reduces the water resources of the WCA via dewatering. Water quality in the WCA is affected by both onsite and offsite sources, with numerous studies indicating the Wonderfonteinspruit has an acid mine drainage (AMD), heavy metal and radionuclide (approximately 50 tons of uranium per year released into the WCA) contamination problem associated with gold mining in the area (Coetzee *et al.*, 2006).

The HIV infection rates in the Wonderfonteinspruit area are among the highest in the world. There are also high rates of tuberculosis and other sexually transmitted diseases. Poor water and sanitation service delivery in the area compound the vulnerability. See Appendix 8 a for further information.



Figure 4-2: Acid mine drainage in the Tweelopiespruit, which shares a source area with the Wonderfonteinspruit. The headwaters area is dominated by mine dumps which pollute both streams.

4.2.2 Identify and Assess Hazards

Hazards for each case study were identified and assessed based on the probability of a particular event and the impact of the event on the area. Scores were assigned, based on hazard probability and impact, from 1 (very low) through to 5 (very high). They were estimated qualitatively based on visual interpretation, historic evidence, and expert opinion. The identified hazards and associated scores for each case study are shown in Table 4-4. Details on the hazards faced in each case study area are found in Appendices 6 (Tsengiwe near Cala in the Sakhisizwe LM), Appendix 7 (Kayamandi in the Stellenbosch LM, Cape Winelands DM), and Appendix 8 (Carletonville in the Wonderfonteinspruit Catchment, Gauteng).

Table 4-4: Hazard Scoring for Case Studies

Hazard	Cala		Kayamandi		Wonderfonteinspruit	
	Score	Information	Score	Information	Score	Information
Flood	2	Incised river valleys, relatively high elevation	3	Township at relatively high elevation above the river	3	Severe flooding likely every 20-50 years along various river courses
Drought	4	Severe drought likely every 10-20 years	4	Severe drought likely every 10-20 years	4	Severe drought likely every 10-20 years
Biological	5	Some cases due to ingestion of river water	5	Highly polluted river system	N/A	Unknown
Technological	2	Minor agricultural runoff pollution	5	Agricultural runoff pollution present	5	AMD constant and severe hazard
Institutional	5	Poor water infrastructure planning and service delivery	4	Poor water infrastructure planning, 5 yearly change in municipal staff	5	Constant upheaval and civil unrest with regards to what DM and province area falls in

4.2.3 Collect Data

4.2.3.1 Data Sources

Information for each of the case study areas was collected via field interviews, telephone interview, and statistical databases. The comprehensive list of indicators (Appendix 5) was used as a guide when collecting data Table 4-5 summarises the various data sources used. Further details of collated data, data sources and correspondence are shown in Appendix 6b and 6c (Cala/Tsengiwe), Appendix 7b and 7c (Kayamandi), and Appendix 8b and 8c (Carletonville/Wonderfonteinspruit Catchment) and Appendices 9 (Data Correspondence).

Table 4-5: Data Sources for the three case studies

Data Source	Cala		Kayamandi		Wonderfonteinspruit	
	Used (Y/N)	Institution	Used (Y/N)	Institution	Used (Y/N)	Institution
Statistics South Africa	Y	Statistics South Africa web page: www.statssa.gov.za	Y	Statistics South Africa web page: www.statssa.gov.za	Y	Statistics South Africa web page: www.statssa.gov.za
Governmental Departments and Municipalities	Y	Head of the Sakhisizwe LM Water Services department Head of LM Integrated Development department LM Disaster management personnel	Y	Disaster management personnel	Y	Merafong Municipality (telephonic interview, community surveys and census data)
Educational Institutions	Y	Cala High School Deputy Principal Tsengiwe Junior Secondary School Principal	Y	Kayamandi High School teacher: Yoliswa Makuleni Educator at Ikaya Primary and Coordinator of Soul Buddiez Club	N	N/A
Non-Governmental Organisations	Y	Masiphile Project Caluso Project	Y	Volunteers from Legacy Centre: Khayalimpilo House of Wellness	N	The Federation for a Sustainable Environment (FSE)
Childcare Facilities	N	N/A	Y	Masifunde Creche	N	N/A
Local Community Members	Y	Members of the Tsengiwe community on the issues they face related to water infrastructure and drought as well as their perceptions of risk and disaster Community radio	Y	Church leaders	N	N/A

4.2.3.2 Problems Associated with Data Collection

Difficulties encountered during data collection made the process of gathering information very time consuming. Although certain data may exist, securing it was difficult when permission was required. Other data (such as the number of wrongly evicted persons, teenage pregnancies, orphans, and single parents) was not available through official channels or had not been collected. Problems associated with data collection are summarised below. A full summary of telephone and email correspondence undertaken for all case studies is in Appendix 9.

4.2.4 Select Final Indicators

Where quantitative data was missing, the available qualitative data was assessed. The initial comprehensive list of indicators was filtered down to a final, measurable set of indicators with associated data sets. The final selection of indicators was based on review and reflection of the case study information and the appropriateness of the indicators for each case study. It was also based on the availability of data at the local municipality and community level.

The final indicators used for each of the four key outcomes are shown in Table 4-7 on the following page although indicators for Key Outcome 4 were not scored but informed the approach documented in Appendix 12.

Table 4-6: Problems Associated with Data Collection

Communication	Municipal organization	Data Attainment
• Reaching the responsible authority • Researcher was passed through several personnel and often not the correct one • Inquiry desk at municipalities was unsure of the responsible person that could assist with data collection • Lack of email response • Limited contact information for data custodians (StatsSa has a general email address but this makes follow-up emails easy to ignore) • Health queries re-directed between different levels of the health department (National Health Department directs to the district municipality or provincial government and vice versa) • Health queries are often delegated to other responsible personnel within the department, as the required health information was three fold – health statistics, implemented standards of health practices (policies and programmes) and budget allocated to health services activities – and due to delegation the substance of queries are lost, and follow ups are needed to clarify requests again	• Lack of clarity (i.e. on municipal websites) as to which municipal office is in charge of which activity. • Municipal websites do not provide necessary documents or information on what data is available	• Lack of readily available data in accessible, interactive data sets (as such found through the Statistics SA website) • Data sensitivity (data such as the number of registered orphans or the number of people that have been infected with a certain disease) not available to the public • Data does not exist, particularly at the community level (i.e. the number of divorces in a community) • Research permission was requested but response never received • Data is available but custodian unable to give certain records (i.e. Randwater water billing and consumption for Merafong Municipality) • Data costs money • Health-related statistics not readily available on Statistics South Africa • Health data considered sensitive • Formal permission required for each province but none was granted even after forms sent in and follow-up conducted • Local clinics unwilling to provide qualitative information without formal research permission • Immunization and Vaccination information custodians, such as SAVIC (South African Vaccination Immunisation Centre, may contain large numbers of useful documents, such as implemented programmes and policies, but do not hold raw data for use in research

Table 4-7: Selected Key Outcomes, Statements of Intent and Key Indicators

Key Outcome 1: Identify and Monitor Hazards	
Statement of Intent	Key Indicators
Identify hazards linked to water and its infrastructure	Document or database of existing hazards at the LM level
Implement monitoring of hazards	Monitoring protocol in place
Develop early warning systems	Protocol for implementing Early Warning Systems at the LM level
	Evaluation and monitoring of early warning and response effectiveness and efficiency
Key Outcome 2: Reduce Vulnerability through Infrastructure	
Statement of Intent	Key Indicators
Development of Disaster Risk Reduction Strategies	Disaster Risk Reduction Strategy in place in place at LM
Develop Disaster Management Plans	Disaster Management Plans in place at DM level and implementation at LM level
Improve water conservation and demand management (drought and water supply)	Demand management and conservation strategy in place
	% of people with water systems in their homes
Increase quality of drinking water	Water treatment works meet Blue Drop minimum requirements
Improve dwelling standards	Building codes in place at national level and a protocol for monitoring dwelling standards in place at the LM level
	Decrease in the number of shack dwellers and homeless people
Improve Waste Water Treatment Works Operations and Maintenance	Waste water treatment works meet Green Drop minimum requirements
Improve Sanitation	Increase in % of people with at least a VIP level sanitation system per household
Improve Health Systems	Health Strategy in place with a reference to water-borne diseases and emergency situations exists at national level
Key Outcome 3: Reduce Vulnerability and Increase Coping Capacity through Social Elements	
Statement of Intent	Key Indicators
Improve standard and availability of education to people of all ages	Increase in literacy rates
	Increase in primary education enrolment
	Increase in secondary school enrolment
	Increase in enrolment in higher education
Empower women to empower themselves	Increase in female employment vs. males per sector group
	Increase in women's enrolment in education (primary, secondary, and higher)
Improve socio-economic situation	Increase in the dependency ratio
	Decrease in the % of people on/below the poverty line
	Decrease in % of people on/below the extreme poverty line
	Decrease in unemployment levels
Establish community support systems	Existence of an increase in the number of community run projects
Improve tenure rights	Policies on land ownership exist which make reference to gender equality
Key Outcome 4: Improve Communication	
Statement of Intent	Key Indicators
Raise awareness to hazards and its impact on water infrastructure	Decrease in sickness, deaths, and property damage
	Increase in education material on hazard mitigation
	Communication strategies in place for early warning
Improve early warning	Decrease in response time to disasters
Identify partners in the community	Increase in number of projects with community members as partners
	Number of community members on steering committees
Engage in public participation	Increase in community attendance of meetings
	Improved understanding of information by public

4.2.5 Score the Indicators

4.2.5.1 Scoring Social Vulnerability and Coping Capacity

The scoring method was developed using the HFA and relevant international and national standards and targets for particular indicators, including the Blue Drop (Drinking Water Quality) Certification 2010 and the Green Drop Certification (Effluent Water Quality) 2009 (see Appendix 11a,b).

These targets reflected the desirable outcomes and therefore acted as a benchmark for scores. The scoring method was also based on data and what is reasonable to achieve in a particular context. Some of the indicator scores needed to be weighted appropriately where there was a bias of data availability for worst or best case variables. The scoring method for both social vulnerability and coping capacity were based on a score range of 1 (very low) to 5 (very high).

Table 4-8: Example of Scoring Method: Unemployment Rate

The unemployment rate for South Africa is 25.2 % (www.mg.co.za). The country aims to halve unemployment by 2014, to approximately 12.5 – 13 %. The ultimate goal for unemployment is much lower, thus 10 – 14 % is used as a score for medium-level vulnerability.				
Key Outcome 3: Reduce Vulnerability and Increase Coping Capacity through Social Elements				
Statement of Intent: Improve Socio-Economic Situation				
Indicator: Unemployment rates				
1	2	3	4	5
Very Low	Low	Medium	High	Very High
0-4%	5-9%	10-14%	15-19%	20+%
The unemployment rate in the Sakhisizwe LM is 24%. Cala urban area has an unemployment rate of 34% and the village areas are estimated to have an unemployment rate as high as 80%, giving a final score for this social vulnerability indicator of 5.				

The scoring method was applied to the data for social vulnerability and coping capacity indicators for one hazard in each case study area. The scores for social vulnerability indicators and coping capacity indicators were then averaged to achieve a final score with respect to the primary hazard decided upon in each case study. Social Vulnerability scores related to Key Outcomes 2 and 3, while coping capacity relates to scores contained in Key Outcomes 1, 2 and 3. (See Appendix 10). The extent to which the HFA Priorities for Action (UN/ISDR, 2005) have been implemented at national, provincial and local level for the dominant hazard largely determined the coping capacity score.

A comparative analysis of scores for Social Vulnerability and Coping Capacity in the case study areas is illustrated in Figure 4-3 below.

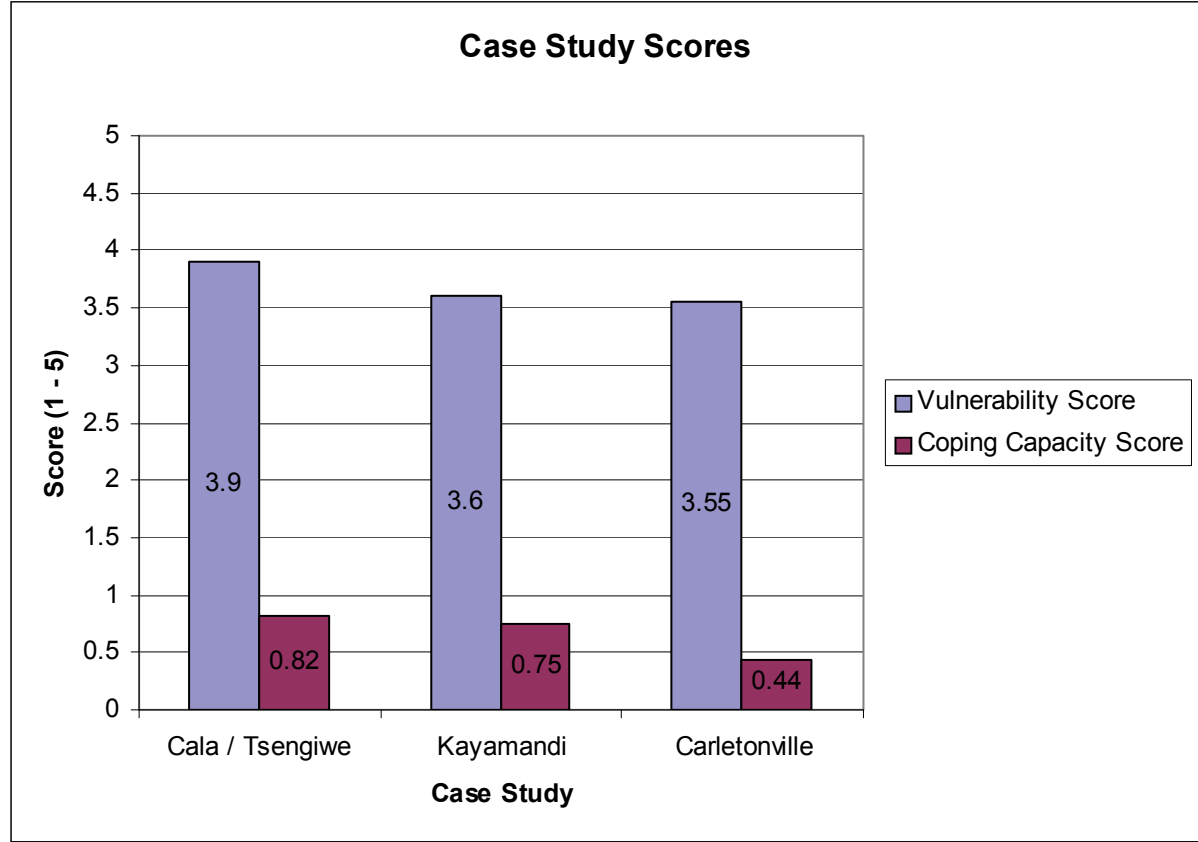


Figure 4-3: Case Study Scores for Vulnerability and Coping Capacity

Details of the scoring per indicator are shown in Table 4-9 and Table 4-10 below.

Table 4-9: Comparative Display of scores for Social Vulnerability per case study for prioritized hazard using Key Outcomes 2 and 3

Key Outcome	Statement of Intent	Key Indicators	Cala (Drought)		Kayamandi (Biological)		Wonderfontein spruit (Technological)	
			Score	Information	Score	Information	Score	Information
Key Outcome 2: Reduce Vulnerability through Infrastructure	Improve access to water and water conservation	% of households using recycled or rain water	5	0.8% of households at the LM level use rain water tanks	5	0.8% at the LM level use a rain water tank (12.5% use the river)	5	0.6% of households at LM Level use the rain water tank system
		% of households with water systems in their homes	4	21.4% of households within the municipality have access to water within their households (Statistics South Africa-CS2007)	4	28.9% of households within the municipality has access to water within their households (Statistics South Africa-CS2007)	5	36.5% of households have piped water inside their homes at the Merafong LM level (Community Survey 2007). Those who have piped water within their homes are the least at risk, however in Carletonville and Khutsong specifically; it is unknown how many households actually have piped water inside their homes. Those most at risk live near mine dumps and do not have reticulated water.
	Develop Waste and Health Management	Increase in % of people with at least a VIP level sanitation system per household	3	45% of people have VIP toilets or better (chemical, flush with septic tank, flush connected to sewer) and of that 60% have a VIP toilet. 32% have a pit latrine without ventilation. In the villages, almost everyone has a pit latrine, some VIP	4	Community Survey 2007 shows that 93.4% of dwellings have at least VIP toilet systems or better (i.e. Flush Toilets). This does not however give a true reflection of the Kayamandi sanitation situation. The final report will provide Qualitative information with regards to this data.	3.5	99% of households in Carletonville have a VIP level toilet system or better (flush with septic or sewerage or chemical toilet) (Census 2001). This data does not necessarily include the Khutsong Township outside of Carletonville.
Key Outcome 3: Reduce Vulnerability and Increase Coping Capacity through Social Elements	Improve standard and availability of education to people of all ages	Increase in literacy rates	3	53.7% are literate in Sakhisizwe (Sakhisizwe IDP 2009-2010 using Census 2001 data) – percentage of people over 13 years who have completed grade 7.	2	Stellenbosch literacy level was measured by the amount of people that completed Grade 7 against the total population above age 13 (of community Census 2007) which equalled 73.4% – may be due to access to secondary and tertiary institutions	4	The literacy rates in Merafong LM (percentage of people over 13 years who have completed grade 7) are 28% (Community Survey 2007)
		Total Population that have highest level of education at grade 7 and more	3	More than half of the school going population have gained Gr7 and higher education – 56.4%	3	57.5% of the population have completed grade 7 and more	2	73.4% of the population in Carletonville have gained Gr7 education and higher. While this is quite high, if this statistic includes mine workers and sex workers, specifically illegal migrants, is unknown.
		Total population that have highest level of education at grade 12 and more	5	13.4% of Cala's school going population have received Gr12 education and higher	5	Only 14.9% of Kayamandi population has completed Gr12 and higher education	4	36.9% of school going population received Grade 12 and higher
		Total population that have highest level of education as tertiary education	5	2.5% of school going population have received tertiary education	5	2.3% of Kayamandi population have gained tertiary education	4	10.5% of school going population in Carletonville have received tertiary education
	Empower women to empower themselves	Increase in female employment relative to males per sector group	2.67	Group 1: 60%; Group 2: 15% Group 3: 41% (1+5+2 = 8/3 = 2.67)	2	Group 1: 49.6% Group 2: 44% Group 3: 44.5 Group 4: 54% (Average of 48%)	2.25	Group 1: 36%; Group 2: 40%; Group 3: 16%; Group 4: 58% (3+2+5+1/4 = 2.25)
		Increase in women's highest level of education as grade 7 and more	2	The percentage of women within Cala that have received basic education and higher stands at 69.6%, the lowest of the three communities.	1	81.1% of the women population within Kayamandi have received basic education and higher	N/A	91.4% of woman within Carletonville have gained a basic level of education and higher. While this is quite high, those living in informal settlements are at highest risk and the education levels are not available for this study.

Key Outcome	Statement of Intent	Key Indicators	Cala (Drought)		Kayamandi (Biological)		Wonderfonteinspuit (Technological)	
			Score	Information	Score	Information	Score	Information
	Improve socio-economic situation	Decrease the dependency ratio	3	In Cala, 64% of the population are dependents (below the age of 15 and older than 65 years, including unemployed). This results in a dependency ratio of 1 income earner to 2.77 dependents, giving a ranking of 3.	3	Stellenbosch LM Dependency is 1:1.05 (not necessarily reflecting the community level). Coupled with unemployment at the LM level, there is a greater dependency. In the Kayamandi context it is likely to be similar, at least 1: 3.	2	The Merafong LM experiences a dependency ratio of 1:0.99. Coupled with unemployment, the score is at least 2 although at the Carletonville level the ratio is unknown.
		Decrease in the % of people on/below the poverty line	5	63.6% of people in Sakhisizwe LM (Community Survey 2007) are on or below R19200 annual household income. 15% have no income.	3	At the LM level there are a total of 8656 people that are on and below the poverty line – 30.3%	3	23% of households in Merafong LM are below the R1600 poverty line (Community Survey 2007)
		Decrease in % of people on/below the extreme poverty line	5	37.6% are below R 9600 annual household income. 26% of people in Sakhisizwe LM (Community Survey 2007) earn R400-R800.	5	At the LM level there are a total of 4928 people that are on and below the extreme poverty line – 17.25%	4	15.67% of households in Merafong LM are below the poverty line (Community Survey 2007), 7.9% of households have no income.
		Decrease in unemployment levels	5	Average unemployment in Sakhisizwe LM 24%. Cala urban area has unemployment rate of 34%, however, only 13% of Cala's economically active population is not engaged in seeking for work (Sakhisizwe IDP 2009-2010, p. 18)	4	At LM Level, the unemployment level within Stellenbosch stands at 17.1%	5	26% are unemployed (Merafong LM Community Survey 2007)
	Improve tenure (i.e. land ownership and renters' rights	Decrease in the number of shack dwellers and homeless people	5	28.6% of dwellings in Cala (Community Survey 2001) are informal dwellings (shacks in backyards or in an informal settlement)	5	The amount of people living in shacks, informal dwellings or homeless in Kayamandi equalled to 48.8% as stated by StatsSa Census 2001	5	17.8% of dwellings are shacks (in backyards or informal settlements), Carletonville (Census 2001)
Average Social Vulnerability Scores				3.9 (54.67/14)		3.6 (51/14)		3.55 (49.75/14)

Table 4-10: Comparative Display of scores for Coping Capacity per case study for specific hazards for Key Outcomes 1, 2 and 3

Key Outcome	Statement of Intent	Key Indicators		Cala (Drought)		Kayamandi (Biological)		Wonderfonteinpruit (Technological)	
		Document or database of prioritized hazards at the LM level		Score	Information	Score	Information	Score	Information
Key Outcome 1: Identify and Monitor Hazards	Identify hazards linked to water and its infrastructure	Document or database of prioritized hazards at the LM level		0	There is a database of hazards at LM level but it is not well-maintained and does not include slow-onset disasters such as drought (only quick onset such as floods, fires, and strong winds)	0	Stellenbosch LM: Waters Consortium (2004) Disaster Hazard, Vulnerability and Risk Assessment for Stellenbosch, Pg 60-65: looks at hazards within the LM and holds record of frequency (not done on a regular basis). At the LM level there is a database of incidents in Greater Stellenbosch documenting victims, structural damage and hazard type. Processes for data collection are only in place for after the disaster has occurred and biological hazard not included in this.	0	The Merafong IDP, Annexure J2, clearly indicates that the LM has plans to develop and maintain a database that would be linked with geographical information systems. However this is not specific to technological hazard.
	Develop early warning systems	Protocol for implementation		0	There is no protocol for implementing early warning systems and no mention of early warning is made in the Sakhisizwe IDP. There are methods of early warning. The disaster management personnel at the LM level goes into the community to issue warnings and there is a radio, SMS system but there is no early warning related to drought.	0	Stellenbosch IDP contains a Response Plan but no reference to biological hazard and no monitoring protocol of early warning systems.	0	Early warning is referred to in the Merafong IDP. The development, implementation and dissemination of early warnings form part of the routine planning processes undertaken by municipal departments and entities and early warnings are issued by the Merafong Disaster Management Centre, however this is not specific to technological hazard. No mention of plans to issue a formal protocol.
		Early warning system in place		0	No monitoring system in place	0	There is an early warning system - announcements are made to the community via loudspeaker or community leaders. Specific protocol does not exist and the system mentioned is for quick onset disasters only.	0	The Merafong IDP states that early warning systems would be adopted within their Ward Disaster Risk Management Constitution. Not yet implemented and not specific to technological hazard.
		Monitoring protocol in place		0	Municipality has no monitoring protocol and relies on notification from SAWS. They would like to set up their own monitoring station at the LM level but have no budget. However this is not drought specific.	0	LM does not have a monitoring system in place but monitoring is dealt with by SA Weather Services	0	The importance of systematic hazard monitoring and collecting, archiving and disseminating data is recognized briefly in the Merafong IDP but no protocol is mentioned.
	Development of Disaster Risk Reduction Strategies	Disaster Risk Reduction Strategy in place		0	DRR is not explicitly referred to in the Sakhisizwe IDP 2009-2010. There is mention that the plan should anticipate disasters and put in place measures that reduce the vulnerability of disaster prone communities and provide appropriate preparedness and mitigation strategies.	1	Stellenbosch IDP Disaster Management Plan refers to the establishment of risk reduction through increased human capacity.	1	The Merafong IDP sets out responsibilities and plans for implementing disaster risk reduction measures
Key Outcome 2: Reduce Vulnerability through Infrastructure	Develop Disaster Management Plans	Disaster Management Plans in place		1	Disaster management referred to in the Sakhisizwe IDP 2009-2010 as part of the Disaster Management Act stipulations. Broad Disaster Management Framework presented but brief.	1	Stellenbosch IDP sets out disaster management plan.	0	The Merafong IDP gives the comprehensive the 'Merafong Local Municipality Disaster Risk Management Plan (DRMP)' but no mention specifically of technological hazards.
	Improve water conservation and demand management (drought and water supply)	Water Services Development Plan in place		0	Chris Hani Municipality has a Water Services Development Plan (WSDP) for the years 2006-2011, currently in the interim phase. There is mention of water conservation and demand management but no strategy in place. Monitoring at the LM level is limited.	N/A	Stellenbosch LM has full and extensive WSDP set in place. Monitoring levels at LM level is unknown. No specific information is available for water conservation and demand management plans/implementation.	N/A	According to the National Department of Water Affairs and their Water Service Authority Listings – Merafong LM is yet to submit a WSDP. There is no information available on WCDM.

Key Outcome	Statement of Intent	Key Indicators	Cala (Drought)		Kayamandi (Biological)		Wonderfonteinspruit (Technological)	
			Score	Information	Score	Information	Score	Information
Key Outcome 2: Reduce Vulnerability through Infrastructure	Increase quality of drinking water	Water treatment works meet Blue Drop minimum requirements	2	Sakhisizwe (Elliot) received an overall score of 26.5%. Cala failed to present the necessary information. It is assumed that Cala is at similar levels in terms of blue drop score as Elliot. For purposes of overall coping capacity, local information and the Elliot score were used.	N/A	Stellenbosch received a 95.02% blue drop score. The blue drop score does not measure the quality of water used by those not receiving services. In this case the blue drop score is not relevant.	N/A	In the 2010 Blue Drop report, Merafong LM was included in the Northwest Province assessment. Merafong LM (with water provided by Rand Water) received a municipal blue drop score of 77.3%. The blue drop score does not measure the quality of water used by those not receiving services.
	Improve dwelling standards	Guidelines on building codes exist and protocol for monitoring dwelling standards in place	N/A	N/A	1	National Regulations and Building Standards Act No. 103 of 1977. Some monitoring at settlement level but regulations relaxed in townships. No protocol in place.	N/A	N/R
	Develop Waste and Health Management	Waste water treatment works meet Green Drop minimum requirements	N/A	N/A	N/A	Stellenbosch WWWTW received a score of 55%. It complies with response management and WWTW capacity – but still fails to regulate its data submissions to DWA. The WWTW is downstream of Kayamandi and therefore the Green Drop score is considered irrelevant.	N/A	Merafong LM received an overall score of 44%, and Khutsong in particular 55%
		Health Strategy in place with a reference to water-borne diseases and emergency situations exists at national level	1	The Primary Health Care Package for South Africa does not mention 'water-borne diseases' but refers to the management of diarrhoea, cholera and community level sanitation. Limited information with regards to how clinics in Cala and Tsengiwe deal with water borne diseases.	1	The Primary Health Care Package for South Africa does not mention 'water-borne diseases' but refers to the management of diarrhoea, cholera and community level sanitation. Limited information with regards to how clinics in Kayamandi deal with water borne diseases.	1	The Primary Health Care Package for South Africa does not mention 'water-borne diseases' but refers to the management of diarrhoea, cholera and community level sanitation. No information with regards to how clinics in the area deal with water borne diseases.
Key Outcome 3: Reduce Vulnerability and Increase Coping Capacity through Social Elements	Establish community support systems	Existence of an increase in the number of community run projects	4	Two main projects in Tsengiwe (Masiphile and Garden project -targeting elderly, people with AIDS and underprivileged children) and several in Cala (mainly Caluso farmer's project, victims of violence organization). Deal generally with drought, limited reach and resources but bold and brave start.	2.5	Many NGOs in Kayamandi -contacts received for at least 20, dealing with social issues (child welfare, single parents), counselling (rape crisis), child development, disability, recreation, residences, education, HIV/AIDS, pregnancy but although dealing with vulnerability associated with reduced immune systems and safety and security, none with biological hazard education.	1	Within Merafong the main projects concentrate on orphans and vulnerable households. Palliative programme for elderly people and some HIV/AIDS interventions.
	Improve tenure (i.e. land ownership and renters' rights)	Policies on land ownership exist which make reference to gender equality	1	Nationally, The White Paper on South African Land Policy dedicates a part of their Land Reform programmes to gender equality (Section 4.11, Pg 50) to allow women to achieve a fair and equitable benefit.	1	Nationally, The White Paper on South African Land Policy dedicates a part of their Land Reform programmes to gender equality (Section 4.11, Pg 50) to allow women to achieve a fair and equitable benefit.	1	Nationally, The White Paper on South African Land Policy dedicates a part of their Land Reform programmes to gender equality (Section 4.11, Pg 50) to allow women to achieve a fair and equitable benefit.
Average Coping Capacity Scores				0.82 (9/11)		0.75 (7.5/10)		0.44 (4/9)

4.2.6 Apply the Risk Equation

The final risk score is hazard specific and was calculated by taking the score for the particular hazard and multiplying it by the average score of all vulnerability indicators divided by the average score of all coping capacity indicators. The final score ranged in value from 0.1 (very low risk) to 25+ (very high risk) (see Table 3-4 on page 27). The threat of Drought, Biological Hazard due to contaminated water and that of Acid Mine Drainage (ADM) was assessed for the case studies of Cala, Kayamandi and Carletonville in the Wonderfontein spruit Catchment respectively. See Appendices 6a, 7a, 8a for further details on hazard exposure and Table 4.4 above for summary comparative Hazard exposure between the case study areas.

The results of the risk index scoring for the case studies are presented in Table 4-11 below.

Table 4-11: Summary Results of Risk Assessment for priority hazard in each case study

Hazard				Risk Index
	Hazard Score	Vulnerability Score	Coping Capacity Score	H X (V/C)
Drought (Cala)	4	3.9	0.8	19.5
Biological (Kayamandi)	5	3.6	0.7	24
Technological (Carletonville)	5	3.6	0.4	44

4.2.7 Analyse Results

The results of the Risk Assessment for the prioritized hazard in each case study were evaluated in light of contextual information, data, and academic opinion.

The Risk Assessment posed several challenges. These were:

- Data scarcity
- Data credibility and data contradictions
- Lack of gender/age specific data
- The challenge of averages
- Developing scoring criteria that accurately reflect the social vulnerability and coping capacity at the community level
- Need for hazard specific indicators related to water supply and water to better reflect complex picture of vulnerability and coping capacity
- Major differences in exposure, vulnerability and coping capacity within selected communities are blurred; data that informs the indicator score mainly reflects formal settlements and services (this is especially the case for Kayamandi and Carletonville)

In reviewing the Risk Assessment results and the overall methodology, key considerations are highlighted to address the challenges touched on above.

4.2.7.1 Data scarcity and Weighting Indicators

Data pertaining to informal settlements in general and medical data in particular was scarce at the community level. The approach developed was in part to overcome this difficulty, which precluded using statistical analysis. Indicators were thus developed that encompass a

wide range of Social Vulnerability characteristics and Coping Capacities. Without more specific data, investigating the degree of influence of these indicators on Social Vulnerability and/or Coping Capacity, and thus weighting indicators, was not within the scope of the study. Indicators were selected as relevant or not relevant for the selected case study hazard and scored on this basis. The study does not claim that a definitive set of indicators was used and suggests that it is through a process of iterative selection – reviewing, reflecting and revising – and scoring of indicators that a most appropriate set of indicators is realised.

Data scarcity was in part overcome through field work in Tsengiwe and Cala, and in Kayamandi. Field work in Carletonville and the greater Wonderfontein spruit catchment was beyond the budget available to the study. In terms of Coping Capacity, contextual information, derived from literature research, expert opinion, and field work, was especially necessary for formulating scoring criteria and scoring indicators. This consideration pertained to the coping capacity indicators in particular which are most dependent on contextual information rather than for defined targets such as for literacy.

For example, for the Key Outcome 3 (Reduce Vulnerability and Increase Coping Capacity), Statement of Intent: Establish Community Support Systems, the key indicator was ‘existence in the number of community run projects’. The data that informed the indicators represented a snapshot and were chosen so that if measured or scored in future years would illustrate a trend towards improved coping capacity or increased social vulnerability, as the case may be. In the example in Table 4-12 below, the emphasis was on establishing a measure as well as a trend in sustainable grassroots resilience.

Table 4-12: The criteria used to score an indicator that reflects to what extent a community may or may not have realised the establishment of Community Support Systems

Statement of Intent: Establish Community Support Systems				
Indicator: Existence of community run projects				
1	2	3	4	5
External NGOs support community projects but the services are not readily accessible to the community. They target only a select range of vulnerable groups.	External NGOs support community projects. The services are reasonably accessible to the community but there is growing awareness of opportunities to reduce vulnerability.	External NGOs support community projects. The services are readily accessible to the community. They reduce overall social vulnerability in targeted groups.	Community projects initiated and run by community members exist in cooperation with local government. Medium-long term funding is not secured. They relate to prioritized hazards or the impacts thereof and the community perceives the benefit.	Community projects initiated and successfully run by community members and enjoy sustained funding and support of local government. They relate to prioritized hazards, the community perceives the benefits of their work, and they target a range of vulnerable groups (women, children, elderly, HIV/AIDS infected, unemployed)

The indicator table above was scored for each case study and the results and reasons for the score given are tabled below.

Table 4-13: The scores for each case study given for the Indicator: Existence of community run projects

<i>Cala (Drought)</i>		<i>Kayamandi (Biological)</i>		<i>Carletonville (Technological)</i>	
Score	Information	Score	Information	Score	Information
4	Two main projects in Tsengiwe (Masiphile and garden project -targeting elderly, people with AIDS and underprivileged children) and several in Cala (mainly Caluso farmer's project, victims of violence organization). Deal generally with drought, limited reach and resources but bold and brave start.	2.5	Many NGOs in Kayamandi - contacts received for at least 20, dealing with social issues (child welfare, single parents), counselling (rape crisis), child development, disability, recreation, residences, education, HIV/AIDS, pregnancy but although dealing with vulnerability associated with reduced immune systems and safety and security, none with biological hazard education.	1	At the Merafong LM level, the main projects concentrate on orphans and vulnerable households. There is a palliative programme for the elderly people and some HIV/AIDS interventions.

It became clear after a number of iterations defining, selecting, and scoring indicators, that even at the community scale, indicators and data which 'map and measure' observed differences between formal and informal settlements, men and women, young and old better reveal who is most at risk, and why.

A minimum breakdown between genders, age, and formal and informal settlement information would significantly inform planning, budgeting and scheduling, development, implementation, operations and maintenance of water supply and services as well as communication and cooperation with Disaster Management Services.

4.2.7.2 Data Credibility and Contradictions

Contextual information, particularly that which was derived from field work, was important in reviewing data credibility and data contradictions. Certain data obtained or observed in the field was contradictory to information derived from literature review and other sources. This is illustrated in the Social Vulnerability scores given to Kayamandi and Carletonville (Table 4-13). In the case of Kayamandi, certain data is questionable. For example, Community Survey data (2007) shows that 93.4% of dwellings have at least VIP level sanitation. While this would have given a social vulnerability score of 5, a more realistic score in light of Kayamandi's actual sanitation situation in the informal settlements areas and the contribution from these areas to the risk, would be a score of 1. Similarly, in the case of Carletonville, Census data (2001) indicated that 99% of households in Carletonville have VIP level sanitation or better. This data does not necessarily reflect the context of mine workers living in hostels, or the sanitation situation in the Khutsong Township. Those with sub-standard infrastructure are likely to be more at risk.

4.2.7.3 The Challenge of Averages and Scoring Criteria

Averages can be a poor representation of the underlying values. The average may be skewed by a single high value while the median or mode and the shape of the data curve may more accurately reflect a trend in low coping capacity scores. Thus an average does not reflect the correct picture if the study domain (sample set) is very diverse, more so if it is bimodal. It can also disguise dependence on effective governance and service delivery that significantly increases vulnerability when it is lacking or corrupt. At best, a weighted average could moderate the limitations of averaging but this was not done in this study.

For example, the coping capacity scores for Kayamandi were generally 1's and 0's. However, the Stellenbosch LM WTW and WWTW received high blue and green drop scores, 5 and 4, respectively. This initially gave Kayamandi a slightly higher average (1.38) although these two indicators do not necessarily reflect grass roots Coping Capacity in townships and especially informal settlements. Thus further consideration was the development of scoring criteria that accurately reflects the impact on social vulnerability and coping capacity at the community level.

Scoring criteria was revised several times in order to ensure that indicators more explicitly reflect actual impact on social vulnerability and coping capacity at the community level. The indicators selected and the criteria used to score these are an indirect measure of a complex reality on the ground. Table 4-14 demonstrates the process of revision for the indicator: 'protocol for implementing Early Warning Systems at the LM level' for the Statement Of intent: Develop Early Warning Systems. The second version incorporates criteria that recognize the need for hazard-specific mechanisms, as well as effective activity at the community level. It also incorporates the need for a 0 score. In the first example, having no coping capacity mechanism related to implementing an early warning system garners a score of 1. Overall this increased the coping capacity score and resulted in an inaccurate final risk index.

Table 4-14: First and second scoring versions for a particular indicator. The second version incorporates hazard-specific mechanisms.

Statement of Intent: Develop Early Warning Systems					
Indicator: Protocol for implementing an Early Warning System (EWS) at the LM level					
	1	2	3	4	5
Version 1	Early warning not referred to in municipal plans and no initiatives for formulating a protocol.	Early warning referred to in municipal plans but there are no initiatives for formulating a protocol.	Early warning referred to in municipal plans and there are initiatives for formulating an early warning protocol.	A protocol is in the process of being formulated	A protocol for implementing an early warning system at all levels exists.
Version 2	The IDP sets out a basic plan for developing an early warning system; however it does not specify the prioritized hazard. There are no plans to formulate a protocol at the LM level.	The IDP sets out a comprehensive plan for an early warning system for prioritized hazards. However, there are no plans to formulate a protocol at the LM level.	The IDP sets out a comprehensive plan for early warning for prioritized hazards and a formal protocol is in the process of being formulated at the LM level, which incorporates early warning at the community/settlement level.	A protocol for implementing a EWS for prioritized hazard exists at the LM level, however it is not effectively implemented at the town/settlement level.	A protocol for implementing a EWS for prioritized hazard exists at the LM level and is effectively implemented at the town/settlement level.

So far as possible within time, budget and constraints of initial knowledge of the study area, the indicators need to be specific to each community or sub-group therein and the relationship and/or hierarchy in and between indicators needs to be explicitly mapped. The latter can be tested in the field and or in a Participatory Rural App (PRA). The approach developed in this study could be readily integrated into PRA process and early stages of water infrastructure planning. The process of finalising and scoring indicators required and stimulated increasingly rigorous examination and thought about the elements of social vulnerability and coping capacity. This in itself is likely to add value to the PRA and project conceptualisation and design process. It can initiate a positive spiral of benefits if the community takes up ideas and insights related to risk reduction.

4.3 KEY FINDINGS

This section explores the key problems identified for specific case studies and deriving from case study analysis as well as opportunities for dealing with identified problems.

4.3.1 Case Study Summary

In examining the results of the case studies, there were different Key Outcomes that stood out in each case study and have informed the recommendations (see Table 4-15).

Table 4-15: Key Outcomes and key Statements of Intent

Relevant Case Study	Problem Identified	Key Outcome (KO)	Statement of Intent (Sol)
Kayamandi	Poor service delivery and service maintenance in terms of water and sanitation	KO2: Reduce Vulnerability through Infrastructure	Improve sanitation and develop waste management systems
	Women are vulnerable to violence and rape. Many single mothers and teenage pregnancies.	KO3: Reduce Vulnerability and Increase Coping Capacity through Social Elements	Empower women to empower themselves
	Community does not always respect the infrastructure that is in place.	KO4: Improve Communication	Public participation and raise awareness
	Primary education enrolment is low and very few matriculants go on to further education.	KO3: Reduce Vulnerability and Increase Coping Capacity through Social Elements	Improve standard and availability of education
Cala	There is little community initiative in terms of income-generating activities.	KO3: Reduce Vulnerability and Increase Coping Capacity through Social Elements	Establish community support systems
	People do little to prepare for drought and lack strong leadership.	KO4: Improve Communication	Raise awareness, public participation, identify partners
	DRR focuses on quick onset disasters but there is very little focus on drought in terms of public awareness or communication between the Water Services department and Disaster Management personnel.	KO2: Reduce Vulnerability through Infrastructure	Develop Disaster Risk Reduction Strategies
Wonderfonteinspruit	No monitoring information or data released by DWA	KO1: Identify and Monitor Hazards	Develop monitoring protocol for different hazards
	Residents of informal settlements are at risk of flooding and sinkholes	KO1: Identify and Monitor Hazards	Research hazard impacts on people and their livelihood
	Non-mining residents are suffering same respiratory diseases as mine workers from dust from un-rehabilitated tailings dumps	KO1: Identify and Monitor Hazards	Research hazard impacts on people and their livelihood

4.3.2 Problems Identified

Grouped themes representing problems identified in the case study analysis are listed in Table 4-16 below.

Table 4-16: Problems Identified

Problem ID	Problem	Case Study Example
1	Lack of vision	Lack of understanding or accounting for the long-term costs in with the short-term gain of gold mining in the Wonderfontein Catchment Area. On a lesser scale but a similar issue, is the pre-emptive forward planning and installation of infrastructure for rural to urban migrants entering the Cape Town Metropolis as noted by the Stellenbosch LM Disaster Manager. Similarly there is no initiative to consider how to address this challenge. (See Item 4 below).
2	Technology (sustainability and maintenance/care)	This is linked to the funding system and cycle. Funding system supports construction of new infrastructure but not maintenance of old. Municipalities can therefore run infrastructure into the ground in the hope of getting new infrastructure built
3	Public participation (leadership and political interface)	Public participation is still a matter of simply ticking the boxes (EIA and IDP). There is no genuine interest in dialogue and engagement to ensure that the intervention is appropriate or sustainable. It is known that genuine dialogue can lead to rapid solutions (see Appendix 12).
4	Demand (urbanisation and lack of adaptation)	The limitations on pre-emptive infrastructure planning and implementation to accommodate the urban influx are linked to the funding cycle and processes in place at DM and LM level. By the time that funding is approved for a particular infrastructure project (this usually takes some years), chances are that the situation has changed: demands have increased; needs have changed; the system is dynamic, but the systems designed to meet the needs are rigid and based on predictable circumstances and are thus unable to accommodate and adapt to the dynamic context of the developing world/changing situation. (See also Item 1 above and 5 and 6 below).
5	Political Will, Insight and commitment to DRR	It has been estimated by the Head of Stellenbosch LM Disaster Management Personnel, Lucinda Segels (pers. Comm, 2010) by 2013, another 10,000 people will have come to live in Kayamandi. Yet the municipality has not given attention to what they will provide in terms of routine services or the budget necessary to prepare let alone cater for the expanding informal settlements. They are unprepared and plan to provide the same services at the same budget and same volume each year. Promises for a better future are politically motivated but not thought through in terms of bureaucratic and practical realities such as municipal budget cycle, grant fund applications which remains largely a reactive process. The concept of water and sanitation infrastructure implementation being a disaster mitigation/risk reduction measure is not appreciated by councillors. Similar issues arise in the Wonderfontein spruit catchment.
6	Funding system and cycle	Current funding systems and cycles are short term in nature when a longer-term vision is necessary, e.g. finances (budget) linked to the IDP/WSDP, which currently outline projects, when in fact it should rather be outlining purpose. If WSDPs were on the level of purpose, it would mean that you can constantly reflect, review, and revise rather than being locked into a particular project with a linked budget. See related issues 1, 4, 5 above).
7	Lack of reliable social protection mechanisms	Dysfunctional Institutions responsible for water supply and services pose a threat to the health of communities, the sustainability of water supplies and protection of the environment. Inadequate disaster management and communication (co-operative governance) between these sectors exacerbates this problem

Problem ID	Problem	Case Study Example
8	Planning/Scaling Issue	Including changes in vulnerability and population growth into drought planning/assurance of supply
9	No responsibility taken	Officials are only concerned with what is on their KPA's; it's a tick-box mentality rather than doing it because there is a belief it is the right thing to do: e.g., if on your KPA is do WSDP, then you don't care how it's done as long as it gets done. See Item 7 and 8 above.

4.3.3 Opportunity Identification

Finding solutions to the problems identified in Table 4-16 above involves unpacking the opportunities that lie within them to take constructive action. These include:

1. **Common good:** realising that by building capacities of vulnerable communities/other institutions, you ultimately can service your own interests too; moving from the attitude that “it’s not my problem/responsibility” to realising that by working together you can come up with solutions that no one person or institution could have thought of. Looking through the risk lens automatically requires working closely together to come up with the most appropriate response.
2. **Turning responsibility into an ability to respond:** realising that taking responsibility is empowerment at its greatest level; it means not waiting for others to improve your particular situation and changing from a mind-set that responsibility is a thing to run away from.
3. **Constructive Dialogue:** the more people are involved in working on a problem from different fields of expertise or interests, the more likely you are to come up with the “correct” answer. This phenomenon is being used a lot in business known as “crowd-sourcing”.
4. **Sustainability:** this refers to the need to take a long-term view on any infrastructure project and to make sure that future costs of operations and maintenance/remediation/rehabilitation are taken into account. There is a further need to realise that the dynamic development context of sustainability in South Africa is different to situations in developed countries, where change is likely to be slower, more predictable or more structured. In the South African context, especially in poor communities, history happens very fast. This means that when working on long-term projects, one needs to bear in mind that knowledge and perceptions are very “unstable”.
5. **Cooperative governance:** related to collaborative dialogue in the sense that cooperative governance is not just the relationships between different government ministries, departments and spheres, but full engagement of all stakeholders in a meaningful way.
6. **Energy, Efficiency and Effectiveness:** Ensure that government departments do have responsible leadership and capacity; ensure that responsive, time and communication efficient and effective channels are available to the communities to hold them accountable to fulfilling their mandate to the people. The Zuma hotline is an example of such a channel at national level. These channels need to be seen to be effective between elections.

An approach that builds on these challenges and opportunities and facilitates mainstreaming DRR into the water services sector is outlined in Chapter 5. The approach is also motivated by the recognition that the risks to providing sustainable water and sanitation services in South Africa are growing daily due to water scarcity, aging infrastructure, increasing water and sanitation backlogs, contamination and the mismanagement of water and land resources amongst others (see Section 2).

“Unless you measure, you do not know where you are going or how you are going to get there”

~ Maria Ramos, Women in Corporate Leadership Census (2004).

5 CONCEPTUAL APPROACH TO MAINSTREAMING RISK MANAGEMENT INTO WATER SERVICES

5.1 INTRODUCTION

There is an urgent and growing need to find innovative and creative solutions to the challenges of service delivery, operations and maintenance of water related infrastructure. Disaster risk management provides a useful and practical lens through which to view challenges that can bedevil water and sanitation services. The risk lens is an approach which is summarized in the maxim of risk reduction: In every Threat there is an Opportunity. Potential threats to successful and sustainable service delivery are used as a starting point for positive change or to initiate plans to mitigate the risks they pose.

The Risk Equation ($R = H \times V/C$) is generally used to determine the risk of a disaster occurring, however, it also implicitly assists in prioritising activities to overcome or mitigate threats that impact on the health and wellbeing of a given community and which could ultimately turn into a disaster if not attended to (e.g. the risk of a cholera outbreak arises from the threat of faecal contamination of a water source being ignored).

Psycho-social-political dimensions of risk seldom receive overt attention. They are sometimes considered but usually not quantified components of vulnerability and coping capacities. However, within the context of risk defined above, certain behaviours and attitudes (such as the sense of entitlement, token compliance, politicization, ego-driven actions and decisions, fear, apathy, and corruption, etc.) pose significant threat to sustainable water service delivery, operations and maintenance. There is a tipping point where psycho-social elements become threats. While the approach in this study is mindful of the psycho-social-political dimensions embedded within the concepts of vulnerability and coping capacity, one of its main intentions is to draw attention to psycho-social-political dysfunctions as potential hazards in their own right.

By the same token, institutional dysfunction is a man-made hazard in the Water Services sector. The lack of relevant skills at all levels within the municipalities, leading to problems in the operation and maintenance of water supply schemes and water services, as well as poor planning of the Water Services institutions, has been recognized by the current DWA All Towns Reconciliation Study as a man-made hazard to both water supply and water delivery in many towns in the Eastern and some in the Western Cape (DWA, 2010a, b). In too many instances at individual and even at an institutional level, political motivation and self-interest seem to trump delivery.

The Conceptual Approach presented provides Water Service Authorities (WSAs) and Water Service Providers (WSPs) with an approach for integrating the psycho-socio-political and institutional dimensions of risk into all aspects of infrastructure development, operations and maintenance for sustainable water and sanitation service delivery.

The intention is to build adaptive capacity and resilience in institutions and communities. Building on the recommendations of the Water Dialogues – South Africa (WD-SA), it focuses on developing appropriate skills, mature and ethical leadership, on-going communication and local accountability, concurring with Galvin (2009) that “Where the importance of any one of these is underestimated and neglected, the impacts are evident in the poor quality and unreliability of services”. Essential to this process is building the ability to communicate, collaborate and engage through a process of constructive dialogue amongst all the relevant stakeholders (in particular the WSA/WSP, the receiving community (with emphasis on the most vulnerable), the technical/consulting team and the communication facilitators).

The study approach made use of the existing legal imperatives of cooperative governance and public participation to achieve this. An adaptive project management approach is more appropriate to the developing world, where the standard project management motto becomes “*adapt brief, secure budget, invest time*”. This challenges the temptation to adopt a rigid project management process (“inflexible brief, immovable deadline, fixed budget”) which can itself become a threat to project success especially if adopted in reaction to what could be ‘experienced’ by some as an overwhelmingly dynamic context.

The approach aims to support empowerment of all South Africans by providing the means and opportunities for individuals and communities to actively participate in and respond to the issues that directly affect their lives. It does this by offering practical ways of implementing the spirit and intention of South Africa’s aspirational Constitution rather than becoming bogged down by the rule of law. The approach proposes to achieve this through purposeful and sustained risk management throughout the full cycle of any water infrastructure project including the conceptual, feasibility, design, implementation and most importantly the operations and maintenance stages.

5.2 SOME KEY CONCEPTS

Risk Management of water services draws on the conceptual frameworks and practical applications of disaster risk management and sustainable development while simultaneously contributing towards the achievement of both. In addition, it is arguable that sustainable water service provision in South Africa can only be achieved through constructive dialogue of all relevant stakeholders underpinned by the principles of cooperative and participatory governance. These concepts are graphically depicted in Figure 5-1 and described in further detail below.

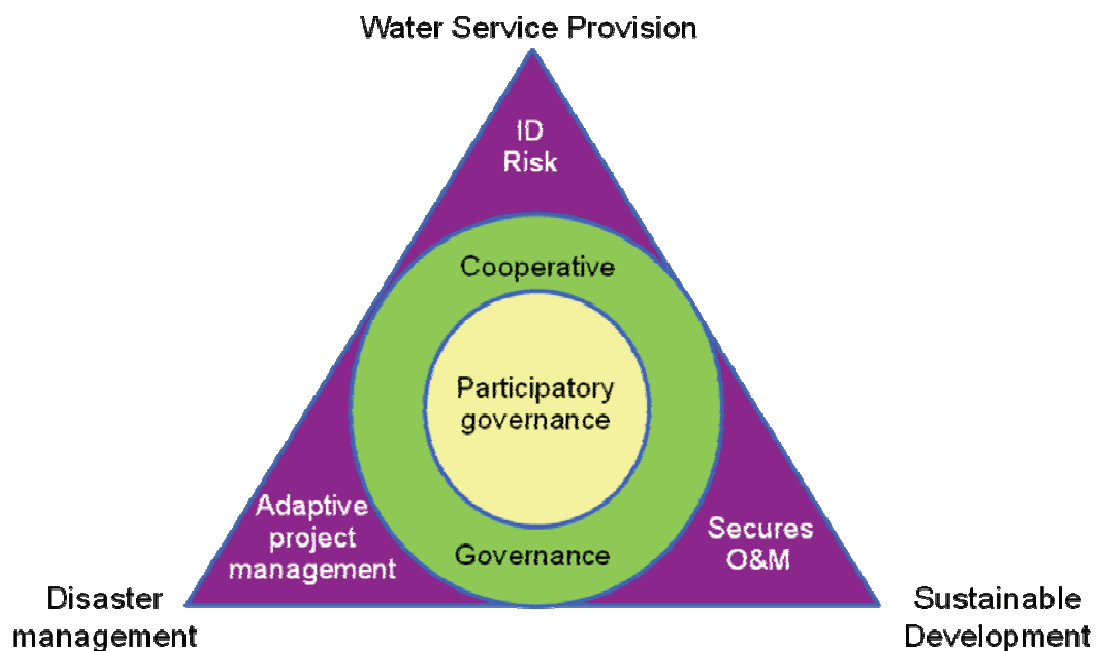


Figure 5-1: Risk management of water services is underpinned by the frameworks of disaster risk management and sustainable development and ensured through cooperative and participatory governance.

5.3 DISASTER RISK MANAGEMENT

Disaster risk management and more specifically the disaster risk reduction approach outlined by the international Hyogo Framework for Action (HFA) 2005-2015, offers a conceptual framework for adaptive project management. South Africa is a signatory to this document which was adopted at the World Conference on Disaster Reduction held in Japan in 2005. One of the three stated strategic goals of the HFA is “***the development and strengthening of institutions, mechanisms and capacities to build resilience to hazards.***”

5.4 SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT

The National Environmental Management Act (Act 107 of 1998) defines sustainable development as “*The integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations*”. Social vulnerability¹ and coping capacities or resilience rely on these social, environmental and economic capitals. Sustainable development aims to promote the net growth and maintenance of all three types of capital (WCED, 1987) and thereby increase coping capacity and decrease vulnerability to hazards.

These three “pillars” of sustainable development, can be further disaggregated into the five social assets defined by the DFID Sustainable Livelihoods Framework (SLF) (DFID, 1999), namely natural, human, social, physical and economic assets.²

Sustainable water services are an essential component of sustainable development. This means that in the planning, provision, and maintenance of water services, all three types of capital need to be equally considered. Of importance here is bearing in mind the needs of current and future generations.

At a practical level, by mainstreaming the concept of sustainability into the provision of water services, operations and maintenance will need to be managed (and budgeted for) as an integral part of water service delivery. It also provides for forecasting, where the short term cost implications are far outweighed by longer term savings. Disaster risk management thus makes long-term financial sense.

5.5 COOPERATIVE GOVERNANCE

The principle of cooperative governance is embedded and supported in South Africa’s legislation. According to Chapter 3 of the South African Constitution (Act No. 108 of 1996), the term “*Cooperative Governance*” refers to the cooperation, mutual trust and good faith that should be fostered among the three spheres of government (national, provincial and

¹ “Social vulnerability is partially the product of social inequalities –those social factors that influence or shape the susceptibility of various groups to harm and that also govern their ability to respond. However it also includes place inequalities – those characteristics of communities and the built environment, such as the level of urbanization, growth rates, and economic vitality, that contribute to the social vulnerability of place.” (Cutter *et al.*, 2003)

² The Forum for the Future has developed the “Five Capital Model” as a framework for Sustainability using the five social assets articulated in the sustainable Livelihoods Framework (Porritt, 2007).

local). The principles of co-operative government and intergovernmental relations are *inter alia* to:

- a) Secure the well-being of the people of the Republic; and
- b) Provide effective, transparent, accountable and coherent government for the Republic as a whole (Section 41)

While disaster management is primarily a national and provincial responsibility, provision of sustainable services and the promotion of a safe and healthy environment are explicit objectives of local government (Constitution, Section 152 (1)).

In addition, local government is meant to “*provide democratic and accountable government for local communities*” (Section 152 (1) (a)) and “*to encourage the involvement of communities and community organisations in the matters of local government.*” (Section 152 (1) (e)). Thus, within the context of this approach, cooperative governance includes not just the three spheres of government involved in the delivery, operations and maintenance of sustainable water services, but has at its centre the receiving community, and is accountable beyond its national borders to international norms, standards and obligations. Figure 5-2 demonstrates the complexity of cooperative governance and highlights that cooperative governance can ultimately only be achieved if the receiving community is seen as central to the process and if the receiving community appreciates that the power to say “no” comes also with the responsibility to say “yes” when necessary.

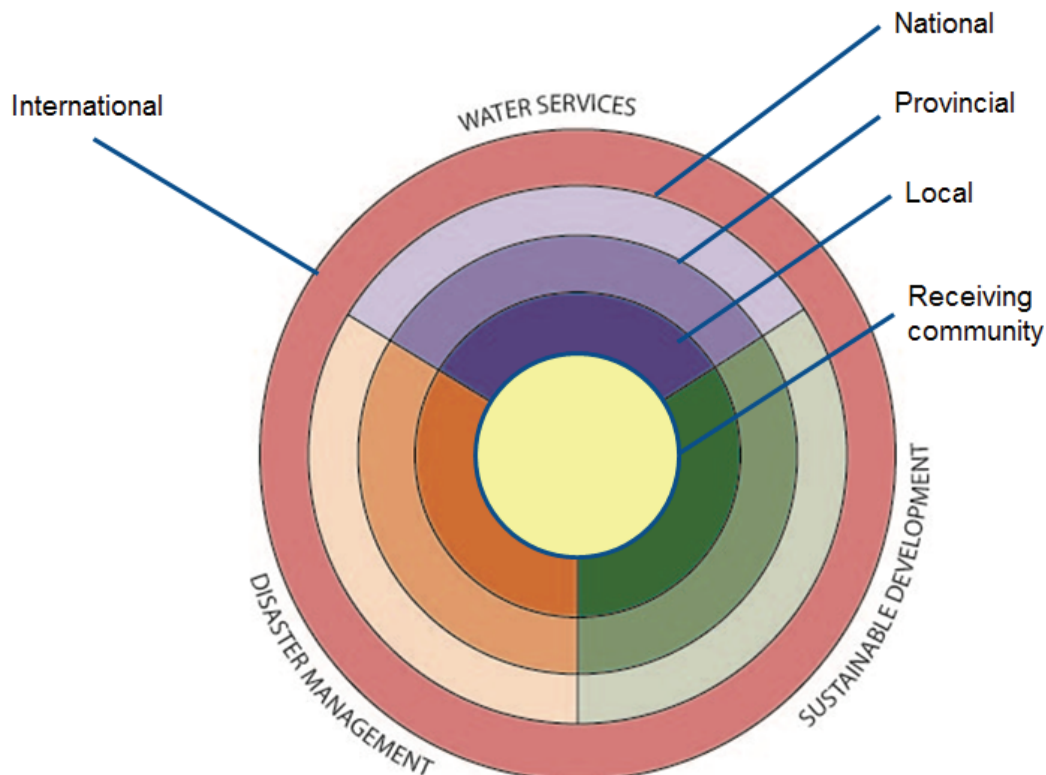


Figure 5-2: Holistic overview of cooperative governance as it pertains to sustainable water service provision, with the three spheres of government accountable to both the receiving community and international obligations.

The principles of cooperative governance are central to several pieces of legislation relevant to sustainable water service provision. These include the Municipal Systems Act (Act No. 32 of 2000) the Municipal Financial Management Act (Act No.56 of 2003), the Water Services Act (Act No.108 of 1997) and the Disaster Management Act (Act No. 57 of 2002).

5.6 COMMUNITY PARTICIPATION

The provision of sustainable water services is only possible through active engagement of all sectors involved in and affected by water service delivery, operations and maintenance. Excluding key stakeholders from planning, implementation, operations and maintenance poses a major risk to the achievement of this goal. In addition, engagement of a wide range of stakeholders provides numerous benefits to any service delivery process. Earle (2006) outlines the tangible benefits to governments of involving the public in water management. They are included verbatim, below:

- **Improved quality of decision-making** – allowing members of the public to express their views regarding social and environmental conditions in their communities and taking those views into consideration in the governmental decision-making process; expands the knowledge base for decisions, resulting in better implementation of environmental and development goals.
- **Improved credibility and public support** – Access to information, public participation, and access to justice improve the credibility, effectiveness, and accountability of governmental decision-making processes. Public participation at the outset of the decision-making process helps to build broad-based consensus for projects and programmes.
- **Improved implementation and monitoring** – Public input supplements scarce government resources for developing laws, as well as for monitoring, inspection, and enforcement, by identifying environmental threats or violations of applicable laws.
- **Early warning of potential challenges** – Public participation can identify and address problems at an early stage, saving time, energy, and scarce financial resources in the long run.

The imperative of public participation is imbedded in South Africa's legislative landscape. According to Section 195 (1) (e) of the Constitution "*the public must be encouraged to participate in policy-making*" and in terms of local government, "[a] municipality must develop a culture of municipal governance that complements formal representative government with a system of participatory governance" (the Municipal Systems Act (MSA), Section 16(1)).

Pretty (1995) outlines a typology of how people participate in development programmes and projects (see Table 5-1 below).

While participatory democracy is encouraged in South Africa in principle, in practice it is often implemented merely as a token of compliance (Gounden, pers comm. 14/02/2011). This pervading attitude is in itself one of the many psycho-social-political risks referred to in this approach, which themselves threaten sustainable water service delivery. Furthermore, where community engagement or public participation are mandatory (for example in Integrated Development Planning (IDP) and Environmental Impact Assessments (EIA)), these processes are often carried out with insufficient understanding of the levels of participation that are most appropriate for a given intervention for

risk management and for maximizing the opportunities that such platforms present. According to Pretty (1995), *“Participation poses a major dilemma for many authorities in that they both need and fear people’s participation. They need people’s agreements and support but they fear that this wider involvement is less controllable, less precise and so likely to slow down planning processes. But if this fear permits only stage-managed forms of participation, then distrust and greater alienation are the most likely outcomes.”*

Rights and obligations of community participation at local government level

The Municipal Systems Act obliges municipal council to encourage the participation of the local community, while municipal administrations are required to be responsive to the needs of the local community, establish clear channels of communication with the local community, inform the local community about the services which they are entitled to receive, and inform the local community how the municipality is managed, what it spends its money on, and who is in charge. Members of the local community thus have a right to participate in the decision-making processes of the municipality and the responsibility to respect the municipal rights of other members of the local community.

~ Taken from Municipal Systems Act

Table 5-1: A typology of participation: how people participate in development programmes and projects (based on Pretty, 1995) with implications for risk management

Typology	Components of each Type	Implications for risk management
1. Manipulative Participation	Participation is simply pretence, with “people’s” representatives on official boards but who are unelected and have no power.	Undesirable form of participation
2. Passive Participation	People participate by being told what is going to happen or has happened. It is a unilateral announcement by an administration or project management without any listening to peoples' responses. The information being shared belongs only to external professionals.	
3. Participation in information giving	People participate by giving answers to questions posed by extractive researchers and project managers using questionnaire surveys or similar approaches. People do not have the opportunity to influence proceedings, as the findings of the research or project design are neither shared nor checked for accuracy.	Common approaches to participation in South Africa
4. Participation by Consultation	People participate by being consulted, and external agents listen to views. These external agents define both problems and solutions, and may modify these in the light of people’s responses. Such a consultative process does not concede any share of decision-making and professionals are under no obligation to take on board people’s views.	
5. Participation For material incentives	People participate by providing resources, for example labour, in return for food, cash, or other material incentives. Much in situ research falls in this category, as rural people provide the fields but are not involved in the experimentation or process of learning. It is very common to see this called participation, yet people have no stake in prolonging activities when the incentives end.	
6. Functional Participation	People participate by forming groups to meet pre-determined objectives related to the project, which can involve the development or promotion of externally initiated social organisation. Such involvement does not tend to be at early stages of project cycles or planning, but rather after major decisions have been made. These institutions tend to be dependent on external structures, but may become independent in time.	Empowering, institution-building forms of consultation

Typology	Components of each Type	Implications for risk management
7. Interactive participation	People participate in joint analysis, which leads to action plans and the formation of new local groups or the strengthening of existing ones. It tends to involve interdisciplinary methods that seek multiple perspectives and make use of systematic and structured learning processes. These groups take control over local decisions, so that people have a stake in maintaining structures or practices.	Empowering, institution-building forms of consultation
8. Self-mobilisation/ active participation	People participate by taking initiatives independent of external institutions to change systems. Such self-initiated mobilisation and collective action may or may not challenge existing distributions of power and wealth.	

Thus, while participation for many local authorities continues to be an unwelcome part of their work, the level to which receiving communities are engaged and empowered to participate actively in decision making is a key determinant of the success and sustainability of any service delivery project. A study of 121 rural water supply projects in 49 countries in Africa, Asia and Latin America found that *“participation was the most significant factor contributing to project effectiveness and maintenance of water supply systems... It was when people were involved in decision making during all stages of the project from design to maintenance that the best results occurred. If they were just involved in information sharing and consultations, then the results were much poorer. According to the analysis, it was quite clear that moving down the typology moved a project from a medium to highly effective category”* (Narayan, 1993, cited in Pretty, 1995). This being said, it should be noted that different types of participation are appropriate at different times to achieve different results. However the choice of level of participation should be a conscious one that bears in mind the risks and opportunities of engaging in this particular type of participation. Furthermore, moving a group of people towards the interactive end of the spectrum is a process of relationship and capacity building which takes time to develop. In a country where empowerment of all its citizens, especially the most vulnerable and marginalized is its ultimate vision, developing robust and mature tools for participation and communication is essential.

5.6.1 Constructive dialogue

The case for the benefits of cooperative governance and community participation to sustainable service delivery has been made. However, both can only be implemented in practice if there is willingness by all parties to enter into dialogue with other stakeholders that hold different and often conflicting views to their own. Such dialogue requires a rigorous approach, implemented by skilled facilitators.

One such method adapted to great effect by the Water Dialogues – South Africa (WD-SA) is confrontative dialogue. The Water Dialogues-South Africa was led by a Working Group comprising members from organisations representative of the South African water sector.

These included national and local government, the private sector, civil society, trade unions, water boards and academic/research organisations. The Water Dialogues was a shared attempt by all stakeholders to move past ideological polarisation, and to examine the successes and challenges in the delivery of water and sanitation services by a range of providers. It focused on the impact of institutional models currently used in South Africa on the quality of service delivery (<http://www.waterdialogues.org/south-africa/>).

Confrontative dialogue aims for better understanding between stakeholders with unequal relationships, significant conceptual gaps, and a high degree of mistrust. It aims to "*make diverging values and interests visible and understandable and to illuminate political alternatives*" (Abrahamsson, 2004).

Based on experiences of WD-SA, the successful practice of multi-stakeholder confrontative dialogue has to be guided by the following principles:

- Transparency, openness and honesty;
- Shared purpose and commitment;
- Plurality of perspectives and inclusivity, valuing diversity and each other;
- Mutual respect;
- Commitment to problem-solving and mutual accountability; and
- Learning and sharing.

According to the WD-SA Working Group, to ensure sustainable water services, it is essential that these values and principles become governance values which are applied at all stages of water infrastructure developing from definition, feasibility, planning to implementation. Furthermore, the WD-SA Working Group "*is convinced that, without a continuous practice of multi-stakeholder dialogue embedded as a generic value and principle, any type of institutional arrangement is not going to be truly sustainable in the long term*" (Mas, 2009).

What can be learned from The Water Dialogues' process of dialogue?

"Instead of forcing a consensus or using a participatory process to mask a dominant position, WD-SA stakeholders created trust and respect that made it possible to explore and listen to other perspectives. The dialogue showed the value of acknowledging and confronting differences in perspective and conviction. It entailed working with integrity to identify the root causes of those differences, and finding ways to move forward together, beyond polarisation, towards constructive resolution of the problems, based on a shared understanding and analysis – in ways that do not disrespect or negate different perspectives.

Our own process of dialogue shows that there is deep commitment, across a diverse range of stakeholders, to achieve better services, particularly for those living in poverty. Through acknowledging this commitment, there can be more honest assessment of what is working, which can be strengthened, and what is not, which must be changed. This dialogue builds a strong platform for taking and implementing decisions that are inclusive and respected by all. For example, Neil Macleod of eThekweni Metro attributes his decision to increase the free water allocation to his engagement with civil society as part of The Water Dialogues process.

It is the conviction of WD-SA participants that this approach can be used effectively at the local level and in national debate to find ways to strengthen services provision, and build municipal delivery mechanisms that serve the needs of users."

~ <http://www.waterdialogues.org/south-africa/process.htm>

5.6.2 Adaptive management

“Rigid control mechanisms that seek stability tend to erode resilience and facilitate breakdown of socio-economic systems”

~(Folke et al, 2002).

At present, the institutions that manage water service provision in South Africa are “*rigid, inaccessible and slow to respond to changes*” (Wilson and Pereira, 2010). The rigid project management style of many municipalities, with their emphasis on the “rule of law” (procedures and protocols, KPAs, etc.), has removed many enabling mechanisms both within institutions and communities that are necessary to ensure sustainable infrastructure development and operations and maintenance as well as build adaptive capacity in uncertain and highly dynamic times. The standard project management style (where the project plan, timeframe and budget are fully defined before initiation and change is seen as a threat or as indicative of poor prior judgment) leaves little room for innovation, creativity, experimentation and adaptability.

Adaptive management, on the other hand, is essentially “*learning by doing*”. According to Virine (2008), “*Adaptive management is a structured and systematic process for continually improving decisions, management policies, and practices by learning from the outcomes of decisions previously taken.*” It includes regular adaptation to changing circumstances, constant collaboration among key stakeholders (both internal and external to a particular project) and an iterative development process. “*The adaptive management approach treats policies as hypotheses, and management as experiments from which managers can learn, accepting uncertainty and expecting surprises*” (Folke et al, 2002). Adaptive management thus creates space for adjusting the process, as new information comes to light or as circumstances change.

Definition of adaptive capacity

“Adaptive capacity” is defined as “*the ability of a social-ecological system to cope with novel situations without losing options for the future... Systems with high adaptive capacity are able to re-configure themselves without significant declines in crucial functions in relation to primary productivity, hydrological cycles, social relations and economic prosperity. A consequence of a loss of resilience, and therefore of adaptive capacity, is loss of opportunity, constrained options during periods of re-organisation and renewal, an inability of the system to do different things*”

~ Folke et al, 2002.

5.7 CONCEPTUAL FRAMEWORK FOR ACTION

This section provides an approach for integrating risk management into water service delivery operations and maintenance, with an emphasis on the psycho-social-political dimensions, in a way is empowering to all parties involved.

The approach used the Hyogo Framework of Action (HFA), adapting it to the South African water service delivery context. A two page summary of the HFA is provided in Appendix 2B while the adapted HFA is presented in Table 5-2 below.

Table 5-2: The Hyogo Framework of Action adapted to the South African water service delivery context.

Strategic Goals	
1). Integration of cost and risk management into water develop adaptive project management tools and techniques such as adaptable infrastructure budgeting, planning and implementation processes that accommodate dynamics of developing world context.	2). Develop and strengthen mechanisms and capabilities for constructive engagement between technical experts, local government institutions and communities to build resilience to water related hazards.

Priorities for Action				
1. Ensure that risk management in the water services sector is a local priority with a strong institutional base for implementation	2. Identify, assess and monitor water related hazards as well as psycho-social-political risk and enhance early warning	3. Use knowledge, innovation, information exchange and education to build a culture of constructive dialogue to promote safety and resilience at all levels	4. Reduce the underlying risk factors	5. Strengthen disaster preparedness for effective response at all levels
- Risk management mechanisms (evaluate capacity of existing multi-stakeholder platforms that include water, land use, agriculture and other sectors to support Risk Management in water sector and infrastructure development or build a specific platform to do so) - Risk Management part of planning, budgeting and implementation of all water and sanitation services (WSS) infrastructure - Decentralisation of	- Risk register is developed - Risk assessment of and during entire infrastructure development, operations and management process. - Develop project specific indicators to manage risk during design, construction, operations and maintenance. - Develop strategy and action plan to initiate data sharing, technological transfer	- Information sharing and cooperation between key project stakeholders. - Use of social media to build networks and raise awareness in receiving communities, moderate dialogue, support conflict resolution and trans-disciplinary collaboration - Agree on standard DRR terminology by all technical disciplines and transfer knowledge of risk reduction concepts and practices in accessible language to receiving - Training and learning of	- Ongoing risk evaluation throughout life cycle of project, including cost – benefit analysis of changes to brief, identification of additional resources required and or savings possible during infrastructure life cycle - Build local government access to grant funds (research and other) to support risk reduction motivated changes to project briefs, community training inter alia - Invest time to develop trust, rapport, respect and	- Expand brief of project specific platforms to include and support cooperative disaster response, reconstruction and rehabilitation between key project stakeholders - Train community leaders and stakeholders to participate as community leaders and volunteers in all disaster response - Ensure transparency and accountability of emergency fund expenditure following disaster - Support the establishment of community-based and

Priorities for Action

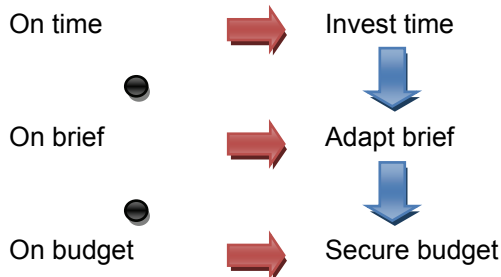
1. Ensure that risk management in the water services sector is a local priority with a strong institutional base for implementation	responsibilities (local government and receiving communities) and resources (including financial resources) (<i>NWA, WSA, NEMA, MFMA, DMA</i>) - Evaluate leadership capacity and ethics at local government, political and community level. - Engage all stakeholders involved in water sector project implementation with focus on risk reduction. - Mitigate psycho-social-political risk through inter-stakeholder engagement
2. Identify, assess and monitor water related hazards as well as psycho-social-political risk and enhance early warning	and education around early warning in receiving communities. - Develop constructive dialogue strategy to build feedback loops between key stakeholders. - Design and implement early warning especially for psycho-social-political risk throughout the life-cycle of water infrastructure development, operations and maintenance.
3. Use knowledge, innovation, information exchange and education to build a culture of constructive dialogue to promote safety and resilience at all levels	(Disaster) Risk Management throughout life cycle of infrastructure at community and local authority level - Identify and train leaders in government and communities, special interest and vulnerable groups on sustainability, ethical and technical elements - Train all key stakeholders in communication skills and conflict resolution to support effective inter-stakeholder engagement
4. Reduce the underlying risk factors	consensus on communication strategy and process between all key project stakeholders. - Ensure all key project stakeholders understand, accept and have the skills for their roles and responsibilities in the successful outcome of an infrastructure project - Develop and implement O&M plan for operation and maintenance of water related infrastructure to avoid over utilisation and or infrastructure failure - Ensure integrated landuse planning for water resource protection and flood management - Ensure regular review of infrastructure needs for timeous planning and development of upgrades or new infrastructure - Ensure public-private partnerships bear in mind the constraints and strengths of each which
5. Strengthen disaster preparedness for effective response at all levels	managed emergency funds - Support the establishment of community-based water forums or Water Users Associations - Prepare and update contingency plans for overcoming infrastructure damage or failure. - Prepare and regularly review operating rules for drought conditions - Prepare and exercise flood response plans integrated with Department of Health and local clinics - Assigning roles and responsibilities for feedback on expenditure to date, budget evaluation, resource constraints and operation and maintenance

Priorities for Action			
1. Ensure that risk management in the water services sector is a local priority with a strong institutional base for implementation		2. Identify, assess and monitor water related hazards as well as psycho-social-political risk and enhance early warning	
3. Use knowledge, innovation, information exchange and education to build a culture of constructive dialogue to promote safety and resilience at all levels		4. Reduce the underlying risk factors	work and cooperate for common good.
5. Strengthen disaster preparedness for effective response at all levels			

Cross cutting issues				
Cooperative governance	Inter-stakeholder engagement	Leadership development	Education and training and technology transfer	Constructive dialogue
				Gender perspective

The overarching process of adaptive project management and the cross-cutting issues mentioned in Table 5-2 are summarised in Table 5-3 and Figure 5-3 below.

Table 5-3: Summary of the overarching process of adaptive project management and the cross-cutting issues necessary for integrating risk management into water service delivery, operations and maintenance.

Over-arching process/Cross-cutting issues	Summary
Adaptive project management	As an Action-Learning process, this approach provides for creativity, innovation and adaptability. It also encourages a shift towards an approach that is more responsive to uncertainties and changes, as presented below:  <i>“Invest time, adapt brief, secure budget”</i> becomes the guiding philosophy to be iterated at each milestone or significant stage of implementing a water infrastructure project (see Figure 5-3).
Cooperative governance	Cooperative governance is not a necessary evil, but essential for getting the job done. See the different spheres as helping you get the job done; also about putting the receiving community back in the centre of the process.
Inter-stakeholder participation	It is important to identify the key stakeholder groupings: e.g. client/WSA, technical team/consultants, receiving community, etc.; different levels of participation are appropriate for different stages – use to delineate minimum level of participation required to mitigate risk
Constructive dialogue	Using the principles for establishing or working with multi-stakeholder forums; also working in the spirit of confrontative dialogue (valuing voices and contributions of each voice; aiming to surface different rather than simply reach consensus)
Technically competent, Emotional Intelligent and Ethical Leadership	Trust in and between project, technical and community Leadership is integral to adaptive management as is the professional and personal integrity and business ethics of a Private Public Civil sector partnership.
Capacity building	Around communication, constructive dialogue, collaboration without co-option, meaningful and appropriate levels of participation by women and men; education and training needs of women and men to be considered at every step in the process
Gender perspective	Strengths and leadership capacity of women and special interest groups who play a primary role in the daily water and sanitation process at household and community level is integral to the sustainable success of a water infrastructure project from design to routine Operations and Maintenance.

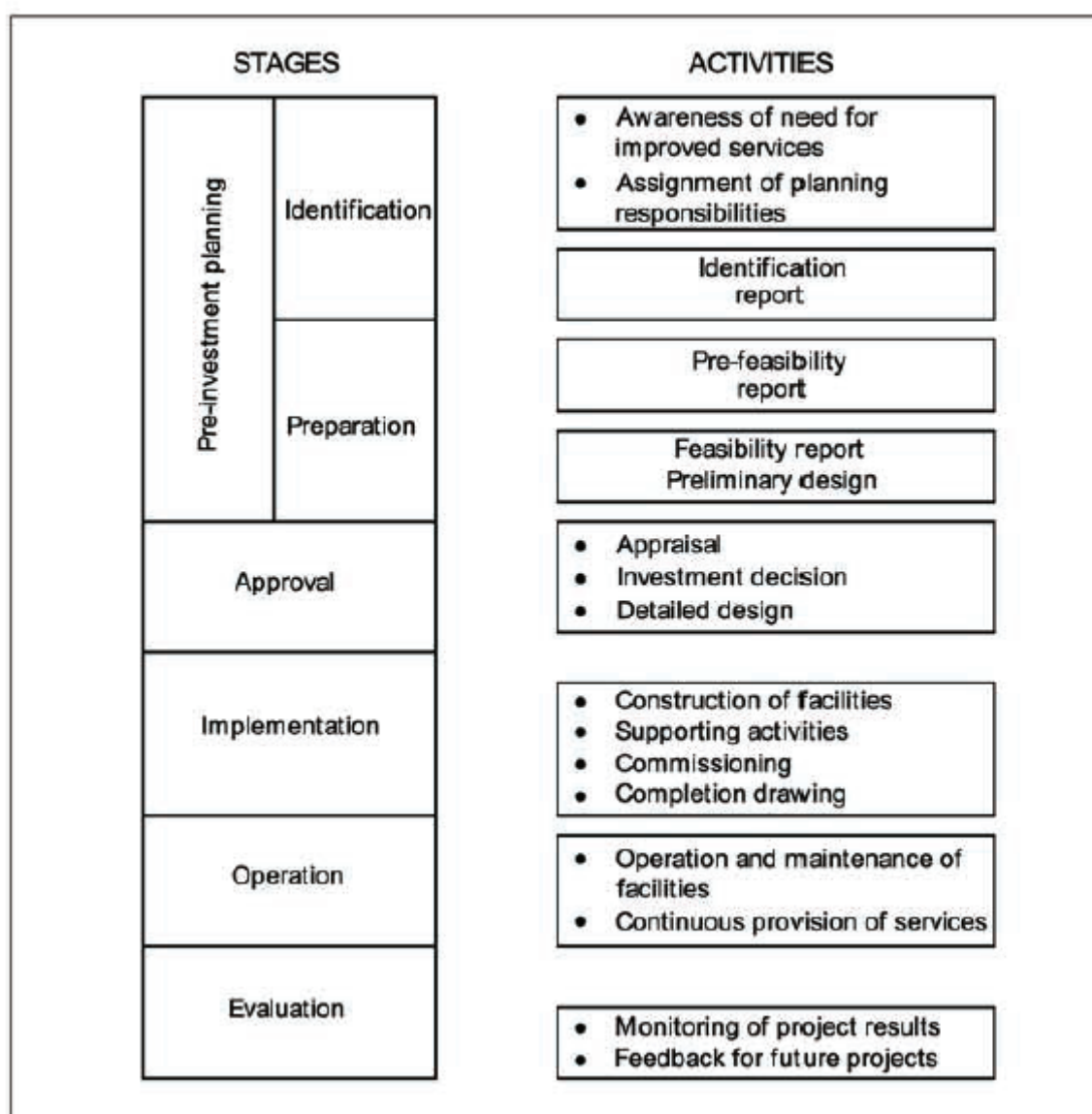


Figure 5-3: Development stages for water supply and sanitation projects (source: CSIR Red Book (2005) Vol 2: Ch 9 pg 3)

The adaptive management could be expanded upon during the recommended pilot study (see Section 6, below).

6 CONCLUSIONS AND RECOMMENDATIONS

Objectives of the project can be summarised into two main objectives. The first is to develop a method for analysing social vulnerability and resilience to selected hazards that negatively impact supply of potable water. The second objective is to identify opportunities to mainstream disaster risk reduction into areas of water services.

6.1 OBJECTIVE 1

A method for analysing resilience and social vulnerability and its impact on potable water supply was developed and tested in three case studies. Case studies included the rural town of Cala in the Eastern Cape, Kayamandi Township in the Western Cape, and Carletonville in the Wonderfonteinspruit in Gauteng Province. This methodology was used to map risk at the District Municipality Scale for the Western Cape Province.

Application of the risk assessment methodology involved data collection, field work, selection of an appropriate set of indicators, and scoring of indicators using relevant data and case study information.

Initiatives for income generation in the Cala community were found to be low. Drought preparation was also low with minimal municipal coordination and a lack of strong leadership. Preparation which existed focused mainly on quick onset disaster. The community, however, has solidly based organizations with coordinated and multi-disciplined activities thereby increasing community coping capacity.

Kayamandi suffers from poor service delivery and service maintenance coupled with poor infrastructure. Women are vulnerable to violence and rape and primary education enrolment is low. Kayamandi high school provides a good standard of education and has relatively high pass rates but few students go onto tertiary education. There are many NGOs in Kayamandi with diverse and overlapping focuses. Their activities are uncoordinated and the benefits not significant to the overall risk faced by Kayamandi residents.

In Wonderfontein poor communities such as Khutsong township are vulnerable to mining-related pollution and sinkholes. The study did find that there is an extreme lack of data and monitoring information available, especially regarding exposed populations. Data for formal areas tends to hide risks faced by informal areas.

6.2 OBJECTIVE 2

Identification of opportunities to mainstream disaster risk reduction into water services, involved an approach focused on improving implementation of water infrastructure projects. Focus was also placed on increasing resilience of vulnerable populations when there is failure in water service delivery. The approach was drawn from a socio-psycho perspective, that attitudes can be a source for hazard development and that institutional dysfunction is a man-made hazard in the Water Services sector. It proposes multidisciplinary and cooperative ways to mitigate risks and maximize opportunities and acts as a guideline for WSAs and WSPs to integrate social vulnerability into water service delivery and it supports sustainable service delivery and O&M in the Water Services Sector.

The approach was derived from some of the key challenges and opportunities identified during the course of the project. Challenges included a lack of vision, short term funding systems and cycles which do not support maintenance, institutional failure, and a lack of responsibility and accountability. Opportunities include promoting the responsibility and ability to respond and promoting constructive dialogue and cooperative governance.

6.3 RECOMMENDATIONS

Based on project results and conclusions, the following recommendations were drawn:

1. During future studies, the risk assessment methodology should be disaggregated to groups within sub areas of a community, e.g. gender and age specific groups/data within formal and informal settlements within Kayamandi. These can be defined after initial data survey and field work. Thereafter indicator definition and selection to best reflect the complex realities on the ground (i.e. establish a conceptual model of this reality indicating variations in and between sub groups/genders) to establish whether further field work, data collection at village and or household level and scoring approach is decided upon. Careful note of power and rank relationships, levels of competence and adequacy of governance in institutional layers within communities and groups are important when defining indicators that reflect the efficacy of these and can evaluate increase in coping capacity from grass roots levels up. Furthermore, regular application of monitoring and evaluation using the risk assessment methodology developed in this study is required in order to help us realise our goals, and tells us, as unequivocally as is possible, whether we have realised them.
2. The application of the risk management approach to the implementation of water infrastructure (as outlined in Section 5) should be piloted in order to develop rigorous guidelines and facilitate mainstreaming of psycho-socio-political risk into water infrastructure development, operations and maintenance. This should be drawn from conception, planning, financing, implementation, monitoring, evaluation, operations and maintenance stages. This guideline should pick up on gaps in existing frameworks and add value by applying a “risk” as opposed to “service delivery” lens. It should propose a multidisciplinary and collaborative manner in which to mitigate risk and maximize opportunities. This should result in enhanced and sustainable water services delivery, management, maintenance, advanced livelihoods and genuine “cooperative governance”.
3. Preparation of a Tool Box to support guidelines and training of WSA/WSP project managers in risk reduction approaches and participatory local government using guidelines and Tool Box
4. Mainstreaming DRR into water infrastructure development, operations and maintenance in rural and informal areas within the context of climate change
5. Development of Guidelines for other target audiences, including community leaders, councillors and politicians.
6. Development of education material aimed at community level to educate and build awareness on water demand management, water and health related matters as well social vulnerability and what communities can do for themselves to improve coping capacity in relation to hazards related to water and its infrastructure. Such material needs also to be less generic and more relevant to the circumstances of the communities.

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APPENDIX 1

SUMMARY TABLE OF CONCEPTUAL APPROACHES, DEFINITIONS, AND ASSESSMENT TOOLS OF SOCIAL VULNERABILITY

APPENDIX 1: Summary Table of Conceptual Approaches, Definitions and Assessment Tools of Social Vulnerability

Key Definitions	Conceptual Approaches	Index Development and Vulnerability Assessment Tools
Vulnerability as Exposure: (Burton, Kates & White, 1993, and Anderson, 2000, in Cutter <i>et al</i>, 2003) → Vulnerability is the potential exposure to a physical hazard. Differential Vulnerability (Blaikie <i>et al</i>, 1994; Nygatan, 2005) → Not all individuals and groups exposed to a hazard are equally vulnerable. Vulnerability to a hazard depends on the system traits, livelihood assets and coping capacity of those affected (Wu <i>et al</i>, 2002 and Nygatan, 2005) → This definition is based on the idea that vulnerability is a social condition; it measures differential social resilience to hazards. Hazards of Place (Cutter <i>et al</i>, 2000) → Vulnerability is an integration of both biophysical processes, threat assessments, and social response, producing an overall place vulnerability → Risk is a measure of the likelihood of a hazard or event. This is coupled with the social fabric of a place to produce the hazard potential → Hazard potential is restrained or augmented by geographic situation as well as the social and institutional characteristics of a place that influence mitigation strategies and societal resilience to a hazard. (Cutter <i>et al</i>, 2003) Perception of Risk (Nygatan, 2005) (Expansion of hazards of place – incorporates perception of risk) → Vulnerability is dynamic and relates to processes of both gradual change and shocks. → Vulnerability is rooted in the behaviour of actors and the social networks that drive and bound it → Poverty and vulnerability are closely related, but attitudes towards disaster are also a major determinant of the actions and adaptations of actors who are constrained or empowered by their use of a resource to reduce the risks they face. → This should be factored into definitions of vulnerability	Exposure Model (Burton, Kates & White, 1993, and Anderson, 2000, in Cutter <i>et al</i>, 2003) → Identifies the distribution of hazardous conditions and the ways in which these conditions affect people (mortality indicator) and structures (economic losses). This model is criticized for: → A focus on technical fixes but no means of implementing them; → Perpetuating a view that people are subordinate to nature. This can turn them into passive recipients rather than active users of technology and information, contributing to a victim mentality (Cannon, 2000). BBC Framework (Bogardi, Birkmann, and Cardona 2006 in Birkmann, 2006) → Focuses on the interactions and characteristics that impact whether people and infrastructure will experience harm. → Proposes feedback loop of risk and vulnerability – reducing one reduces the other and introduces methods for increasing coping capacity. → Recognizes the link between vulnerability, human security and sustainable development and combines elements of many frameworks. → Does not account for hard and soft risk, but the three main thematic spheres of sustainable development in which vulnerability is measured (economic, social, environmental). → Considers exposure to the extent that the location of human settlements and infrastructure influences susceptibility of communities to hazard and analyses hazard types, their frequency, and magnitude. Holistic Approach (Cardona & Barbat, 2000 in Birkmann 2006) → Aims to capture via indicators both the physical conditions and abstract aspects of impact → Vulnerability is characterized as: • Physical exposure (hard risk) • Fragility of social economy (soft risk/non-hazard dependent) • Lack of resilience to cope and recover (also form of soft risk) → This interaction is the basis for the approach's feedback loop of control and an actuation system representing risk management and potential corrective interventions. The Pressure and Release Model (PAR) (Blaikie, 1994 and Wisner <i>et al</i>, 2004) → Disaster is the intersection of two major forces: those processes generating vulnerability and the natural hazard/event → Vulnerability defined with three progressive levels:	Hotspots Approach (Birkmann, 2007) → Vulnerability is human and economic losses, disaster frequency and mortality → Vulnerability is not measured outright but indicated in relation to the exposure of hazardous events and the elements at risk (risk of direct economic losses as a proportion of GDP) → The three main indicators focus on mortality, related risk, and on the total and relative economic losses → Hazards are viewed in terms of frequency and consequence → Approach based on study by Columbia University and the World Bank aiming to identify global hot spots of risk by comparing risk across countries and regions – to see where risk management was most needed. → Applicability mainly at the global and national level Disaster Risk Index (DRI) (Birkmann, 2007) → Aims to establish quantitative measures to compare relative levels of physical exposure to hazards, vulnerability and risk between countries and hazard types (informs most international disaster risk index projects). The emphasis is on selecting indicators that allow for comparison between countries even though disaster impacts vary in each context. → Identifies vulnerability indicators of disaster and explores relationship between development, risk and vulnerability. → DRI indices are based on mortality data (i.e. one person killed by a cyclone was comparable to one person killed in earthquakes, floods, etc.) Higher relative mortality indicates higher vulnerability (calculated by dividing the number of people killed by the number of people exposed). Physical exposure is the number of people in the location of the hazard combined with the frequency of events. Plus a low Gross Domestic Product (GDP) per capita and low population densities (mainly rural areas) characterize countries that are most vulnerable. This model is criticize because: → Only characterizing vulnerability on the basis of mortality is not very indicative of the losses that occur due to a hazard (property,

APPENDIX 1: Summary Table of Conceptual Approaches, Definitions and Assessment Tools of Social Vulnerability

Key Definitions	Conceptual Approaches	Index Development and Vulnerability Assessment Tools
	• Root causes (governance, institutions) • Dynamic pressures (activities that transform root causes to cause unsafe conditions) • Unsafe conditions This model is criticized for: → Criticized because it is hard to differentiate between the causal links of root causes, dynamic pressures, and unsafe conditions quantitatively → However, it is considered one of the best approaches for addressing the underlying forces of vulnerability and it recognizes that disaster can bring opportunity. Onion Framework (UN University, Institute for Environment and Human Security, in Birkmann, 2006) → A disaster depends as much on the nature of the event itself as on preparedness and coping capacity – risk and vulnerability related to potential losses in the economic, social, and natural events spheres → Incorporates intangible aspects of risk and disaster such as fear and loss of confidence or trust This model is criticized for: → Criticized because the environment is not defined directly but in the context of events although environmental impacts can have long term impacts on coping capacities Capacities and Vulnerability Analysis (CVA) → Matrix for viewing people's vulnerabilities and capacities in three broad, interrelated areas: → Physical/material (productive resources, skills and hazards) → Social/organisational (relations and organization among people) → Motivational/attitudinal (how does the community view its abilities to create change) (Anderson and Woodrow, 1990) Vulnerability and Capacity Assessment (VCA) → Divides threats, vulnerabilities, and capacities into three categories: → Potential threats (natural, violence, deterioration of systems) → Vulnerabilities (based on proximity and exposure, poverty, and exclusion or marginalization) → Capacities and resources of the community to prevent or cope with threat (physical and material resources, social and organizational, skills and attitudes), the context, and the National Society. (Cannon <i>et al.</i>, 2003)	livelihoods) → Averaging across extremes in a short time and not taking into account the variability in extremes is problematic (i.e. a major event could shift a country's vulnerability profile to be comparable with a country's average of extreme events over a period of twenty years, without major changes to the underlying causes of vulnerability) → The approach does not explain why people with the same level of exposure can be more or less at risk. The Prevalent Vulnerability Index (PVI) (Cardona <i>et al.</i>, 2005) → Vulnerability is viewed as inherent to the system and independent of the hazard. → This approach uses an index to measure the risk management ability of a country in terms of policy measures undertaken for disaster risk reduction. → PVI is the sum of exposure and susceptibility (population growth, density, GDP, etc.), socio-economic fragility (human poverty index, unemployment, soil degradation, etc.) and lack of resilience (human development index, gender-related development index, environmental sustainability index, technological advancement, etc.). → Each index is composed of a number of indicators and sub-indices, thus the approach includes a total number of more than 50 indicators. → It is derived from the Americas Indexing Programme carried out by the Institute of Environmental Studies at the National University of Columbia in cooperation with the Inter-American Development Bank. → The study gave more indicators for vulnerability including the Disaster Deficit Index (DDI), the Local Disaster Index (LDI), Prevalent Vulnerability Index (PVI), and Risk Management Index (RMI). Social Vulnerability Index (SoVI) Model (Cutter <i>et al.</i>, 2003). → In adding a physical component, vulnerability is examined not just as a social or a biophysical phenomenon, but also as a complex interaction of the two. → Final social vulnerability scores

APPENDIX 1: Summary Table of Conceptual Approaches, Definitions and Assessment Tools of Social Vulnerability

Key Definitions	Conceptual Approaches	Index Development and Vulnerability Assessment Tools
		are given relative to each other and mapped using standard deviations from the mean to classify data. The resulting map can be used for spatial comparison of social vulnerability across the given area → It is based on the Hazard-of-Place model which utilizes census data on gender, income, education, etc. to quantify social vulnerability to environmental hazards at the county level for the United States → Assists local decision-makers in pinpointing those factors and that threaten the sustainability and stability of the county (or community) and which areas are most in need of assistance → Not in the SoVI model is the next step -to look at the relationship between the level of social vulnerability and biophysical risk. Are those places with the most exposure/highest hazard potential or greater biophysical risk also the most socially vulnerable? Pareto Ranking Model (Rygel et al., 2005) → Also uses a hazard-of-place theoretical framework and similar method to SoVI → Differences between the two models emerge when calculating an overall vulnerability score for each spatial unit. Indicators are not ranked but scored with Pareto Ranking → This approach was used initially to calculate social vulnerability to hurricane storm surge, however the model can be adapted to other types of hazard events by the selection of indicators specific to the hazard The Community-Based Index (CBI) → Quantifies the main risk characteristics (exposure, vulnerability, management capacities) within a community, compares communities, and identifies whether the level of risk is an outcome of the hazard, exposure, vulnerability, or capacity → Uses 47 indicators systematized into four main factors and used to measure four thematic areas: physical/demographic (population density, demographic pressure), social (poverty levels, literacy, decentralization), environmental,

APPENDIX 1: Summary Table of Conceptual Approaches, Definitions and Assessment Tools of Social Vulnerability

Key Definitions	Conceptual Approaches	Index Development and Vulnerability Assessment Tools
		and economic vulnerability. For each indicator, classifications were developed for low, medium and high risk. → Different indicators were weighed for specific hazards in order to give different measures for specific countries. All categories were integrated into an exposure index. → CBI allows for the comparison of different communities nationwide (Birkmann, 2007) Predictive Indicators of Vulnerability (PIV) → Risk – expressed as mortality – is seen as a function of physical climate hazards and vulnerability, which is socially constructed (Brooks et al, 2005) → Decadal climate-related mortality aggregated to inform the selection of predictive indicators of vulnerability. From an initial set of 46 social vulnerability variables, literacy, governance, as well as political and civil rights emerged as the dominant factors that ranks countries in terms of their vulnerability → Problematic is the selection of indicators (i.e. that hazard mortality directly correlated with life expectancy although hazard mortality is intrinsic to life expectancy) (Gall, 2007) Capacities and Vulnerability Analysis (CVA) → Distinguishes 'vulnerabilities' (long term factors that affect responses to events or make it more susceptible) and 'needs' (immediate requirements for survival or recovery) → Diagnostic tool not prescriptive. Used for data-gathering at project or community levels and it allows different organisations to use it in a variety of contexts → The diversity of data sources and data sets makes comparison between projects very difficult and hence limits the potential for drawing more general lessons → Designed and tested in the late 1980s by an inter-NGO initiative, the International Relief/Development Project (IRDP) to make relief interventions more development focused and gives NGOs a better understanding of the impact of interventions and complex situations/factors behind them.

APPENDIX 1: Summary Table of Conceptual Approaches, Definitions and Assessment Tools of Social Vulnerability

Key Definitions	Conceptual Approaches	Index Development and Vulnerability Assessment Tools
		→ Adopted by vulnerability assessment methodologies and used in training courses and manuals for disaster preparedness and mitigation → Most significant adoption in the Philippines by the Citizens' Disaster Response Centre and Network (CDRC/N) of NGOs since the early 1990s, as part of their Citizenry-Based and Development-Oriented Disaster Response (CBDO-DR) approach (Cannon <i>et al</i>, 2003) Vulnerability and Capacity Assessment (VCA) → Identifies and assesses vulnerabilities, capacities, and threats and produces a Vulnerability and Capacity Assessment → Also identifies different vulnerable groups (not just traditional 'women, children and the elderly' categorisations) such as social status, trade, group affiliation, resource access → Recognizes dynamic relationship between governmental policies, civil society, and vulnerability and focuses on building local livelihood capacity (i.e. capital other than human and social), to reduce disaster risk → Produces a diagnostic tool in form of 92 page 'toolbox' (also on CD Rom) plus supporting literature → Designed to help countries understand the risks that communities face; where these risks come from; what and who will be worst affected; what is available at all levels to reduce risks; and what capacities need to be strengthened including attitudes. Product of International Federation of Red Cross and Red Crescent Societies (IFRC) to get a more focused understanding of 'vulnerability' in relation to IFRC programming. → Lacks mechanisms for analysis of relationships between data sets (i.e. Gambian Red Cross VCA lists a high rate of illiteracy as a form of vulnerability but not how illiteracy makes a person vulnerable to a particular hazard) (Cannon <i>et al</i>, 2003).
Key Definitions	Conceptual Approaches	Index Development and Vulnerability Assessment Tools

APPENDIX 1: Summary Table of Conceptual Approaches, Definitions and Assessment Tools of Social Vulnerability

Sustainable Livelihoods* and Development (Cannon <i>et al.</i>, 2003) → Social vulnerability is a complex set of characteristics including: → Initial well-being (physical and mental health, morale) → Livelihood and resilience (capital, income, exchange options, qualifications) → Self-protection (protection afforded by capability and willingness to prepare for disaster) → Social protection (hazard preparedness by society such as building codes, shelters) → Social and political networks and institutions (social capital and role of institutions in setting conditions for hazard precautions, peoples' rights to express needs, access to preparedness) (Cannon, 2006) → Livelihoods affected by the amount, diversity, and balance between assets *Definition of Sustainable Livelihoods: → Those that "can cope with, recover from and adapt to stresses and shocks, maintain or enhance their capabilities and assets and provide net benefits to other livelihoods locally and more widely, both at present and in the future, without undermining the natural resource base." (Chambers & Conway, 1991).	Sustainable Livelihoods Framework (SLF) (IFAD SL Workshop) → Vulnerability analysis partially rooted in the sustainable livelihoods approach and development work aiming to reduce vulnerability related to poverty → According to the SLF assets are the endowments, entitlements, and capabilities that a person holds. There are five types which define a person's ability to survive, thrive and cope with shock or seasonality and environmental trends: → Human (health, knowledge and skills, capacity to work and adapt) → Social (networks and formal/informal connections (neighbourhoods, kinship, business, organizations), mechanisms for participation in decision-making, access to leadership, common rules and sanctions, and representation) → Physical (infrastructure (transport, shelter, water supply and sanitation, energy, communications), tools and technology) → Natural (land and agricultural or other produce, biodiversity, water, building materials, etc.) → Economic/Financial (savings, access to formal/informal credit, other sources of income such as remittances, pensions, and wages) → Livelihood strategies combine the assets that can be accessed, the vulnerability context, and the support or obstruction of policies, institutions and processes → Different households have different access to livelihood assets. Livelihood outcomes for the poor are more poor and often cannot sustain shocks → Institutional context of SLF shows interaction between institutional structures, policies and processes, and SL strategies. Policies of different organizations such as decision-making, social norms, gender, caste, class, and language influence social capital and vulnerability.	Oxfam Risk-Mapping and Local Capacities (Cannon <i>et al.</i>, 2003) → Vulnerability is a social phenomenon related to level of exposure to risk (not the same as the hazard itself), in combination with factors that affect people's ability to cope with their exposure: • Level of poverty • Standard of health • Level of malnutrition • Proportion of female-headed households • Level of illiteracy • Living conditions • Rights → Analyses threats (hazards), followed by a risk analysis (the human 'sectors and elements' exposed to the threats), and an analysis of vulnerability (level of risk, local capacities and living conditions) → Argues that the impact of economic and political processes on peoples' assets should be addressed in the context of vulnerability and development (emergencies are not external to development processes, but part of them) → Highlights relevance of human agency and conflicts in regard to peoples' access to assets (SL framework is relatively weak on this point): capitals are the object of conflict and are competed for by different groups (use and abuse of natural resources is a cause and consequence of conflict and hinders capacities) → Emphasizes local capacity as qualities not covered by the concept of vulnerability, particularly the institutional framework for managing disasters; civil society organisations; and selected actors and initiatives relevant (or potentially relevant) to disaster response. → The approach does not have enough on individual capacities/capacities of people as opposed to institutional → Based on Oxfam initiative to identify disaster risks in Mexico and Central America (MCA) → Produces a booklet describes hazards that might threaten people in MCA and highlights that integrated risk analysis (relationship between them) necessary
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APPENDIX 1: Summary Table of Conceptual Approaches, Definitions and Assessment Tools of Social Vulnerability

		Household Livelihood and Security Assessment (HLSA) Tool (Cannon <i>et al.</i>, 2003) → HLSA is the basic framework for CARE's planning and project implementation and evaluation. Used to: • Organize socio-cultural, economic and ecological data on vulnerable groups in different places • Give causal explanations regarding shocks, trends and processes • Provide macro-micro linkages that are key to understanding the programming areas → HLSA is formulated for a country or region by using a set of analytical lenses that are clustered under: • Contexts • Conditions and trends (macro-level factors influencing possibilities for livelihood systems) • Livelihood resources (economic, natural, human and social capital) • Institutional processes and organizational structures (government, civil society and private sector); Livelihood strategies (productive and exchange activities) • Livelihood outcomes (e.g. nutritional security, food security, health security, habitat security, education security, income security, social network security, safety and environmental security) → Vulnerability arises out of the everyday conditions that people live under (poverty, marginalization) as a result of their livelihood opportunities (definition closer to concepts of disadvantage and deprivation but relevant to risks and shocks so it is discussed in context of vulnerability to disasters)
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APPENDIX 1: Summary Table of Conceptual Approaches, Definitions and Assessment Tools of Social Vulnerability

		→ HLSA is a systems approach (recognises that poor people are part of wider socio-economic and socio-political systems that influence resource production and allocation decisions) → It has parallels with the SL approach and converges with NGOs addressing livelihood issues at the household level and below
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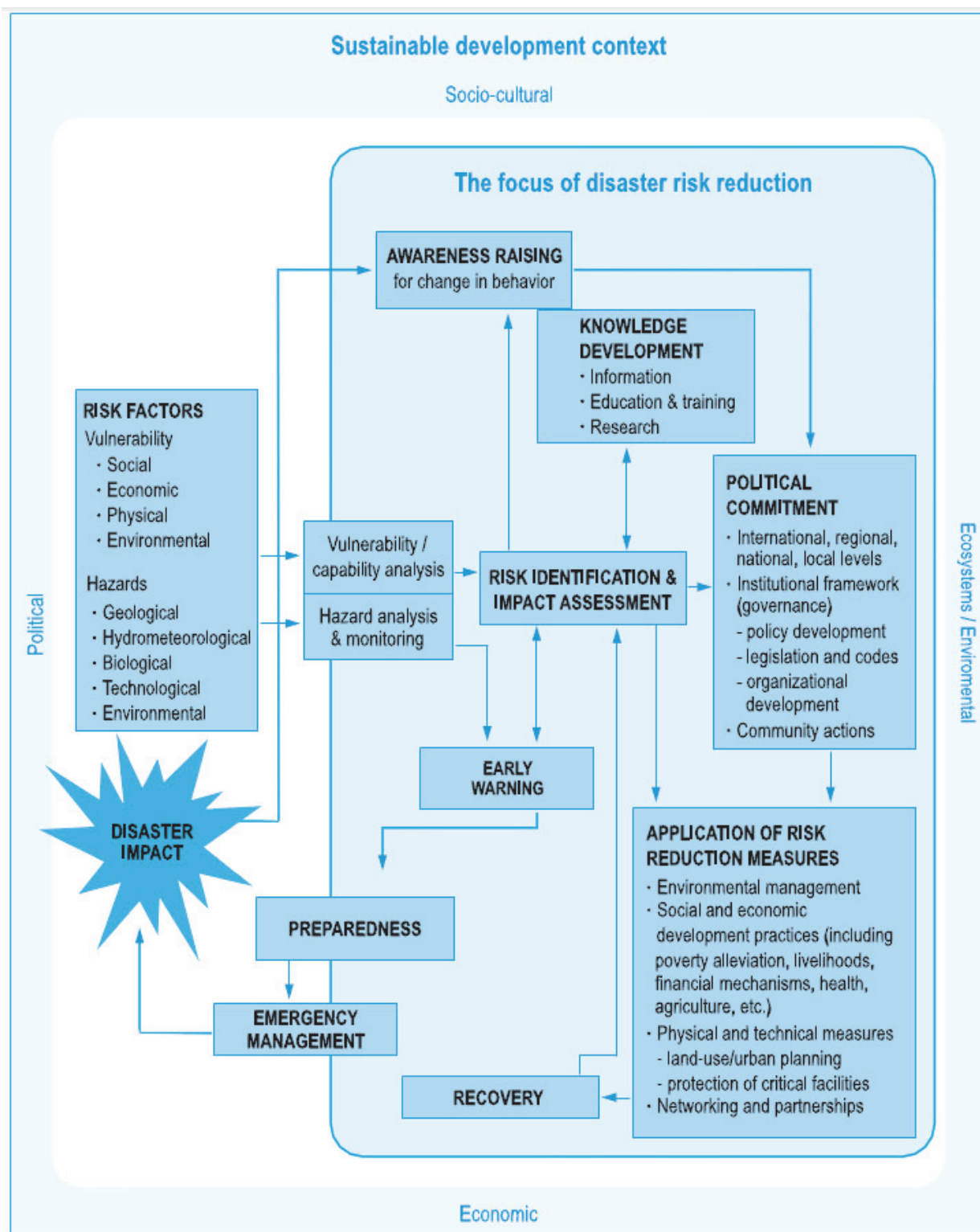
APPENDIX 2

SUMMARY INFORMATION ABOUT THE HYOGO FRAMEWORK OF ACTION (UN/ISDR, 2005)

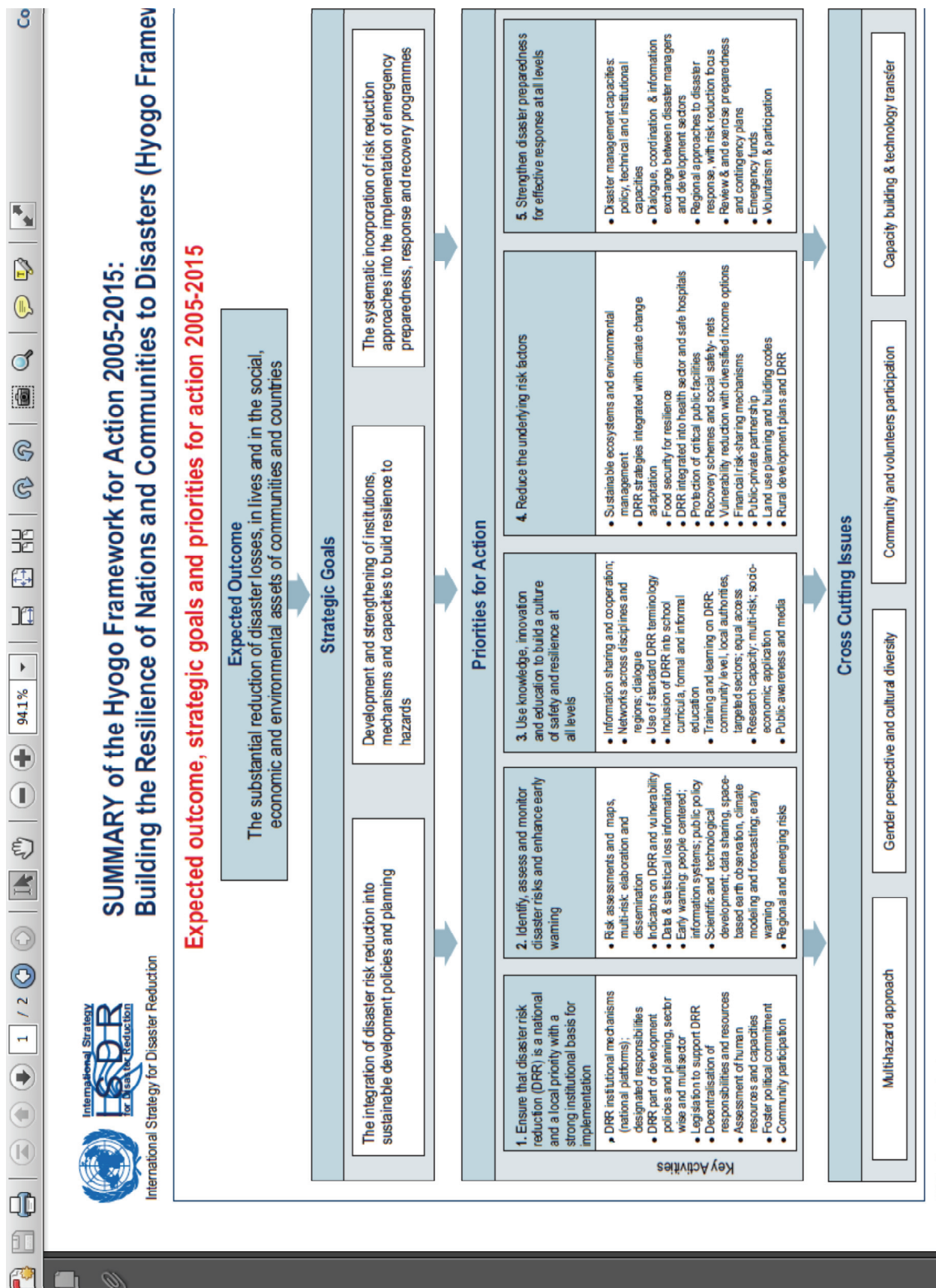
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APPENDIX 2A: UN/ISDR Framework for Disaster Risk Reduction



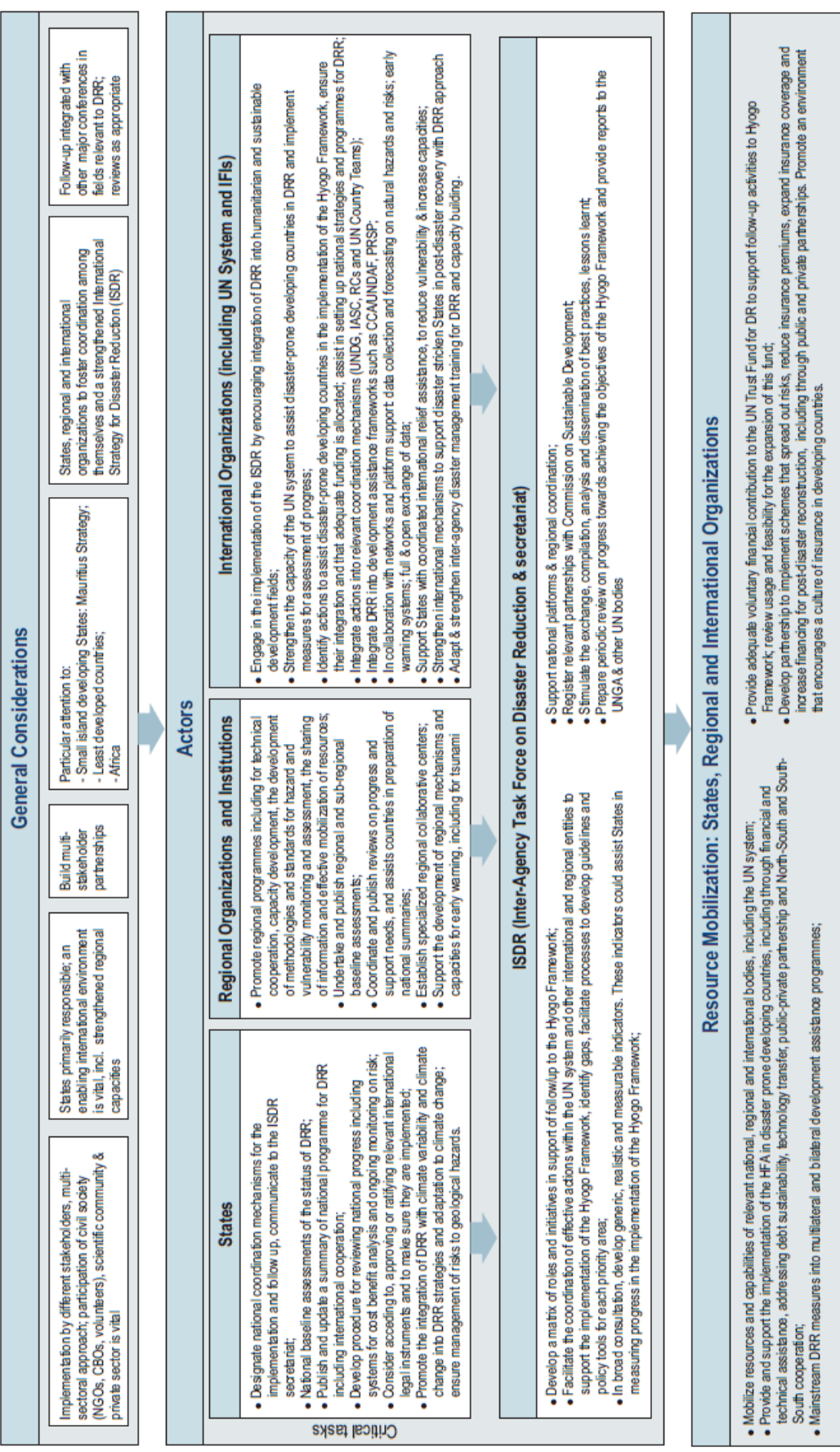
Source: UN/ISDR (2004). Living with risk: A Global Review of Disaster Reduction Initiatives. Pg 15





Implementation and Follow-Up

In order to achieve the goals and act upon the priorities identified in this Framework, the following tasks have been identified to ensure implementation and follow-up by States, regional and international organizations in collaboration with civil society and other stakeholders. The ISDR partners, in particular the Inter-agency Task Force on Disaster Reduction and secretariat, are requested to assist in implementing this Framework for Action.



Source: Outcome of the World Conference on Disaster Reduction, Hyogo, Kobe Japan, 18-22 Jan 2005

www.unisdr.org

APPENDIX 2C: Indicators for Core Task Implementation In Each Priority Area of the HFA at National Level

HFA Priority Areas	Core Tasks for Disaster Risk Reduction (DRR)	Key Indicators
HFA 1: Making Disaster Risk a Priority	Engage in multi-stakeholder dialogue to establish foundations	Legal framework exists with explicit responsibilities defined for all levels
	Create or strengthen mechanisms for systematic coordination	National multi-stakeholder platform
	Assess and develop institutional basis	National policy framework exists that requires plans and activities at all levels
	Prioritize and allocate appropriate resources	Dedicated adequate resources to implement plans at all levels
HFA 2: Improving Risk Information and Early Warning	Establish an initiative for country wide risk assessments	National risk assessment based on hazard and vulnerability info/data and include risk assessment for key sectors
	Review availability of risk related info and capacities for data collection and use	Systems are in place to monitor, archive and disseminate data on hazard and vulnerability
	Assess capacities and strengthen early warning	Early warning in place for all major hazards
	Develop communication and dissemination mechanisms	Early warnings reach and serve people at community level
HFA 3: Building a culture of safety and resilience	Develop a programme to raise awareness	National awareness strategy exists that reaches all communities and people of all education
	Include DRR in education system and research community	School curricula at all levels includes DRR elements and instructors are trained in DRR at all levels
	Develop DRR training for key sectors	-
	Enhance the compilation, dissemination and use of DRR info	-
HFA 4: Reducing the Risks in Key Sectors	Environment: incorporate DRR in environmental and natural resource management	Environmental protection and natural resource management and climate change policies include DRR elements
	Social needs: establish mechanisms for increased resilience of poor and most vulnerable	Specific policies and plans are implemented to reduce vulnerability of impoverished groups
	Physical planning: establish measures to incorporate DRR in urban and land use planning	Land-use development zoning, plans and building codes exist, include DRR elements and are strongly enforced
	Structures: strengthen mechanisms for improved building safety and protection of critical facilities	Long term national programme to protect schools, health facilities and critical infrastructure from common natural hazards
	Stimulate DRR activities in production and service sector	Procedure in place to assess the DRR implications of major infrastructure project proposals
	Financial/economic instruments: create opportunities for private sector involvement in DRR	-
	Disaster recovery: develop a recovery planning process that includes DRR	-

APPENDIX 2C: Indicators for Core Task Implementation In Each Priority Area of the HFA at National Level

HFA Priority Areas	Core Tasks for Disaster Risk Reduction (DRR)	Key Indicators
HFA 5: Strengthen Preparedness for Response	Develop a common understanding and activities to support preparedness	Disaster preparedness and contingency plans at all levels with regular training drills and rehearsals to test and develop disaster preparedness and response
	Assess preparedness, capacities and readiness	Independent assessment done, responsibilities for implementing recommendations and resources schedule assigned
	Strengthen planning and programming for response, recovery and rehabilitation	All organizations, personnel and volunteers responsible for maintaining preparedness are equipped and trained for effective disaster preparedness and response
		Financial and contingency mechanisms are in place to support effective response and recovery
		Procedures are in place to document experience during hazard events and disasters and to undertake post event reviews

APPENDIX 3

RECONCILIATION OF REQUIREMENTS FOR AND AVAILABILITY OF WATER

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APPENDIX 3A:	Reconciliation of the Requirements for and Availability of Water for the Year 2000
APPENDIX 3B:	Reconciliation of Requirements for and Availability of Water for the Year 2025

APPENDIX 3A: Reconciliation of the Requirements for and Availability of Water for the Year 2000 (MILLION M³/A)

Water management area	Reliable local yield (1)	Transfers in (2)	Local requirements (3)	Transfers out (4)	Balance [(1+2)-(3+4)]
1 Limpopo	281	18	322	0	(23)*
2 Luvuvhu/Letaba	310	0	333	13	(36)
3 Crocodile West and Marico	716	519	1 184	10	41
4 Olifants	609	172	967	8	(194)
5 Inkomati	897	0	844	311	(258)
6 Usutu to Mhlatuze	1 110	40	717	114	319
7 Thukela	737	0	334	506	(103)
8 Upper Vaal	1 130	1 311	1 045	1 379	17
9 Middle Vaal	50	829	369	502	8
10 Lower Vaal	126	548	643	0	31
11 Mvoti to Umzimkulu	523	34	798	0	(241)
12 Mzimvubu to Keiskamma	854	0	374	0	480
13 Upper Orange	4 447	2	968	3 149	332
14 Lower Orange	(962)	2 035	1 028	54	(9)
15 Fish to Tsitsikamma	418	575	898	0	95
16 Gouritz	275	0	337	1	(63)
17 Olifants/Doring	335	3	373	0	(35)
18 Breede	866	1	633	196	38
19 Berg	505	194	704	0	(5)
Total for country	13 227	0	12 871	170	186

Source: Department of Water Affairs and Forestry, (2004). National Water Resources Strategy.

1. * Brackets around numbers indicate a negative balance.
2. Surpluses in the Vaal and Orange water management areas are shown in the most upstream water management area where they become available (that is, the Upper Vaal and Upper Orange water management areas).
3. Transfers into and out of water management areas may include transfers between water management areas as well as to or from neighbouring countries. Yields transferred from one water management area to another may also not be numerically the same in the source and recipient water management area. For this reason, the addition of transfers into and out of water management areas does not necessarily correspond to the country total.
4. The transfer of water from Lesotho to South Africa is reflected in the tables as being from the Upper Orange water management area.

APPENDIX 3B: Reconciliation of the Requirements for and Availability of Water for the Year 2025 Based Scenario (MILLION M³/A)

Water management area	Reliable local yield (1)	Transfers in (2)	Local requirements (3)	Transfers out (4)	Balance [(1+2)-(3+4)]	Required for development
1 Limpopo	281	18	347	0	(48)	8
2 Luvuvhu/Letaba	404	0	349	13	42	102
3 Crocodile West and Marico	846	727	1 438	10	125	0
4 Olifants	630	210	1 075	7	(242)	239
5 Inkomati	1 028	0	914	311	(197)	104
6 Usutu to Mhlatuze	1 113	40	728	114	311	110
7 Thukela	742	0	347	506	(111)	598
8 Upper Vaal	1 229	1 630	1 269	1 632	(42)	50
9 Middle Vaal	55	838	381	503	9	0
10 Lower Vaal	127	571	641	0	57	0
11 Mvoti to Umzimkulu	555	34	1 012	0	(423)	1 018
12 Mzimvubu to Keiskamma	872	0	413	0	459	1 500
13 Upper Orange	4 734	2	1 059	3 589	88	900
14 Lower Orange	(956)	2 082	1 079	54	(7)	150
15 Fish to Tsitsikamma	456	603	988	0	71	85
16 Gouritz	278	0	353	1	(76)	110
17 Olifants/Doring	335	3	370	0	(32)	185
18 Breede	869	1	638	196	36	124
19 Berg	568	194	829	0	(67)	127
Total for country	14 166	0	14 230	170	(234)	5 410

Source: Department of Water Affairs and Forestry, (2004). National Water Resources Strategy.

1. Brackets around numbers indicate a negative balance.
2. Based on infrastructure in existence and under construction in the year 2000. Also includes return flows resulting from a growth in requirements;
3. The assumed growth in urban and rural water requirements results from the anticipated high population growth and current ratios of domestic to public and business water use. Allowance has been made for known developments in urban, industrial and mining sectors only, with no general increase in irrigation.

APPENDIX 4

INTERNATIONAL, NATIONAL AND PROVINCIAL DISASTER RISK REDUCTION AND SOCIAL PROTECTION MEASURES FOR WATER RELATED HAZARDS

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APPENDIX 4A: International and National Social Protection

Social Protection at the Urban, District Municipal and Local Municipal Level				
NTIOK	The prime responsibility for handling disasters vests with the local government. Immediate response normally by the emergency services. (5)	Community Water Supply and Sanitation Program (CWSS): launched by the Department of Water Affairs (DWA). Identification and implementation of key water projects, increasing delivery of water and sanitation services to decrease backlog. DWA partners were NGOs, small-scale private sector teams, and local committees (for health and hygiene promotion. The third and final phase of the program is currently ongoing (3)	Constitutional Mandate for Local Government 1996 (Department of Housing): detailed and legislated for in the White Paper on Local Government (1998) and the Municipal Systems Act (No 32 of 2000). Requires authorities to promote social and economic development. (9)	Integrated Development Plans: The White Paper on Local Government endorses the need for local government to initiate partnerships with community-based organisations and non-governmental organisations. (43)
		White Paper on Water Supply and Sanitation Policy 1994: Responsibility for the implementation and management of sanitation services lies with the local authority. (24)	National Environmental Management Act: Waste Act 2007: Local government must prepare integrated waste management plans as part of their integrated development plans. (7)	The Minister of Provincial Affairs and Constitutional Development has the power to declare a state of disaster. The Disaster Management Act does not make provision for any funding from the national level. (5)
		District Food Security Committees (DFSC) and Local Food Security Action Groups (LFSAG) of local government officers, traditional authorities, churches and NGOs. The Food Security Officers (FSO) technical support to the LFSAG. (14)	The 'Improving Human Settlement Through Local Government' (Department of Housing): plan outlines interventions to be undertaken by the Department of Housing: Coupled with this was the Constitutional Mandate for Local Government (RSA, 1996). (9)	Municipalities must develop their own disaster management plans in line with the Disaster Management Act. This must be synthesized at the metropole level (see city catchment storm river water management department) (16)
		District municipalities are to render Municipal Health Services (MHS). MHS is defined in the Bill as Environmental Health Services (EHS). (33)		Department of Provincial and Local Government Integrated Development Plans: primary tool for local government to identify and budget for local service, infrastructure and development needs over a five-year period. (9)
		The 1997 Water Services Act assigned municipalities the responsibility for providing water and sanitation services. Since 1999, DWA has been transferring responsibility for rural water and sanitation		

APPENDIX 4A: International and National Social Protection

		provision to municipalities. (18)		
		Local authorities are Constitutionally mandated to provide municipal services to all people within their areas of jurisdiction. The IDPs and the Water Services Plans provide the framework within which the Local Authority or Service Provider can be influenced to provide services consistent with the requirements of this Strategy. (21)		
Social Protection at the Community Level				
Water user associations are co-operative associations and fall under the authority of the Summary Proposed First Edition National Water Resource Strategy August 2002 (12)	NTOK	White Paper on Water Supply and Sanitation Policy 1994: The Department uses Local Water Committees as the vehicle for sanitation development. (24)	NTOK	NTOK
Social Protection at the Household/Individual Level				
The National Water Act places the responsibility for ensuring the structural and operational safety of dams on the dam owners. (15)	Any assistance to farming communities should be in accordance with the Disaster Management Framework. (4)	Social Grants provided by the government are targeted at people in need. The Department of Housing is embarking on energy efficient housing design and implementation. (9)	Land Redistribution for Agricultural Development Programme (LRAD): The Land Use Management Bill, provides a more detailed approach to land management than a focus on meeting the need for land redistribution. (9)	NTOK
		White Paper on Water Supply and Sanitation Policy 1994: Service provision and catchment transfer schemes. (24)		

APPENDIX 4B: Eastern Cape

Floods/Water Management	Drought	Biological (hazardous waste, food security, environment)	Technical/Infrastructure (sanitation, water services/water management)	Disaster/Development
Provincial				
	DWA: 2009 drought interventions in Eastern Cape, R36.4 million allocated to all district municipalities.(1)	Eastern Cape Provincial Health Care Waste Management Report (From South Africa) 2004: manages health care waste management in terms of NWMS. Also involves Eastern Cape Provincial Department of Environment. (3)	Department of Water Affairs (DWA) Eastern Cape: six Water Services Authorities -with policies for free basic water provision though limited by infrastructure (1)	Provincial Growth and Development Plan 2004-2014 (PGDP): addresses spatial marginalization, guides planning in municipality. IDPs are the implementing mechanism for the principles in the PGDP and PSDP. (2)
		Department of Agriculture (in line with PGDP): food security, diversification of manufacturing base, tourism potential. Strategic Plan: services for emerging farmers. Aim to increase produce/trade. Involves Eastern Cape Rural Finance Corporation (ECRFC)/Provincial institutions. ANC Rural Development Priorities: by 2014 redistribution of 30% of agricultural land; tools to farmers and improved market access. (6)	DWA Eastern Cape -Projects: Sanitation Resource Centers, provision of water and sanitation services to 81 schools. Vision 2020 Programme, School and Sanitation Programme (920 schools 2008/2009), Regional Bulk Infrastructure Programme. (1)/(4)	Department of Public Works Eastern Cape Province 2007-2010. Expanded Public Works Programme; Public Works Programmes (PWWPs) (labour intensive – aim is to create 4.5 million jobs by 2014); Community-Based Public Works Programme (drives Expanded Public Works Programme) (8)
		Department of Public Works Eastern Cape Province 2007-2010. --> Expanded Working for Water Programme: Invasive Alien Plants (IAPs) threatening bio-diversity and can divert water from productive uses/intensity impact of floods, fires, and soil erosion. Working for Water 1995 launched to deal with this by DWA. (8)	2008/2009 WSAs allocated more than 80% of the Municipal Infrastructure Grant (MIG) for water and sanitation projects.(1) Masibambane: Water services sector support program integrated with Community Water Supply and Sanitation (CWSS) for provision of basic water services to rural communities in Limpopo, KwaZulu-Natal and Eastern Cape through projects but emphasis on whole water sector (DWA and EU funded/bilateral co-operation SA and	Department of Water Affairs (DWA) Working for Water programme: poverty alleviation, resource management and climate change mitigation, employed 4667 people in Eastern Cape. (Meeting Regional Departments of Water Affairs (1)

APPENDIX 4B: Eastern Cape

Floods/Water Management	Drought	Biological (hazardous waste, food security, environment)	Technical/Infrastructure (sanitation, water services/water management)	Disaster/Development
			UK, Ireland, Netherlands and France) (7)	
			DWA Dam Safety Rehabilitation: Belfort Dam safety rehabilitation and O&M – R6m; Belfort and Ntenetyana Dams O & M – R1.3m; Gcuwa & Toleni Dams – R50m; Gamtoos Scheme (Cacadu & NMBM areas) R150m by end 2009/2010 (4)	
			Provincial Growth and Development Plan 2004-2014: Programmes: Massive Food; Comprehensive Nutrition (School Nutrition Programme and Integrated Nutrition with TB and ARV treatment patients); Integrated Agricultural Infrastructure; Water and Sanitation; Housing; Improved Service Delivery (2)	
			Eastern Cape Institutions in Water Service Provision: Consultative Committee on Agricultural Water ((CCAW); Licensing Assessment Advisory Committee (LAAC); MUNIMEC System (Municipality and MEC forum for local government, mayors, provincial departments) MM's (Linked to PCF and Clusters) WSA Municipalities, Water Boards, DWA, SALGA (IRG). Eastern Cape Water Committee; Provincial water forum, Provincial sanitation Task team (4)	

APPENDIX 4B: Eastern Cape

Floods/Water Management	Drought	Biological (hazardous waste, food security, environment)	Technical/Infrastructure (sanitation, water services/water management)	Disaster/Development
Private Services/Public Private Partnerships				
		Eastern Cape Development Corporation (ECDC): official economic development and investment agency for Eastern Cape. Government-owned, aligned with PGDP. Supporting existing business and creating new opportunities/markets. Annual report 2008/2009: project involvement includes the Department of Education's school nutrition scheme and Department of Health's food parcel distributions (10)	Amatola Water: state-owned, non-profit making business enterprise under DWA. Bulk water services provider, assists local government in water supply maintenance/waste water services/water and sanitation backlogs. 11 plants. 7 sub-regional bulk distribution networks covering most of Amatola and part of Chris Hani DMs. (11) DWA Negotiated an IA agreement with Amatola Water Boards and Mvula Trust Implementation underway (183 schools) (4)	The Eastern Cape Rural Finance Corporation Act, Act 9 of 1999: Act to provide for establishment of the Eastern Cape Rural Finance Corporation Ltd (uVimba), to facilitate sustainable rural development in the Eastern Cape; provide for abolition of the Agricultural Bank of Transkei and the Ciskeian Agricultural Bank Ltd. (8)
			Electricity is distributed by Eskom (state owned enterprise) to Sakhisizwe Municipality (electricity supplies to certain areas require upgrading, as the present current is too weak to cater for all of the demands placed upon it. Negotiations with Eskom are problematic as they do not want to commit themselves to projects (Sakhisizwe IDP) (12)	Chris Hani targeted public include National Development Agency, Development Bank of Southern Africa, Eastern Cape Socio Economic Consultative Council, and Council for Scientific and Industrial Research, Independent Development Trust, Msobomvu Youth Fund, Khula Enterprise Financial Limited, Intsika Development Fund. For community services, economic development finance, etc. is Nodal Delivery Teams (NDT), Planning and Implementation Management Support Systems (PIMSS), MIG, Independent Development Trust (IDT), German Development Service and DEAET support. Need for more integrated

APPENDIX 4B: Eastern Cape

Floods/Water Management	Drought	Biological (hazardous waste, food security, environment)	Technical/Infrastructure (sanitation, water services/water management)	Disaster/Development planning. (18)
			Bohiweki Environmental consulting company: bulk infrastructure and supply (wastewater treatment works, pipelines, landfills), electricity generation/transmission, mining industry, urban/rural/township developments, environmental aspects of Local IDPs. Environmental Impact Assessment for a new Regional, General and hazardous Landfill in the Eastern Cape (Coega Development Corporation) (13)	
		Equal Opportunity Fund (EOF) South Africa: funds Siyavuselela Agricultural Association – in Cala, in the Eastern Cape, was funded for R58 000 00 equipment in 2004. It initially was a small nursery and today it provides seedlings on a large scale. It also provides training and advice to small farmers in the surrounding areas (5)	ASIST/Development Bank of Southern Africa (DBSA) and the South African DPW: independent assessment of the Targeted Procurement (TP) System to address national government development service delivery objectives. Enables socio-economic components to be specified/monitored within public sector procurement system. Address specific development objectives. (8)	Chris Hani Institute: independent NGO set up through a joint initiative of COSATU and the SACP (14). Researching and developing socialist alternatives to equip shop stewards, trade union officials, community activists and the children of the working class and the poor. (9)

APPENDIX 4B: Eastern Cape

Floods/Water Management	Drought	Biological (hazardous waste, food security, environment)	Technical/Infrastructure (sanitation, water services/water management)	Disaster/Development
	Chris Hani Integrated Sustainable Rural Development Programme: Business plans have been prepared for areas targeted for Drought relief fund allocated by DWAF and the district is still waiting for the transfer of funds. (18)		Regional Bulk Services Provision: Amatola Water (AW) well established in the Amathole DM and Buffalo City LM. Assets that they were operating that belonged to DWA have been transferred to AW. AW expanding area of operation to Chris Hani DM and Ukhahlamba DM. Provision of water and sanitation in clinics (214 Clinics provided 2007/2008 at R43m). Councillor Induction in all WSA's since 2005 to date (4)	Chris Hani Disaster Management Centre – Community Services Department has primary responsibility for disaster management though not ideal. Fire protection department will be established to take responsibility. Disaster Management Framework sets out institutional arrangements, roles, communication lines, finances, priorities, framework for Disaster Management continuum, coordination of programmes of agencies and departments. (16)
Chris Hani (CHDM)				
			Community Water supply and Sanitation Delivery, Implementation of Sustainable Water Institutions Programme, Use of IDP as planning manual (4)	Integrated Development Plan (IDP): Economic development; Access to basic services; Adequate land for housing and development; Appropriate forms of land tenure; Social development; Conservation; development initiatives/capacity building (17)
			CHDM WSA: to provide efficient and sustainable water supply and develop water infrastructure, metering and monitoring systems, and attain capital to meet current/future water service needs. Implementation of a Water Demand Management plan. Also See CH Region IDP (17)	
			Draft Water Services Development Plan March 2001 (WSDP) (Under Water Services Act (Act 107 of 1998) subsection of integrated planning process: WSA provision and regulation of water and sanitation services. Database of customers, policy development for service provision to informal settlements, water conservation awareness, capacitating local municipalities. DMs to develop water services payment strategies. (17)	

APPENDIX 4B: Eastern Cape

Floods/Water Management	Drought	Biological (hazardous waste, food security, environment)	Technical/Infrastructure (sanitation, water services/water management)	Disaster/Development
			National Groundwater Database: managing/planning ground water resources in rural areas. National Groundwater Division of DWA (all boreholes monitored for their database). DWA hands over responsibility of completed boreholes to rural community with approval from CHDM. DWA water quality monitoring for all potable water supplies in CHDM & LMs Monitoring of flows throughout conveyance system (17)	
			Water Conservation and Demand Management: DWA funded development of Business Plans, Water Quality Monitoring, Establishment of Sanitation Resource Centres & Appropriate technology Manuals for CHDM/providing guidance to PERCCI. Funded training and employment of community plumbers and trainers; Provision of water and sanitation in schools (81 schools in 2008/9). (4)	
			Chris Hani Water Services: DWA has transferred water schemes to DM. Greatest backlog in Intsika Yethu, Engcobo, Sakhisizwe and Emalahleni. DM requires about R1 billion to eradicate the entire backlog for Water and Sanitation. To eradicate bucket system in whole district, loan application submitted to the DBSA is being processed. Water Services Authority Business Plan and Water Services Development Plan. Partnership with the Municipal Infrastructure Investment Unit and Amatola Water Board. Refurbishment, operation and maintenance of rural water schemes going on in six LMs. Community-based organisations and training started. (18)	

APPENDIX 4B: Eastern Cape

Floods/Water Management	Drought	Biological (hazardous waste, food security, environment)	Technical/Infrastructure (sanitation, water services/water management)	Disaster/Development
			Chris Hani Integrated Sustainable Rural Development Programme: Some key developmental areas are Roads and Storm water, capital programmes and electrification. Municipality capital projects funded through Municipal Infrastructure Grant, Water and Sanitation, Building for Sports and Recreation Programme and Equitable Share. In terms of Roads & Stormwater DM responsible for proclaimed roads on agency basis on behalf of the Department of Roads & Public Works. Responsibility also lies with Department of Transport. (18)	
			Water resources management: fresh water comes from two WMAs. Several irrigation schemes and dams which provide subsistence fishing opportunities to local communities. District concerned about over-abstraction of surface and groundwater. Some wetlands occurring within the catchments of significant dams in the district are threatened by gully erosion and invasion by alien vegetation. Loss of wetlands can contribute to floods, droughts, etc. (18)	
Sakhisizwe LM				

APPENDIX 4B: Eastern Cape

Floods/Water Management	Drought	Biological (hazardous waste, food security, environment)	Technical/Infrastructure (sanitation, water services/water management)	Disaster/Development
		Sakizwe IDP Integrated Waste Management Plan (IWMP): One sector officer in charge of IWM Planning from IDP (otherwise dealt with in parallel planning). Both urban centres in Sakizwe Municipality have solid waste disposal site. Female labourers sweep streets. Council Environmental Health Officer. No local Waste Management Plan so few public refuse receptacles; no recycling facilities. See also Guidelines for the compilation of the IWMP/White Paper on Integrated Pollution and Waste Management for South Africa (16)		Sakizwe IDP Disaster Management: Sakizwe Municipality has to prepare a disaster management plan. Community Services Department responsible for disaster management. Fire protection department to be established. Community pre and post-disaster; Incident Management (emergency services in Cala, Elliot and rural areas); Technical, Financial and Corporate Support. In event or threat of a disaster, municipal official should inform the relevant Satellite Disaster Management Centre. Next the National/provincial centres and municipal role-players. CHDM Disaster Management Centre (response vests with municipality) activates the disaster response through DMP and DMC plus rehabilitation. (16)
				Sakizwe IDP: sustainable tourism (Thompson Dam in Elliot, Air Strip in Elliot, Cala Library Monument and Cultural Village); use of land and agricultural resources (Conservation of Agricultural Resources Act); upgrade road surfaces; protect Water Resources and Catchments Areas; land rehabilitation; forest conservation (Environmental Conservation Act and National Forests Act and Regulations). Council getting funds for developing spatial development framework (16)

APPENDIX 4B: Eastern Cape

Floods/Water Management	Drought	Biological (hazardous waste, food security, environment)	Technical/Infrastructure (sanitation, water services/water management)	Disaster/Development
				Sakhisizwe Spatial Development Framework: formulated on behalf of the municipality 2006. Municipality Spatial Planning and Settlement Upgrade project in rural settlements. Spatial and legal basis for the formalisation of land tenure rights/land use control. Facilitation of community interaction with the relevant authorities over land use issues. Also plans for improving transport networks to promote more compact settlements. (16) Sakhisizwe IDP Local Economic Development (LED): Poverty Reduction and Gender Equity Strategy. DM must cross reference LED-related projects as part of the IDP. Sector plan being done by DM in conjunction with LMs. Plus Integrated Environmental Program, Integrated institutional program (p.123)
Cala/Tsengwiwe				
			Sakhisizwe IDP Infrastructure: 51% of households utilize their own refuse dump for solid waste disposal. Solid waste sites do not meet standards. Local authorities service Masibambane, Elliot and parts of Cala. Additional infill sites demarcated. Municipality planning provision of water reticulation and sanitation to various settlements around Cala. Plan for solid waste site. (16)	Sakhisizwe IDP Project Plans: Tsengwiwe and Cala road improvement and building of access road Elliot Town/Sifondile/Cala Urban/Lower Tsengwiwe Access Road. Tsengwiwe & Mnxe Water Supply/Cala Reservoir and Sewerage. Shearing Sheds – Cala Pass, Tsengwiwe, Manzimdaka, Tiwane, CH taxi rank and shelters, Cala Reserve Community Hall, Cala Pass Community Hall, Lower Cala/Cala Reserve Primary School, Food Security Project in Cala Town. Projects for socially vulnerable. Cultural Village Plan in Cala has been designed and is to be submitted to MIG for funding (16)

APPENDIX 4B: Eastern Cape

Floods/Water Management	Drought	Biological (hazardous waste, food security, environment)	Technical/Infrastructure (sanitation, water services/water management)	Disaster/Development
				The Land Reform and Settlement Plan: prepared 2005 by CHDM with proposals for Sakhisizwe: Formalization and Densification around the Cala Urban Area; Development Support Zone – reestablishment of productive agriculture. Special Projects – Potential LRAD and Conflict Resolution within south-eastern part of Ward 2; Settlement Zone (urban) around Elliot Urban Area. Residential formalisation and upgrade in lower income, semi-informal areas. Residential extension to southern town. Proposed extension of the Urban Edge to include the Manzimdaka and Cala Reserve and settlement extending along the Lady Frere Road. (16)

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APPENDIX 4C: Western Cape

Floods	Drought	Biological (hazardous waste, food security, environment)	Technical/Infrastructure (sanitation, water services/water management)	Disaster Management/Development
Provincial				
		Department of Environmental Affairs and Tourism: developing policies related to impact of sanitation systems on the environment. Service levels of existing in formal developed and informal areas (excluding rural areas) must meet minimum standards (Water Services Act 108 of 1997). These households have either a metered water connection to the house or to a yard toilet with water tap (uncontrolled volume supply). (12) Department of Environmental Affairs and Development Planning/Western Cape: land use management/capacity building. Supporting the Accelerated and Shared Growth Initiative of South Africa (ASGISA) and the National Spatial Development Perspective (NSDP) initiatives. Aligned PGDS, supported by the iKapa Eilhlumayo strategy. See also Western Cape Nature Conservation Board. Pollution and Waste Management. Strategic Environmental Management. (13)	Department of Public Works: implementing agent for national/provincial government when facilities (schools, clinics), are constructed or rented. Responsibility to ensure adequate provision made for sanitation facilities in government and public buildings. (12) Western Cape Regional Sanitation Programme (2000-2003) A Sanitation Implementation project was set up to accommodate farmdwellers and people in informal settlements: communities who fall outside the formal delivery process in terms of basic sanitation provision. (18)	Western Cape Planning and Development Act, 1999: objectives set in an integrated spatial development plan, including land development objectives. Development should consider carrying capacity with regards to water and potential to cause water related hazards. (Development Facilitation Act, 1995) (15) National Environmental Management Act 1998 provides for duty to prevent environmental damage. Power given to Provincial Department of Environmental Affairs and Development Planning of the Western Cape Provincial Administration. (37) Western Cape Strategic Infrastructure Plan (SIP) -Disaster management role of province: monitoring, warning, weather stations. National Disaster Management Act (no. 57 of 2002)/Western Cape Disaster Management Frameworks. DRR programmes reviewed by Provincial Disaster Management Steering Committee, the Western Cape Disaster Management Advisory Forum and the National Disaster Management Centre. (14)
		IDP: mechanism for integration among local role players/municipalities and their provincial/national government counterparts (local government coordination up to DM/Metro as WSA or LM). Water Services Development Plan WSDP (within IDP) provides the basis for sanitation provision and operation. Clearance of backlog, health education. Community-based (rather than contractor-based) approach (12) (10)	Community Water Supply and Sanitation (CWSS) – Western Cape Farmdweller Sanitation Pilot Programme. Provincial Sanitation Unit Task Team (PSTTs) mandated CWSS to support communities to access DWA subsidies and Capital Sanitation Programme. Cooperation with DWA, National Sanitation Training Forum, the Masibambane Forum (16) Klipheuwel Community-based Sanitation Project. CWSS technical support, Quality Assurance, follow-up training in plastering and latrine repair. (18)	

APPENDIX 4C: Western Cape

		IWRM promotes co-ordinated management of water, land and related resources to maximise economic and social welfare in a sustainable manner (Global Water Partnership, 2000). IWRM also deals with solid waste management and pollution, population growth, and water resources. (19)	National Sanitation Task Team (NSTT): Coordination of national level programs. re-established as a sub-committee of the Municipal Infrastructure Task Team. DWA convenes sanitation sub-committee/ensures stakeholder participation. Minimum standard for water supply service is education on water use and 25 litres/person/day. No consumer should be without supply for more than seven full days/year. Should be in accordance with minimum standards related to chemical and microbial contaminants. Provincial Sanitation Co-ordinating Forums: comprise representatives of DM and metro/relevant national government departments. Chaired by provincial representatives. (12)	Western Cape Provincial Spatial Development Framework (PSDF) (Department of Environmental Affairs and Development Planning (EADP)): one of 8 lead strategies of PGDS. guides municipal integrated development plans (IDPs) and spatial development frameworks (SDFs) and provincial and municipal framework plans (i.e. sub-SDF spatial plans). Prioritises and aligns investment and infrastructure plans of other provincial, national and parastatals; provide signals to the private sector. Guided by NSDP; gov spending should prioritise economic growth potential, activity corridors linked to main growth centres; and shift in current patterns of resource use (17)	Western Cape Provincial Spatial Development Framework (PSDF) (Department of Environmental Affairs and Development Planning (EADP)): one of 8 lead strategies of PGDS. guides municipal integrated development plans (IDPs) and spatial development frameworks (SDFs) and provincial and municipal framework plans (i.e. sub-SDF spatial plans). Prioritises and aligns investment and infrastructure plans of other provincial, national and parastatals; provide signals to the private sector. Guided by NSDP; gov spending should prioritise economic growth potential, activity corridors linked to main growth centres; and shift in current patterns of resource use (17)
			Provincial Department of Health manages 45 ambulance stations but generally in dilapidated buildings. In response to this, Physical Infrastructure Plan developed in 2004. Plan proposes a framework within which ambulance stations developed to meet health service delivery requirements of Health Care 2010. (14)	Directorate Disaster Management and Fire Brigade Services: aim to promote the development, implementation and maintenance of effective disaster management and fire brigade services in the Western Cape. (11)	Directorate Disaster Management and Fire Brigade Services: aim to promote the development, implementation and maintenance of effective disaster management and fire brigade services in the Western Cape. (11)
			Western Cape Strategic Infrastructure Plan (SIP) Provincial Emergency Services: DWA manages riverine flooding and wildfires. City growth, streams, rivers Department of Transport, Roads and Stormwater. Metro hydrological monitoring network (rainfall and river flow stations) and those connected to telemetry network. Western Cape has physical infrastructure (storm surge/wave action protection) and medical services, fire services and sea rescue. (14)	Western Cape Strategic Infrastructure Plan (SIP) Provincial Emergency Services: Municipal medical/fire/emergency/weather services. Also provincial traffic authorities, South African Police and National Defence/Air Force for rescue and evacuation, and Department of Agriculture/Health for epidemics. Departments of Local Government, Housing and Social Services and Poverty Alleviation also involved (settlement fires, urban flood) (14)	Western Cape Strategic Infrastructure Plan (SIP) Provincial Emergency Services: Municipal medical/fire/emergency/weather services. Also provincial traffic authorities, South African Police and National Defence/Air Force for rescue and evacuation, and Department of Agriculture/Health for epidemics. Departments of Local Government, Housing and Social Services and Poverty Alleviation also involved (settlement fires, urban flood) (14)
			Western Cape Reconciliation Strategy Study: commissioned by DWA to facilitate the reconciliation of predicted future water requirement scenarios with supply from the Western Cape Water Supply System (WCWSS) over a 25 year planning horizon. (8)	2002-2003 Risk and Vulnerability Assessment for the Western Cape (provincial Department of Local Government): develop support management tools for the Western Cape to assist the Provincial Disaster Management to execute risk and vulnerability assessments and formulate strategies. Sponsored by Municipal Infrastructure Enhancement (Department of Local Government and Housing,	2002-2003 Risk and Vulnerability Assessment for the Western Cape (provincial Department of Local Government): develop support management tools for the Western Cape to assist the Provincial Disaster Management to execute risk and vulnerability assessments and formulate strategies. Sponsored by Municipal Infrastructure Enhancement (Department of Local Government and Housing,

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				Provincial Government of the Western Cape) (1)
				Provincial Disaster Management Centre (PDMC): 2005 Training, Education, Awareness and Marketing (TEAM) programme, disaster management project to enhance risk reduction and coping capacity through TEAM interventions tailored to hazards in vulnerable communities. Kayamandi one of 11 most vulnerable communities in WC. (2)
				Draft Western Cape Disaster Management Framework: emphasis on prevention and mitigation. Obligations include: establish provincial disaster management centre and disaster management centres within each DM; prepare disaster management plan; integrate DRR into development planning (IDP) and Strategic Environmental Assessments (SEAs) and DRR assessments of infrastructure, communities, environment. (14)
Cape Winelands DM				
		Waste Water Treatment Works (WWTWs): managed by municipalities. DWA issues permits for works and monitors. Many WWTWs need upgrading in WC. Most municipalities chosen to focus on more politically acceptable infrastructure due to lack of understanding between sanitation and health. Environmental Impact Assessment process required to obtain permission for new waste disposal sites (IWRM) slowed due to envi concerns. (19)	Cape Winelands Municipal Government Subsidy Scheme for the Provision of Toilet Facilities, Drinking Water, Electricity and Hot Water to Farm Worker Housing Project: Provide subsidies to farms/rural areas and rural schools for provision of water and basic sanitation facilities and health awareness. Incentive for farm owners to provide and upgrade basic subsistence facilities on farms and for farm workers. (3)	Cape Winelands IDP 2006 -Cape Winelands Disaster Management Center: Conduit of disaster information; disaster plans; identification of water pollution sources, sustainable sources of water and education in terms of water purification; subsidies for housing upgrades; promotes volunteerism. Disaster Management Framework to be aligned with Provincial and national frameworks; advisory forum. (21)

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		Cape Winelands Clean and Green' Clean-Up Project aims to create awareness about pollution control through education and clean up campaigns. Jobs for vulnerable (disabled, elderly and women). Implemented through small-scale recycle contractors. Assistance to B-municipalities by cleaning-up problem areas. Awarded as Best Innovative Project in waste management for excellence in the implementation of the Expanded Public Works Program. (23)	Cape Winelands District Municipality Subsidy Scheme for the Provision of Toilet Facilities, Drinking Water, Electricity and hot Water to Farm Worker Housing 2004-2007: provide subsidies to farms and rural schools for the provision of water and sanitation. (4)	Western Cape Planning and Development Act 1999 municipal planning "means strategic planning, inclusive of spatial planning and land development management..." (8) Cape Winelands IDP: LM, DM and stakeholders Process Plan for public development. Representative Forums as a link to civil society. Strategy envisions that vulnerable people are provided with basic services; aims to build skill base and foster effective governance and access to information. Planning Implementation and Management Support Centre (PIMS) conducted surveys on service delivery to measure municipal delivery. IDP Managers Forum and a District Advisory Forum for Mayors have formed and met. (Intergovernmental Relations Bill) (21)
		Municipal Structures Act 117 of 1998: district municipalities have bulk supply and bulk sewage purification duties as stated in section 84. Cape Winelands DM has powers of water supply and sanitation and liable for pollution prevention under the National Water Act (RSA, 1998c). (28)	Water Service Development Plan (WSDP): provides data and a starting point for municipalities to measure their performance against other municipalities or set goals. Municipalities are responsible for the delivery of water and sanitation services. Olifants and Berg River catchment areas of the Western Cape include 56 towns/communities including Stellenbosch LM. (20)	
		Department of Environmental Affairs through the Western Cape Clean-up Fund for an emergency had extended a grant of R150 000 to the municipality clean up. A further R575 000 was provided for construction of emergency cut-off drains to prevent polluted water reaching the Plankenburg River.		
Stellenbosch LM				
		Sewage Master Plan (SMP): sewer mains and sewage treatment. Black bags distributed to residents and collected weekly, daily for Kayamandi. A "blue bag" pilot project is being executed to gain experience in recycling, currently done on the waste site. For cleansing a combination of private contractor and departmental personnel are reorganising. (29)	National Environmental Management Act 1998. LM responsible for: roads; refuse removal; refuse dumps; solid waste disposal; Air pollution; building regulations; electricity and gas reticulation; municipal health services; Stormwater management systems in built up areas; Water and sanitation services limited to potable water supply systems and domestic waste water and sewage disposal systems (37)	Stellenbosch IDP 2007: In the absence of a Traffic Master Plan, estimations and improvements to the road network done ad hoc. Streets, collectors and main roads evaluated every three years in terms of the Pavement Management System. Traffic calming projects according to Council's Traffic Calming Policy and the Annual Budget. (29)

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		September -October 2008, municipality cleaning and greening campaign, coincided with National Arbor Week. Included donations of fruit trees to local communities and assistance in planting them; river clean-ups; educational talks; and handing out of pamphlets and brochures. (30)	Landfills: Municipality short term crisis management (permit conditions). Long term planning: recycling at source; chipping of green waste; crushing of builders' rubble; composting; management of informal pickers and trolley people. MIG funding to install storm water systems to prevent contamination. Will appoint waste specialist to evaluate and design landfill site. Municipality has established Landfill Monitoring Committee. Recycling center started soon. (28)	The Department of Local Government and Housing are spearheading a Built Environment Support Programme 2008/2009 in six municipalities in order to provide spatial planning support for the development of credible SDF's aligned to the PSDF. The aim is to transform and restructure the urban areas in a way that redresses the apartheid spatial legacy. The six municipalities were identified on the basis of their economic growth potential as well as their high levels of poverty. Saldanha Bay, Drakenstein, Overstrand, Stellenbosch, Knysna and George will be benefiting from this programme. (10)
		Waste removal and cleansing in accordance with Waste Management Plan (to be compiled) and for now in so far as Council budget will go; the rest are outsourced in terms of five-year contracts, annual contracts and ad hoc use of private contractors. (29)	Stellenbosch IDP 2007: Water and Sanitation in relation to Civil Engineering Services. Water treatment and Bulk distribution monitoring (telemetry/backup manual system). "Engineering Standards of Stellenbosch"/Water Master Plan (WMP). Pipe breakages and Potable water quality monitored by an independent expert; meters maintained by Municipality. Sanitation and Water Services in built up areas to basic level (Water Services Development Framework WSDF). (29)	
		Stellenbosch WSA responsible for its rivers and water pollution. DWA, Department of Environmental Affairs and Tourism, and the Provincial Department of Environmental Affairs and Development Planning responsible to prevent river pollution. CMA recover costs from polluter or land owner (28)	Water Services Act: water services delivery divided into role of a Water Services authority and Water Services provider. City of Cape Town is the WSA and provider for city of Cape Town, but it is also the regional bulk water service provider to Boland, West Coast and Drakenstein Municipalities (including the towns of Paarl, Wellington, Stellenbosch and some of the surrounding farms). (22)	
		Municipality has responsibility for cleaning Plankenburg/preventing debris from entering. DWA, department environmental affairs and department of health at national and provincial level involved. 2003, emergency clean up of the river, continued by 19 unemployed youth from Kayamandi, funded by Western Cape Clean Up. Provincial and municipal Government constructed emergency cut off drains and litter traps to prevent stormwater from Kayamandi reaching the river, diverted to Waste Water Treatment Works. (28)	Strategic Infrastructure Plan: provides for monitoring and warning of disasters -provincial weather monitoring stations; critical infrastructure (flood detention ponds) for timely response and recovery (ambulance, fire stations, emergency management centres). (14)	

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			Stellenbosh IDP: Basic sanitation systems should reach Water Services Development Framework (WSDF) targets regarding bucket system and basic sanitation. Waste removal according to Integrated Waste Management Plan/Departmental removal in so far as the personnel, plants and vehicles are budgeted for by Council. The rest outsourced. (29)	
			The National Water Audit: WSA's to prepare WC/WDM strategies for efficient use of water/reduce water wastage. Install systems that measure key parameters such as minimum night flows/enable water audits and balances. Stellenbosch LM has implemented a number of WC/WDM projects and compiled a WC/WDM strategy for the Winelands District Municipality in 2008 (recommendations being implemented). Cape Winelands appointed a Service provider to assist with WC/WDM development. (26)	
Kayamandi				
		The Kayamandi Clinic serves the residents of Kayamandi. Two other clinics are located in the outskirts of Kayamandi, but as there is no clear distinction with respect to their catchment areas, it is not possible to disaggregate and relate health data to specific service level characteristics. (26)	Western Cape test case for managing the water quality effects of settlements- Kayamandi Test Case Steering Committee (KTCSC). Dense Settlements Project: Danida I (Danish Government organization) approached by DWA to rehabilitate sanitation facilities 1997. Kayamandi test case 2002. Community collected money to pay "Toilet Block Supervisors" (plumbers and cleaners) to maintain communal toilets. Lack of authority. Only 1 toilet/5 families. Local task team said municipality does not want to provide good services to the people because they do not pay for services. (5)	
			Consolidated Municipal Infrastructure Program (CMIP): R1, 1 million approved for the development of Kayamandi infrastructure. Clean-up of pollution in the Plankenburg River and the rehabilitation of some of the tar roads in the area (Stellenbosch Municipality contributing another R550 000 towards these projects) Already been R1, 7 million in CMIP funding invested in Kayamandi for bulk electricity and street lighting. (31)	
Public Private Partnerships/NGOs				

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	Western Cape Provincial Department of Environmental Affairs and Development Planning (DEA&DP) has appointed the Environmental Evaluation Unit (EEU) and Incite Sustainability to develop a Sustainable Development Implementation Plan (SDIP) for Western Cape projects/government (see also product of Provincial Growth and Development Strategy). (25)	Cleansing at Stellenbosch Municipality Unit: 200 refuse bins placed in the Stellenbosch, Pniël and Franschhoek CBDs and entrance routes into Kayamandi, Cloetesville and Ida's Valley. Separation of dry and wet waste and recyclables such as paper, plastic and glass. Bins emptied daily by teams of contractors. (30)	Western Cape Strategic Infrastructure Plan (SIP): Partnerships with Fire Protection Associations (FPAs) supported by DWA, established to manage and control wildfire risk across large areas often far from urban-based fire fighting services. The model is also envisaged in the forthcoming establishment of CMAs. (14)
	Legacy Community Development Corporation: Kayamandi NGO. built the Medical Knowledge Institute (MKI) November 2009 -a non-profit health care education center. MKI aims to offer platform for delivery/access to health care information. (32)/(33)	Stellenbosch Landfill: Science and Society initiative (Sustainable Stellenbosch Programme): Sustainability Institute workshop to discuss full landfill. Star Metals and Trolley Operator Representative: collect blue bags from some of Stellenbosch sites. Private service to those who recycle. Gordon Smith & Alex Basjan (Representatives of Pickers living on the Landfill): Group of 70 people collect different recyclables for cash from Star Metals. Huis Horison: Recycling at home for the adults with disabilities or mental handicaps and sold to Sell Waste. Stellenbosch uses the landfill gas where possible, biogas from the sewerage treatment. (34)	Ikamva Lethu Benefit Association: non - profit, charitable organization. Money generated in the company go to Kayamandi. Company managed by 5 local people in Kayamandi and one outsider. Main focus is to try and help those in need focusing on the youth in Kayamandi, focus on AIDS and Youth (9)
	2003, Klomp Consult and Tempo Construction constructed 4 storm water diversion channels to direct storm water into the sewerage system and prevent it from reaching the river. 2002, the Municipality of Stellenbosch appointed a consultant, SRK Consulting to investigate controlling polluted stormwater entering the river. Municipality furthermore encourages local schools to become involved in the WAME project (Waste Management in Education). Most schools include responsible environmental management in curriculum (i.e. recyclable products in art) (28)	Western Cape Strategic Infrastructure Plan (SIP): Civil society organisations work with province and municipality to provide for urgent needs (food, shelter) in event of a disaster. (14)	
	Enviro Water: International Conference and exhibition on water in the environment 20-22 February 2006 Stellenbosch (24)	Private sector and parastatal entities, including Eskom, Transnet and Telkom, maintain ongoing internal risk management capabilities to ensure that critical infrastructure does not fail to deliver essential services, and where possible, does not pose additional risks to the public. (14)	

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Floods	Drought	Biological (hazardous waste, food security, environment)	Technical/Infrastructure (sanitation, water services/water management)	Disaster Management/Development
Provincial				
		Department of Environmental Affairs and Tourism: developing policies related to impact of sanitation systems on the environment. Service levels of existing in formal developed and informal areas (excluding rural areas) must meet minimum standards (Water Services Act 108 of 1997). These households have either a metered water connection to the house or to a yard toilet with water tap (uncontrolled volume supply). (12)	Department of Public Works: implementing agent for national/provincial government when facilities (schools, clinics), are constructed or rented. Responsibility to ensure adequate provision made for sanitation facilities in government and public buildings. (12)	Western Cape Planning and Development Act, 1999: objectives set in an integrated spatial development plan, including land development objectives. Development should consider carrying capacity with regards to water and potential to cause water related hazards. (Development Facilitation Act, 1995) (15)
		Department of Environmental Affairs and Development Planning Western Cape: land use management/capacity building. Supporting the Accelerated and Shared Growth Initiative of South Africa (ASGISA) and the National Spatial Development Perspective (NSDP) initiatives. Aligned PGDS, supported by the iKapa Elihlumayo strategy. See also Western Cape Nature Conservation Board, Pollution and Waste Management, Strategic Environmental Management. (13)	Western Cape Regional Sanitation Programme (2000-2003) A Sanitation Implementation project was set up to accommodate farmdwellers and people in informal settlements: communities who fall outside the formal delivery process in terms of basic sanitation provision. (18)	National Environmental Management Act 1998 provides for duty to prevent environmental damage. Power given to Provincial Department of Environmental Affairs and Development Planning of the Western Cape Provincial Administration. (37)
		IDP: mechanism for integration among local role players/municipalities and their provincial/national government counterparts (local government coordination up to DM/Metro as WSA or LM). Water Services Development Plan WSDP (within IDP) provides the basis for sanitation provision and operation. Clearance of backlog, health education. Community-based (rather than contractor-based) approach (12) (10)	Community Water Supply and Sanitation (CWSS) – Western Cape Farmdweller Sanitation Pilot Programme. Provincial Sanitation Unit Task Team (PSTTs) mandated CWSS to support communities to access DWA subsidies and Capital Sanitation Programme. Cooperation with DWA, National Sanitation Training Forum, the Masibambane Forum (16) Klipheuwel Community-based Sanitation Project. CWSS technical support, Quality Assurance, follow-up training in plastering and latrine repair. (18)	Western Cape Strategic Infrastructure Plan (SIP) -Disaster management role of province: monitoring, warning, weather stations. National Disaster Management Act (no. 57 of 2002)/Western Cape Disaster Management Frameworks. DRR programmes reviewed by Provincial Disaster Management Steering Committee, the Western Cape Disaster Management Advisory Forum and the National Disaster Management Centre. (14)

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		IWRM promotes co-ordinated management of water, land and related resources to maximise economic and social welfare in a sustainable manner (Global Water Partnership, 2000). IWRM also deals with solid waste management and pollution, population growth, and water resources. (19)	National Sanitation Task Team (NSTT): Coordination of national level programs. re-established as a sub-committee of the Municipal Infrastructure Task Team. DWA convenes sanitation sub-committee/ensures stakeholder participation. Minimum standard for water supply service is education on water use and 25 litres/person/day. No consumer should be without supply for more than seven full days/year. Should be in accordance with minimum standards related to chemical and microbial contaminants. Provincial Sanitation Co-ordinating Forums: comprise representatives of DM and metro/relevant national government departments. Chaired by provincial representatives. (12)	Western Cape Provincial Spatial Development Framework (PSDF) (Department of Environmental Affairs and Development Planning (EADP)): one of 8 lead strategies of PGDS. guides municipal integrated development plans (IDPs) and spatial development frameworks (SDFs) and provincial and municipal framework plans (i.e. sub-SDF spatial plans). Prioritises and aligns investment and infrastructure plans of other provincial, national and parastatals; provide signals to the private sector. Guided by NSDP: gov spending should prioritise economic growth potential, activity corridors linked to main growth centres; and shift in current patterns of resource use (17)
			Provincial Department of Health manages 45 ambulance stations but generally in dilapidated buildings. In response to this, Physical Infrastructure Plan developed in 2004. Plan proposes a framework within which ambulance stations developed to meet health service delivery requirements of Health Care 2010. (14)	Directorate Disaster Management and Fire Brigade Services: aim to promote the development, implementation and maintenance of effective disaster management and fire brigade services in the Western Cape. (11)
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			Western Cape Reconciliation Strategy Study: commissioned by DWA to facilitate the reconciliation of predicted future water requirement scenarios with supply from the Western Cape Water Supply System (WCWSS) over a 25 year planning horizon. (8)	2002-2003 Risk and Vulnerability Assessment for the Western Cape (provincial Department of Local Government): develop support management tools for the Western Cape to assist the Provincial Disaster Management to execute risk and vulnerability assessments and formulate strategies. Sponsored by Municipal Infrastructure Enhancement (Department of Local Government and Housing, Provincial Government of the Western Cape) (1) Provincial Disaster Management Centre (PDMC): 2005 Training, Education, Awareness and Marketing (TEAM) programme, disaster management project to enhance risk reduction and coping capacity through TEAM interventions tailored to hazards in vulnerable communities. Kayamandi one of 11 most vulnerable communities in WC. (2) Draft Western Cape Disaster Management Framework: emphasis on prevention and mitigation. Obligations include: establish provincial disaster management centre and disaster management centres within each DM; prepare disaster management plan; integrate DRR into development planning (IDP) and Strategic Environmental Assessments (SEAs) and DRR assessments of infrastructure, communities, environment. (14)	
Cape Winelands DM					
		Waste Water Treatment Works (WWTWs): managed by municipalities. DWA issues permits for works and monitors. Many WWTWs need upgrading in WC. Most municipalities chosen to focus on more politically acceptable infrastructure due to lack of understanding between sanitation and health. Environmental Impact Assessment process required to obtain permission for new waste disposal sites (IWRM) slowed due to envi concerns. (19)	Cape Winelands Municipal Government Subsidy Scheme for the Provision of Toilet Facilities, Drinking Water, Electricity and Hot Water to Farm Worker Housing Project: Provide subsidies to farms/rural areas and rural schools for provision of water and basic sanitation facilities and health awareness. Incentive for farm owners to provide and upgrade basic subsistence facilities on farms and for farm workers. (3)	Cape Winelands IDP 2006 -Cape Winelands Disaster Management Center: Conduit of disaster information; disaster plans; identification of water pollution sources, sustainable sources of water and education in terms of water purification; subsidies for housing upgrades; promotes volunteerism. Disaster Management Framework to be aligned with Provincial and national frameworks; advisory forum. (21)	

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		Cape Winelands Clean and Green' Clean-Up Project aims to create awareness about pollution control through education and clean up campaigns. Jobs for vulnerable (disabled, elderly and women). Implemented through small-scale recycle contractors. Assistance to B-municipalities by cleaning-up problem areas. Awarded as Best Innovative Project in waste management for excellence in the implementation of the Expanded Public Works Program. (23)	Cape Winelands District Municipality Subsidy Scheme for the Provision of Toilet Facilities, Drinking Water, Electricity and hot Water to Farm Worker Housing 2004-2007: provide subsidies to farms and rural schools for the provision of water and sanitation. (4)	Western Cape Planning and Development Act 1999 municipal planning "means strategic planning, inclusive of spatial planning and land development management..." (8) Cape Winelands IDP: LM, DM and stakeholders Process Plan for public development. Representative Forums as a link to civil society. Strategy envisions that vulnerable people are provided with basic services; aims to build skill base and foster effective governance and access to information. Planning Implementation and Management Support Centre (PIMS) conducted surveys on service delivery to measure municipal delivery. IDP Managers Forum and a District Advisory Forum for Mayors have formed and met. (Intergovernmental Relations Bill) (21)
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		Department of Environmental Affairs through the Western Cape Clean-up Fund for an emergency had extended a grant of R150 000 to the municipality clean up. A further R575 000 was provided for construction of emergency cut-off drains to prevent polluted water reaching the Plankenburg River.		
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		Sewage Master Plan (SMP): sewer mains and sewage treatment. Black bags distributed to residents and collected weekly, daily for Kayamandi. A "blue bag" pilot project is being executed to gain experience in recycling, currently done on the waste site. For cleansing a combination of private contractor and departmental personnel are reorganising. (29)	National Environmental Management Act 1998. LM responsible for: roads; refuse removal; refuse dumps; solid waste disposal; Air pollution; building regulations; electricity and gas reticulation; municipal health services; Stormwater management systems in built up areas; Water and sanitation services limited to potable water supply systems and domestic waste water and sewage disposal systems (37)	Stellenbosch IDP 2007: In the absence of a Traffic Master Plan, estimations and improvements to the road network done ad hoc. Streets, collectors and main roads evaluated every three years in terms of the Pavement Management System. Traffic calming projects according to Council's Traffic Calming Policy and the Annual Budget. (29)

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		September -October 2008, municipality cleaning and greening campaign, coincided with National Arbor Week. Included donations of fruit trees to local communities and assistance in planting them; river clean-ups; educational talks; and handing out of pamphlets and brochures. (30)	Landfills: Municipality short term crisis management (permit conditions). Long term planning: recycling at source; chipping of green waste; crushing of builders' rubble; composting; management of informal pickers and trolley people. MIG funding to install storm water systems to prevent contamination. Will appoint waste specialist to evaluate and design landfill site. Municipality has established Landfill Monitoring Committee. Recycling center started soon. (28)	The Department of Local Government and Housing are spearheading a Built Environment Support Programme 2008/2009 in six municipalities in order to provide spatial planning support for the development of credible SDF's aligned to the PSDF. The aim is to transform and restructure the urban areas in a way that redresses the apartheid spatial legacy. The six municipalities were identified on the basis of their economic growth potential as well as their high levels of poverty. Saldanha Bay, Drakenstein, Overstrand, Stellenbosch, Knysna and George will be benefiting from this programme. (10)
		Waste removal and cleansing in accordance with Waste Management Plan (to be compiled) and for now in so far as Council budget will go, the rest are outsourced in terms of five-year contracts, annual contracts and ad hoc use of private contractors. (29)	Stellenbosch IDP 2007: Water and Sanitation in relation to Civil Engineering Services. Water treatment and Bulk distribution monitoring (telemetry/backup manual system). "Engineering Standards of Stellenbosch"/Water Master Plan (WMP). Pipe breakages and Potable water quality monitored by an independent expert; meters maintained by Municipality. Sanitation and Water Services in built up areas to basic level (Water Services Development Framework WSDF). (29)	
		Stellenbosch WSA responsible for its rivers and water pollution. DWA, Department of Environmental Affairs and Tourism, and the Provincial Department of Environmental Affairs and Development Planning responsible to prevent river pollution. CMA recover costs from polluter or land owner (28)	Water Services Act: water services delivery divided into role of a Water Services authority and Water Services provider. City of Cape Town is the WSA and provider for city of Cape Town, but it is also the regional bulk water service provider to Boland, West Coast and Drakenstein Municipalities (including the towns of Paarl, Wellington, Stellenbosch and some of the surrounding farms). (22)	

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		Municipality has responsibility for cleaning Plankenburg/preventing debris from entering. DWA, department environmental affairs and department of health at national and provincial level involved. 2003, emergency clean up of the river, continued by 19 unemployed youth from Kayamandi, funded by Western Cape Clean Up. Provincial and municipal Government constructed emergency cut off drains and litter traps to prevent stormwater from Kayamandi reaching the river, diverted to Waste Water Treatment Works. (28)	Strategic Infrastructure Plan: provides for monitoring and warning of disasters -provincial weather monitoring stations; critical infrastructure (flood detention ponds) for timely response and recovery (ambulance, fire stations, emergency management centres). (14) Stellenbosh IDP: Basic sanitation systems should reach Water Services Development Framework (WSDF) targets regarding bucket system and basic sanitation. Waste removal according to Integrated Waste Management Plan/Departmental removal in so far as the personnel, plants and vehicles are budgeted for by Council. The rest outsourced. (29) The National Water Audit: WSA's to prepare WC/WDM strategies for efficient use of water/reduce water wastage. Install systems that measure key parameters such as minimum night flows/enable water audits and balances. Stellenbosch LM has implemented a number of WC/WDM projects and compiled a WC/WDM strategy for the Winelands District Municipality in 2008 (recommendations being implemented). Cape Winelands appointed a Service provider to assist with WC/WDM development. (26)	

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Kayamandi			
		Western Cape test case for managing the water quality effects of settlements- Kayamandi Test Case Steering Committee (KTCSC). Dense Settlements Project: Danida I (Danish Government organization) approached by DWA to rehabilitate sanitation facilities 1997. Kayamandi test case 2002. Community collected money to pay "Toilet Block Supervisors" (plumbers and cleaners) to maintain communal toilets. Lack of authority. Only 1 toilet/5 families. Local task team said municipality does not want to provide good services to the people because they do not pay for services. (5) The Kayamandi Clinic serves the residents of Kayamandi. Two other clinics are located in the outskirts of Kayamandi, but as there is no clear distinction with respect to their catchment areas, it is not possible to disaggregate and relate health data to specific service level characteristics. (26)	Consolidated Municipal Infrastructure Program (CMIP): R1, 1 million approved for the development of Kayamandi infrastructure. Clean-up of pollution in the Plankenburg River and the rehabilitation of some of the tar roads in the area (Stellenbosch Municipality contributing another R550 000 towards these projects) Already been R1, 7 million in CMIP funding invested in Kayamandi for bulk electricity and street lighting. (31)
Public Private Partnerships/NGOs			
	Western Cape Provincial Department of Environmental Affairs and Development Planning (DEA&DP) has appointed the Environmental Evaluation Unit (EEU) and Incite Sustainability to develop a Sustainable Development Implementation Plan (SDIP) for Western Cape projects/government (see also product of Provincial Growth and Development Strategy). (25)	Cleansing at Stellenbosch Municipality Unit: 200 refuse bins placed in the Stellenbosch, Pniel and Franschhoek CBDs and entrance routes into Kayamandi, Cloetesville and Ida's Valley. Separation of dry and wet waste and recyclables such as paper, plastic and glass. Bins emptied daily by teams of contractors. (30)	Western Cape Strategic Infrastructure Plan (SIP): Partnerships with Fire Protection Associations (FPAs) supported by DWA, established to manage and control wildfire risk across large areas often far from urban-based fire fighting services. The model is also envisaged in the forthcoming establishment of CMAs. (14)

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			Legacy Community Development Corporation: Kayamandi NGO. built the Medical Knowledge Institute (MKI) November 2009 -a non-profit health care education center. MKI aims to offer platform for delivery/access to health care information (32)/(33) 2003, Klomp Consult and Tempo Construction constructed 4 storm water diversion channels to direct storm water into the sewerage system and prevent it from reaching the river. 2002, the Municipality of Stellenbosch appointed a consultant, SRK Consulting to investigate controlling polluted stormwater entering the river. Municipality furthermore encourages local schools to become involved in the WAME project (Waste Management in Education). Most schools include responsible environmental management in curriculum (i.e. recyclable products in art) (28)	Stellenbosch Landfill: Science and Society initiative (Sustainable Stellenbosch Programme): Sustainability Institute workshop to discuss full landfill. Star Metals and Trolley Operator Representative: collect blue bags from some of Stellenbosch sites. Private service to those who recycle. Gordon Smith & Alex Basjan (Representatives of Pickers living on the Landfill): Group of 70 people collect different recyclables for cash from Star Metals. Huis Horison: Recycling at home for the adults with disabilities or mental handicaps and sold to Sell Waste. Stellenbosch uses the landfill gas where possible, biogas from the sewerage treatment. (34) Western Cape Strategic Infrastructure Plan (SIP): Civil society organisations work with province and municipality to provide for urgent needs (food, shelter) in event of a disaster. (14) Private sector and parastatal entities, including Eskom, Transnet and Telkom, maintain ongoing internal risk management capabilities to ensure that critical infrastructure does not fail to deliver essential services, and where possible, does not pose additional risks to the public. (14)	Ikamva Lethu Benefit Association: non - profit, charitable organization. Money generated in the company go to Kayamandi. Company managed by 5 local people in Kayamandi and one outsider. Main focus is to try and help those in need focusing on the youth in Kayamandi, focus on AIDS and Youth (9)
			Enviro Water: International Conference and exhibition on water in the environment 20-22 February 2006 Stellenbosch (24)		

References: Western Cape Social Protection Table

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APPENDIX 4D: Gauteng

Floods	Drought/Disaster	Biological (hazardous waste, waste management, food security, development, pollution, health)	Technical/Infrastructure (sanitation, water services/water management)	Disaster management	Development
Province					
SA Disaster Management Centre flood plan, emphasizes mitigation (barriers such as levees, flood insurance) and community participation National Flood Insurance Program (NFIP) and enforcing sound floodplain management techniques.(5)	SA National Disaster management Centres 10 step drought policy for province and LM level. First step is to appoint a Drought Task Force (to supervise/coordinate plan and action/response programs, plus website and climate/water supply information, should coordinate with National and Provincial government agencies and universities - multidisciplinary approach to drought, communication with media/public) (3)	Waste management Directorate -Agriculture Conservation and Environment Department: Manages threats arising from development pressure and the burden of waste and pollution. The Department monitors waste pollution and advises on waste handling to improve conditions of communities living around dumps (2)	Gauteng Integrated Water and Waste Management System. Strategic Water Quality Management Plan: scenario planning, catchment assessment, water quality component of Catchment Management System. Catchment forums formulate a catchment vision, giving rise to Resource Management Class/future Reserve and specification of Resource Quality Objectives - strategies to reconcile water resource supply and demand. Source Directed Controls (pollution prevention, impact minimisation, and market-based management instruments (Waste Discharge Charge System for example). (15)	Gauteng Department of Local Government and Housing: Disaster Management Programme/Provincial Disaster Management Centre/Provincial Disaster Management Plan. Sub programmes: Fire Brigade Services; Disaster Management Strategic Support Services -effective disaster management system by 2009; implement DRR in Gauteng and focus on 2010 World Cup. (14)	Gauteng Department of Development Planning and Local Government: Land Disposal and Acquisition program; Gauteng Land Committee – manage land issues and ensure land for government goals of development. (4)
				Government has approved the establishment of formal structures, from national to local levels, for the management of disasters. At present, the Department of Constitutional Development has overall responsibility for the disaster management function. These structures at present are: • A national disaster management committee – national level. • Similar structures at provincial and local	Gauteng Department of Development Planning and Local Government: Transformed Local Government Programme: support local government to ensure financial and institutional viability/municipalities with effective financial, institutional and Human Resources, Quality service delivery, Integrated development planning, Democratic and co-operative government and Effective business processes.

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				(4)	
DWA flood management. Regional Offices responsible on local level. Directorate Hydrological Services responsible for Vaal River system flood management. During floods, network in flood management room in Pretoria gathers information, analyzes it and disseminates it to National Disaster Centre, media, and dam operators. Management Authority should monitor downstream activities, water quality in the aquifer, and boreholes (land owners should also monitor boreholes), form database for surface and groundwater, register with the National Disaster Centre and develop communication strategy for land owners. (15)	Drought relief under the National and Provincial governments who declare an area a Disaster Area and then manage the situation. Management Authority should facilitate that people in VDWHS can apply for assistance in cases of severe drought/convey to other levels of government. (15)	DMs required to compile Integrated Waste Management Plans with Management Authority. Land owner waste storage and disposal rules negotiated between the District Municipalities, the Management Authority and the land-owners. Aim is to prevent partially treated sewage entering Vaal River as return flow and verify that sewage from on-site systems/domestic waste disposed according to legal/sanitation requirements. (15)	Gauteng Department of Development Planning and Local Government: Consolidated Municipal Infrastructure Programme (MIP) and Water and Sanitation Programme. Executive Council implement in formalised settlements at intermediate level (limited quantity of water requiring yard connection to operate). Informal settlements that will have to be relocated because they cannot be formalised, will be captured in the housing programme in future. DWA, Department of Agriculture, Conservation and Environment involved and Department of Housing (Essential Services Programme). Project categories: water sanitation, roads, solid waste, community lighting, storm water, and community services. (4)	government levels. (18)	At provincial level, relevant policies and legislature related to development are the: Vision 2014 and the Gauteng Growth and Development Strategy; Gauteng IDP; Gauteng Trade and Industry Strategy; Gauteng Spatial Development Framework; Blue IQ; Gauteng LED; Gauteng Global City Region Strategy; Gauteng Rural Development Strategy; Land Decision Support System; Expanded Public Works Programme & Gauteng; Labour Intensive Strategy; Gauteng Responsible Tourism Planning Framework (7)

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The Catchment Management Agencies (CMAs), through the CM Strategies -framework for integrated management of water resources within the broader catchments. However, the CMA establishment has been put on hold by the DWA indefinitely; but the impacts, development and uncoordinated decision making continue to threaten the provinces precious water resources. (13)	Management of pollution incidents. Periodic cases of severe contamination of the Vaal River reported to DWA who mitigates contamination (through blending of water or flushing by selective opening of sluice gates of the Vaal Dam). (15)	Auditing of the Water Management System takes place to verify whether all components of the system are functional. Water Quality Management corrective actions are done, followed by a regular Water Quality Management Review, and cycle repeated. (15)	Gauteng Emergency Centre: 2007 R50 million disaster management and emergency medical services centre opened in Midrand as part of preparation for the 2010 FIFA World Cup. Disaster Management and the Emergency Management Medical Services (EMMS) centre. Expansion of the provision of Planned Patient Transport between health care institutions as well as the delivery of ambulance services, directly under the management of the Department of Health. (9)	Gauteng Global City Region Strategy aims to: Build Gauteng into an economic hub for Africa/globally competitive. Align planning instruments, structures and sectors. Human Resource Development (HRD) Strategy: focuses on improving human resource and skills development in the provinces' labour market. (16) Gauteng Department of Development Planning and Local Government: Capacity Building draft policy for Municipalities. Human resource systems that enables them to deliver effective and efficient services to communities. Management Support Programme, part of Municipal Institutional Support Centre pilot programmes- Provincial government, in 2001-2002 to provide adequate water and appropriate sanitation to all people in Gauteng over four years. All municipalities now providing a basic amount of water and electricity in their areas of supply for the next 10 years under Quality Service Delivery Municipal department. (4)
	Vredefort Dome World Heritage Site Waste Management Plan. Disaster Management Plan compiled by the Fazile Dabi District Municipality. Authority of the VDWHS should monitor the water quality of the Vaal River at the point where the River enters the VDWHS as well as the point where the River leaves the VDWHS in order to quantify the impact of the VDWHS on the Vaal River. A regulatory framework should be established with the Authority writing relevant by-laws to control waste disposal in the VDWHS (25)	Surface and Ground Water - Resource Quality Objectives (DWA and Management Authority). Source Directed Controls for Pollution prevention: certification/regulation (Water use licensing, EMPR process for mining, EIA regulations, Landfill permits), market-based management (Waste Discharge Charge System). Source directed measures: Water Use Licenses. Ground water Management – monitor groundwater abstraction, water quality and drilling activity. Regular spacing and representative sampling of all aquifer units within the VDWHS. (25)	National, provincial and local government have different responsibilities for disaster management in terms of current legislation. The main law governing disaster management is the Civil Protection Act, 1997. Government has approved the establishment of formal structures, from national to local levels, for the management of disasters. At present, the Department of Constitutional Development has overall responsibility for the disaster management function. (6)	

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			DWA and Upper Vaal Reference Group: management of Upper Vaal River system: dilution of unacceptable levels of contamination from Vaal Dam, blending of water from Rand Water, Sasol and Mittal Steel, source control measures (Waste Discharge Charges), water infrastructure maintenance (leaking pipes and valves, load reduction through the management of point sources as well as diffuse sources like seepage, improved treatment of waste water before it being returned to the river, etc.) (15) Vaal Barrage Catchment Executive Committee: water resource management/support to the Upper Vaal CMA process. Guide activities of the Forum Management Committees within the Vaal Barrage Catchment. DWA Water Quality Scenario Planning Group: support system for catchment management and reconciliation of water resource supply and demand, and adapting land-use planning. Reserve (National Water Act 1998) is 25L/person/day). DWA reserve determination 2010. (15)	Emergency Management Centres: traditional Emergency Services, i.e. ambulance, traffic and fire brigade will work closely together with disaster management in the establishment of emergency services call centres in the same facility where the disaster management centre is to be housed. (9) Provincial Disaster Management Framework: legal requirement in Disaster Management Act. Aligned with National Disaster Management Framework published on 29 April 2005 (9)	Gauteng Provincial Government Social Development Strategy (GSDS): sustainable development, poverty alleviation. Aligned with Gauteng Growth and Development Strategy (GGDS) and the Gauteng Global City Region Strategy. GGDS identifies means for GPG to enhance provincial economy, primarily labour absorbing growth that increases per annum. Linked to NEPAD (16) Gauteng Department of Development Planning and Local Government: established ward committees and IDPs for each municipality (432 wards). Program Building Local Democracy and Accountability –developed draft chapter on local democracy (Gauteng local government white paper) and a Capacity building program for wards and Community Liaison officer. (4)
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			IWRM -Gauteng Water Sector Forum (GWSF) 2006 (International Relations Framework Act, 2005) – Collaborative management of rivers/water quality and supply. Part of Gauteng Water Sector Support Programme. MEC for Local Government leadership in early GWSF stages. Task Teams (TT) technical implementation report to Technical Steering Committee (include Environmental Management and Pollution Control Task Team, headed by the GDACE (now GDARD)) technical advice on water pollution. (13)	Disaster Management Information Management System (DMIMS): software programme distributed to all 30 municipalities, all provincial departments and the security forces in the province. Used as the information management and discussion-making mechanism to be established at disaster management centres. Provincial Disaster Management Centre: in collaboration with the compulsory district and metropolitan centres. (9)	Gauteng Department of Development Planning and Local Government: Integrated Development Planning programme: Spatial Development Strategies targeting peripheral townships. Movement towards compact cities. National and provincial strategies and municipal IDPs as guide. Management system for urban edge with geo-technical, environmental and satellite imagery. The provincial IDP and the GSDF including the Urban Edge and a revised Spatial Planning System become statutory with Gauteng Development Bill. Community involvement in IDP formulation. Guide municipal infrastructure provision. (4)
			Cleaner technology implementation in Gauteng Agriculture Conservation and Environment Department: technical assistance on Cleaner Technology Projects. Feasibility study to determine the need for such a fund and thereafter will identify specific projects and provide aid in the implementation of cleaner technology practices. (3)	Disaster Management Training, Education and Awareness Marketing (TEAM) programme: developed for uplifting of the most disadvantaged and vulnerable communities in the Western Cape. This programme focuses mainly on capacity building in basic skills such as first aid, fire safety and prevention, home care and disaster management. This project will be launched with an initial roll-out in 10 pilot projects in the most vulnerable communities in this province.	

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West Rand District Municipality (WRDM)					
		WRDM: Municipal Health Services (MHS) Strategy. Ensured alignment of the strategy of MHS with that of the National Department and the National Health Act of 2003 to ensure that the environment is safe and healthy for population living within the West Rand District Municipality. WRDM will enforce regular sampling of drinking water and food from all sources. (1)	WRDM IDP informs the municipal management and Council on development and infrastructure upgrades. Provision of housing and sustainable human settlements; job creation Local Economic development and capital projects; fighting the spread of HIV/Aids, improve social conditions, crime prevention, good governance. (1)		WRDM IDP: Health and Social Development related projects/Social Development, HIV and AIDS, Sports, Recreation, Arts and Culture. Special programmes: Mayor's Senior Citizens Programme, day for people living with disabilities, Mayoral Gender Programme. Shared Services, Gauteng Global City Region and Vision 2016. (1)
			WRDM IDP – Basic Service Delivery and Infrastructure - Water and Sanitation: WRDM appointed service provider to compile Water Services Development Plan (WSDP) for DMA. Energy/Electricity: WRDM reviving the West Rand Energy Forum of 2006. Housing: Comprehensive Plan for the Development of Sustainable Human Settlements (BNG) outlining a new strategic direction. Disaster management is categorized into proactive services and reactive services. (1)		WRDM Local Economic Development (LED) Strategy 2008 Urban-Econ Development Economists. LED Projects: Establishment of Sector forums, SMME Development, Tourism training. Within the Basic Service Delivery and infrastructure the projects are Water reticulation to Portion 26 Kromdraai, VIP toilets in the DMA, LED Infrastructure Projects. DM policies and legislation relevant to LED process: IDP and Performance Management Plan; WR Spatial Development Framework; WR Broad Based Economic Development Strategy; WR Urban Renewal Strategy; WR Growth and Development Strategy; Mining Charter Roll-out; Tourism Development Strategy; WR Transportation and Nodal Development Strategy (1)

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			Upper Vaal Reference Group: established 2003 to implement Integrated Catchment Management Strategy and facilitate establishment of Upper Vaal CMA, platform for stakeholders. Established Strategic Task Teams and action plans for industry, coal mining, gold mining, sewerage treatment, agriculture and monitoring. DWA to finalise policies on polluted mine water for industrial use. Waste Discharge Charge System and cost implications of NWRS, etc. Upper Vaal Reference Group is still not CMA. Managed by Gauteng Regional office of DWAF in Pretoria. (15)		WRDM IDP -Sustainable Development Framework (SDF): locational, physical and environmental, service provision, disaster management, and transport issues. Spatial Development Initiative (SDI): improvement of the transport system and urban/rural nodal development. West Rand Transportation and Nodal Development Strategy and Environmental Management and Spatial Planning. SDF incorporated in transport and spatial planning along with Land Use Management Framework, Environmental Sustainability, Roads and Transportation (1)
					WRDM IDP: strategies according to five National Key Performance Areas (KPA) plus Environmental Management and Spatial Planning. LED, tourism, manufacturing, Trade and Commerce, Small Enterprises and stimulation of the second economy. Municipal Transformation and Organizational Development. KPA: HR Strategy, Employment Equity Plan, Recruitment and Retention Strategy, Workplace Skills Plan, Succession Plan, Skills Development Programme, Employee Assistance Programme, ABET programme, Occupational Health and Safety and Organisational Performance Management System (OPMS), Public safety and

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					regional support: Disaster Management, Emergency Services and Community Safety. (1)
					WRDM IDP – Growth and Development Strategy: As a direct result of the Bekkersdal Renewal Presidential Project, the Gauteng Department of Housing, in consultation with the WRDM, incorporation of Regeneration Strategy for WRDM –aims to increase socio-economic and development potential by identifying potential growth sectors, aligning existing strategies. Establishment of intergovernmental consultation & coordination structures for projects; Internal HR management o strengthen implementation of GDS; Source additional revenue and FDI, Transport. (1)

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					WRDM IDP- Municipal Governance: Municipal Financial Viability and Management With regard to Supply Chain Management and Municipal Transformation and Organizational Development. Good Governance and Public Participation. Audit Committee (AC): independent governance to provide oversight on internal control, risk management and governance. (1)
Merafong City LM					
	Merafong City State of the Environment Report: provide an early warning system for emerging environmental problems; identify knowledge deficiencies; policy and program performance assessment; encourage environmental considerations in the development of economic and social policies. Develop an Air Quality Management Plan and climate change adaptation strategies (e.g. drought relief programmes and early warning systems (21)	Merafong City State of the Environment Report. Health: budget constraints and shortages of staff and equipment; HIV/AIDS treatment and orphan/elderly plans. Air pollution awareness, from coal and wood/awareness treatments for lung infections and asthma to improve diagnosis/AIDS counselling, welfare office, 24 hour clinic, emergency transport/Special facilities for the aged, destitute and poor to be communicated to the provincial department, Interaction with local development committees, refuse removal (11)	Gauteng Local Government Prov Budget 2006 The Department of Local Government in Gauteng are continuing to provide support and financial transfers to implement Municipal Infrastructure Grant (MIG) projects in Merafong Local Municipality (8)	Department of Local Government aims to assist municipalities to implement the Disaster Management Act and work towards ensuring that there is synergy and co-ordination between the provincial and municipal disaster management centres.(8)	Merafong City LM IDP 2006-2011 Review. IDP meets the requirements of the Municipal Planning and Performance Management Regulations (2001) and incorporates details setting out development and investment initiatives and projects to be implemented within the municipality by any organ of state. Meets the requirements of the Municipal Systems Act by incorporating sections on municipal council's visions as well as national or provincial sector oral plans. (19)

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	Merafong City State of the Environment Report (Infrastructure): Energy - utilize existing services efficiently; inform the community with respect to electricity supply and usage and ensure access. Waste Management -regular waste removal/different types of infrastructure to all communities. Roads and Stormwater -access to safe and adequate road and stormwater infrastructure; improve rural roads. Water Demand – Repair network leaks; community awareness; water network analysis; read meters; facilitate spatial framework (11)	Gauteng Local Government Prov Budget 2006 The Department of Local government have deployed 19 senior engineers, five unemployed graduates and 21 students in need of experiential training to Emfuleni, Kungwini, Merafong, Midvaal, Lesedi, Mogale and Randfontein local municipalities. These teams are involved in a variety of projects including master planning, MIG and capital project management to accelerate the delivery of infrastructure addressing critical operational and management issues including improving water quality and addressing sewerage spillage problems.(8)	The purpose of the Merafong Local Municipality Disaster Risk Management Plan (DRMP) Level 1 is to document the institutional arrangements for disaster risk management planning which includes the assignment of primary and secondary responsibilities for priority disaster risks posing a threat in the Merafong Local Municipality. (12)	
	Merafong City State of the Environment Report (Water): water quality monitoring programme and management strategy required for Merafong City LM. Management on a catchment basis (Integrated Catchment Management plan and forum). A water conservation (WC)/water demand management (WDM) strategy should be instituted within the Municipality. WRDM Collaboration: Management and control of water pollution as a result of urban run-off and industrial, mining and sewage effluent release into rivers and streams; Control of increased urban stormwater run-off; Protection and rehabilitation of riparian zones and wetlands; and Optimisation of the use and	Department of Local Government: aims to support and monitor municipalities in the province. Municipal IDP as expression of state wide planning and includes infrastructure investment and sustainable economic development component and equal access to municipal services. (8)	National, provincial and local government have different responsibilities for disaster management in terms of current legislation. The main law governing disaster management is the Civil Protection Act, 1997. (18)	

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		reuse of existing water resources through transfer schemes. (21)			
		Merafong City State of the Environment Report: Land Use Recommendations - Agriculture: urban agriculture policy to broaden the economic base; Housing policy for land tenure, housing types and public/private sector partnerships; infill development; housing backlog; land redistribution programme of the Department of Land Affairs. - Industry: mining sector opportunities; monitor pollution of groundwater sources (21)	Merafong City LM Waste Management Plan - Municipality responsible for collection, transportation and cleaning. Re-use and recycling activities being pursued. Landfill sites of Fochville and Carletonville will reach maximum capacity. Daily litter picking/labourers with carts, brooms and spades and refuse trucks. Gauteng financial assistance but only for litter picking in CBD. Supplementary service provincial initiative (Zivuseni) for outside CBD - mass container service or Front End loader tractors to minimize the illegal dumping of refuse, mainly on open and vacant stands in CBD/residential areas (32% of waste in landfill). (11)		

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Carletonville				
			Department of Water Affairs: Western Cape -Directions from the Environment Conservation Act, 1989 Agreement with Tiger Brands (Pty) Ltd. (23)	Fire Raiders partners through Strategic Alliance Partnerships (SAP) with local suppliers to strengthen empower service providers and bring stability to the market. Fire Raiders, the single source solutions company for all your Fire Fighting, Rescue, Hazmat, and Disaster Management requirements in South Africa, Africa and The Middle East. (22)
			Waste minimisation: re-use and recycling activities are currently being pursued. Disposal: landfill sites of Fochville and Carletonville will reach maximum capacity, unclear if alternative sites have been identified. All waste collected to those sites/managed by waste management services (11)	Planact: integrated framework for local community development in urban areas of Gauteng. local government transformation. Organization networking, training technical assistance, research and advocacy at policy levels, Build the capacity of civil society/disadvantaged communities to engage with government. (24)

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APPENDIX 5

KEY OUTCOMES, STATEMENTS OF INTENT, INDICATORS AND DATA

APPENDIX 5: Comprehensive List of Key Outcomes, Statements of Intent, Indicators and Data

Key Outcome	Coping Capacity and Social Vulnerability Factors	Statement of Intent	Key Indicators	Data
Key Outcome 1: Identify and Monitor Hazards	Disaster Risk Planning	Identify hazards linked to water and its infrastructure	Document or database of existing hazards at the LM level	Record of existing hazards
		Research new and potential hazards	% of departmental budget allocated to researching new hazards linked to water & infrastructure	Total budget allocated to new hazard research
			Working groups have been established	No. of working groups working on new hazard related tasks
			Number of research programmes	Number of research proposal calls
		Research hazard impacts on people and their livelihood	Funds allocated to research	Number of research programmes funded
				Total departmental budget
				Total budget allocated to new hazard research
		Research hazard impacts on people and their livelihood (cont.)	Number of research programmes	Number of research proposal calls
			Document or database of hazard impacts at LM level	Number of research programmes funded
			Protocol for implementation	Record of hazard impacts on people and their livelihood
		Develop early warning systems	Early warning system in place	Report on implementation of early warning system
			Early warning monitoring system – effective response time between different levels of responsibility	Early warning system
			Monitoring protocol in place	Procedure to document experience and response during and after
		Implement monitoring of hazards	Monitoring protocol in place	Response records for during and after the hazard occurrence
			% of departmental budget allocated to implementation of monitoring system	Monitoring protocol
				Total budget allocated to new hazard research

APPENDIX 5: Comprehensive List of Key Outcomes, Statements of Intent, Indicators and Data

Key Outcome	Coping Capacity and Social Vulnerability Factors	Statement of Intent	Key Indicators	Data
Key Outcome 2: Reduce Vulnerability through Infrastructure	Disaster Risk Planning	Development of Disaster Risk Reduction Strategies	Disaster Risk Reduction Strategy in place at LM level	LM DRR strategies Document
		Develop Disaster Management Plans	Disaster Management Plans in place	LM disaster management plan
		Improve water conservation and demand management (drought and water supply)	Demand management and conservation strategy in place	LM Demand Management Strategy Document
			Decrease in Per capita usage of water	Quantity of Water billed/# of people in LM
	Health	Increase quality of drinking water	% of households using recycled or rain water	% of people using rain water tanks
			Treatment works in place O & M	O & M document for each treatment works
			Maintenance protocol for treatment works in place	Maintenance schedule/protocol
			Number of qualified operators of water treatment works employed	No. of employed at water treatment works
	Infrastructure	Improve dwelling standards	Guidelines on building codes exist	Document on building codes
			Protocol for monitoring dwelling standards in place	Protocol on dwelling standards
			Increase in the percentage of buildings that meet requirements	No. of buildings that meet standards/total no. of buildings
	Health	Improve health services	Increase in funding allocated to health services	Budget for health
			Decrease the number of patients per doctor/nurse	Ratio of no. of doctors/nurses: no. of people
			Decrease in distance to hospitals	Hospital per sq km (radius)
			Decrease in distance to clinics	Clinics per sq km (radius)
			Increase in number of ambulances per area coverage	Ambulance per radius
			Decrease in number of deaths by water borne diseases per year	No. Of patients; reported cases
			Waste Water treatment works meet	Green Drop Report 2009
		Develop Waste/Refuse		

APPENDIX 5: Comprehensive List of Key Outcomes, Statements of Intent, Indicators and Data

Key Outcome	Coping Capacity and Social Vulnerability Factors	Statement of Intent	Key Indicators	Data
Key Outcome 3: Reduce Vulnerability and Increase Coping Capacity through Social Elements		management	minimum green drop requirements	
		Implement Immunisation Programmes	Increase in % of people with at least VIP level sanitation	No. of people with VIP level sanitation
			Increase in number of people immunised according to regular immunisations	No. of people immunized
			Immunisation protocol in place with a reference to water-borne diseases and emergency situations	Document
	Economic	Improve Social Grant system	Increase in % of eligible persons receiving the child grant	% of eligible persons receiving the child grant
			Increase in % of eligible disabled persons receiving the grant	% of eligible disabled persons receiving the grant
			Increase in % of eligible persons receiving the pension grant	% of eligible persons receiving the pension grant
	Education	Improve standard and availability of education to people of all ages	Increase in training and vocational school enrolment	Training and Vocational School enrolment
			Increase in standard education enrolment	Enrolment rates
			Decrease in distance to vocational training for learners	Vocational centres per square km
			Increase in accessibility to schools for learners	% of children that live far (over 30 minutes) from primary or secondary school
			Increase in literacy rates	Literacy rates
			Increase in primary education enrolment	Education enrolment rates
			Increase in secondary school enrolment	Education enrolment rates
			Increase in enrolment in higher education	Education enrolment rates
			Decrease unemployment rates	Unemployment rates
	Gender	Empower women to empower themselves	Increase in female employment vs. males per sector group	Employment rates per sector and gender

APPENDIX 5: Comprehensive List of Key Outcomes, Statements of Intent, Indicators and Data

Key Outcome	Coping Capacity and Social Vulnerability Factors	Statement of Intent	Key Indicators	Data
			Increase in women's enrolment in education (primary, secondary, higher, vocational)	Enrolment rates
			Increase in women's business ownership	No. of businesses owned by women
			Increase in % of women taking up micro finance loans	% of women taking up microfinance loans
			Decrease in number of child headed households	Number of child headed households
			Decrease in number of divorces	Number of Divorces
	Safety and Security	Improve family bonds	Decrease in number of street children	Number of street children
			Existence of community run projects	Number of community run projects
			Improvement in the perception of benefits	Perception of benefits of community run projects
			Increase in budget for community projects	Budget increments per year
			Decrease in the number of single parents	Number of single parents
	Education & Gender	Increase awareness of family planning and prospects	Decrease in the number of teenage pregnancies	Number of teenage pregnancies
			Increase in number of families with four or less children	% of families with four or less children
			Increase in programmes targeting family planning	Number of programmes targeting family planning
			Presence of awareness raising through television, billboards, sex education outside of clinics	sex education; no. of schools giving sex education; no. of posters, TV, radio, etc.
			Policies on land ownership exist and make reference to gender equality	Policy exists
Legal		Improve tenure (i.e. land ownership and renters' rights)	Decrease in the number of shack dwellers and homeless people	Number of shack dwellers and homeless people
			Decrease in 'wrongly-evicted' claims	Number of wrongly evicted claims

APPENDIX 5: Comprehensive List of Key Outcomes, Statements of Intent, Indicators and Data

Key Outcome	Coping Capacity and Social Vulnerability Factors	Statement of Intent	Key Indicators	Data
Key Outcome 4: Improve Communication	Education	Raise awareness to hazards and its impact on water infrastructure	Decrease in sickness, deaths, and property damage	Statistics on sickness, deaths, and property damage for disasters faced by community per year
			Increase in education material on hazard mitigation	Educational material on hazard mitigation
			Communication strategies in place for early warning	Early warning communication strategies
	Disaster Risk Planning	Improve early warning	Decrease in response time to disasters	Response time per disaster
	Public Participation	Identify partners in the community	Increase in number of projects with community members as partners	Number of projects with community members as partners
			Increase in number of community members on steering committees	Number of community members on steering committees
		Engage in public participation	Increase in community attendance of meetings	Community attendance of meetings per month
			Improved understanding of information by public	Community survey information

APPENDIX 6

CALA/TSENGIWE CASE STUDY

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Cala/Tsengiwe

Introduction

Cala is a rural town and settlement situated approximately 100 km west of Umtata in the Eastern Cape province of South Africa. It has a temperate inland climate. The Tsomo River runs through the area just to the west of the town. Cala is the main administrative centre of the Sakhisizwe Local Municipal (LM) Area, which consists of seven wards. Sakhisizwe LM falls within the Chris Hani District Municipality (DM). Excluding small pockets of privately owned land in Cala Town, the largest part of the Municipality consists of various forms of tenure on communal or state owned land. There are small pockets of privately owned land. Existing settlements are variably categorised as scattered low-density rural residential settlements, communal agricultural land, commercial farms, and urban settlements.

The village of Tsengiwe is divided into two village sectors, Upper Tsengiwe and Lower Tsengiwe both of which are within the Sakhisizwe LM boundaries. 'Tsengiwe Engine' is referred to as an area of Tsengiwe in the context of water infrastructure. The engine that pumps water from the Tsomo River is located in Tsengiwe Engine.

Both Upper and Lower Tsengiwe (and Tsengiwe Engine) are the community level focus of this study. The village is defined as a scattered low-density rural residential settlement. It is surrounded by communal grazing land and arable lands and is considered to be representative of most villages in the area.



Collage of photos taken during field work in Tsengiwe (September 2010)

Many people in the Sakhisizwe LM area live in poverty as a result of the high illiteracy (90%) and unemployment (24%) rates. The unemployment rate in urban Cala is 34%. The

unemployment rate in Tsengiwe is estimated by locals to be close to 80%. There is no industrial area nearby, and most of the men that worked in mines in Gauteng have been retrenched since 1999. This has led to social problems including crimes such as theft, murder and rape, drug abuse, alcoholism, youth suicide, gender inequality and the rapid spread of HIV/AIDS.

The balance of the population at the village level comprises the elderly, many of whom are grandmothers taking care of young children and some youth who have chosen to settle there. The elderly people depend on pension and child grants for the children they take care of (if children's' parents do not use the grants to supplement their own income). Most of the people living in the Sakhisizwe LM are youth; 47.6% are between the ages of 0 and 19 and 34.5% are below age 15. The most productive age group (20 to 45) is only 30% of the population. Much of the labour for the wealthier provinces comes from the Eastern Cape (IDP 2009-2010, p.16) and many of this latter age group travel to other provinces to find work. People of 65 years and up comprise 8.6% of the population which below the age of 15 results in a dependent population of approximately 46%, which is further increased by the numbers of unemployed.



Youth outside the local goods shop in Tsengiwe

Ultimately the economic earners in the population are few compared to the elderly and young or school-going children they have to support, resulting in high levels of dependency. The most productive age group (20 to 45) is only 30% of the population and at least 34% of not up to 80% (seasonally?) of these are unemployed. As elsewhere the high level of unemployment compounds the problems of dependency on grants.

The high percentage of youth in the population will likely lead to an increase in demand for schools and facilities such as sporting fields, as well as educational training centres that can facilitate entrance into the workforce of these young people (i.e. vocational training).

Hazard Identification

Seasonal water scarcity and drought, a lack of water services, food security issues and social problems are experienced throughout the Sakhisizwe LM. There is mention that less water is flowing for shorter periods in the Tsomo river (pers. comm.; Village Headman,

December 2010). Assessment of longer term rain and runoff record to assess whether this is linked to larger scale changes in climate or to land use patterns in the headwaters or both has not been undertaken in this study.



Dry unfenced fields in Lower Tsengiwe show the impact of drought exacerbated by overgrazing and incipient erosion.

Ineffective governance by local and regional leaders and limited water service delivery add to the problems experienced by the community. The villages surrounding Cala will go without water because pumping does not occur frequently enough and the trucks do not have enough carrying capacity to meet the demands.

There are high rates of HIV/AIDS in the economically active and younger age groups. The issues of food insecurity and water scarcity exacerbate the health problems of those infected and those who care for them.

Table 4 Hazard Scoring for Case Studies

Hazard	Cala		Kayamandi		Carletonville	
	Score	Information	Score	Information	Score	Information
Flood	2	Incised river valleys, relatively high elevation	3	Township at relatively high elevation above the river	3	Severe flooding likely every 20-50 years along various river courses
Drought	4	Severe drought likely every 10-20 years	4	Severe drought likely every 10-20 years	4	Severe drought likely every 10-20 years
Biological	2	Few cases of water borne diseases each year	5	Highly polluted river system	5	Information unknown
Technological	2	Minor agricultural runoff pollution	5	Agricultural runoff pollution present	5	AMD constant and severe hazard
Institutional	5	Poor water infrastructure planning and service delivery	4	Poor water infrastructure planning, 5 yearly change in municipal staff	5	Constant upheaval and civil unrest with regards to what DM and province area falls in

Drought combined with institutional dysfunction is considered the biggest hazard faced by the Tsengiwe community. Floods can happen but seldom have a significant impact since villages are well above flood lines. Contamination of water is reported but is not a chronic risk and villagers considered floods and polluted water a lesser priority than drought. The HIV/AIDS infection is a serious issue in the community and risk of infection is increased because of crime patterns and generally weakened immune systems associated with food insecurity, and the social and health ailments of alcoholism. HIV/Aids is a complex disaster warranting more in depth study and is not as directly related to water supply and sanitation infrastructure and the management thereof as drought is. The Risk Assessment methodology developed in this study was applied to Drought in the context of Institutional Dysfunction which compounds the impact of drought.

Social Vulnerability and Coping Capacity

The key elements associated with coping capacity and social vulnerability as described in Section 2 and Appendix 1 of this report are used to select indicators that can be used as a qualitative to semi-quantitative measure of the Vulnerability and Coping Capacity variables in the Risk Equation ($R=H \times V/C$) (See Section 3 and 4 of the Main Report and Appendices 4, 5, and 8).

Social vulnerability and coping capacity are considered in terms of those elements that would exacerbate/mitigate the impact of a disaster and or hinder/support disaster recovery. For example low income, illiteracy, poor sanitation and housing are elements of social vulnerability reflected in the economic, health and education profile of the community itself. Indicators consider literacy and educational enrolment rates, income, the number of people receiving social grants, unemployment levels, and levels of sanitation and basic housing.

Coping capacity is discussed in relation to the availability, functioning or lack of responsive social protection factors viz. disaster management, policing, provision, operations and maintenance of adequate potable water and sanitation services. At the municipal level disaster management mechanisms such as early warning systems and water and waste water treatment works are evaluated. At the community level, community run projects and community responses to disasters are considered.

The Key Outcomes (KO) developed and accompanying Statements of Intent (Sol) incorporate these indicators that reflect the Social Vulnerability (V) and Coping Capacity (C) used to calculate the risk of an impact arising from Drought (the focus Hazard selected) at community/village level.

At the community level, it is apparent that institutional mechanisms for social protection are limited and that more in depth research on local coping capacities of men and women is required. In order to address this gap, fieldwork was conducted in the town of Cala and the Tsengiwe Village. The fieldwork explored community level vulnerabilities and coping capacity, and coping mechanisms at local municipal and non-governmental level. It was not possible in the time and with the resources available for the study to collect and collate an adequate set of gender specific data. Interviews were conducted with:

APPENDIX 6B: Cala Case Study

Members of the Tsengiwe community on the issues they face related to water infrastructure and drought as well as their perceptions of risk and disaster

Head of the Sakhisizwe LM Water Services department

Head of LM Integrated Development department

LM Disaster management personnel

Community radio

Masiphile Project

Caluso Project

Cala High School Deputy Principal

Tsengiwe Junior Secondary School Principal

Social Vulnerability

Economic

One of the main key issues identified by the Sakhisizwe LM is the dispersed settlement pattern. The area is characterized by centres surrounded by scattered, underdeveloped rural villages and there is limited economic activity outside of urban areas. There is a need to develop rural economic development initiatives and programmes outside of urban centres. (Sakhisizwe IDP 2009-2010, p. 28).

The unemployment rate in the Sakhisizwe LM is 24%. Cala urban area has an unemployment rate of 34% and the village areas are estimated to have an unemployment rate as high as 80%. Most people go to other provinces such as Gauteng, the Western Cape and Free State to get jobs. The old age pension and child grants help to sustain people and approximately 20% of people rely on these social grants as their primary source of income for themselves and those in their care (Saleni, 2010).

Although 45% of residents are dependent on farming and livestock production for survival, fencing which once prevented overgrazing has been destroyed in the last 15 years as it was considered an apartheid legacy. Subsequently most fields have been over-grazed and people can no longer afford to re-fence. The impact of reduced carrying capacity of the land is compounded by periodic drought and a lack of appropriate water supply and conservation. There is potential for maize farming along the banks of the Tsomo River but the maize-fields that once thrived have not been ploughed for years.

Apart from a few stores selling basic grocery items and alcohol, and agricultural activities, there is little sign of any other economic activity in this area. Improvements in Tsengiwe Village are delayed by the limited service delivery systems by the Sakhisizwe LM.

Health

Many residents in Cala are malnourished. There is a high prevalence of TB and HIV/AIDS and the traditional stigma attached to HIV/AIDS hampers the halting of the transmission of the virus. According to Nurse Nqobo at the Tsengiwe clinic (pers. comm., September 2010), the clinic treats a dysentery case approximately once a month usually derived from children playing in the river. Most children are immunized and are registered at the clinic which distributes immunization cards. The clinic does a follow up when immunization is due.

Education

In Cala, only 10% of people have completed secondary school, while 34% have some secondary. Only 13% have Grade 12 and higher, and 2.5% have tertiary education. At Cala High School, out of approximately 500 students, at least ten girls become pregnant each year (although they do usually manage to finish school), and around 20 students drop out each year (usually in grade ten). Out of the 515 students, 228 are boys and 287 girls. In the graduating class of 2010, there are 43 girls and 30 boys. Out of the graduating class of 2009, only two students went on to tertiary education – one girl and one boy, both doing a BSc. The school provides transport for students from the village. There is some career planning and an exhibition by the District Educational Office was held in 2010 to give students an introduction to accessing funding. However, there are limited vocational training opportunities available for students – those that can go to the Queenstown technical college. Most students end up unemployed after high school. In terms of disaster management at Cala High, there is some mention of natural disasters in the environmental sciences classes.

Coping Capacities

Water Supply and Sanitation Infrastructure

The Sakshisizwe LM Water Services Department is overseen by the WSA as the water services provider to manage Sakhisizwe water, namely water and sanitation, operation and maintenance, treatment and disposal of effluent. Service provision in Cala, and particularly Tsengiwe reflects both the need for integration between disaster management and water services at the rural community level and two-way communication between communities and the water services authority.

The levels of service to Tsengiwe are generally low, with the majority of residential structures and toilets are self-built.



Typical village toilet (non-ventilated pit latrine)

Water is provided for Tsengiwe via three springs the latest two of which were brought 'on line' in November 2010. All are located in Upper Tsengiwe. A small dam was constructed around each spring and inlet and outlet pipes connected. Water is transported to taps

through pipes. There are a total of 25 taps in Upper and Lower Tsengiwe and Tsengiwe Engine, which is not enough to fulfill the demand or the requirement that a tap be within 200m of a house. In Lower Tsengiwe there are approximately 18 taps (4 for 40 households). In the Tsengiwe Engine area there are approximately four taps for 160 households and there are three taps in Upper Tsengiwe (household number unknown). Since 2004, there has been an increase by 100 households but the infrastructure has not expanded to meet population demands. Some people also have household water catchment tanks.

There is one green tank for all of Tsengiwe which the municipality fills (on an irregular basis) when the springs are dry. The municipality has two trucks to cart extra water from treatment works to the green tanks (a second tank is located in the neighbouring village Manzana). One truck is 15,000 L and the other 13,000 L. However, at least three or four trucks are needed to fulfill the demand. There is one water pump engine in Tsengiwe Engine, which pumps water from the river and links to four taps for Tsengiwe Engine. As of May 2011, the two newer springs are dry due to seasonal variation in rain.



Municipal water truck, delivering to Tsengiwe

Assurance of Supply

Water does not always reach the higher lying villages because it is often assumed that tanks are full when they are not or the pumps are stopped because the work day is over. Longer periods of pumping or improved infrastructure are required to meet the water demand but the station is not manned 24 hours a day.

The LM Water Services department is aware of the need to get more plant operators, so that if shifts are shared, the water will be pumped constantly and reduce or eliminate lapses in water availability. No action has been taken since to date (May 2011) since field work was conducted in September 2010. Operators go to the municipality to complain about water services delivery but several operators have said it will take collective community action to realise a positive response.

Currently a working team has been set up to bring the issue to the council but little action has been taken beyond getting the Sakhisizwe Water Services Department to approve plans to buy another plant that would also improve assurance of supply to all five villages.

The Sakhisizwe LM has limited capacity in terms of keeping up with existing projects let alone initiating new infrastructure projects. There is a feeling that it will take concerted community action to move the matter forward since the District Municipality, where Water & Sanitation capital projects must be initiated, considers the project too big and the Water Services department at the LM level has argued that they have little say in devising new projects and therefore 'can't do much'.

There are currently one water quality technician, three O&M technicians (one civil and two electrical technicians for the electrified borehole pumps), a water quality practitioner for

routine maintenance, and a customer care officer dealing with rural education, an administration clerk, water quality technician and finance control. Eight DWA staff was recently transferred to the local municipality, five of which deal with routine maintenance.

The pipes and taps in Tsengiwe are monitored by Community-based technical operators, who are paid R400 a month by the municipality. They check if engines, pipes and taps are working and if there is a problem they report to customer care at the municipality and organize the ordering of new supplies such as screws if necessary. According to the operator for Lower Tsengiwe, water pipes are not often affected but taps need to be fixed once a month. The Water Committee for Ward 6 which includes Tsengiwe (Upper and Lower), Lower Cala, and Manzana holds monthly meetings with the operators. The operators themselves used to hold meetings once a month but attendance has become political, particularly with the current divide in the villages between those supporting two different local leadership bodies: the Headman (put in power under suspicious circumstances) and the Committee of Thirteen council.

Water Quality

In the Blue Drop Report 2010, for the Chris Hani District Municipality, Sakhisizwe (Elliot) received a score of 26%. Cala failed to provide the necessary information for assessment. Water supplies to Cala and the surrounding villages come from the Cala water treatment works and the Tsomo River Package plant. The Cala WTW has:

A water quality monitoring technician

A water quality practitioner -routine maintenance

Three operations and maintenance technicians (2 electro, 1 civil)

Eight DWA transfer staff (five dealing with maintenance)

The eight DWAF staff were transferred in August 2010, to do maintenance work at the Cala Water Treatment Works. There is no O&M manual followed and according to the head of the water services department in Cala, the process controllers for water treatment are only qualified as general workers though they deal with chlorine, conductivity, rapidity, etc.

Health Services

There is a clinic in the village, built in 2004, but many youth and members of the community do not take full advantage of its services and allegations are made that the clinic managers are negative and do not show up regularly. The clinic is supposed to provide the following services: health education, ante and post natal care and delivery; immunization of children; testing for HIV; diagnosis and treatment of TB; family planning; treatment of sexually transmitted infections; screening for cancer -pap smear; treatment for minor and chronic ailments and referrals.

The clinic is short staffed since it has only two nurses and one visiting doctor. It is estimated by the workers at the Masiphile project (see below) that 50% of Cala residents have HIV/AIDS, approximately 60-70% of whom are young parents. Elderly women are usually left to look after children who have lost parents due to AIDS. The elderly are at risk of crimes by youth gangs in the village, stealing their livestock or vandalizing their homes for example. The village has no emergencies services, but does deliver babies and undertakes post natal care. The clinic conducts campaigns on measles and polio, and has initiated a Chronic Disease Support Group (hypertension, diabetes, epilepsy, TB) as well as a vegetable garden project (a patch of land dedicated to growing vegetables for the elderly and the families of approximately 50 volunteers that participate).



Tsengiwe Clinic Garden

The clinic provides school health services – immunization and vitamin, as well as discussions on the health risks of sexually transmitted diseases and the importance of family planning. According to Nurse Nqobo, teenage girls are encouraged to come to clinic for birth control (pill or injection) and many come on the weekends to seek more information. The clinic also does outreach Upper Tsengiwe and Manzana – visiting elderly people once a month in each location. Overall the clinic sees around 200 people a month, mainly elderly women. Patients that cannot be treated at the clinic are referred to Cala hospital and HIV/AIDS patients are referred to the hospital also.

Community run projects

The Masiphile Project is a community and church supported, multi-disciplinary social upliftment project. The project was founded by community member Nomfundo Lily-Mlisa, a former nurse and trained clinical psychologist who is currently the Director of Counselling Services at Fort Hare University and a church leader in Tsengiwe Village. The project is currently run by a small group of women from Tsengiwe Village, overseen by Nomfundo Lily-Rose Mlisa. The project focuses on the support and upliftment of people infected and affected by HIV/AIDS (Mlisa, 2009). They also invest in building longer term coping capacity by assisting vulnerable children with purchasing their uniforms and providing a daily meal to support school attendance not forgetting short term vulnerability issues such as food insecurity and malnutrition. They intervene to mitigate the effects of HIV/AIDS and drought on vulnerable people (elderly, orphans) through the provision of vitamins and food programmes. All of the community members interviewed know of the project and approximately 185 people benefit directly from the project's work.

The project started receiving funding in 2010 from the Integrated Development Department of the Sakhisizwe municipality. The project aims to build a shelter for children living in abusive situations but is in need of sustained funding and more qualified psychologists, nurses, and management leaders. The Sakhisizwe LM sees Special Programs with priority areas being youth, the elderly, women, disabled people, and HIV/AIDS and has recently started funding the Masiphile Project. There are 25 volunteers.

The operation of the Masiphile Project in Upper and Lower Tsengiwe Village demonstrates the impact a small community run project can have in mitigating the impacts of hazards for vulnerable community members. It provides care and support to people infected with HIV and AIDS (including the aged who are often left to look after families, and orphans and vulnerable children), as well as aiming to reduce the stigma around HIV/AIDS. The project undertakes the development of community awareness campaigns and education around HIV/AIDS, crime, gender issues, alternative positive living and teenage pregnancy. The project also focuses on food security; through the development of plans to fence off the Tsomo River bank to re-form fields that can be managed and to develop irrigation schemes in order to facilitate community run sustainable agriculture and feeding schemes (Mlisa, 2009).

Approximately 37 people per village benefit from project, and 24 people are visited personally once a week. 42 children are assisted by the project, receiving food through the centre and financial assistance for buying school uniforms. The project also makes an effort to bring water to vulnerable villagers by going to people with tanks and asking them for assistance. The Masiphile volunteers run awareness campaigns in the villages on HIV/AIDS, teen pregnancy, and drug abuse and through volunteers from the University of Fort Hare have provided training on home-based care. Volunteers have started a sewing group for ladies to earn extra income and a children's choir. Food is grown communally by the Masiphile project and distributed. The majority of the elderly people interviewed reported being assisted by the garden project.

The Masiphile project is important in dealing with long-term causes of vulnerability (education) as well as shorter term causes (food insecurity and malnutrition) as well as mitigating the effects of HIV/AIDS and drought on vulnerable people (elderly, orphans) through the provision of vitamins and food programmes.

Although the health workers and volunteers are not all well educated, they have a passion and dedication to servicing the community. During periods of drought or high unemployment such projects increase the coping capacity of those most vulnerable in the village (the elderly, sick, and orphaned).

Disaster Management

There is no explicit reference to Disaster Risk Reduction in the Sakhisizwe LM IDP. There is mention of putting in place measures that reduce the vulnerability of disaster prone communities and provide appropriate preparedness and mitigation strategies. Discussing with the LM disaster management personnel, there was little focus on DRR when it comes to slow onset disasters such as drought but there was awareness and awareness raising initiatives that focus on basic fire safety and how to secure house roofs against strong winds. There is almost no interaction between the water services department and the disaster management department even when it could be expected. For example when the water service provision is delayed, the disaster management department does not step in to alert and prepare the community. Disaster Management at LM and community level is discussed further below.

At community level all 25 persons interviewed in Upper and Lower Village, answered "no" in response to the question 'Do you prepare for drought?' They cited money, or most

commonly, 'there is nothing we can do' as the reason for their response. The consequences of fencing being destroyed since the late 1990s and consequences thereof were discussed and it was simply stated that there are not enough funds on a household level to rebuild areas of fencing. Fencing costs approximately R822 per roll but 90% of inhabitants depend on pensions of R1000 a month.

In January 2009, the Headman started the Auylwamasango Agricultural Multi-purpose project. The project involves 20 villagers in a co-operative, planting 20 hectares of land in Upper Tsengiwe, primarily for the production of mealies. The money produced is used to get fertilizer. So far no profits have been made but it is only entering the second ploughing season. In meetings held by the Headman, there are discussions about cooperating on fencing, water, and crop production issues and people are eager for assistance. However, most of these people are elderly people – the young people, aside from a minority of village youth, do not even attend meetings. The headman faces the current of issue of his leadership being in dispute, which ultimately impacts support for projects and meeting attendance.

There is one customer care officer under the LM Water Services Department who holds monthly meetings with the communities through councillors. There were five campaigns between March 2010 and October 2010 in Cala to raise awareness and encourage water conservation and the use of alternative sources such as rainwater. The majority of villagers interviewed during fieldwork all attend community meetings, but none recalled interaction with the community service provider. Most people interviewed take a "wait and see" approach to drought with little action to prepare. Furthermore there is a lack of regulation of village activity in relation to water infrastructure. At least eight households in the villages have connected personal pipes to the municipal source with no punishment and others use the water to make bricks to sell.

In terms of disaster risk reduction there is general operation and maintenance but no real integration of water services with disaster management personnel. The Water Services Authority has disaster management staff at the district level and trucks are available to deliver extra supplies in the event of a drought but more trucks are needed. During case study fieldwork, it was revealed that money was paid under the table before the trucks delivered to the village.

In the Sakhisizwe LM (but not in Tsengiwe) boreholes are supplemented with spring water through a pipeline to reservoir supplies. The District is also drilling more boreholes to cater for those that are drying up but there is no monitoring at the LM level besides the Water Services Authority's general sustainability monitoring for all ground water projects and checking of boreholes. The Drought Relief Fund from the Water Services Authority and Department of Water Affairs is R1 million for the purpose of spring protection. The Tsengiwe springs have recently been upgraded as part of this project.

In summary there is a lack of disaster risk reduction at the community level in terms of facilitating the use of rainwater and encouraging conservation and preparation. Given the economic circumstances in the villages it would be necessary to subsidise the installation of rainwater tanks at household level. There is very seldom communication between the water services department and the disaster management department. Both departments claim to

hold community meetings but have never combined efforts such as in communication regarding water-borne diseases and the importance of boiling water.

1. References

Mlisa, N.L. (2009). Masiphile Home Based Care Business Plan.
Sakhisizwe Local Municipality. Integrated Development Plan 2009-2010.
Saleni, N. (Head of Integrated Development Department, Sakhisizwe Local Municipality)
Interview with Paula Hay: September 2010

APPENDIX 6B: Data Collection – Data and Collection

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 1				
Document or database of existing hazards	Record of existing hazards	Mr. Memani, Head of Disaster Management Department (Chris Hani)	Hazard monitoring database)	There is no database running currently within the Disaster Management dept.
% Of departmental budget allocated to researching new hazards linked to water & infrastructure	Total budget allocated to new hazard research	N. Saleni, Department of Integrated Development and Mr. Memani, Head of Disaster Management (Chris Hani)	Research on hazards (proposal calls, programmes funded, budget allocated to new hazard research, research proposal calls)	No part of Sakhisizwe LM budget dedicated to hazard research. Mr Memani – Excluding community risk assessment and public awareness and training campaign (later cancelled due to lack of funding) there are no other research programmes. We mainly receive ad hoc funding and use it for the daily running of the department. There is a separate account for when a disaster strikes but not for research.
Working groups have been established	No. Of working groups working on new hazard related tasks	Mr. Memani, Head of Disaster Management (Chris Hani)		
Number of research programmes	Number of research proposal calls			
	Number of research programmes funded			
Funds allocated to research	Total budget allocated to new hazard research	Nomqibelo Niwzi, Disaster Management Personnel, Sakhisizwe LM	Record of hazard impacts	Does not know
Number of research programmes	Number of research proposal calls			
	Number of research programmes funded			
Document or database of hazard impacts	Record of hazard impacts on people and their livelihood			There is a record of hazards impacts but they are not very detailed

APPENDIX 6B: Data Collection – Data and Collection

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 1				
Protocol for implementation	Protocol for implementation of early warning system	Mr. Memani, Head of Disaster Management Department (Chris Hani)	Is there a protocol for implementing early warning systems?	There is no protocol for implementing but we have a system of SMS and radio.
Early warning system in place	Early warning system	Mr. Memani, Head of Disaster Management Department (Chris Hani)	Does an early warning system exist	Chris Hani makes use of a notification system through SMS and a radio station
Early warning monitoring system – effective response time between different levels of responsibility	Procedure to document experience and response during and after	Nongqibelo Niwzi, Disaster Management Personnel, Sakhisizwe LM	Is there a procedure to document experience and response during and after a disaster?	No
	Response records for during and after the hazard occurrence	Nongqibelo Niwzi, Disaster Management Personnel, Sakhisizwe LM	Response records?	No
Monitoring protocol in place	Monitoring protocol	Mr. Memani, Head of Disaster Management Department (Chris Hani)	Hazard monitoring protocol	Municipality has no monitoring protocol and relies on notification from SAWS
% of departmental budget allocated to implementation of monitoring system	Total budget allocated to new hazard research	Mr. Memani, Head of Disaster Management Department (Chris Hani)	Is there hazard monitoring?	Hazard monitoring database can be found in Chris Hani Water Services Department. Risk Assessment was conducted in communities in 2010.
Key Outcome 2				
Disaster Risk Reduction Strategy in place	LM DRR strategies Document	Nongqibelo Niwzi, Disaster Management Personnel, Sakhisizwe LM	Is there a Strategy Document for DRR at LM level?	Community Risk Assessment conducted by District Municipality in 2010.
Disaster Management Plans in place	LM disaster management plan	Nongqibelo Niwzi, Disaster Management Personnel, Sakhisizwe LM	Is there a Disaster Management Plan at LM level?	There is a Disaster Management Plan and policy framework but they are not formally in place. Used as working document.

APPENDIX 6B: Data Collection – Data and Collection

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 1				
Treatment works in place O & M	O & M document for each treatment works	Babolo Tutu, Water Services Department, Sakhisizwe LM	Is there an O&M document?	No
Maintenance protocol for treatment works in place	Maintenance schedule/protocol	Babolo Tutu, Water Services Department, Sakhisizwe LM	Is there a maintenance schedule	There is no schedule/protocol but there are maintenance staff; no major monitoring at LM level. There are maintenance staff at the community level to make sure pipes are working.
Number of qualified operators of water treatment works employed	No. of employed at water treatment works	Babolo Tutu, Water Services Department, Sakhisizwe LM	Operators at water treatment works	There are two treatment works in Cala (Cala town and Tsomo River package plant) -water monitoring technician, O&M technicians (electric and diesel), water quality practitioner (not properly qualified) = 3 technicians plus 8 DWA transferred staff dealing with maintenance. Problem is that qualified process controllers dealing with treatments are employed as general workers.
Increase in the percentage of buildings that meet requirements	No. of buildings that meet standards/total no. of buildings	Mr. N. Saleni, Department of Integrated Development, Sakhisizwe LM	Housing backlog	There is a backlog of 3,000 for Cala and 8350 for whole LM. More than 80% of Cala residents are in formalized township housing but goal is to get all people in RDP level housing by 2014.
Increase in funding allocated to health services	Budget for health	Candy Day – Health Systems Trust	Budget allocated to health in Cala	Only have data available at provincial level – pay for
Decrease the number of patients per doctor/nurse	Ratio of no. of doctors/nurses: no. of people	Candy Day – Health Systems Trust/Field Work – N. Nqobo, nurse at Tsengiwe Clinic	Ratio of Dr./Nurses: people	HR data is difficult to come by from the national information system at district level/Field work – there is 1 doctor: 20 patients (doctor comes in on Tuesdays and sees approximately 20 patients)/1 nurse to 35 patients
Decrease distance to hospitals	Hospitals per sq./km	Field Work, N. Nqobo, nurse at Tsengiwe Clinic	How many hospitals are there and how far do people have to walk?	There are 11 clinics in Sakhisizwe, 8 in Cala, and a major medical centre in Cala. Tsengiwe clinic has 4 staff (5 th works in school health). Farthest people have to walk 30 mins to 1 hour.

APPENDIX 6B: Data Collection – Data and Collection

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 1				
Increase in number of ambulances per area coverage	Ambulance per radius	Field Work, N. Nqobo, nurse at Tsengiwe Clinic	Are there ambulances for the villages	No – people use friends cars
Decrease in number of deaths by water borne diseases per year	No. of patients; reported cases	Field work -Tsengiwe Clinic, nurse N. Nqobo/Head nurse V. Dube	Impact of water borne diseases on Tsengiwe population?	Water borne diseases (cholera, dysentery) rare, once a month a dysentery case comes in –usually children from playing in river
O & M system in place	Document	Musa Maringa (Institute of Waste Management, SA)	O&M document of waste sites	Assisted with contact details and websites where information might be attainable. Thus far websites and databases rendered less than desired results
Increase number of qualified operators	No. of operators (HR status)	Musa Maringa (Institute of Waste Management, SA)	No. Of qualified employees at waster site	Assisted with contact details and websites where information might be attainable. Thus far websites and databases rendered less than desired results
Landfills have sufficient capacity	Landfill follows DWA minimum requirements	Musa Maringa (Institute of Waste Management, SA)	Landfill sites Meeting Requirements set by DWA	Assisted with contact details and websites where information might be attainable. Thus far websites and databases rendered less than desired results
Increase in number of people immunised according to regular immunisations	No. of people immunized	Joseph Abrahams (National Health Dept)/Mohlaphametse Maditsi (DOH)/info@statssa.gov.za	Immunization Range for all 3 case studies	No response with regards to this request//signed and sent information request form – no reply (DOH)/no response from statssa.gov.za
Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 3				

APPENDIX 6B: Data Collection – Data and Collection

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 1				
Increase in % of eligible persons receiving the child grant	% of eligible persons receiving the child grant	Siulami Budaza (SASSA)/Field Work	% Of people receiving Child support grant/ do you receive a child grant?	Followed up and received no reply/Field work: many grandparents are taking care of children but the child's parents keep the grant
Increase in % of eligible disabled persons receiving the grant	% of eligible disabled persons receiving the grant	Siulami Budaza (SASSA)	% Of people receiving Disability Grant	Followed up and received no reply
Increase in % of eligible persons receiving the pension grant	% of eligible persons receiving the pension grant	Siulami Budaza (SASSA)/Field Work	% Of people receiving Old age grant	Followed up and received no reply/Most elderly people in Tsengiwe receive the grant (depend on it as main income)
Increase in training and vocational school enrolment	Training and Vocational School enrolment	Vuyisma Nicohra – Cala High School	Where are the vocational training centres?	No vocational training centres in Cala – just Queensstown technical (most students just look for work and often end up unemployed)
Decrease in distance to vocational training for learners	Vocational centres per square km			
Increase in accessibility to schools for learners	% Of children that live far (over 30 minutes) from primary or secondary school	Tsengiwe Junior School and Cala High School	How many children have to walk over 30 mins?	Tsengiwe Junior School – 20% of children walk over 30 mins Cala High School – most students walk less than 30 mins and the villages have a transport system.
Increase in literacy rates	Literacy rates	Phakedi Gaongalelwe (StatsSa)	Literacy levels of people in case study areas and % that are able to read, write, speak English	Handed over information on language spoken, except EC

APPENDIX 6B: Data Collection – Data and Collection

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 1				
Increase in primary education enrolment	Education enrolment rates	Kenneth Chatindiara (StatsSa)	Level of education of case study areas grouped with population census at primary education	Data received – grade 1 to 7
Increase in secondary school enrolment	Education enrolment rates	Kenneth Chatindiara (StatsSa)	Level of education of case study areas grouped with population census at secondary education	Data received – grade 8 to 12 and Cert. & Dip. With less Gr. 12
Increase in enrolment in higher education	Education enrolment rates	Kenneth Chatindiara (StatsSa)	Level of education of case study areas grouped with population census at tertiary education	Data received – Cert. & Dip above Gr. 12 and Bachelors to Postgraduate
Increase in female employment vs. males per sector	Employment rates per sector and gender	Info@statssa.gov.za	Amount of people within study areas that are unemployed	Response not made but information acquired.
Increase in women's enrolment in education (primary, secondary, higher, vocational)	Enrolment rates	Field Work -Cala High School and Tsengiwe Junior School	How many girls are enrolled vs. boys?	Tsengiwe Junior school: there are 213 students (more girls than boys – reflects overall village demographics and girls education is considered important). Most go onto grade 10. Cala High School – 515 students (228 boys/287 girls) graduating class: 30 boys/43 girls/In 2009 two students went to UCT (one girl and one boy). Both girls and boys drop out equally.
Increase in women's business ownership	No. of businesses owned by women	Field Work	How many businesses do women run?	One business in Tsengiwe run by husband and wife; mostly women running Masiphile project (started by a woman) -in Cala itself unknown
Increase in % of women taking up micro finance loans	% of women taking up microfinance loans	Field Work	No micro-finance organizations known	X

APPENDIX 6B: Data Collection – Data and Collection

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 1				
Existence of community run projects	Number of community run projects	Field Work	No of community run projects	Two main projects in Tsengiwe and several in Cala (mainly Caluso farmer's project, victims of violence organization)
Improvement in the perception of benefits	Perception of benefits of community run projects	Field Work	Are people aware of the community projects and do they perceive the benefits?	People are aware of Masiphile and the Garden Project but the benefits are specific to certain groups and most people feel that village life has gotten worse in the last 20 years
Increase in budget for community projects	Budget increments per year	Mr. N. Saleni, Department of Integrated Development, Sakhisizwe LM	Budget increase	Integrated Development Plan 2009-2010 (some projects receive funding but there are few increases)
Decrease in the number of single parents	Number of single parents	Feroza Mohideen (StatsSa)/Kelebogile Olifant (StatsSa)/Field Work	No. Of single parents in case study areas	Responded with single parents and parents alive. Response not desired outcome as other information was not available/Field work in Tsengiwe village: children are often raised by grand-parents (parents are in western cape or urban centres looking for work)
Decrease in the number of teenage pregnancies	Number of teenage pregnancies	Feroza Mohideen (StatsSa)/Kelebogile Olifant (StatsSa)/Field Work -Cala High School (Deputy Principal Cala High School Vuyiswa Nicohra)	Teenage pregnancy occurrences	Responded with single parents and parents alive. Response not desired outcome as teenage pregnancies were not available/Field Work -there are at least 10 girls pregnant each year out of 287 female students but they usually finish school though do not go onto higher education.
Increase in number of families with four or less children	% Of families with four or less children	Feroza Mohideen (StatsSa)/Kelebogile Olifant (StatsSa)	Percentage with families with either 4 or less children	Responded with single parents and parents alive. Response not desired outcome as other information was not available

APPENDIX 6B: Data Collection – Data and Collection

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 1				
Increase in programmes targeting family planning	Number of programmes targeting family planning	Field Work -Cala High School (Deputy Principal Cala High School Vuyisma Ntsohla)/Tsengile Clinic N. Nqobo and Head nurse V. Dube	Is there sex education and family planning at the school level?	Group Love Life sends rep to speak to grade 10 learners about sex at Cala High. Clinic provides some schools with family planning; girls encourage to come to clinic for pills/injection and given pamphlets (girls research and come to clinic on weekends)
Presence of awareness raising through television, billboards, sex education outside of clinics	Sex education; no. Of schools giving sex education; no. Of posters, TV, radio, etc.			
Decrease in the number of shack dwellers and homeless people	Number of shack dwellers and homeless people	Mr. V Rajkumar (DHS)/Field Work – N. Saleni, Sakhisizwe Department of Integrated Development	Houses that receive subsidies and no. Of indigent households in Cala/Dwelling Types of population in case study areas/How many homeless people are there? What is the housing backlog in Cala?	No response. Field Work -Cala has 420 RDP houses; 1070 which have all been allocated in LM will be provided by the project started in 2003 -should be done by June 2011 (challenges due to contractor capacity). Backlog combined for all LM is 8250 -for Cala 3000 (people stay with relatives) More than 80% of residents of Cala are in formalized township housing. Not a big flood as in CT but grows as young people leave home. After campaigns against the formal government they were formalized into townships.

APPENDIX 6C: Data Collection – Sources and Availability of Data

Key Outcome 1						
Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do we have it?	Information (Form and Source)	
Identify hazards linked to water and its infrastructure	Document or database of existing hazards at the LM level	Record of existing hazards	Y	N	Not sent from LM disaster management personnel but does exist	
	% of departmental budget allocated to researching new hazards linked to water & infrastructure	Total budget allocated to new hazard research	N	N	No information available	
Research new and potential hazards	Working groups have been established	No. of working groups working on new hazard related tasks	N	N	No information available	
	Number of research programmes	Number of research proposal calls	N	N	No information available	
		Number of research programmes funded	N	N	No information available	
Research hazard impacts on people and their livelihood	Funds allocated to research	Total departmental budget	N	N	No information available	
		Total budget allocated to new hazard research	N	N	No information available	
	Number of research programmes	Number of research proposal calls	N	N	No information available	
		Number of research programmes funded	N	N	No information available	
Develop early warning systems	Document or database of hazard impacts at LM level	Record of hazard impacts on people and their livelihood	Y	N	Exists at LM level but unable to retrieve	
	Protocol for implementation	Report on implementation of early warning system	Y	N	Information to be attained	
	Early warning system in place	Early warning system	Y	Y	Qualitative/field work information	

APPENDIX 6C: Data Collection – Sources and Availability of Data

Key Outcome 1

Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do we have it?	Information (Form and Source)
Implement monitoring of hazards	Early warning monitoring system – effective response time between different levels of responsibility	Procedure to document experience and response during and after	Y	Y	Qualitative/field work -Know that there is no such procedure
		Response records for during and after the hazard occurrence	Y	Y	Qualitative/field work -Know that there is no such procedure
	Monitoring protocol in place	Monitoring protocol	Y	N	LM level is monitored by SA weather services
	% of departmental budget allocated to implementation of monitoring system	Total budget allocated to new hazard research	N	N	No information available

Key outcome 2

Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do We have it?	Information (Form and Source)
Development of Disaster Risk Reduction Strategies	Disaster Risk Reduction Strategy in place at LM level	LM DRR strategies Document	Y	Y	Disaster Management Personnel at LM level do not have Protocol
Develop Disaster Management Plans	Disaster Management Plans in place	LM disaster management plan	Y	Y	LM (Sakhisizwe IDP 2009-2010 5.8 Disaster Management Framework) -Plans within IDP
Improve water conservation and demand management (drought and	Demand management and conservation strategy in place	LM Demand Management Strategy Document	Y	Y	National Demand Management and Conservation Strategy

APPENDIX 6C: Data Collection – Sources and Availability of Data

Key outcome 2						
Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do We have it?	Information (Form and Source)	
water supply)	Decrease in Per capita usage of water	Quantity of Water billed/# of people in LM	Y	Y	Information to be attained soon	
	% of households using recycled or rain water	% of people using rain water tanks	Y	Y	Community Survey 2007, StatsSa, Sakhisizwe LM/Sakhisizwe IDP	
	Treatment works in place O & M	O & M document for each treatment works	Y	Y	No O&M manual in place (see Blue Drop 2010)	
Increase quality of drinking water (cont.)	Maintenance protocol for treatment works in place	Maintenance schedule/protocol	Y	Y	No maintenance protocol in place (see Blue Drop 2010)	
	Number of qualified operators of water treatment works employed	No. of employed at water treatment works	Y	Y	Qualitative Interview with head of Water Services Sakhisizwe LM	
	Guidelines on building codes exist	Document on building codes	Y	Y	National Building Act	
Improve dwelling standards	Protocol for monitoring dwelling standards in place	Protocol on dwelling standards	?	N	No information available	
	Increase in the percentage of buildings that meet requirements	No. of buildings that meet standards/total no. of buildings	N	N	No data	
	Increase in funding allocated to health services	Budget for health	N	N	Sensitivity of data	
Improve health services	Decrease the number of patients per doctor/nurse	Ratio of no. of doctors/nurses: no. of people	N	N	Sensitivity of data	
	Decrease in distance to hospitals	Hospital per sq km (radius)	N	N	Some qualitative information	
	Decrease in distance to clinics	Clinics per sq km (radius)	N	N	Some qualitative information	

APPENDIX 6C: Data Collection – Sources and Availability of Data

Key outcome 2

Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do We have it?	Information (Form and Source)
	Increase in number of ambulances per area coverage	Ambulance per radius	N	N	Some qualitative information
	Decrease in number of deaths by water borne diseases per year	No. of patients; reported cases	N	N	Some qualitative information
	Waste Water treatment works meet minimum green drop requirements	Green Drop Report 2009	Y	Y	Green Drop Report 2009
Develop Waste/Refuse management	Increase in % of people with at least VIP level sanitation	No. of people with VIP level sanitation	Y	Y	Community Survey 2007, StatsSa, Sakhisizwe LM
Implement Immunisation Programmes	Increase in number of people immunised according to regular immunisations	No. of people immunized	N	N	Health data sensitivity
	Immunisation protocol in place with a reference to water-borne diseases and emergency situations	Document	?	N	No information available

Key Outcome 3

Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do we have it?	Information (Form and Source)
Improve Social Grant System	Increase in % of eligible persons receiving the child grant	% of eligible persons receiving the child grant	N	N	Can deduce from population and grants received but not exact therefore used in qualitative analysis
	Increase in % of eligible disabled persons receiving the grant	% of eligible disabled persons receiving the grant	N	N	Can deduce from population and grants received but not exact therefore used in qualitative analysis
	Increase in % of eligible persons receiving the pension grant	% of eligible persons receiving the pension grant	N	N	Can deduce from population and grants received but not exact therefore used in qualitative analysis

APPENDIX 6C: Data Collection – Sources and Availability of Data

Key Outcome 3					
Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do we have it?	Information (Form and Source)
Improve standard and availability of education to people of all ages	Increase in training and vocational school enrolment	Training and Vocational School enrolment	N	N	No data
	Increase in standard education enrolment	Enrolment rates	Y	Y	Census 2001, StatsSa, Cala/Community Survey 2007, StatsSa Sakhisizwe LM
Improve standard and availability of education to people of all ages (cont.)	Decrease in distance to vocational training for learners	Vocational centres per square km	Y	N	Information to be attained
	Increase in accessibility to schools for learners	% of children that live far (over 30 minutes) from primary or secondary school	N	N	No data
	Increase in literacy rates	Literacy rates	Y	Y	Sakhisizwe IDP
	Increase in primary education enrolment	Education enrolment rates	Y	Y	Census 2001, StatsSa, Cala/Community Survey 2007, StatsSa Sakhisizwe LM
	Increase in secondary school enrolment	Education enrolment rates	Y	Y	Census 2001, StatsSa, Cala/Community Survey 2007, StatsSa Sakhisizwe LM
Empower women to empower themselves	Increase in enrolment in higher education	Education enrolment rates	Y	Y	Census 2001, StatsSa, Cala/Community Survey 2007, StatsSa Sakhisizwe LM
	Decrease unemployment rates	Unemployment rates	Y	Y	Community Survey 2007, StatsSa, Sakhisizwe LM
	Increase in female employment vs. males per sector group	Employment rates per sector and gender	Y	Y	Community Survey 2007, StatsSa, Sakhisizwe LM
	Increase in women's enrolment in education (primary, secondary, higher, vocational)	Enrolment rates	Y	Y (N vocational)	Census 2001, StatsSa, Cala
	Increase in women's business ownership	No. of businesses owned by women	N	N	No data

APPENDIX 6C: Data Collection – Sources and Availability of Data

Key Outcome 3					
Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do we have it?	Information (Form and Source)
Empower women to empower themselves (cont.)	Increase in % of women taking up micro finance loans	% of women taking up microfinance loans	N	N	No data
	Decrease in number of child headed households	Number of child headed households	Y	N	Data unavailable
	Decrease in number of divorces	Number of Divorces	N	N	No data
	Decrease in number of street children	Number of street children	Y	N	Data unavailable
Establish community support systems	Existence of community run projects	Number of community run projects	Y	Y	Qualitative/field work
	Improvement in the perception of benefits	Perception of benefits of community run projects	Y	Y	Qualitative/field work
	Increase in budget for community projects	Budget increments per year	Y	Y	Sakhisizwe IDP
	Decrease in the number of single parents	Number of single parents	N	N	No data
Increase awareness of family planning and prospects	Decrease in the number of teenage pregnancies	Number of teenage pregnancies	Y	N	Data unavailable
	Increase in number of families with four or less children	% of families with four or less children	Y	Y	Census 2001, StatsSa, Cala
	Increase in programmes targeting family planning	Number of programmes targeting family planning	Y	Y	Qualitative/field work
	Presence of awareness raising through television, billboards, sex education outside of clinics	sex education; no. of schools giving sex education; no. of posters, TV, radio, etc.	Y	Y	Qualitative/field work
Improve tenure (l.e. land ownership and renters' rights)	Policies on land ownership exist and make reference to gender equality	Policy exists	Y	N	Information to be attained

APPENDIX 6C: Data Collection – Sources and Availability of Data

Key Outcome 3						
Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do we have it?	Information (Form and Source)	
Improve tenure (i.e. land ownership and renters' rights) (cont.)	Decrease in the number of shack dwellers and homeless people	Number of shack dwellers and homeless people	Y	Y	Census 2001, StatsSa, Cala	
	Decrease in 'wrongly-evicted' claims	Number of wrongly evicted claims	N	N	No data	

APPENDIX 7

KAYAMANDI CASE STUDY

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Appendix 7A: Kayamandi Case Study Results

Introduction and summary background

Kayamandi is an informal township situated on the outskirts of Stellenbosch, the well known historical centre of the wine farming industry in the Western Cape Province of South Africa. It lies within the Cape Winelands District Municipality and within the Stellenbosch Local Municipality.

The Plankenburg River runs through Stellenbosch, past the Stellenbosch industrial area, which houses a clothes factory, cheese factory, dairy producing plants and spray-painting/mechanical industries, around Kayamandi and joins the Eerste River on the outskirts of town (Barnes, 2002).

The high levels of unemployment and poverty in Kayamandi, mean that few people can afford to pay the municipality for better services. Sanitation is considered poor due to overcrowding and overstrained toilet and sewerage systems. Street taps and communal bus toilets are used (Barnes et al., 2004). The communal toilets are often far distances from the housing units, and hence some people use buckets and leave their waste on the streets. The municipality provides irregular solid waste management to the informal areas and toilets are not well maintained. As a result they are often blocked and overflowing, resulting in people using the bucket system or bushes. The leaking buckets and runoff after rains further contribute to human waste entering the township stormwater and grey water system which discharges into the Plankenburg River.



Kayamandi Township (Kleinerweltenbummler, 2006)³

Due to the lack of water services, the community makes use of the river for domestic use as well as recreation, agricultural irrigation and livestock watering, which activities greatly

³ http://commons.wikimedia.org/wiki/File:Kayamandi_01.jpg

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increase the contact between this community and the contaminated water of the Plankenburg River. The Plankenburg River water is also used downstream for commercial agriculture (vegetables, deciduous fruit and grapes), livestock watering and animal fodder. This cycle for the transmission of infectious diseases such as diarrhoea is fatal when combined with widespread poverty that accommodates lower resistance to infectious diseases as a result of malnutrition.

More detailed background information pertaining to social vulnerability in relation to water and sanitation infrastructure in Kayamandi is presented below. It is structured according to the methodology described in Section 4 of the main report so as to facilitate the cross reference with the presentation of the risk assessment associated with various identified hazards in the area.

The risks associated with water contaminated by faecal matter and other human wastes arise in some part because of social vulnerabilities and limited coping capacity at community, local and district level. Thus the emphasis on this case study is on the contextual description, facts and information which have influenced the selection and scoring of social vulnerability and coping capacity indicators as detailed in the main body of the report. These indicators reflect the circumstances of the Kayamandi community as well as the Local and District Municipality responsible for Disaster Management and water related infrastructure and the operations and maintenance thereof.

The data collection process and associated challenges are described in Section 4 of the report Appendix 8. This case study fieldwork explored community vulnerabilities and coping capacities, and mechanisms for social protection at local government and non-governmental level. Case study fieldwork involved interviews at local and LM level.



Shacks in Kayamandi (Wikipedia, 2010)

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In Kayamandi interviews were conducted with:

Church leaders

Disaster management personnel

Masifunde Creche

Kayamandi High School teacher

Volunteers from Legacy Centre: Khayalimpilo House of Wellness

Yoliswa Makuleni – Educator at Ikaya Primary and Coordinator of Soul Buddiez Club

The results of these interviews and background literature review are presented in the information below.

Identified Hazards and Associated Risks

The community of Kayamandi is exposed to periodic floods and fires which are dramatic and short onset disasters, but the primary threat is that of infections contracted through recreational exposure to and drinking contaminated water or consumption of food contaminated by bacteria. It is a biohazard that arises from contamination of the Plankenburg River and various studies have been undertaken since 2000.

Sampling studies over the past 10 years along the Plankenburg River in the vicinity of Kayamandi have shown greatly elevated levels of *E. coli* bacteria, with samples below Kayamandi exceeding the cut off level of 2000 *E. coli* per 100 ml of water 90% of the time, and *E. coli* levels reaching 16 million per 100 ml in some instances (Barnes *et al.*, 2004). High levels of *Streptococcus*, *Staphylococcus* and *Enterobacter* bacteria are also present, and these cause serious disease and illness in both humans and animals, including streptococcal throat, progressive pneumonia, streptococcal toxic shock syndrome, infection of superficial skin layers and wounds, and urinary tract infections (Barnes *et al.*, 2004).

The dominant source of these bacteria is identified as storm water, grey water and local runoff that is contaminated by human faeces and solid waste mostly from informal settlement area(s) of the Kayamandi township as well as the Pappegaaiberg Informal Settlement south west of Kayamandi. The contamination is primarily a result of poor sanitation services and waste management (Barnes *et al.*, 2004). The failure of formal sewerage systems in other towns in the area also contributes to the contamination but to a lesser extent, along with untreated winery effluent (often with high nitrate and phosphate concentrations which cause the development of algal blooms in dams) and industrial waste.

Tests by a departmental community health team from the University of Stellenbosch exposed dangerously high levels of faecal contamination in the river below Kayamandi. For example, in February 2003 a test for Faecal Coliforms, taken from a section of the river that runs above Kayamandi, found 329 Faecal Coliforms per 100 ml. At the testing point below Kayamandi the water was contaminated with 12 860 000 Faecal Coliforms per 100 ml (Barnes, 2002a). Barnes estimates that since 2003 these levels have only become worse (Barnes interview, 2010).

The repeated results of water quality testing indicate a high level of a multitude of diseases within the population of Kayamandi. Several bacteria that can cause severe diseases, serious infections in humans, a high fatality rate or serious impairment were detected. So-called 'flesh eating' bacteria that cause throat infections and cardiac conditions when the organisms settle on the valves and rheumatic fever were detected. Bacteria that cause skin and wound infections, septicaemia, heart disease, arthritis, pneumonia, violent nausea, vomiting and diarrhoea were also found in addition to *E. coli* (Yeld, 2004; Thom, 2002).

The Plankenburg River also poses a health hazard to users downstream where farmers use the water for irrigation of grape fields and fresh fruits. Aside from exposure through recreational use of the river, these farmers have complained about the possible impacts of the pollution on their ability to export due to quality and buyers' perceptions of quality. In addition, the river flows through Stellenbosch's industrial area after it has past Kayamandi, which is the location for, amongst others, a clothing factory, a well-known cheese factory, yoghurt- and dairy-producing plants, and spray-painting and mechanical workshops (Paulse et al., 2009).

Interestingly, in 2007, the Community Water Supply and Sanitation Unit of the Cape Peninsula University of Technology (CPUT) conducted a Participatory Rural Appraisal Workshop in Kayamandi. The Community Risk Assessment also highlighted the high levels of water contamination and prevalence of disease.

The participants' purpose was to analyse the causes of the hazards they considered to have the greatest impact. The results of the exercise reflected the relevance of community risk perception and the importance of incorporating community experience into water infrastructure planning, implementation, operation and maintenance.

Participants identified several major themes associated with risk of disease, including:

Spread of disease (namely TB, AIDS and water-borne diseases) which in itself is a risk

Solid Waste (identified as a Hazard)

Toilets (identified as a Hazard)

The inextricable link between bad community practises and adverse social conditions was identified as the underlying causes of the spread of diseases. It was recognized that certain behaviours compound the risk and spread of disease associated with the man made hazard of poorly designed, installed, operated or maintained water or sanitation related infrastructure.

According to participants, diseases result primarily from dirty water caused by blocked drains, the dumping of inappropriate materials into toilets and drains and rotting waste water adding harm to the grey water that flows out of blocked drains and black water from blocked toilets. Blocked drains have the most negative health impacts in the hostel areas. Throwing of food, solid waste and children's nappies were identified as an immediate cause of blocked drains. Inadequate municipal services, mainly a lack of skips and bins (also due to theft of bins) results in waste being disposed of everywhere, including water streams. It was agreed that such behaviour of residents increases the threat and their vulnerability to it, especially of children who also play around and drink with their mouths from the taps which are left unattended and running by adults. All these behaviours were identified as a 'hazard'.

Table 5 Hazard Scoring for Case Studies

Hazard	Cala		Kayamandi		Carletonville	
	Score	Information	Score	Information	Score	Information
Flood	2	Incised river valleys, relatively high elevation	3	Township at relatively high elevation above the river	3	Severe flooding likely every 20-50 years along various river courses
Drought	4	Severe drought likely every 10-20 years	4	Severe drought likely every 10-20 years	4	Severe drought likely every 10-20 years
Biological	5	HIV/AIDS pandemic	5	Highly polluted river system	5	Very high HIV/AIDS prevalence

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Technological	2	Minor agricultural runoff pollution	5	Agricultural runoff pollution present	5	AMD constant and severe hazard
Institutional	5	Poor water infrastructure planning and service delivery	4	Poor water infrastructure planning, 5 yearly change in municipal staff	5	Constant upheaval and civil unrest with regards to what DM and province area falls in

Adverse social conditions were explained as the result of the influx of migrant workers from the Eastern Cape into Kayamandi, who can lack awareness of the appropriate use of shared facilities and sanitation systems. There was a sense among permanent residents that others, who come from neighbouring provinces they consider home, see Kayamandi as a temporary 'dormitory' residence and therefore have a lack of ownership and care for the facilities. Due to a lack of alternative accommodation and high demand for living space with limited supply, there is in addition an increase in the potential risk of the spread of water borne, airborne and contact diseases; a lack of privacy and overcrowding and overloaded services.

Social Vulnerability and Coping Capacity

The key elements associated with coping capacity and social vulnerability are used to select indicators that can be used as a qualitative to semi-quantitative measure of the Vulnerability and Coping Capacity variables in the Risk Equation ($R=H \times V/C$) (See Section 3 and 4 of the Main Report). Social vulnerability is considered in terms of those elements that would hinder disaster recovery such as a low income, illiteracy, poor sanitation and housing. Coping capacity is discussed in relation to the availability, functioning or lack thereof of responsive social protection factors viz. disaster management, policing, provision, operations and maintenance of adequate potable water and sanitation services.

Indicators that reflect disaster management mechanisms at the municipal and community level such as early warning systems and water and waste water treatment works requirements are used to score coping capacity. At the community level, community run projects and community responses to disasters are considered. Social vulnerability is reflected in the economic, health and education profile of the community itself. Such indicators consider literacy and educational enrolment rates, income, the number of people receiving social grants, unemployment levels, and levels of sanitation and basic housing.

Social Vulnerability

Economic factors

In 2007 it was estimated that Kayamandi had a population of 15943 (Community Survey, 2007). However, many non-governmental organizations operating in the area estimate a current population of between 28,000 and 33,000 and a growth rate of up to 10,000 people a year (see Pochorous, International Student Organization Stellenbosch, and Threads websites).

Housing in Kayamandi is both informal (squatter dwellings, shacks) and formal (detached houses, hostels, flats, townhouses) housing, although the majority of housing units are of an informal character. The 2001 census reflected that 48.8% of residents live in shacks, informal dwellings or are homeless.

Incomes in Kayamandi are generally low but there is a higher risk of poverty among females. Three quarters of the economically active population are employed full time, largely in

unskilled work resulting in the majority of households having incomes of R 3500 or less per month and 92% with R1500 or less (DAG, 2003). One half of employed women earn R1000 per month or less as opposed to only 27% of men. Furthermore many women raise children alone without a proper income due to a lack of job opportunities (US, 2001). It is likely that job opportunities are rare, especially for poor, unskilled and uneducated women (Campbell, 2003), a situation that further contributes to poverty in these households.

Overall a large percentage of the community lives below the poverty line with most recent available data shows that 8.7% of the economically active earned less than R500 a month (US, 2001). At the LM level there are approximately 17% living on the extreme poverty line while the average unemployment in Stellenbosch and environs is 17.1%. The highest unemployment rate is 36.4% reported amongst women in the 15-29 age groups (US, 2001). This is a possible indicator for a high unemployment rate especially among younger population segments in Kayamandi.

Health Issues

The majority of the community has impaired immune systems, and there is a high prevalence of tuberculosis and HIV/AIDS (Barnes *et al.*, 2004). Shack dwellings provide inadequate protection against damp, which can lead to chronic diseases such as rheumatism and arthritis, and respiratory illnesses such as pneumonia and bronchitis (Barnes *et al.*, 2004). Due to the informal nature of the housing, and the climate of the south Western Cape, the area is also prone to flooding during winter cold fronts and spring cut-off lows, compounding risks. Children are particularly vulnerable in Kayamandi. Turcotte (2003) examined the nutritional status of children younger than five years in a 24-hour recall survey in Kayamandi. The most significant finding was a 24% prevalence of stunting in the sample. Children who suffer from stunting (including growth retardation as a result of poor diets and/or recurring infections) tend to have more frequent episodes of severe diarrhoea and are more susceptible to infectious diseases such as malaria, meningitis and pneumonia (Steyn & Labadarios, 2002).

As a result of an uneven distribution of services, the majority of incidences of diarrhoea in Stellenbosch come from Kayamandi. The statistics of the Kayamandi Community Day Care Clinic indicate that, from January to December 2003, only 156 children were treated for severe diarrhoea (WC Stellenbosch Municipality, 2003). However, there are indicators for a much higher rate of children with diarrhoea than reflected in the statistics (Paulse *et al.*, 2009).

Diarrhoea is fatal when combined with widespread poverty that accommodates lower resistance to infectious diseases. It is directly related to a lack of access to clean water and appropriate sanitation, and is considered one of the main causes of infant mortality in developing countries (WC Stellenbosch Municipality, 2003).

Education

Kayamandi has two main schools, the Ikhaya Primary School and Kayamandi High School. It was estimated in 2004 (Dennerlein & Adami, 2004) that at least eight primary schools and five secondary schools would be needed to meet the actual requirement of basic education in Kayamandi. Another demand is the establishment of a centre for illiterate adults and children with learning problems.

It is estimated that around 6 000 children in Kayamandi are at primary school age. In 2001 22% of the total population were between the age of 5 and 14 years (Statistics South Africa, 2001). However, only 1 700 learners are registered at the primary school (Statistics South Africa, 2001).

Information from school clinics in Stellenbosch indicates that approximately 900 learners attend schools outside Kayamandi in Cloetesville, Idas Valley, the surrounding areas of Stellenbosch and private schools. There are currently 850 students enrolled at Kayamandi high school. One teacher at Kayamandi High estimated that if one would follow the 180 grade 8 students that start in 2010 and follow the individuals, not all would make it to grade 12 in five years (some would take six or seven), and about 35% would have dropped out by the time of class graduation.

Of those that graduate, less than half go onto other forms of education (college, university, technical, vocational training) and, of that less than 20% that go onto university level education. Most students go on to work because they have limited access to funding, additional income, and continuing with higher education in Stellenbosch requires overcoming a cultural divide. During case study work at Kayamandi High school it was noted that alcohol is a problem for most students and on average there are ten teenage pregnancies a year. Pregnant students are required to finish their year-end exams if possible but few of the young women return to finish their schooling.

Educators are motivated and learners are aware that the way out of poverty is through education. Furthermore the school is 100% government funded and there is a free meal for all students at 10 am. The school uses courses such as Life Orientation to discuss the issues of drugs, alcohol, and rape. Geography classes use the Plankenburg River as case study material. The school is considered a safe place, free of violence but unfortunately the context from which students come is a barrier for many students in furthering their educational potential.

Lack of education, or human capital, is thought to be one of the biggest causes of the poverty cycle. Access to education in impoverished areas has been proven to decrease infant mortality rates, reduce family sizes thereby reducing population growth, and increase health and nutritional awareness. Closing the gender gap in education is a particularly important development goal and is one of the main benchmarks of the Millennium Development Goals (MDGs). Education empowers women to seek better health care for themselves and their children, know their rights and claim them. Overall, educating the girl child and providing opportunities for women has a ripple effect in terms of reducing poverty and creating a culture of education within families (UNFPA).

A survey (US, 2001) found that 57.5% of the interviewed women, 12 years and older, had borne a child. More than one third of this group of women (34.5%) had one child, 47% had two or three children and 18.3% had four or more children (US, 2001). Furthermore, 42.4% of the women had borne their first child when they were still at school, of which 5.9% testified that they were still in primary school when they had borne their first child. Only 5% of the women were older than 30 years when they first gave birth (US, 2001).

These shocking statistics which straddle education, safety and security health and economic issues are most starkly reflected, directly or indirectly, in the information on safety and security below.

Safety and Security

According to the Crime Analysis Centre in Stellenbosch (CIACS) (2004 in Business Intelligence Meny, 2004), crimes in the residential area of Kayamandi are mainly contact crimes such as murder, rape, assaults and robberies (including attempted robberies) against individuals. The majority of these crimes are liquor-related and occur at weekends and at night in dense informal settlement areas (Business Intelligence Menu, 2004). People state that during these periods a state of emergency dominates the atmosphere in Kayamandi with little police supervision, especially at night.

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Domestic violence, rape and sexual abuse of children are contact crimes that tremendously influence the mental and physical safety of women and children in their living areas and contribute to the spread of HIV/AIDS. The majority of households (64%) used communal facilities some distance away (Barnes, 2002b). Residents, especially women and young girls, try not to leave their houses or walk around the area at night since the narrow and dark pathways between shacks are where sex-related attacks happen. This situation is life threatening to women and a limitation to their personal freedom and safety. For women, a journey to the toilet at night can be fatal.

The three main forms of violence faced by women in Kayamandi are domestic violence, rape and sexual abuse of children. These forms of violence are not only assumed to have an impact on the general health of women and children, but are also risk factors contributing to the increasing prevalence of HIV in South Africa (known as the 'Twin Epidemic').

The majority of cases of domestic violence occur in squatter areas in Kayamandi. The most frequent forms of violence were kicks, strikes, and abusive language and the use of sharp objects. Victims were mainly women and children (Business Intelligence Menu, 2004).

In Kayamandi, 33 cases of rape by strangers were reported from September 2002 until August 2004 (Rape Crisis, 2005). These incidences mainly occurred in densely populated and informal areas and/or in areas adjacent to the police station. All victims were female and forced to have sexual intercourse concomitant with physical violence (they were held down) or other objects (including guns). The mean age of rape survivors was between 12 and 30 years (Business Intelligence Menu, 2004). Girls under 18 were particularly vulnerable to rape, constituting approximately 40% of reported rape and attempted rape cases nationally, with 12 to 17 year-olds reflecting the highest rape ratio per 100 000 of the female population (Human Rights Watch, 2004b). These statistics only include rape between two strangers. Rape in a relationship, rape of men, oral rape and rape with objects are excluded from these statistics (Rape Crisis, 2005). International scientific results in this field conclude that most incidences of sexual abuse occur by someone known to the child (Richter et al., 2004).

The reality in Kayamandi is likely to be a lot worse than official statistics confirm. In general, reporting of all crimes to the police is low in South Africa, particularly rape, which is stigmatised and reporting can make women more vulnerable. Rape Crisis (2005) assumes that only one out of 20 cases of rape and/or sexual abuse, including sexual abuse of children, is reported to the South African Police. Reasons why people do not report crime to the police are manifold and include social and cultural factors, e.g. financial dependence of women on their husbands or stigmatisation of rape victims and people living with perpetrators.



Informal Housing and sewage line running past houses in Kayamandi (Bicher, 2005)

Coping Capacity

Coping capacity is scored on the basis of the Hyogo Framework of Action indicators of progress, criteria which is adapted to fit the local context. Coping capacity is conceptualized by indicators related to disaster risk reduction and disaster management mechanisms at the local and community scale, as well as the existence of early warning systems. It is also rated by indicators concerning the social protection mechanisms at the *community* level (community development projects, education, and health care) and water and sanitation infrastructure. At the local municipal level, indicators regarding water and waste water treatment works are developed. Qualitative information regarding municipal functioning, community projects and disaster risk management is also provided to contextualize these indicators and provide a basis for recommendations for increasing coping capacity at the municipal level.

Water and Sanitation Infrastructure, Operations and Maintenance

The Reconstruction and Development Project (RDP), the governmental programme for housing and development in disadvantaged communities, has improved the infrastructure of Kayamandi since 1994. However, most of the residents have been on the waiting list since 1993 (Development Action Group, 2002). According to the Pilot Project in Southern Africa (2004), 2300 formal living units would be needed in Kayamandi (Erhard, 2000) to improve living and sanitation conditions for its inhabitants and to help contain overcrowding. In general, those people living in brick and detached houses have a toilet inside the house (18%) in 2002. Informal dwellings and settlement areas of Kayamandi have very low levels (DWAf, 2001) of water, sanitation, waste or electricity services although the formal areas and town of Stellenbosch has a high level of services (all households have in-house water connections and most have a water sewer system; most roads are tarred and the refuse removal system is the black-bag type; the municipality generally provides electricity) People living in the informal settlement area use public taps for drinking and washing. (Bicher, 2005).

The sanitation system is by communal “bus toilets”. These were first built in the hostels area around 1990 when overcrowding increased followed by outbreaks of TB and HIV around 1987 and 1988 which were associated with poor hygiene. Some residents now have toilets outside their residences but the majority use communal facilities located quite a distance from most dwellings, often not within walking distance. According to a 2002 study, 12% of people interviewed had toilets outside, but directly next to the house, whilst the majority of households (64%) used communal facilities some distance away from dwellings (Barnes, 2002). A total of 6.4% in a study (Barnes, 2002) reported that there was no toilet available within walking distance. For the official estimated population of almost 16,000 there are approximately 29 ablution blocks (around 550 people per ablution block).

Communal toilets were and remain inadequate and poorly serviced especially in relation to the ongoing influx from the rural areas of the Western Cape and other provinces (See disaster management section below). When there are too few toilets for too many people, operations and maintenance issues that impact the proper functioning of the few toilets there are and render them unusable or dysfunctional. When too many people are sharing a toilet and the social fabric and bonds do not facilitate cooperative behaviour the toilets become dirty, are not cleaned regularly or toilets are locked to limit the use by strangers leading to defecation next to the toilets. When toilets become blocked or pipes break the situation worsens.

Van Wyk et al., 2004 reported that the ablution blocks were not well maintained, often had blockages or overflows, that the shared toilet keys were not always available, leaving people to use the surrounding bushes or their own containers (often leaky). Many people leave their human waste on the streets where children play and dogs and insects are attracted to

it. It can remain in the streets for days as the waste management provided by the Municipality of Stellenbosch is once a week for formal areas and irregularly for informal areas.

Further aggravating the situation there are too few skips available for domestic solid waste and those that exist are often overfilled and/or too far from many houses. Waste is therefore thrown into water streams and placed next to houses. Additionally, waste is often left next to skips. There is a lack of responsibility for solid waste disposal and poor service monitoring.

Disaster Risk Management

Develop Disaster Risk Reduction Strategies: Municipal Functions

In an interview with Lucinda Segels, the sole member of the Disaster Management Personnel team for the Stellenbosch Local Municipality, several important themes and recommendations related to disaster management on the part of municipalities and local leaders, particularly in the context of Kayamandi, arose.

These include:

A lack of a long-term view on issues

A lack of regulation and disaster risk reduction/planning

Local political corruption

Lack of a Long Term Vision: Municipal projects are often very focused on a particular event for a limited period of time, such as a massive river clean up or waste removal after a fire but there are few long-term initiatives, mainly maintenance of the status quo.

Lack of regulation and disaster risk reduction: The municipality is negligent in dealing with environmental health. Informal areas have almost no waste removal even though new houses are erected daily. There is little regulation in informal areas; people sometimes build their homes over storm water drains so that they can have their own toilets.

The municipality is aware of the flood lines and degree of flooding that occurs during the winter but hostels are almost always affected. Residents themselves know that the flood happen in the winter but continue to build in flood prone areas. This is perceived by authorities to reflect generally low levels of responsibility and poor self discipline. That being said, Segels (pers. Comm. 2010) argues that it is difficult to compare informal and formal areas in terms of service use. Informal settlements do not have the amenities that formal settlements have (such as roll bins for garbage) and therefore expectations of what people can realise for themselves with given energy, health and material resources, should be different as well.

In the next two years it is estimated that another 10,000 people will be in Kayamandi, yet the municipality has not given attention to what they will provide in terms of routine services or the budget necessary to prepare let alone cater for the expanding informal settlements. They are unprepared and plan to provide the same services at the same budget and same volume each year. Promises for a better future are politically motivated but not thought through in terms of bureaucratic and practical realities such as municipal budget cycle, grant fund applications which remains largely a reactive process. The concept of water and sanitation infrastructure implementation being a disaster mitigation/risk reduction measure is not appreciated by councillors.

Segels also deals with social grants and works with NGOs, which she feels is important in disaster management, but for most municipal managers, there is little disaster management focus because it is not part of their Key Performance Areas (KPA's). The disaster management department itself focuses on fires and flooding but there is a lack of interaction with other municipal departments.

Local political corruption: In terms of community politics, there are five wards in Kayamandi each with their own councillors. Councillors only look after certain groups in order to gain political support, taking credit for work that gets done but otherwise inciting blame. Within communities people may be eager to assist with clean ups within their ward but there is no remuneration for this and people become complacent. A 'help me to help you' attitude does not exist and people become dependent.

Segels suggests several key actions for the local and district municipality:

Identify land and service needs before people move in and plan accordingly (e.g. space for paths for trucks and ambulances)

Beefing up informal services (more money and will needed)

Interdepartmental communication

Budget constraints can be lessened with better organization

Incorporate disaster management into KPAs and performance bonuses

More pro-activity (less reactivity)

Contract and pay local services and community members

Monitor impact assessments and supply chain management to avoid politics

Sustained, multi-dimensional approach to disaster management (health, social aspects, planning, housing, engineering departments, etc.)

Make people aware of their options (social grants)

Challenge municipality assumptions that things are happening as they should

Attitude change from directors downwards

Better communication between district municipality and local municipality

There is a clear need in term of risk reduction activities to improve sanitation and waste management systems, empower women, raise awareness of and improve education related to known risks at community and the institutional layers of government as well as increase the levels of public participation in order to realise risk reduction and improved preparedness and response to not only the biological threat but more rapid onset disasters such as fires and floods.

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APPENDIX 7A: Kayamandi Case Study Results

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APPENDIX 7B: Data Collection – Data Contacts

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 1				
Document or database of existing hazards	Record of existing hazards	Waters Consortium (2004) Disaster Hazard, Vulnerability and Risk Assessment for Stellenbosch	Existing Hazards within area	In document Pg 60-65
% of departmental budget allocated to researching new hazards linked to water & infrastructure	Total budget allocated to new hazard research	Lucinda Segels, Disaster Management Personnel, Stellenbosch LM	Budget allocated to hazard research	Unknown
Working groups have been established	No. of working groups working on new hazard related tasks	Lucinda Segels, Disaster Management Personnel, Stellenbosch LM	No. Working groups on new hazard related tasks	Unknown
Document or database of hazard impacts	Record of hazard impacts on people and their livelihood	Craig Knight –Records and Access Management Dept., Western Cape/Lucinda Segels, Disaster Management Personnel, Stellenbosch LM	Death during disaster	Responded that there were no deaths with associated disasters within Kayamandi/there is a database of 'Incidents in greater Stellenbosch' which contains information on area affected, number of structures and people affected and the type of hazard.
Protocol for implementation	Report on implementation of early warning system	Stellenbosch Municipality – Disaster Management Plan	Existence of Early Warning system	Plan concentrates on sections of response
Early warning system in place	Early warning system	Lucinda Segels, Disaster Management Personnel, Stellenbosch LM	Early warning System	There is an early warning system -announcements are made to the community via loudspeaker or community leaders. Specific protocol does not exist
Early warning monitoring system – effective response time between different levels of responsibility	Procedure to document experience and response during and after disaster	Lucinda Segels, Disaster Management Personnel, Stellenbosch LM	Documentation of experiences during and after disasters	Ms. Segels records this information but this is informal
	Response records for during and after the hazard occurrence	Lucinda Segels, Disaster Management Personnel, Stellenbosch LM	Response records	No such records

APPENDIX 7B: Data Collection – Data Contacts

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 1				
Monitoring protocol in place	Monitoring protocol	Lucinda Segels, Disaster Management Personnel, Stellenbosch LM	Monitoring protocol	Monitoring done by SA Weather Services
% of departmental budget allocated to implementation of monitoring system	Total budget allocated to new hazard research	Lucinda Segels, Disaster Management Personnel, Stellenbosch LM	% Of department budget to monitoring system	None that I am aware of
Key outcome 2				
Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Disaster Risk Reduction Strategy in place	LM DRR strategies Document	Disaster Hazard, Vulnerability and risk assessment for Stellenbosch municipality (Compiled by: Watees Consortium – March 2004)	Disaster Risk Reduction document exist	Watees Consulting and Netgroup Solutions developed methods and procedures to execute disaster hazard and risk assessments as first step in DRR
Disaster Management Plans in place	LM disaster management plan	Stellenbosch Municipality IDP 2010	Disaster Management Plan	The IDP sets out the Disaster Management Plan.
Demand management and conservation strategy in place	LM Demand Management Strategy Document	Mr. September (Chief Accountant – Services Dept, Stellenbosch Municipality	Water demand management strategy	Blankenberg had no reply to this request
Decrease in Per capita usage of water	Quantity of Water billed/# of people in LM	Mr. September (Chief Accountant – Services Dept, Stellenbosch Municipality	The number of water that Khayamandi is billed for and the amount of water that the community receives	Sawyer & Pretorius were irrelevant personnel
Treatment works in place O & M	O & M document for each treatment works	Mr. September (Chief Accountant – Services Dept, Stellenbosch Municipality	O&M document of water treatment works that feed into Khayamandi	Mr Blankenberg responded that the document was too big to be sent and is available for pick up – document exists.
Number of qualified operators of water treatment works employed	No. Of employed at water treatment works	Mr. September (Chief Accountant – Services Dept, Stellenbosch Municipality	No. Of employees at water treatment works	No response with regards to this request

APPENDIX 7B: Data Collection – Data Contacts

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key outcome 2				
Guidelines on building codes exist	Document on building codes	Housing Dept – Building regulations (8402 Project management), Mr. King	Documents on building codes	National Building Standards Act
Protocol for monitoring dwelling standards in place	Protocol on dwelling standards	Housing Dept – Building regulations (8402 Project management), Mr. King	Protocol for monitoring dwelling standards	Regulations relaxed for sub-economic housing. For example the regulations on how far apart buildings have to be is related to 1 or 2m for housing in Kayamandi as houses are smaller. Evictions do not occur often because when an eviction occurs the people must be moved elsewhere but there is nowhere else to move them/they rebuild in the night and evictions must occur within 24hours of house being built.
Increase in the percentage of buildings that meet requirements	No. of buildings that meet standards/total no. of buildings	Housing Dept – Building regulations (8402 Project management), Mr. King	No. of buildings that meet requirements	Can't release information. The main regulations broken/most important concern Fire Hazard and Safety (at least 50% of houses in Kayamandi do not meet these regulations plus people in government houses add illegally wendy houses and unregistered shacks). If there is a fire there should be assistance from local authority to move people to another location but mainly people rebuild in the same place.
Increase in funding allocated to health services	Budget for health	Candy Day – Health Systems Trust/Mark Bolton (CFO – Stellenbosch)/Craig Knight – Records and Access Management Dept., Western Cape	Budget allocated to health in Kayamandi/Amount of finances set aside for Kayamandi and community health services/Health Data	Only have data available at provincial level – pay for/Mark Bolton replied that function is dealt with by DM – Hanlie Linde responded that health budget and finance allocation is a provincial function but able to contact Denise Johnson for Stellenbosch clinic information/responded with attached document replying to some information
Decrease the number of patients per doctor/nurse	Ratio of no. Of doctors/nurses: no. Of people	Candy Day – Health Systems Trust/Craig Knight – Records and Access Management Dept., Western Cape	Ratio of Dr./Nurses: people	HR data is difficult to come by from the national information system at district level/Assisted with closest possible response to this query
Decrease in distance to hospitals	Hospital per sq km (radius)	Faiza Steyn & KB Lowenherz(DOH, WC)	No. & name of health service institutions within Western Cape. Both public and private institutions	Followed up but no response

APPENDIX 7B: Data Collection – Data Contacts

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key outcome 2				
Decrease in distance to clinics	Clinics per sq km (radius)	Faiza Steyn & KB Lowenherz(DOH, WC)	No. & name of health service institutions within Western Cape. Both public and private institutions	Followed up but no response
Increase in number of ambulances per area coverage	Ambulance per radius	Craig Knight – Records and Access Management Dept., Western Cape	Allocated emergency health services to Kayamandi	Responded with amounts of EMS vehicles and response vehicles
Decrease in number of deaths by water borne diseases per year	No. Of patients; reported cases	Denise Johnson, Head of Stellenbosch Clinics	No. Of reported cases of water borne diseases	Cannot release information
O & M system in place	Document	Musa Maringa (Institute of Waste Management, SA)	O&M document of waste sites	Assisted with contact details and websites where information might be attainable. Thus far websites and databases rendered less than desired results
Increase number of qualified operators	No. Of operators (HR status)	Musa Maringa (Institute of Waste Management, SA)	No. Of qualified employees at waste site	Assisted with contact details and websites where information might be attainable. Thus far websites and databases rendered less than desired results
Landfills have sufficient capacity	Landfill follows DWA minimum requirements	Musa Maringa (Institute of Waste Management, SA)/Field Work – interview with Department of solid waste Management (Jeremy Burns)	Landfill sites Meeting Requirements set by DWA/what kind of garbage collection occurs in Kayamandi	Assisted with contact details and websites where information might be attainable. Thus far websites and databases rendered less than desired results/Jeremy Burns – garbage is collected 5 days a week in formal areas, there are two trucks – one 5 ton truck and one compactor and a flat back that picks up bags. 5 workers for the informal settlements plus LED street collectors that come every day to clear from illegal dumping sites (receive R80 per day with two month contract). Every two months a new set of 30 people from unemployment list are given work. Informal houses are given black bags and can take to bins (15 bins emptied 3 times a week/public drop off spaces). Or there is a drop off that the 20-30 workers take the garbage and this is collected by municipality. Gives people jobs (ETW program to give permanent jobs) but people don't care enough and there is too big a job for resources.

APPENDIX 7B: Data Collection – Data Contacts

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key outcome 2				
Increase in number of people immunised according to regular immunisations	No. of people immunized	Joseph Abrahams (National Health Dept)/Mohlaphametse Maditsi (DOH)/info@statssa.gov.za	Immunization Range for all 3 case studies	No response with regards to this request/signed and sent information request form – no reply (DOH)/no response from statssa.gov.za
Key Outcome 3				
Increase in % of eligible persons receiving the child grant	% of eligible persons receiving the child grant	Silulami Budaza (SASSA)	% Of people receiving Child support grant	Followed up and received no reply
Increase in % of eligible disabled persons receiving the grant	% of eligible disabled persons receiving the grant	Silulami Budaza (SASSA)	% Of people receiving Disability Grant	Followed up and received no reply
Increase in % of eligible persons receiving the pension grant	% of eligible persons receiving the pension grant	Silulami Budaza (SASSA)	% Of people receiving Old age grant	Followed up and received no reply
Decrease in distance to vocational training for learners	Vocational centres per square km	Bernedette Baily (Cape Winelands – Centre Management)	Requested location of vocational and adult education centres	Responded that she needs time to gather information and will get back to enquiry. Still awaiting reply.
Increase in literacy rates	Literacy rates	Phakedi Gaongalelwe (StatsSa)	Literacy levels of people in case study areas and % that are able to read, write, speak English	Handed over information on language spoken, except EC
Increase in primary education enrolment	Education enrolment rates	Kenneth Chatindiara (StatsSa)	Level of education of case study areas grouped with population census at primary education	Data received – grade 1 to 7

APPENDIX 7B: Data Collection – Data Contacts

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 3				
Increase in secondary school enrolment	Education enrolment rates	Kenneth Chatindiara (StatsSa)/Field Work – Logan Orteli, Kayamandi High School	Level of education of case study areas grouped with population census at secondary education/how many students drop out? What is the quality of education? Are there school fees?	Data received – grade 8 to 12 and Cert. & Dip. With less Gr. 12/Field Work -35% of students drop out between their start in grade 8 and finishing grade 12.School is 100% government funded and there are above average results in terms of the Western Cape Province. Aside from model C schools Kayamandi High does better than most (in the last 5 years they had 80% pass rates). Educators and students are motivated.
Increase in enrolment in higher education	Education enrolment rates	Kenneth Chatindiara (StatsSa)/Field Work – Logan Orteli, Kayamandi High School	Level of education of case study areas grouped with population census at tertiary education/how many students go onto higher education – why?	Data received – Cert. & Dip above Gr. 12 and Bachelors to Postgraduate/Field Work – Most students go onto work because they have limited access to funding; less than half go onto other forms of education; less than 20% go onto university-level education. Going to university in Stellenbosch presents a cultural divide so they could go to Belleville but this is impractical and therefore a deterrent.
Decrease unemployment rates	Unemployment rates	Info@statssa.gov.za	Amount of people within study areas that are unemployed	Response not made but information acquired.
Decrease in number of street children	Number of street children	Ms. MJ Louw (WC Provincial Govt.)/Field Work – Kibwe Kids, Sinekhaya Safehouse, Kuyasa –I nterview with Cynthia Nolwando from Sinekhaya Safehouse	No. Of children that are in need of foster care in Stellenbosch and Khayamandi.	No response/Field Work – many safe houses for children that come from abusive homes or are orphaned. Most children go to extended families but these are becoming less reliable and there are a lot of problems with drinking and unemployment.
Existence of community run projects	Number of community run projects	Legacy Centre – Khayalimpilo House of Wellness	Qualitative information on community run projects	Many NGOs in Kayamandi –contacts received for at least 20, dealing with social issues (child welfare, single parents), counselling (rape crisis), child development, disability, recreation, residences, education, HIV/AIDS, pregnancy.

APPENDIX 7B: Data Collection – Data Contacts

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 3				
Improvement in the perception of benefits	Perception of benefits of community run projects	Volunteers from Legacy Centre – Khayalimpilo House of Wellness	Perception of benefits of community run projects	NGOs – lots of after school and feeding programs and many crèches but NGOs in Kayamandi don't speak to each other. Soon there will be monthly meetings of NGOs to get joint projects going (initiated by Kuyasa, one of main Kayamandi NGOs who started the 'Keep them Safe' campaign – trying to pull together so that more gaps filled)
Increase in budget for community projects	Budget increments per year	Stellenbosch IDP 2010-2011 and Field Work	Budget for community projects for 2009-2010	Total budget R145,000 (most NGOs receive from private sources) Small locally run NGOs receive from churches or operate for free (i.e. soup kitchens)
Decrease in the number of single parents	Number of single parents	Feroza Mohideen (StatsSa)/Kelebogile Olifant (StatsSa)	No. Of single parents in case study areas	Responded with single parents and parents alive. Response not desired outcome as other information was not available
Decrease in the number of teenage pregnancies	Number of teenage pregnancies	Feroza Mohideen (StatsSa)/Kelebogile Olifant (StatsSa)/Field Work – Logan Ortell, Kayamandi High School	Teenage pregnancy occurrences	Responded with single parents and parents alive. Response not desired outcome as teenage pregnancies were not available/Field work – on average there are 10 teenage pregnancies a year. They must finish their year-end exams if possible until they are at risk. Some come back to finish properly. Alcohol also a problem.
Increase in number of families with four or less children	% of families with four or less children	Feroza Mohideen (StatsSa)/Kelebogile Olifant (StatsSa)	Percentage of families with 4 or less children	Responded with single parents and parents alive. Response not desired outcome as other information was not available
Increase in programmes targeting family planning	Number of programmes targeting family planning	Volunteers from Legacy Centre – Khayalimpilo House of Wellness	Number of programmes targeting family planning	Few programmes targeting family planning
Presence of awareness raising through television, billboards, sex education outside of clinics	sex education; no. of schools giving sex education; no. of posters, TV, radio, etc.	Some Field Work - Kayamandi High School (Logan Ortell, geography teacher) and Legacy Centre	Sex education	Covered in Life Orientation Studies; some NGOs dealing with pregnancy and child welfare but little on family planning itself

APPENDIX 7B: Data Collection – Data Contacts

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 3				
Decrease in the number of shack dwellers and homeless people	Number of shack dwellers and homeless people	info@stellenbosch.gov.za/ Megan Bosch (WC Prov Govt)/Mr. V. Rajkumar (DHS)	No. Of houses that receive housing subsidies within Stellenbosch/Tenure status of households within Kayamandi/Dwelling Types of population in case study areas	Response from Ms. Bosch that Provincial Govt does not deal with such queries and handed over to Jenny at Stellenbosch Municipality. Requested direct contact details. Assisted with responsible authorities to approach.

APPENDIX 7C: Data Availability Kayamandi Case Study

Key Outcome 1						
Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do we have it?	Information (Form and Source)	
Identify hazards linked to water and its infrastructure	Document or database of existing hazards at the LM level	Record of existing hazards	Y	Y	Lucinda Segels -Disaster Management Personnel Stellenbosch LM	
Research new and potential hazards	% of departmental budget allocated to researching new hazards linked to water & infrastructure	Total budget allocated to new hazard research	N	N	No data	
	Working groups have been established	No. of working groups working on new hazard related tasks	N	N	No information available	
	Number of research programmes	Number of research proposal calls Number of research programmes funded	N N	N N	No information available No information available	
Research hazard impacts on people and their livelihood	Funds allocated to research	Total departmental budget	Y	N	Information to be attained	
	Number of research programmes	Total budget allocated to new hazard research	N	N	No information available	
	Document or database of hazard impacts at LM level	Record of hazard impacts on people and their livelihood	Y	Y	Information to be attained -Lucinda Segels -Disaster Management Personnel Stellenbosch LM	

APPENDIX 7C: Data Availability Kayamandi Case Study

Key Outcome 1

Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do we have it?	Information (Form and Source)
Develop early warning systems	Protocol for implementation	Report on implementation of early warning system	?	N	Information to be attained
	Early warning system in place	Early warning system	Y	N	Information to be attained
	Early warning monitoring system – effective response time between different levels of responsibility	Procedure to document experience and response during and after	Y	Y	Lucinda Segels -Disaster Management Personnel Stellenbosch LM
		Response records for during and after the hazard occurrence	Y	Y	Lucinda Segels -Disaster Management Personnel Stellenbosch LM
Implement monitoring of hazards	Monitoring protocol in place	Monitoring protocol	Y	N	Information to be attained
	% of departmental budget allocated to implementation of monitoring system	Total budget allocated to new hazard research	N	N	No information available

Key outcome 2

Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do We have it?	Information (Form and Source)
Development of Disaster Risk Reduction Strategies	Disaster Risk Reduction Strategy in place at LM level	LM DRR strategies Document	Y	N	Information to be attained
Develop Disaster Management Plans	Disaster Management Plans in place	LM disaster management plan	Y	Y	Stellenbosch IDP 2010 4.8 Disaster Management Plan

APPENDIX 7C: Data Availability Kayamandi Case Study

Key outcome 2						
Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do We have it?	Information (Form and Source)	
Improve water conservation and demand management (drought and water supply)	Demand management and conservation strategy in place	LM Demand Management Strategy Document	Y	Y	National Demand Management and Conservation Strategy	
	Decrease in Per capita usage of water	Quantity of Water billed/# of people in LM	Y	N	Information to be attained	
	% of households using recycled or rain water	% of people using rain water tanks	Y	Y	Community Survey 2007, StatsSa, Stellenbosch LM	
Increase quality of drinking water	Treatment works in place O & M	O & M document for each treatment works	Y	Y	See Blue Drop 2010	
	Maintenance protocol for treatment works in place	Maintenance schedule/protocol	Y	Y	See Blue Drop 2010	
	Number of qualified operators of water treatment works employed	No. of employed at water treatment works	N	N	No data	
Improve dwelling standards	Guidelines on building codes exist	Document on building codes	Y	Y	National Building Act	
	Protocol for monitoring dwelling standards in place	Protocol on dwelling standards	Y	Y	Qualitative information from Dept. Housing, Stellenbosch LM	
Improve dwelling standards (cont.)	Increase in the percentage of buildings that meet requirements	No. of buildings that meet standards/total no. of buildings	Y	Y	Qualitative information from Dept. Housing, Stellenbosch LM	
Improve health services	Increase in funding allocated to health services	Budget for health	N	N	Sensitivity of data	
	Decrease the number of patients per doctor/nurse	Ratio of no. of doctors/nurses: no. of people	Y	Y	Information for Primary Health Care Clinic in Kayamandi (District Health Information Systems)	
	Decrease in distance to hospitals	Hospital per sq km (radius)	Y	Y	Stellenbosch LM	

APPENDIX 7C: Data Availability Kayamandi Case Study

Key outcome 2						
Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do We have it?	Information (Form and Source)	
	Decrease in distance to clinics	Clinics per sq km (radius)	Y	Y	Stellenbosch LM Health Institutions	
	Increase in number of ambulances per area coverage	Ambulance per radius	Y	Y	Stellenbosch LM (District Health Information Systems)	
	Decrease in number of deaths by water borne diseases per year	No. Of patients; reported cases	N	N	Some qualitative information and information from Jo Barnes	
Develop Waste/Refuse management	Waste Water treatment works meet minimum green drop requirements	Green Drop Report 2009	Y	Y	Green Drop Report 2009	
Develop Waste/Refuse management (cont.)	Increase in % of people with at least VIP level sanitation	No. of people with VIP level sanitation	Y	Y	Census 2001, Kayamandi (incorrect data)	
Implement Immunisation Programmes	Increase in number of people immunised according to regular immunisations	No. of people immunized	N	N	Health data sensitivity	
	Immunisation protocol in place with a reference to water-borne diseases and emergency situations	Document	?	N	Information to be attained	

APPENDIX 7C: Data Availability Kayamandi Case Study

Key Outcome 3						
Statement of Intent	4. Key Indicators	Data	Availability (Y/N)	Do we have it?	Information (Form and Source)	
Improve Social Grant system	Increase in % of eligible persons receiving the child grant	% of eligible persons receiving the child grant	N	N	Can deduce from population and grants received but not exact therefore used in qualitative analysis	
	Increase in % of eligible disabled persons receiving the grant	% of eligible disabled persons receiving the grant	N	N	Can deduce from population and grants received but not exact therefore used in qualitative analysis	
	Increase in % of eligible persons receiving the pension grant	% of eligible persons receiving the pension grant	N	N	Can deduce from population and grants received but not exact therefore used in qualitative analysis	
Improve standard and availability of education to people of all ages	Increase in training and vocational school enrolment	Training and Vocational School enrolment	N	N	No data	
	Increase in standard education enrolment	Enrolment rates	Y	Y	Census 2001, Kayamandi	
	Decrease in distance to vocational training for learners	Vocational centres per square km	Y	N	Information to be attained	
	Increase in accessibility to schools for learners	% of children that live far (over 30 minutes) from primary or secondary school	N	N	Some qualitative information	
Improve standard and availability of education to people of all ages (cont.)	Increase in literacy rates	Literacy rates	N	N	No data	
	Increase in primary education enrolment	Education enrolment rates	Y	Y	Census 2001, Kayamandi	
	Increase in secondary school enrolment	Education enrolment rates	Y	Y	Census 2001, Kayamandi	

APPENDIX 7C: Data Availability Kayamandi Case Study

Key Outcome 3						
Statement of Intent	4. Key Indicators	Data	Availability (Y/N)	Do we have it?	Information (Form and Source)	
Empower women to empower themselves	Increase in enrolment in higher education	Education enrolment rates	Y	Y	Census 2001, Kayamandi	
	Decrease unemployment rates	Unemployment rates	Y	Y	Community Survey 2007, Stellenbosch LM/Stellenbosch LM IDP 2007-2011	
	Increase in female employment vs. males per sector group	Employment rates per sector and gender	Y	Y	Community Survey 2007, Stellenbosch LM	
	Increase in women's enrolment in education (primary, secondary, higher, vocational)	Enrolment rates	Y	Y (N vocational)	Census 2001, Kayamandi	
	Increase in women's business ownership	No. of businesses owned by women	N	N	No data	
Improve family bonds	Increase in % of women taking up micro finance loans	% of women taking up microfinance loans	N	N	No data	
	Decrease in number of child headed households	Number of child headed households	Y	N	Sensitivity of data	
	Decrease in number of divorces	Number of Divorces	N	N	No data	
	Decrease in number of street children	Number of street children	Y	N	Sensitivity of data (some qualitative information)	
establish community support systems	Existence of community run projects	Number of community run projects	Y	Y	Qualitative/field work	
	Improvement in the perception of benefits	Perception of benefits of community run projects	Y	Y	Qualitative/field work	

APPENDIX 7C: Data Availability Kayamandi Case Study

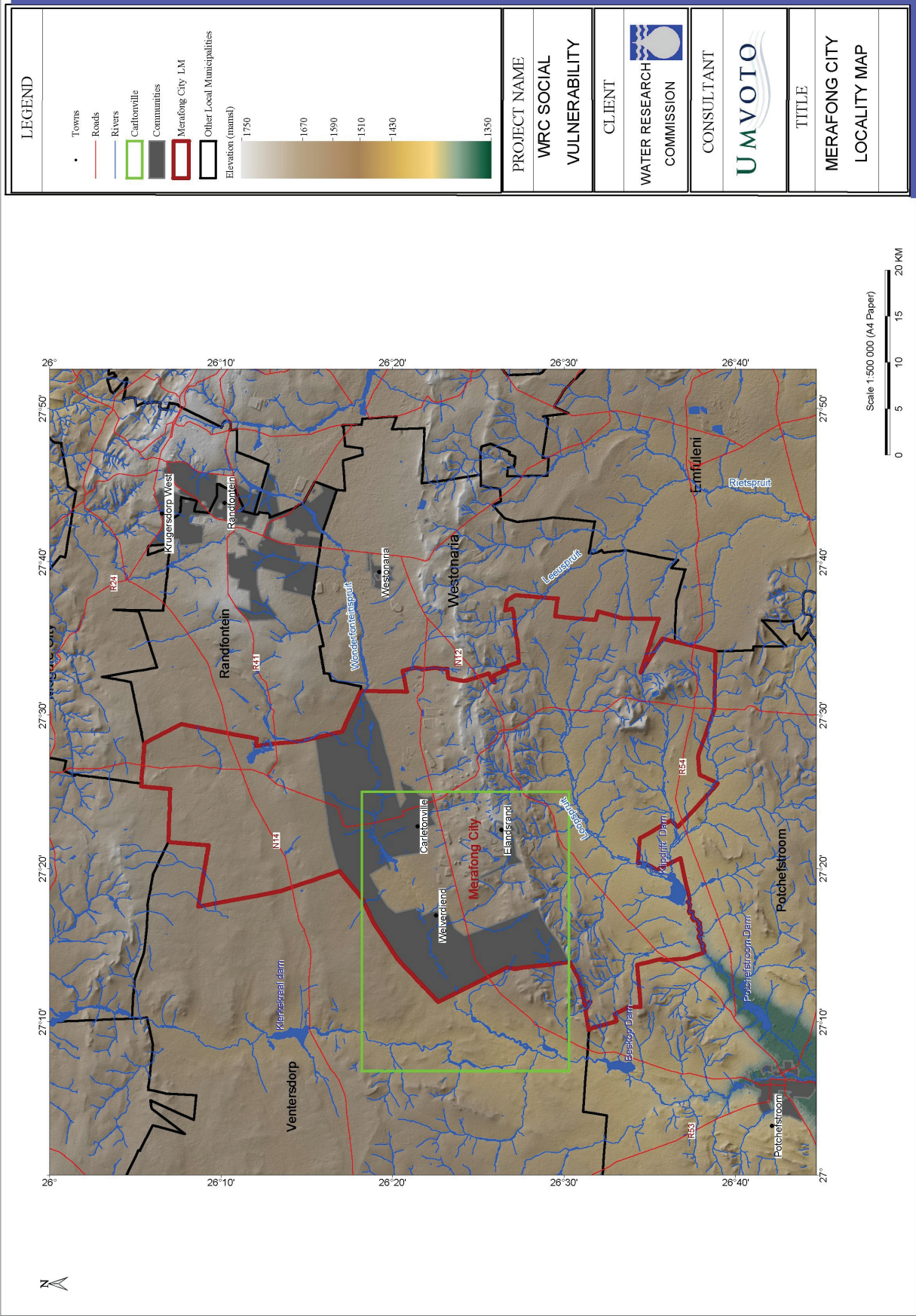
Key Outcome 3						
Statement of Intent	4. Key Indicators	Data	Availability (Y/N)	Do we have it?	Information (Form and Source)	
	Increase in budget for community projects	Budget increments per year	Y	Y	Stellenbosch IDP 2007-2011	
	Decrease in the number of single parents	Number of single parents	N	N	No data	
	Decrease in the number of teenage pregnancies	Number of teenage pregnancies	Y	N	Some qualitative information	
Increase awareness of family planning and prospects	Increase in number of families with four or less children	% of families with four or less children	Y	Y	Census 2001, Kayamandi	
	Increase in programmes targeting family planning	Number of programmes targeting family planning	Y	Y	Some qualitative/field work	
	Presence of awareness raising through television, billboards, sex education outside of clinics	sex education; no. of schools giving sex education; no. of posters, TV, radio, etc.	Y	Y	Some qualitative/field work	
Improve tenure (i.e. land ownership and renters' rights)	Policies on land ownership exist and make reference to gender equality	Policy exists	?	N	Information to be attained	
	Decrease in the number of shack dwellers and homeless people	Number of shack dwellers and homeless people	Y	Y	Census 2001, Kayamandi	
	Decrease in 'wrongly-evicted' claims	Number of wrongly evicted claims	N	N	No data	

APPENDIX 8

CARLETONVILLE (WONDERFONTEINSPRUIT CATCHMENT AREA) CASE STUDY

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Carletonville (Wonderfonteinspruit Catchment Area)

Introduction

The Wonderfonteinspruit Catchment Area (WCA) forms the eastern catchment of the Mooi River, and straddles both the Gauteng (upper catchment) and North West (lower catchment) provinces over a distance of approximately 100 km. The river itself is known as either the Mooi River or Wonderfonteinspruit at various points; the Wonderfonteinspruit is regarded as starting in Krugersdorp in the northeast (ironically at the base of a large mine waste dump and municipal landfill), and ends at the inflow to the Mooi River just north of Potchefstroom to the southwest (which ultimately drains into the Vaal and Orange Rivers).

Today, almost half a million people live in the Wonderfontein Catchment area. These include the towns of Carletonville, Welverdiend, Fochville, Westonaria, Potchesftroom and Randfontein, as well as the formal townships and informal settlements of Azaadville, Kagiso, Mohlakeng, Toekomsrus, Rietvallei, Bekkersdal and Khutsong. Many of these towns and settlements were established as a result of mining activities in the area. Roodepoort, Krugersdorp and Soweto border the catchment to the east. Rand Water supplies the towns with domestic water, except for Potchefstroom, which is supplied by Boskop Dam.

Wolverdiend also makes use of a borehole for some domestic supply.

Carletonville is the largest gold-mining complex in South Africa, employing approximately 75,000 workers. The Carletonville district includes the town of Carletonville, Khutsong township and 12 mine shafts as well as some smaller residential areas. Khutsong township has a range of housing types, including private and council houses, site and service plots and squatter settlements. The gold miners in Carletonville are predominantly workers from rural areas in South Africa or neighbouring countries (Botswana, Mozambique and Lesotho). Remittances from mineworkers are important to the economies of the labour source areas.

Hazard Identification

The Carletonville – Wonderfontein Catchment Area case study highlights the impact of a lack of hazard monitoring and forecasting of long-term risks.

The Far West Rand mining area lies on the western outskirts of Johannesburg, between Potchefstroom, and Krugersdorp and Roodepoort, an area once rich not only in gold but also in Uranium deposits. Gold mining in the area started in the late 1880s, but mining was problematic due to groundwater flooding from the overlying Malmani Subgroup dolomites (Coetzee et al., 2006). Only 40 years later once technology was available to deal with the groundwater problem did the second phase of mining start. The third and most recent phase began in the 1950s and 1960s and continues at two major goldfields, namely the West Rand (along the non-dolomitic headwaters of the WCA), and the Far West Rand (along the upper section of the lower dolomitic WCA). The Far West Rand, which is the richest of all seven goldfields in the Witwatersrand Basin has two major mining areas, namely the West Wits Line near Westonaria, and Carletonville. The Far West Rand was also the first goldfield to start uranium production at a large scale, with 11 000 tons produced between 1952 and 1988 (Coetzee et al., 2006).

Deep-level gold mining (performed by exploited miners) during the last century has brought to the surface hundreds of thousands of tonnes of radioactive Uranium ore which has seeped into the groundwater and been dispersed by air to surrounding areas. In order to access many of the gold deposits, huge areas were “dewatered”, creating enormous sinkholes and destabilizing the underlying dolomites. In addition, pyrite (“fool’s gold”), which is part of the ore brought up from depth, forms sulphuric acid when exposed to oxygen and water, giving rise to acid mine drainage (AMD). Uranium demand has however decreased

since the 1980s with the end of nuclear proliferation, and only one mine produces uranium for the Nuclear Fuel Corporation (NUFCOR) at present (which is also the world's largest producer of uranium oxide, and is present in the WCA) (Coetzee *et al.*, 2006).

Gold mining in the WCA affects water resources in two ways, namely water availability (quantity hazard) and water pollution (quality hazard) (Coetzee *et al.*, 2006). With respects to water availability, gold mining reduces the water resources of the WCA via dewatering. Dewatering has been occurring at a large scale since the 1960s after the mines were granted a permit (Coetzee *et al.*, 2006). Four groundwater components (which are situated in the Malmani Subgroup and sub-divided by syenite dykes) have been dewatered in the area, lowering the original groundwater level by 300 m in some places and drying up springs and boreholes in the WCA farming areas (Coetzee *et al.*, 2006). Dewatering has also caused a large number of sinkholes to form in the Wonderfonteinspruit streambed, and as a result in 1977 stream flow was diverted into a 1 m wide, 30 km long pipeline near Carletonville that passed the dewatered compartments in order to prevent re-watering occurring (Coetzee *et al.*, 2006). This in turn caused a decrease in water availability upstream of the pipeline, and consequently an increase in water availability above the natural status downstream.

Dewatering has also affected land use patterns in the area as a result of the lack of water for agriculture and formation of sinkholes. The cessation of mining and pumping in the WCA will also have drastic natural and socio-economic implications. It is in effect a man made hazard arising from the land use and demographic patterns now present on surface.

Water quality in the WCA is affected by both onsite and offsite sources, with numerous studies indicating the Wonderfonteinspruit has an acid mine drainage (AMD), heavy metal and radionuclide (approximately 50 tons of uranium per year released into the WCA) contamination problem associated with gold mining in the area (Coetzee *et al.*, 2006).

Onsite sources of pollution can be subdivided into controlled and uncontrolled discharges. Controlled discharges (from point sources such as mines) in the form of fissure and process water, is released into the surrounding natural environment via canals and pipelines.

It was estimated in 1991 that 12 tons of uranium enter the Wonderfonteinspruit watercourse annually from point discharges (Coetzee *et al.*, 2006). The National Nuclear Regulator Brenk Report (2007) on uranium pollution in the WCA found that in the Gerhard Minne wetlands, uranium levels three times higher than the safe levels permissible for human consumption were present in tested asparagus, oats and onions grown there.

Uncontrolled discharges result in the release of pollutants from numerous diffuse sources. This includes seepage from tailing deposits (slimes dams), unlined return water dams and evaporation facilities, runoff from contaminated surfaces (e.g. slimes dams, rock dumps, high grade ore piles, metal plants, etc.), leaks from broken canals and pipelines, and spillages from recovery plants (Coetzee *et al.*, 2006). The large spatial extent of slimes dams in the WCA, their hydraulic variability and the fact that they store approximately 100 000 tons of uranium, has resulted in an estimated 24 tons of dissolved uranium being released into the environment from unlined slimes dams alone annually (Coetzee *et al.*, 2006).



Acid mine water is pouring out of an old mine shaft on the West Rand, near Randfontein⁴

Offsite sources of pollution in the WCA include (Coetzee *et al.*, 2006):

Dust from slimes dams, which is blown into storm water drainage systems in the area and contributes approximately 10 tons of particulate uranium into the receiving environment annually

Tailings and scrap metal from illegal underground operations used for construction in townships

A large proportion of the thousands of sinkholes that have been filled for stability reasons with pollutant rich slimes material

Fluvial sediment within rivers, dams and wetlands downstream of the point sources, which is elevated in contaminants and acts as a secondary sink, but under certain environmental conditions, can release pollutants back into the water column, hence acting as a secondary source

In the WCA, samples from various studies exceed not only background concentrations, but also the regulatory levels for cobalt, zinc, arsenic, cadmium and uranium, with cadmium and uranium the greatest worry (Coetzee *et al.*, 2006). Risk quotients divide measured contaminant concentrations in water that could be used by communities for drinking water, by the limits or guidelines for that contaminant, with a significant risk having a risk quotient greater than 1. Both chemical and radiological risk quotients have been determined for uranium in the WCA, namely 6.67 and 2.22 respectively, based on a safe uranium concentration limit of 31 µg/l for chemical toxicity and 63 µg/l (based on 1 mSv/a, 500 l/a) for radiological toxicity (Coetzee *et al.*, 2006). This indicates a significant chemical and radiological uranium risk in the WCA, with some dams having uranium concentrations in the order of 1 000 000 µg/l (Coetzee *et al.*, 2006).

Uranium chemical toxicity can have an effect on renal functioning, while chronic radiological toxicity can affect the lymph nodes and bone development. It may also be a neurotoxin and weaken the immune system. Cadmium and uranium exposure may also cause increased cancer infections, decreased cognitive functioning and the appearance of skin lesions. Reduced mental development and possible mental retardation in foetuses is also possible. In the WCA, the main pollutant pathway is usually via the direct ingestion of uranium bearing water, or via indirect ingestion of uranium through animal and vegetable products (Coetzee *et al.*, 2006).

⁴ <http://www.eco-h2o.co.za/2010/02/09/acid-mine-drainage-amd/>

Table 6 Hazard Scoring for Case Studies

Hazard	Cala		Kayamandi		Carletonville	
	Score	Information	Score	Information	Score	Information
Flood	2	Incised river valleys, relatively high elevation	3	Township at relatively high elevation above the river	3	Severe flooding likely every 20-50 years along various river courses
Drought	4	Severe drought likely every 10-20 years	4	Severe drought likely every 10-20 years	4	Severe drought likely every 10-20 years
Biological	5	HIV/AIDS pandemic	5	Highly polluted river system	5	Very high HIV/AIDS prevalence
Technological	2	Minor agricultural runoff pollution	5	Agricultural runoff pollution present	5	AMD constant and severe hazard
Institutional	5	Poor water infrastructure planning and service delivery	4	Poor water infrastructure planning, 5 yearly change in municipal staff	5	Constant upheaval and civil unrest with regards to what DM and province area falls in

AMD and heavy metal pollution can lower water pH to 2, causing ecosystem destruction and rendering it unusable for human consumption.

The WCA is an excellent case study with respects to social vulnerability to water hazards for various reasons. The Wonderfonteinpruit is used by residents of the informal settlements and townships (who do not receive piped water from Rand Water) along the watercourse and associated greenbelt for domestic use (drinking water, washing, etc.), livestock watering and agriculture. These users are hence at most risk, not only from direct and indirect pollutant consumption, but also because of the fact that a large percentage of the population in these informal settlements have immune systems that have already been compromised as a result of poor nutrition and a high prevalence of HIV/AIDS.

Social Vulnerability and Coping Capacities

Social vulnerability in this study is placed in the context of social protection or coping capacity at different scales. This case study is contextualized in terms of the hazard and specific social protection available at the provincial, district municipal, local municipal, and community level (see **Appendix 4 a, b, and c** for the tabular summary of Social Protection Elements either in place or not). The tables detail the mechanisms (policies, strategies, protocols, and organizations) that aim to improve pre- and post-disaster coping capacity.

It is clear that further work is needed to evaluate the functioning or not of available Social protection Elements but the budget did not allow for fieldwork in the WCA and phone calls were made instead to relevant departments. The interviews conducted and contacts made during data collection for are detailed in **Appendix 8 b, c**.

The elements of social vulnerability considered further relate to the economic, health and education profile of the Carletonville community. Coping capacity is discussed in relation to the availability, functioning or lack thereof of responsive social protection factors primarily the response to the risks posed to people and the environment and consequences thereof

by the threat (hazard) of Acid Mine Drainage, viz. disaster management, maintenance of adequate potable water and environmental integrity.

Social Vulnerability

The risks of serious health and environmental problems arising from Acid Mine Drainage as well as uranium rich nuclear waste exposed in slimes dams and mine dumps in the WCA are described in the section on Hazards above. Potential pollutant pathways include direct exposure to pollutants through the substance being ingested, inhaled or absorbed through the skin, or in the case of a radionuclide, exposure to ionizing radiation from sources external to the body.

Exposure to the Hazard

By virtue of living in the WCA (and beyond) communities are more or less (but never not at all) exposed to the threat of breathing, drinking and or eating contaminated air, water or food.

In the absence of historical pollution control mechanisms and water quality monitoring, massive pollution plumes of heavy metals and sulphates made their way into the water table and downstream. Many of the mines in the area have been closed for several years leaving behind “destitute communities, now living on denuded landscapes, often relying on polluted water sources” (Turton, 2008). Uranium pollution is a big problem in the headwaters of the Wonderfontein Spruit which drains into the Mooi River, the Boskop Dam (the main water supply to Potchefstroom), the Vaal and ultimately the Orange River system. This stream is also used by residents of the informal settlements and townships who do not receive piped water for domestic use (drinking water, washing, etc.), livestock watering and agriculture.

Many of the springs and boreholes in the dewatered areas have been dry for decades. However, as mines are decommissioned and the pumps that kept the mines dewatered are switched off, water levels are beginning to rise, bringing with it a toxic cocktail of sulphates, heavy metals and uranium, while simultaneously increasing the risk of flooding and sinkholes. In 2007 for example, huge sinkholes swallowed houses in Khutsong. To make things worse, for unknown reasons the Department of Water Affairs and Forestry stopped monitoring the flow of the Wonderfontein Spruit in the late 1990s or at the very least stopped making the information publicly available.

When the winds blow, dust from tailings dumps is blown to surrounding areas, carrying with it uranium, silicates and other harmful particles that contaminate soils, agricultural produce and livestock and are deleterious to human health. Non-mining residents living south of Carletonville are suffering from the same respiratory diseases such as silicosis, as miners working deep underground. These tailings dumps are meant to be rehabilitated with the establishment of proper vegetation cover, but in many cases this has never been done. With the increasing value of Uranium, tailings dumps are now being re-milled to extract Uranium. This means that the dust particles are far finer than before and far more easily airborne.

Health

With high prevalence of HIV/AIDS (the Wonderfonteinspruit area has some of the highest rates of HIV/AIDS in the world) and chronic and acute malnutrition, this population is particularly vulnerable to additional stresses of uranium to their already-compromised immune systems.

The migrant labour system of the mines and housing of single men in hostels encourages unsafe sexual behaviour by removing men from their families and regular partners and providing a means of transmitting the disease to rural areas when men return home during leave or upon completion of mining contracts. In Carletonville, a 1998 survey showed that 22% of sampled mineworkers were HIV positive. There are also high rates of tuberculosis

and other sexually transmitted diseases. Most of the women that come to the mines seeking employment become commercial sex workers. Most of these women are marginalized from their home communities and have little contact with families. Many become marginalized from their home communities and have little contact with their families.

Coping Capacities

Water and Sanitation Infrastructure and Solid Waste Management

Poor water and sanitation service delivery in the area compounds the problem, as has already been witnessed through the high political tension and riots in the settlement of Khutsong (Johnston and Bernstein, 2007). Regulatory reaction to the radionuclide and heavy metal Acid Mine Drainage (AMD) hazard has also been stifled, due to the complex regulatory environment present, which includes numerous departments (Department of Water and Environmental Affairs, Department of Minerals and Energy, the National Nuclear Regulator, and various local and district municipalities) and legislation (the Minerals and Petroleum Resources Development Act of 2002, Mine Health and Safety Act of 1996, National Water Act of 1998, Water Services Act of 1997, National Nuclear Regulator Act of 1999 and the National Environmental Management Act of 1998).

Planning and Regulatory Environment and Hazard Monitoring

The full environmental, natural resource, health, livelihoods, economic, social and political fall-out as a result of a legacy of unaccountable mines and governmental regulatory agencies during the first round of gold mining is not fully known. No forecasts were done of the long-term risks and future generations were assigned the costs of irresponsible action for short-term gain. Currently there are approximately 8000 derelict and ownerless mines on record, which at current rates would take 800 years to rehabilitate at a current cost of 100 billion South African rand (Brown, 2007). This figure does not include the cost implications of human health such as treatment for cancers, loss of earnings and social disruption (Turton, 2008).

A small and temporary revival of uranium mining and milling activity in the area is once again driven by economic incentives (although some remediation will occur as a result of the efforts). But have the water and energy costs that will be required to rehabilitate the tailings dumps to prevent harmful dust pollution been factored into the overall costs of this venture and who will ultimately pick up the tab? And what will happen to the workers, currently employed for minimal wage and at the expense of their health, once these mines too inevitably close?

As the dolomites re-water, the risk of floods, sinkholes and the effects of AMD increase. But with no monitoring data available, how can any effective risk management plans be developed? How can the residents be assured that they are not consuming toxic drinking water or using polluted water to irrigate food-crops or livestock or about to disappear into a sinkhole? Whether it is denial, incompetence, politics, or hidden agendas, it is the ordinary people of the region who bear the costs.

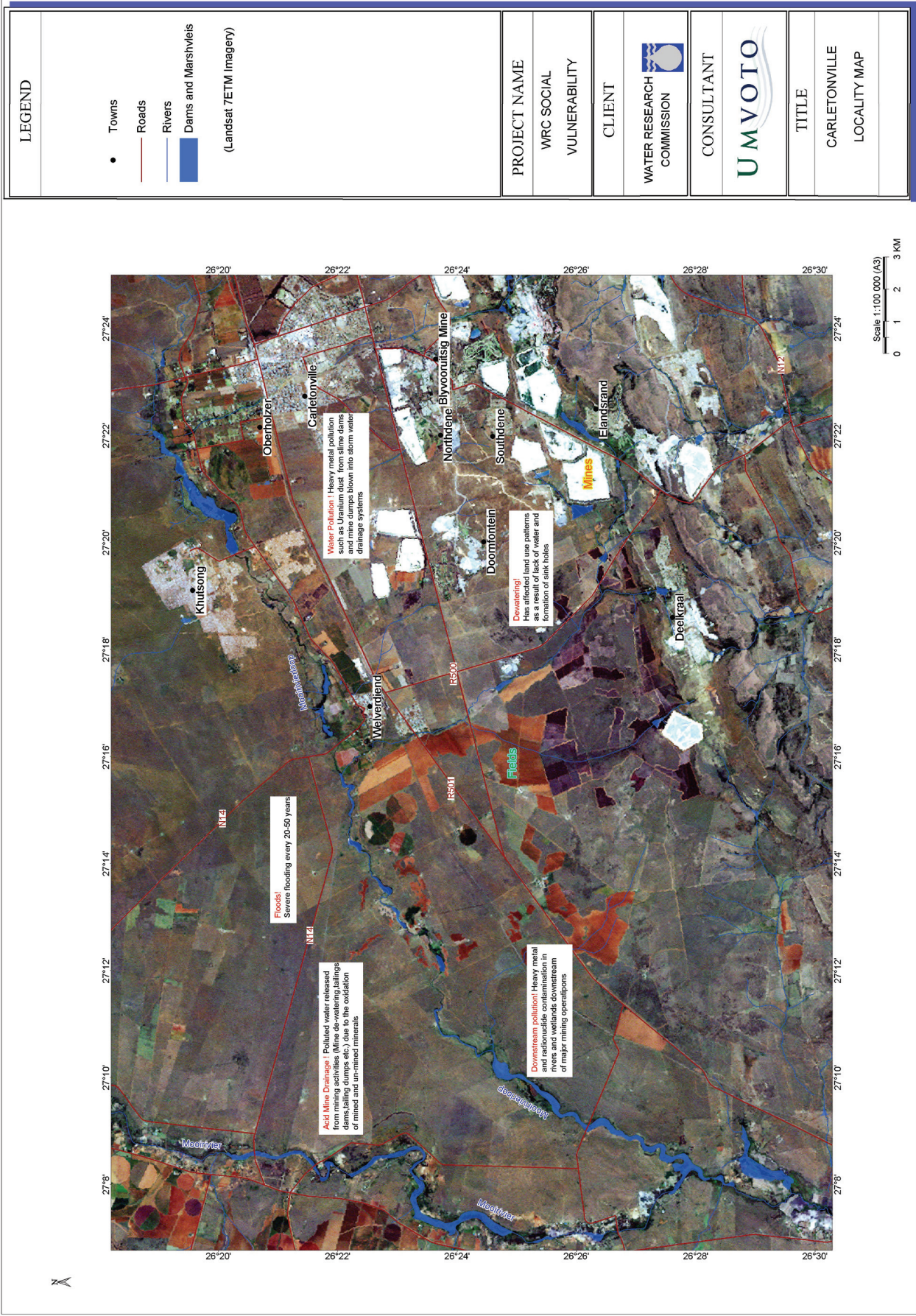
A summary of how the contextual information above informs the risk assessment score is tabled below.

Table 7 Discussion of Outcomes – Carletonville

Key Outcome	Coping Capacity	Social Vulnerability
1	The Merafong IDP states that the LM plans to develop and maintain a hazard database linked with monitoring and GIS. Early warning systems are also outlined by the IDP. The IDP is quite comprehensive although some aspects of disaster management and hazard monitoring remain as plans, giving Carletonville a coping capacity score for Key Outcome 1 of 2.5 (low-medium coping capacity).	
2	Merafong received a low score for quality of Waste Water Treatment Works, which contributes to Carletonville's low coping capacity, particularly for the hazards faced by the Wonderfonteinspruit.	Although data at the Carletonville level shows that 99% of people have at least VIP level sanitation, this does not necessarily take into account the townships in the Carletonville area (such as Khutsong) or the context of those living in mine worker hostel areas and therefore the social vulnerability score of 3.3 for Key Outcome 2 is perhaps lower than in reality.
3	The community-based programmes in Carletonville mainly deal with HIV/AIDS issues as well as a skills development and training program. Although the organizations are not very wide-ranging in terms of focus (receiving a low score of 2 coping capacity), as HIV/AIDS is one of the main hazards faced in Carletonville, the score does not necessarily reflect the relevance or impact of the work.	Carletonville received a score of 3.3 (medium coping capacity) for Key Outcome 3. 37% of people in Carletonville according to the Census 2001 have at least completed high school and 91.4% of women have a basic level of education or higher. However, this may not take into account illegal migrant workers who make up a significant portion of the Carletonville population.

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APPENDIX 8B: Data Availability and Contacts - Carletonville

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 1				
Document or database of existing hazards	Record of existing hazards	Merafong IDP 2009 – Disaster Management Plan	Database to record hazards as they occur	Database not in existence yet
% of departmental budget allocated to researching new hazards linked to water & infrastructure	Total budget allocated to new hazard research	Merafong IDP 2009	Budget allocated to disaster management	No budget for hazard research
Working groups have been established	No. Of working groups working on new hazard related tasks	Merafong IDP 2009 – Disaster Management Plan	Working groups with regards to Disaster Management	IDP – Disaster management plan points out West Rand District Disaster Risk Management Advisory Forum
Document or database of hazard impacts	Record of hazard impacts on people and their livelihood			
Protocol for implementation	Report on implementation of early warning system	Merafong IDP 2009 – Disaster Management Plan	Report of early warning system	Implementation of early warning system to be handled by Local Municipality (Merafong)
Monitoring protocol in place	Monitoring protocol	Merafong IDP 2009 – Disaster Management Plan	Protocol for monitoring hazards	Merafong DMP indicates different activities and actions that needs to take place for monitoring different disaster entities
Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 2				
Disaster Management Plans in place	LM disaster management plan	Merafong IDP 2009 – Disaster Management Plan	Disaster Management Plan	Exist as Annexure J.2 of Merafong IDP 2009

APPENDIX 8B: Data Availability and Contacts - Carletonville

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 1				
Demand management and conservation strategy in place	LM Demand Management Strategy Document	Tebogo Letsoalo & Peter Dingalo (Rand Water)/DWA – WSDP list	Water demand strategy in place	Tebogo Letsoalo referred to Mandla – unsure if strategy could be handed to third party. The WSDP list shows no strategy yet handed to DWA by LM or DM
Decrease in Per capita usage of water	Quantity of Water billed/# of people in LM	Tebogo Letsoalo & Peter Dingalo (Rand Water)/N. Ngoma (Debtors Sup-Rand Water)/Noluthando Ngoma (Rand Water)	Quantity of water billed & Quantity of source/Merafong Monthly Consumption and amount billed for/amount of water consumed by Merafong Municipality	Tebogo Letsoalo – Unsure if information requested can be handed over to third party (Umvoto). Peter Dingalo – Lebanon Reservoir Feeds Merafong with 49.773MI and 2 other decommissioned 11MI reservoirs/follow up made with no reply given/Noluthando Ngoma responded with attached documents
Treatment works in place O & M	O & M document for each treatment works	Tebogo Letsoalo & Peter Dingalo (Rand Water)	O&M Documents of water treatment works that feed into Merafong	Tebogo Letsoalo – Unsure if information can be handed over to third party (Umvoto)
Maintenance protocol for treatment works in place	Maintenance schedule/protocol	Tebogo Letsoalo & Peter Dingalo (Rand Water)	Maintenance schedule for these water treatment works	Tebogo Letsoalo – Unsure if information can be handed over to third party (Umvoto)
Number of qualified operators of water treatment works employed	No. Of employed at water treatment works	Tebogo Letsoalo & Peter Dingalo (Rand Water)	No. Of operators that are employed at water treatment works	Tebogo Letsoalo – Unsure if information can be handed over to third party (Umvoto)
Increase in funding allocated to health services	Budget for health	West Rand District Municipality Budget 2010-2011	Budget allocated to health services	Adjusted budget for West Rand DM (2010-2011): R32'722
Decrease in distance to hospitals	Hospital per sq km (radius)	Patricia Mokoena (DOH, Gauteng)	No. & name of health service institutions within Gauteng	No response
Key Indicators	Data	Source (document, person, contacted)	Data Requested	Response
Key Outcomes 2				
Decrease in distance to clinics	Clinics per sq km (radius)	Patricia Mokoena (DOH, Gauteng)	No. & name of health service institutions within Gauteng	No response
O & M system in place	Document	Musa Maringa (Institute of Waste Management, SA)	O&M document of waste sites	Assisted with contact details and websites where information might be attainable. Thus far websites and

APPENDIX 8B: Data Availability and Contacts - Carletonville

Key Indicators	Data	Source (Document, Contacted)	Person	Data requested	Response
Key Outcome 1					
					databases rendered less than desired results
Increase number of qualified operators	No. Of operators (HR status)	Musa Maringa (Institute of Waste Management, SA)		No. Of qualified employees at waster site	Assisted with contact details and websites where information might be attainable. Thus far websites and databases rendered less than desired results
Landfills have sufficient capacity	Landfill follows DWA minimum requirements	Musa Maringa (Institute of Waste Management, SA)		Landfill sites Meeting Requirements set by DWA	Assisted with contact details and websites where information might be attainable. Thus far websites and databases rendered less than desired results
Increase in number of people immunised according to regular immunisations	No. Of people immunized	Joseph Abrahams (National Health Dept)/Mohlalameitse Maditsi (DOH)/info@statssa.gov.za		Immunization Range for all 3 case studies	No responses with regards to this request//signed and sent information request form – no reply(DOH)//no response from statssa.gov.za
Key Indicators	Data	Source (Document, Person Contacted)		Data requested	Response
Key Outcome 3					
Increase in % of eligible persons receiving the child grant	% Of eligible persons receiving the child grant	Siilulami Budaza (SASSA)/Statistics SA		% Of people receiving Child support grant/% depending on various social welfare	Followed up and received no reply//data received
Increase in % of eligible disabled persons receiving the grant	% Of eligible disabled persons receiving the grant	Siilulami Budaza (SASSA)/Statistics SA		% Of people receiving Child support grant/% depending on various social welfare	Followed up and received no reply//data received
Increase in % of eligible persons receiving the pension grant	% Of eligible persons receiving the pension grant	Siilulami Budaza (SASSA)/Statistics SA		% Of people receiving Child support grant/% depending on various social welfare	Followed up and received no reply//data received
Increase in literacy rates	Literacy rates	Phakedi Gaongalelwe (StatsSa)		Literacy levels of people in case study areas and % that are able to read, write, speak English	Handed over information on language spoken, except EC
Increase in primary education enrolment	Education enrolment rates	Kenneth Chatindiara (StatsSa)		Level of education of case study areas grouped with population census at primary education	Data received – grade 1 to 7

APPENDIX 8B: Data Availability and Contacts - Carletonville

Key Indicators	Data	Source (Document, Person Contacted)	Data requested	Response
Key Outcome 1				
Increase in secondary school enrolment	Education enrolment rates	Kenneth Chatindiara (StatsSa)	Level of education of case study areas grouped with population census at secondary education	Data received – grade 8 to 12 and Cert. & Dip. With less Gr. 12
Increase in enrolment in higher education	Education enrolment rates	Kenneth Chatindiara (StatsSa)	Level of education of case study areas grouped with population census at tertiary education	Data received – Cert. & Dip above Gr. 12 and Bachelors to Postgraduate
Decrease unemployment rates	Unemployment rates	Info@statssa.gov.za	Amount of people within study areas that are unemployed	Response not made but information acquired.
Increase in budget for community projects	Budget increments per year	Merafong IDP 2009	Budget for community projects	None for Carletonville
Key Indicators	Data	Source (Document, Person, Person Contacted)	Data Requested	Response
Key Outcome 3				
Decrease in the number of single parents	Number of single parents	Feroza Mohideen (StatsSa)/Kelebogile Olifant (StatsSa)	No. Of single parents in case study areas	Responded with single parents and parents alive. Response not desired outcome as other information was not available
Decrease in the number of teenage pregnancies	Number of teenage pregnancies	Feroza Mohideen (StatsSa)/Kelebogile Olifant (StatsSa)	Teenage pregnancy occurrences	Responded with single parents and parents alive. Response not desired outcome as teenage pregnancies were not available
Increase in number of families with four or less children	% Of families with four or less children	Feroza Mohideen (StatsSa)/Kelebogile Olifant (StatsSa)	Percentage with families with either 4 or less children	Responded with single parents and parents alive. Response not desired outcome as other information was not available
Decrease in the number of shack dwellers and homeless people	Number of shack dwellers and homeless people	Chris E Spies (Merafong Municipality)/Mr. V Rajkumar (DHS)	Requested contact details of personnel to assist with inquiry of households receiving subsidies in Carletonville/Dwelling Types of population in case study areas.	Sent request to relevant department. No reply since. Mr. V. Rajkumar assisted with responsible authorities to approach/data has been sourced

APPENDIX 8B: Data Availability and Contacts - Carletonville

Key Indicators	Data	Source (Document, Contacted)	Person	Data requested	Response
Key Outcome 1					
Policies on land ownership exist that make reference to gender equality	Policy exists	Merafong IDP 2009 – housing plan		Gender equity policy exist	Housing Policy makes reference to a gender Equity Programme

APENDIX 8C: DATA AVAILABILITY CARLETONVILLE CASE STUDY

Key Outcome 1					
Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do we have it?	Information (Form and Source)
Identify hazards linked to water and its infrastructure	Document or database of existing hazards at the LM level	Record of existing hazards	?	N	Information to be attained
Research new and potential hazards	% of departmental budget allocated to researching new hazards linked to water & infrastructure	Total budget allocated to new hazard research	N	N	No information available
	Working groups have been established	No. of working groups working on new hazard related tasks	N	N	No information available
	Number of research programmes	Number of research proposal calls	N	N	No information available
		Number of research programmes funded	N	N	No information available
Research hazard impacts on people and their livelihood	Funds allocated to research	Total departmental budget	N	N	No information available
		Total budget allocated to new hazard research	N	N	No information available
	Number of research programmes	Number of research proposal calls	N	N	No information available
		Number of research programmes funded	N	N	No information available

APPENDIX 8C: DATA AVAILABILITY CARLETONVILLE CASE STUDY

Key Outcome 1					
Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do we have it?	Information (Form and Source)
Research hazard impacts on people and their livelihood (cont.)	Document or database of hazard impacts at LM level	Record of hazard impacts on people and their livelihood	?	N	Information to be attained
Develop early warning systems	Protocol for implementation	Report on implementation of early warning system	?	N	Information to be attained
	Early warning system in place	Early warning system	?	N	Information to be attained
	Early warning monitoring system – effective response time between different levels of responsibility	Procedure to document experience and response during and after	?	N	Information to be attained
		Response records for during and after the hazard occurrence	?	N	Information to be attained
Implement monitoring of hazards	Monitoring protocol in place	Monitoring protocol	?	N	Information to be attained
	% of departmental budget allocated to implementation of monitoring system	Total budget allocated to new hazard research	N	N	No information available

APPENDIX 8C: DATA AVAILABILITY CARLETONVILLE CASE STUDY

Key outcome 2

Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do We have it?	Information (Form and Source)
Development of Disaster Risk Reduction Strategies	Disaster Risk Reduction Strategy in place at LM level	LM DRR strategies Document	Y	N	Information to be attained
Develop Disaster Management Plans	Disaster Management Plans in place	LM disaster management plan	Y	Y	Merafong City LM IDP Disaster Management Plan
Improve water conservation and demand management (drought and water supply)	Demand management and conservation strategy in place	LM Demand Management Strategy Document	Y	Y	National Demand Management and Conservation Strategy
	Decrease in Per capita usage of water	Quantity of Water billed/# of people in LM	Y	N	Information to be attained
	% of households using recycled or rain water	% of people using rain water tanks	Y	Y	Community Survey 2007, Merafong City LM
Increase quality of drinking water	Treatment works in place O & M	O & M document for each treatment works	Y	Y	See Blue Drop 2010
	Maintenance protocol for treatment works in place	Maintenance schedule/protocol	Y	Y	See Blue Drop 2010
	Number of qualified operators of water treatment works employed	No. of employed at water treatment works	N	N	No data
Improve dwelling standards	Guidelines on building codes exist	Document on building codes	Y	Y	National Building Act
	Protocol for monitoring dwelling standards in place	Protocol on dwelling standards	Y	N	Information to be attained
	Increase in the percentage of buildings that meet requirements	No. of buildings that meet standards/total no. of buildings	N	N	No information available
Improve health services	Increase in funding allocated to health services	Budget for health	N	N	Sensitivity of data

APPENDIX 8C: DATA AVAILABILITY CARLETONVILLE CASE STUDY

Key outcome 2						
Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do We have it?	Information (Form and Source)	
Improve health services (cont.)	Decrease the number of patients per doctor/nurse	Ratio of no. of doctors/nurses: no. of people	N	N	Sensitivity of data	
	Decrease in distance to hospitals	Hospital per sq km (radius)	N	N	No information available	
	Decrease in distance to clinics	Clinics per sq km (radius)	N	N	No information available	
	Increase in number of ambulances per area coverage	Ambulance per radius	N	N	No information available	
	Decrease in number of deaths by water borne diseases per year	No. of patients; reported cases	?	N	Information to be attained	
Develop Waste/Refuse management	Waste Water treatment works meet minimum green drop requirements	Green Drop Report 2009	Y	Y	Green Drop Report 2009	
	Increase in % of people with at least VIP level sanitation	No. of people with VIP level sanitation	Y	Y	Census 2001, Carletonville	
Implement Immunisation Programmes	Increase in number of people immunised according to regular immunisations	No. of people immunized	N	N	Health data sensitivity	
	Immunisation protocol in place with a reference to water-borne diseases and emergency situations	Document	?	N	Information to be attained	

APPENDIX 8C: DATA AVAILABILITY CARLETONVILLE CASE STUDY

Key Outcome 3						
Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do We have it?	Information (Form and Source)	
Improve Social Grant system	Increase in % of eligible persons receiving the child grant	% of eligible persons receiving the child grant	N	N	Can deduce from population and grants received but not exact therefore used in qualitative analysis	
	Increase in % of eligible disabled persons receiving the grant	% of eligible disabled persons receiving the grant	N	N	Can deduce from population and grants received but not exact therefore used in qualitative analysis	
	Increase in % of eligible persons receiving the pension grant	% of eligible persons receiving the pension grant	N	N	Can deduce from population and grants received but not exact therefore used in qualitative analysis	
Improve standard and availability of education to people of all ages	Increase in training and vocational school enrolment	Training and Vocational School enrolment	?	N	Information to be attained	
	Increase in standard education enrolment	Enrolment rates	Y	Y	Community Survey 2007, Merafong City LM/Census 2001, Carletonville	
	Decrease in distance to vocational training for learners	Vocational centres per square km	Y	N	Information to be attained	
Improve standard and availability of education to people of all ages	Increase in accessibility to schools for learners	% of children that live far (over 30 minutes) from primary or secondary school	?	N	Qualitative information to be attained	
	Increase in literacy rates	Literacy rates	N	N	No data	
	Increase in primary education enrolment	Education enrolment rates	Y	Y	Community Survey 2007, Merafong City LM/Census 2001, Carletonville	

APPENDIX 8C: DATA AVAILABILITY CARLETONVILLE CASE STUDY

Key Outcome 3

Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do We have it?	Information (Form and Source)
	Increase in secondary school enrolment	Education enrolment rates	Y	Y	Community Survey 2007, Merafong City LM/Census 2001, Carletonville
	Increase in enrolment in higher education	Education enrolment rates	Y	Y	Community Survey 2007, Merafong City LM/Census 2001, Carletonville
	Decrease unemployment rates	Unemployment rates	Y	Y	Community Survey 2007, Merafong City LM
Empower women to empower themselves	Increase in female employment vs. males per sector group	Employment rates per sector and gender	Y	Y	Community Survey 2007, Merafong City LM
	Increase in women's enrolment in education (primary, secondary, higher, vocational)	Enrolment rates	Y	Y	Community Survey 2007, Merafong City LM/Census 2001, Carletonville
Empower women to empower themselves (cont.)	Increase in women's business ownership	No. of businesses owned by women	N	N	No data
	Increase in % of women taking up micro finance loans	% of women taking up microfinance loans	N	N	No data
Improve family bonds	Decrease in number of child headed households	Number of child headed households	Y	N	Sensitivity of data
	Decrease in number of divorces	Number of Divorces	N	N	No data
	Decrease in number of street children	Number of street children	Y	N	Sensitivity of data (some qualitative information)
Establish community support systems	Existence of community run projects	Number of community run projects	?	N	Information to be attained

APPENDIX 8C: DATA AVAILABILITY CARLETONVILLE CASE STUDY

Key Outcome 3						
Statement of Intent	Key Indicators	Data	Availability (Y/N)	Do We have it?	Information (Form and Source)	
Increase awareness of family planning and prospects	Improvement in the perception of benefits	Perception of benefits of community run projects	N	N	No information available	
	Increase in budget for community projects	Budget increments per year	N	N	No information available	
	Decrease in the number of single parents	Number of single parents	N	N	No data	
	Decrease in the number of teenage pregnancies	Number of teenage pregnancies	N	N	No data	
Increase awareness of family planning and prospects (cont.)	Increase in number of families with four or less children	% of families with four or less children	Y	Y	Census 2001, Carletonville	
	Increase in programmes targeting family planning	Number of programmes targeting family planning	N	N	No information available	
	Presence of awareness raising through television, billboards, sex education outside of clinics	sex education; no. of schools giving sex education; no. of posters, TV, radio, etc.	N	N	No information available	
Improve tenure (i.e. land ownership and renters' rights)	Policies on land ownership exist and make reference to gender equality	Policy exists	?	N	Information to be attained	
	Decrease in the number of shack dwellers and homeless people	Number of shack dwellers and homeless people	Y	Y	Census 2001, Carletonville	
	Decrease in 'wrongly-evicted' claims	Number of wrongly evicted claims	N	N	No data	

APPENDIX 9

DATA COLLECTION: TELEPHONE AND EMAIL CORRESPONDENCE

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
Health (health budget allocated to districts; doctor and nurse; patient ratio)	Candy Day	Health Systems Trust	candy@hst.org.za	2010/05/03	Email to Health Systems Trust requesting data on health budget allocation; doctor: patient ratio; and nurse: patient ratio for Kayamandi, Capa, Carletonville Health Systems Trust	2010/05/04	From Candy Day: the HR data is difficult to come by from the national information system at district level, since it is only 3 areas you may be more successful gathering that from the bottom up – i.e. from the District Managers. Regarding the budget information, we may be able to assist – if you can clarify a few issues then we can estimate the time and cost of collecting that information for you. Which financial year are you considering? Do you need the provincial health or local government budgets for health (we only have the former)? Are you looking for district or sub-district budgets – since all the areas you specify are in fact sub-districts? Merafong may be problematic due to the cross-border changes, particularly since the NW does not use the same financial system as the rest of the country.		
Water	Tebogo Letsolo; Peter Dingalo	Rand Water	tletsolo@randwater.co.za pdingalo@randwater.co.za	2010/05/03	Email to Ms. Letsoal (Rand Water) Re Merafong: Information requested -Rand Water's Water Demand Strategy; Quantity of water Billed for Merafong; Quantity of source; O&M Documents of Water Treatment Works that feed into Merafong; Maintenance Schedule	03/05/2010 and 04/05/2010	Response from Tebogo Letsolo - forward to colleagues: Mandla – Is it possible to give out the below requested strategy? Luvuyo – I referred the guy to request information about the Bill from the said municipality since it is their property and am not sure if we can give it to the third party. He said the municipality is referring him to us. Peter – Please advise of the capacity of the Reservoir supplying Merafong (This is the only info I know we can	Follow up 07/09/2010	Follow up to Letsolo: First contacted 3rd May 2010 -inquiry was forwarded to relevant personnel. Mr. Dingalo and Mr. Letsolo responded on May 3 and 4 2010. Regarding previous responses, I have not received feedback from other personnel (Mandla and Luvuyo) re information

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
					of these Water Treatment Works and the number of operators that are employed at these Water Treatment Works.		provide). From Peter Dingalo: The reservoir supplying Merafong is Lebanon and its capacity is 49,773 ML. There are two other 11megs reservoirs which are currently decommissioned due to low demands and quality issues. They can be commissioned anytime when the need arises.		requested of them on the availability of data.
Housing Subsidies	Xolani Dube	Department of Human Settlement	xolani.dube@dhs.gov.za	2010/05/03	Mr. Dube: information for three case studies on: amount of households that receive subsidies (of all sorts) in these areas, and the national protocol of housing delivery	2010/05/03	Response from Dube: I will forward your request to relevant people to assist you	Follow Up 08/09/2010	Follow up with Mr. Dube: first contacted May 3 2010, told that my inquiry would be sent to the relevant people but no contact from department (Department of Housing: Human Settlement – Library and knowledge Management)
Housing Subsidies			plengisi@sakhisizwe.gov.za	2010/04/07	How many houses within the Sakhisizwe Municipality receive Housing Subsidies? How many indigent Households are there in Cala?	2010/09/07	Follow up: First contacted on April 7, 2010 but received no response. As collection is now a matter of urgency please respond as soon as possible on the availability of the data		
Housing Subsidies	Request done through online request mail		info@stellenbosch.org	2010/04/07	How many houses within the Stellenbosch Municipality receive Housing Subsidies?	Follow Up 08/09/2010	Follow Up: Having received no response after contacting you on April 7th 2010, I would like to request a response regarding the availability of the number of indigent household data in Kayamandi data as this data is now a matter of urgency		

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
Health	Jacky Masemene		jacky.mesemene@gmail.com	2010/04/30	we require information on: a list of the facilities in the Western Cape (Stellenbosch Hospital; Stellenbosch Medi Clinic) and Gauteng (Leslie Williams Private Hospital; Carletonville Hospital) which you mentioned in order to extract the immunization data we are looking for		No Response		
Water Management	Allen Blanken-berg Glynn Sawyer Jaco Pretorius	Stellenbosch Municipality	allenb@stellenbosch.org glynns@stellenbosch.org iacop@stellenbosch.org	Correspondence 30/03/2010 and 29/04/2010	Request to Mr. Blanken-berg: amount of water that Kayamandi is billed for and the amount of water that they community receives. Document attached to Blacken-berg requesting, particularly for Kayamandi: LM Demand Management Strategy Document; Quantity of Water billed/# of people in LM; No. of households that supplement their water in LM; Quantity of source and quantity of water billed; Increase quality of drinking water; O&M Documents; Maintenance schedule; No. of employed at water treatment works. Mr. Blanken-berg	Follow Up 08/09/2010	Follow up to Mr. Blanken-berg: First contacted on March 30 2010 - response that request was forwarded to relevant personnel. Second correspondence April 29 2010 received notice that request was sent to Glynn Sawyer and Jaco Pretorius. Unfortunately no response has been received since from department of Water and Sanitation of Stellenbosch Municipality. Response from Jaco Pretorius: Sawyer and Pretorius are part of Credit Control section, dealing with customers owing Council money and the recovery of debt. Unable to provide details on Water consumptions, etc. as this info is managed by the Services department. Contact Mr. September Chief Accountant in Services Department (021.808.8532)	2010/09/10	Request to Mr. September: Referred by Jaco Pretorius who said you could assist in knowing the amount of water consumed by the community of Kayamandi and amount of water billed for.

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
					forwarded request (on 29/04/2010) for amount of water Kayamandi billed for vs. amount community receives to colleagues and asked for document requesting data. (Phone discussion: The O&M Manual was said to be too big to send so would have to be collected but it was discussed over the phone that the interest is in whether the document exists (meaning that there is effort of the responsible authorities towards the WTW's)).				
No. of Orphans	Bathembu Futshane	Department of Social Development	bathembuf@d.d.gov.za	2010/04/14	Request for data sets regarding the number of orphans and child headed households in case study areas or their local municipalities (LM).	2010/04/14	From Bathembu Futshane (Customer Care, Department of Social Development): The Department does not have a specific database as per your enquiry. Could you kindly specify precisely what it is that is sought by you and perhaps we could be of better assistance.		
Vulnerability Mapping	Larry Zietsman	Geographical Systems Research Bureau	lzietsman@gmail.com Tel: 0218871433	2010/04/09	Request to Mr. Zietsman: Information/data/models regarding instructions on how to map vulnerability. Especially that of Social vulnerability within the context of water resource management/access/services.	2010/04/09	Response from Mr. Zietsman: Vulnerability is a broad concept. Have a look at this website to get some information http://www.aiacproject.org/meetings/Trieste_02/trieste_cd/Vulnerability/Vulnerability.htm . Zietsman involved in work relating to Food Risk. Which was many years ago and recalls using mapping software developed specifically for that purpose, called		

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
							RiskMap, developed by either the UN World Food Programme or the UK Save the Children Fund. FEMA in the USA also has a RiskMap system, which is not what he is referring to.		
Urbanization and Social Vulnerability	Kenneth Sinclair-Smith	Cape Town Municipality	kenneth.sinclair-smith@capetown.gov.za	2010/04/06	To Mr. K. Sinclair-Smith: information on urbanisation trends in South African cities. And one of the members in our reference groups requested that we include urbanisation trends as part of vulnerability mapping. What are the processes taking place and are we able to produce a map demarcating/illustrating social vulnerability with the assistance of urbanisation trends of South African cities. If such a process can take place could you please direct me into which types of documents, journals, references I should use to study so that I may be able to attain such information/data, (or if possible – if you may have any at hand).	2010/04/07	From Ken: I don't have any readily available, however, Janet Gie may be able to assist if you ask her Dept deals more with this type of information. Perhaps you can let her know more specifically what you are looking for (See 'Urban Vulnerability Mapping')		

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
Urban Vulnerability Mapping	Janet Gie Senior Professional Officer (Strategic Information)	City of Cape Town	janet.gie@cape.gov.za Tel: 0214002526	2010/04/08	Request to Ms. Gie for contact of person that may assist in finding information/data pertaining to Urbanisation and its impacts on Social Vulnerability through its Water entities.	2010/04/09	Response from Ms. Gie: Our Department has not done any work on information/data pertaining to Urbanisation and its impacts on Social Vulnerability through its Water entities. My colleague suggested you check the following websites. Check the African Centre for Cities – http://africancentreforcities.net/TheSouthAfricanCitiesNetwork – http://www.sacities.net/ Stellenbosch University http://www.sun.ac.za/ (not sure who/which dept.), but definitely Prof. Larry Zietsman who was previously with USB		
Orphan, Single Parents, Teenage pregnancies	Feroza Mohideen		ferozam@statsa.gov.za	2010/03/26	Information for three case studies on: percentage of children that are orphaned; number of single parents (male and female); number or percentage of teenage pregnancies; number of families with four (4) of less children	Follow Up 09/04/2010	To Feroza Mohideen: forwarded information requested that I have not received from StatsSa. If possible, could you please assist me in attaining this information.		
Merafong – Housing Subsidies	Chris E Spies Manager: Corporate Communication and Marketing	Merafong City Local Municipality	cspies@merafong.gov.za TEL: (018) 788 9692 FAX: (018) 788 9529 Cell: 083 645 7986	2010/04/08	Request to Chris Spies: to be put in contact with any persons can assist with data on the number of households in Merafong that receive subsidised housing	2010/04/08	Response: request forwarded to relevant department. Revert back to me if you do not get a reply within a reasonable period.	2010/09/08	Follow up with Spies: No feedback since request was forwarded April 8 2010. Please respond as to availability of data/contact information.

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
Budget for Community Health Services	Mark Bolton (Chief Financial Officer) Adv Hanlie Linde (Director Community Services)	Stellenbosch Municipality	cfo@stellenbosch.org HanlieL@stellenbosch.org Linde: Tel: 021- 808 8023	2010/04/07	Request to Mr. Bolton for financial/budget allocation information: the amount of finances set aside for the Kayamandi community and their health services (clinics, hospitals, awareness programs, etc).	07/04/2010	From Mark Bolton (Chief Financial Officer): The functions referred to are dealt with by the District Municipality as health is a provincial function and done on an agency basis by the Cape Winelands Municipality.	Follow up 08/09/2010	Follow up with Mr. Bolton: Please reply with contact details of individuals within the Provincial Department that may be able to assist me with required information as it is a matter of urgency. 10/09/2010Response from Hanlie Linde: Received request from Mark Bolton to refer correct people within the Provincial Government dealing with Clinic, Health, etc. Primary Health Care is not a Municipal function anymore. The services were transferred to provincial Government more than three years ago. All clinics are managed by Denise Johnson (called she is in Monday). Her office is at the Provincial Hospital in Stellenbosch (021-8870310) and her cell number is 0724320798. The Superintendent of the Hospital is Dr Davids. They will be able to assist you with all queries regarding health services.

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
Stellenbosch Housing Subsidies			chaheda@stellbosch.org	2010/04/07	Request (having received email from Stellenbosch Municipality: How many houses within the Stellenbosch Municipality receive Housing Subsidies				
Sakhisizwe – Housing Subsidies			plengisi@sakhisizwe.gov.za	2010/04/07	Request re Sakhisizwe Municipality: How many houses within the Sakhisizwe Municipality receive Housing Subsidies?				
Literacy Levels	Phakedi Gaongalewe	Statistics South Africa	Pphakedig@statsa.gov.za	2010/03/05	Request for information on literacy levels of people in three case studies to StatsSa: Populations that can read, write, and/or speak English.	2010/04/06	Response: Please find attached data on language spoken. I cannot find the names in the EC area		
Employment and Unemployment		StatsSa	info@statsa.gov.za	2010/03/29	Request for information on three case studies regarding: Amount of unemployed people within study areas; Amount of people employed within study areas by which industry/occupation				
Children in need of Care	Ms. Louw	Western Cape Provincial Government	milouw@pgw.gov.za	2010/03/29	Request to Ms. Louw: the number of children that are in need of care and the number of orphans (all	Follow Up 08/09/2010	Follow up to Ms. Louw: first contacted on March 29 2010 but received no response from your department and data is matter of urgency. Response from Ms. Louw:		

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
					classifications) within the study area.		Does not have information required but will follow to up as to why response not received and revert back in next few days -week. Will try utmost to attain data.		
Immunization Data	Joseph Abrahams	-	abrahaj@health.gov.za Tel: 012 395 18054	2010/03/31	Request for information/data on three case studies: Immunization ranges within these study areas	Follow up 06/04/2010	As for requested information could you please respond with a possible time frame in which this information could be available	Follow up 08/09/2010	First contacted on March 31 2010 with no response and again as a follow up on April 6 2010 will no response. Regarding our previous discussions (see below), I still have not received any feedback from your department. As data collection is now a matter of urgency for the completion of this project, I would like to request a response regarding the availability of the data requested.
Immunization Data	Mohlapietse Maditsi Assistant Director Vital Registration , National Health Information System	Department of Health	MaditM@health.gov.za	2010/04/07	Request to Mohlapametse Maditsi: data on the number of people in community case study areas that have been immunised vaccinated and reported	2010/04/07	Response: must sign a Department of Health data user's agreement form from	Follow up 29/04/2010	Follow up to Mohlapametse Maditsi: Form sent in complete but reply not received. Request further clarification on the status of the data or the next step in attaining it. 07/09/2010 A follow up was made, still no reply has been given.

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
Immunization Data		Statistics South Africa	info@statsa.gov.za	2010/03/26	Request for data on the number of patients that have been immunised, vaccinated and reported cases of water borne diseases in three case study areas.				
People Receiving Grants	Silulami Budaza	SASSA: Manager	silulamib@sassa.gov.za bandilem@sassa.gov.za	2010/03/26	Request to SASSA: number of people living in three community case studies that receive child support, old age grant and/or disability grant.	Follow up 07/09/2010	Follow up to StatsSa: First contacted on March 26 2010 but received no feedback from department. Response requested as to availability of data as collection is now an urgent matter for project completion.		
Merafong Water Consumption	N. Ngoma Debtors Supervisor, Rand Water, Water Service Provider to Merafong	Randwater	nngoma@randwater.co.za	03/24/2010	Ms. Ngoma: The amount of water that Merafong Local Municipality consumes per month; the amount that the municipality is billed for, as although they may consume (e.g.) 7000L they may only be billed for 1000L.	Follow Up 08/0/2010	Follow up to Ms. Ngoma: First contacted March 24 2010 but have received no feedback from the Financial Department. Request for response regarding availability of data		
Aerial Photography	Marise Bronkhorst	Principal Archivist	mbronkhorst@ogwc.gov.za Tel: 0214668120	2010/03/09	Request to Ms. Bronkhorst: aerial photographs of Kayamandi (Stellenbosch) since the squatter settlement has been established.	2010/03/15	Response: The Western Cape Archives do not have aerial photographs of the squatter settlement at Kayamandi in its possession.		
Social Grants		Statistics South Africa	info@statsa.gov.za	2010/03/09	Community/town level data on: Social Dependence (Child, Old age and Disability Grants); Employment status; Occupation;				

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
					Race, Gender, Age and Population Distribution.				
Kayamandi Tenure Status	Megan Bosch	Western Cape Provincial Government	mbosch@pgwcc.gov.za	2010/03/09	Ms M. Bosch: data about the Tenure Status of certain settlements within South Africa for Kayamandi. Tenure status of the housing settlement Kayamandi (owned and fully paid off; owned but not yet paid off; rented; occupy living space rent free; other tenure; unspecified).	Follow Up 08/09/2010 Response 10/09/2010	Follow up to Ms. Bosch: first contacted you on 9th March 2010 and was given no response from your department and data collection is now an urgent matter. -Telephone conversation (said that Provincial Government does not deal with admin-related queries referred to. Called Jenny at Stellenbosch Municipality and will forward request. She will respond with relevant persons who can assist). Request: Sorry to disturb you again. But could you please give me Jenny's contact details so that I may be able to follow up with her if data or contact hasn't been made. Thank you for your assistance		
Education Levels	Kenneth Chatindiara	Senior Information Officer	kennethc@statssa.gov.za	2010/03/05	Request to Kenneth after phone conversation: level of education, gender and population groups in three community case studies. Number of individuals at tertiary education, secondary education, primary education and individuals that have not received any form of education.	2010/03/05	Response from Mr. Chatindiara: Please find the attached table which shows the highest levels of education per population group per gender in the mentioned areas. Your request number is REQ-11858-8P6187		

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
Water Supply Infrastructure	Derril Daniels	Assistant Director: Water Affaires	derril@dwaf.gov.za v.za Tel: 0219507267	2010/03/04	Request to Mr. Daniels: prevalence of certain types of water supply infrastructure in Kayamandi. Piped inside dwelling; Piped inside yard; Piped water from access point outside yard Borehole; Spring; Dam/pool; River/stream; Water vendor; Rain water tank; Other	2010/03/04	Response: The Departmental role as a Regulator is only to oversee that things are in place and that Municipalities are being monitored, and they report back on their Projects. Legislation requires all municipalities to have a WSDP that addresses most of these issues as you have highlighted. I might be able to assist you with some of the items However, I would advise you to engage directly with the Stellenbosch Municipality.		
Dwelling Types	Victor Rajkumar Director: Analysis	Department of Housing Settlements: Housing Atlas	victor.rajkumar@dhs.gov.za	2010/03/04	Request to Mr. Rajkumar for statistics regarding "dwelling types" in three community case studies. Information on: Dwelling Types (House on separate stand; traditional dwelling; Flat in block of flats; Town/cluster/semi-detached houses; Unit in retirement village; House/flat/room in backyard; Informal dwelling/shack in backyard; Informal dwelling/shack elsewhere; Room/flatlet on shared property; Caravan/tent; None/homeless; Other; Unspecified	Follow Up 08/09/2010	Follow up Mr. Rajkumar: last contacted on March 2 2010 but received no response and now a matter of urgency.	2010/09/08	From Rajkumar: Unsure of what is meant by "National Protocol of housing delivery. Request for confirmation of credentials due to use of g.mail account (response was to give contact details of director at Umvoto Africa as interns are not given company emails). Only received this request today, checking if information is available at this level of detail, otherwise the best source would be the respective municipalities, which you should then approach directly. You will receive a response based on what information is available in the National

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
									Department before the end of business tomorrow.
Water Supply and Dwelling Types		Statistics South Africa	info@statsa.gov.za	2010/03/04	Request to StatsSa: statistics regarding "water supply" and "dwelling types" within Kayamandi, Stellenbosch. Water Supply, Dwelling Types				
Waste sites	Musa Maringa	Dept: Environmental Affairs	mmaringa@dept.gov.za	2010/05/04	Request (having been directed by the Institute of Waste Management of Southern Africa. For three case studies inquiry is: Does the South African Waste Information Centre have any information about the landfills that are within those Local Municipalities? If so: do these landfills have an operations and maintenance document that is readily available? Can you account for the number of employees each landfill within the Local Municipality has? Do these landfills meet the minimum DWA minimum requirements/standards? If not: what	2010/05/06	Response from Mr. Maringa: For the Western Cape site, please go to www.ipwis.gov.za or contact Mr. August Hoon at 021 483 2712 (just ringing right now). The other two site you can filter them and check if they are registered in our system at www.sawic.org.za and www.cr.org.za , you will also get the contact details of these site so that you can ask them about their operations and maintenance documents and the number of employees of those sites. They should be also able to tell you their license conditions in terms of DWA min requirements.		

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
					information, about those landfills, in those municipalities is readily available from SAWIC? Do you have any suggestions about how to request this information?				
Health (number of hospitals in Gauteng and locations)	Patricia Mokoena	Department of Health, Gauteng Government	patricia.mokoena@gauteng.gov.za	2010/03/08	Request to Ms. Mokoena: assistance in finding the number of registered hospitals and clinics within the Gauteng Province and their locations, in order to define the number of registered hospitals and clinics within municipality, local municipality and towns within the Gauteng Province, namely Carletonville.	Follow Up 08/09/2010	Follow up to Ms. Mokoena: First contacted March 8 2010 but given no response by Department of Health (Gauteng Provincial Government)		
Health (location of hospitals)	Faiza Steyn and K.B. Lowenherz Lowenherz: Professional Support	Department of Health Western Cape Provincial Government	klowenhe@pg.wc.gov.za Tel + 27 21 483 8702 Fax + 27 21 483 6155	2010/03/08	Request to Ms. Steyn: Number of registered hospitals and clinics within the Western Cape and their locations (in order to define the number of registered	08/03/2010	Response from Kim for clarification if the request was for public or private facilities in the Western Cape. Reply to forward both public/government aided facilities and private. Clarification that aims to establish what distances rural community	2010/09/08	To Lowerherz: first contacted on 8 March 2010 and clarified information and requesting list of public/government aided and private health care

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
	Services,				hospitals and clinics within a given district, municipality, local municipality, and towns - primarily Cala). Forwarded by Steyn to K.B. Lowenherz and Paul.		population must go in order to find health care.		facilities (hospitals and clinics). Received no response after that and data is a matter of urgency. I first contacted you on 8th March 2010 and was told that I needed to respond to you with exactly what kind of information I was looking for.
Water Consumption Kayamandi - amount billed	Mr. September Administration	Stellenbosch Municipality	elies@stellenbosch.org	10/0/2010	referred to you by Jaco Pretorius as he mentioned that you may assist us regarding the following inquiry: We would like to know the amount of water that is consumed by the community of Kayamandi, and the amount of water that they are billed for	2010/09/10			
General Info for all provinces	Ms Kelebogile Olifant Information Officer	Statistics South Africa	kelebogileo@stats.gov.za Tel: (012) 310-8600/8095 Fax: (012) 310-8500	2010/03/09	Request to Ms Olifant regarding -Household income - housing tenure status - Sanitation - Refuse removal - Level of education - Dwelling type - Social Dependence (child, old age, and disability grants only) - Employment status - Occupation - Water supply &	2010/03/11	Response by Ms Olifant contained the following information: Toilet Facilities, access to water, age and sex of population, age of population, dwelling types, education levels, employment status, household income, occupation, population group, population, refuse removal, sex, social grants, tenure status.	2010/10/09	Request to Ms Olifant: The availability of community level data regarding household's income, occupation, refuse removal, social grants and tenure status. 15/09/2010Response from Ms Olifant: stating that in future it should only use

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
					- Gender, Race, Age and Population distribution				info@statssa.gov.za so that someone can attend to the request if information officers are not available. Data sent: Household Income, dwelling types & tenure status, household size (Community level) occupation, population, refuse disposal, and social grants.
Orphan, SingleParents, Teenage pregnancies	Ms Kelebogile Olifant Information Officer	Statistics South Africa	kelebogileo@statssa.gov.za Tel: (012) 310-8600/8095 Fax: (012) 310-8500	2010/03/26	Request Data and information relating to all categories of orphans, teenage pregnancies and Family Size.	2010/04/09	Response from Ms. Olifant: Thank you for this request, find attached information on number of children with mother and father alive, marital status and the household size, however the information as requested is unfortunately not available. This information contained: Mother Alive, Father Alive, Mother and Father Alive, Household Size and Marital Status of Case Study areas.		
Water Consumption and Amount – Merafong Municipality	Noluthando Ngoma Debtors Department : Finance Division: Debtors Supervisor	Rand Water	nngoma@randwater.co.za Tel: (011) 6820885	2010/08/09	Requested Data/Information about water Consumption in Merafong Municipality	28/09/2010	Responded with Files attached: 1) The Consumption billed per month for Merafong LM from August 2009 to August 2010. 2) Billed in Rand Value from August 2009 to August 2010		

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
Vocational and Adult Education Training	Bernedette Baily	Centre Management	Tel: 0233427633	2010/11/10	Requested Information with regards to the location of Vocational and Adult Education Training facilities within the Cape Winelands Education district. She then responded that she would need time to gather all the relevant information and would hopefully return to my inquiry on Friday (i.e. 2010/10/12)				
New Housing Developments	Lester van Stavel	New Housing Management	lesters@stellenbosch.org Tel: 0218088462.	2010/11/11	Requested a meeting to gain insight on processes and procedures with regards to new housing developments and planning within Kayamandi. Still awaiting response to meeting (time and date)				

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
Kayamandi Health Information	Craig Knight	Directorate, Information Management	cknight@bgwc.gov.za Tel: 0214833876	2010/10/19	Requested information regarding health data and services within Kayamandi with regards to budget and death during disasters as well on a 'Request for information form'	Response 2010/10/25	Mr C. Knight confirms that he has received the request form and will attend to the matter.	Response 2010/11/17	Response from Mr. Knight: I attach a document received from our Cape Winelands District for your further attention. Please note that in terms of item 1(d), I have been advised by our Emergency Medical Services that the following is in place in Stellenbosch: 3 ambulances, a response vehicle and a rescue vehicle. The Health Department does not have statistics for orphans and I recommend that you contact the local offices of the Department of Social Development. Should you have any further enquiries please contact me. Regards Craig Knight" with an attached document – see: P:\753 WRC Social Vulnerability\Data WINSTON\Case Studies\Kayamandi-Town – Access to information Health.doc

APPENDIX 9: Data Collection – Telephone and Email Correspondence

Data	Person	Company	Contact Information	Date	Request	Date	Response/Follow up	Date	Response/Follow up
Kayamandi Health Information	Ms. Denise Johnson PHC Manager:	Stellenbosch Municipality	denjohns@pgw.c.gov.za Tel: 0218870310	2010/11/06	This was a follow up mail from previous emails that we (Paula Hay & Winston Harris) sent to her on 2010/10/16 and telephonic interaction that took place prior to these emails. These emails request information regarding health of residents information within Kayamandi	Response 2010/11/16	Response from Ms. Johnson: Ms Marvinna Johnson from our district office is handling your case. Information has been forwarded to her. You will thus hear shortly from the relevant official. Thanks for your patience. Denise"		

APPENDIX 10

CRITERIA FOR SCORING INDICATORS OF SELECTED KEY OUTCOMES and STATEMENTS OF INTENT

APPENDIX 10: Scoring Criteria

Key Outcome 1 Scoring Template

KEY OUTCOME 1: Identify and Monitor Hazards					
Statement of Intent: Identify hazards linked to water and its infrastructure and research hazard impacts on people and their livelihood					
Indicator	5	4	3	2	1
Document or database of existing hazards and hazard impacts at the LM level	A comprehensive geographical information system on hazards and areas at risk exists; it is regularly updated with high quality and high resolution. Consideration of both man-made and natural hazards	Processes for data collection and dissemination are in place for all hazards and shortcomings being addressed. Database of areas at risk has adequate information incorporating man-made hazard assessment; no geographical information system in place but the database regularly updated; the quality and information resolution may still be improved.	Incomplete of hazard database exists with irregular updating; persistent and some significant problems with quality and information resolution and little awareness of all data needed.	Ongoing efforts to build the first comprehensive database on areas at risk (hazard maps) and impacts but updating of the information not yet considered; problems with quality and information resolution.	No hazard research or only fragmentary and incomplete research and based on historical records alone.
Statement of intent: Develop Early Warning Systems					
Indicator	5	4	3	2	1
Protocol for implementing Early Warning Systems (EWS) at the LM level	A protocol for implementing an EWS for prioritized hazards exists at LM level and is effectively implemented at town/settlements level.	The IDP sets out a basic framework for early warning for prioritized hazards, a protocol exists at LM level and plans to extend to and implement at town/settlement level. .	The IDP sets out a basic framework for early warning for prioritized hazards and a protocol for implementation at LM level. .	The IDP sets out a basic framework for early warning for prioritized hazards and some initiative to formulate protocol at LM level.	The IDP sets out a basic framework for early warning for prioritized hazards but Early Warning not referred to in municipal plans and no initiatives for formulating a protocol
Indicator	5	4	3	2	1

APPENDIX 10: Scoring Criteria

KEY OUTCOME 1: Identify and Monitor Hazards					
Early warning monitoring system	A protocol is in place to monitor effective response time between different levels of responsibility and improvements routinely undertaken. Plans and commitments are publicized	Processes for monitoring effective response time in place for all hazards and a protocol is being formulated.	Systematic commitment to monitoring early warning response time but no protocol being formulated.	Some monitoring of early warning systems but done in ad hoc way. Plans to improve monitoring activities but no protocol being formulated	No systems are in place to monitor early warning systems and effective response time. Little awareness of the need to formulate a protocol.
Statement of Intent: Implement monitoring of hazards					
Indicator	5	4	3	2	1
Monitoring protocol in place	A protocol is in place to monitor, archive and disseminated data on key hazards and vulnerabilities, with evaluation, analysis and improvements being routinely undertaken. Plans and commitments are publicized	Processes for data collection, dissemination, and monitoring are in place for all hazards and a protocol is being formulated.	Systematic commitment to collecting and archiving data, monitoring hazards but no protocol being formulated.	Some hazard data collection and analysis has been done in an ad hoc way. Plans to improve monitoring activities but no protocol being formulated.	No systems are in place to collect, archive and disseminate data on prioritized hazard(s) or vulnerability to them. There is an awareness of the need to develop these systems.

Key Outcome 2 Scoring Template

KEY OUTCOME 2: Reduce Vulnerability through Infrastructure					
Statement of Intent: Develop Disaster Risk Reduction Strategies					
Indicator	5	4	3	2	1
Disaster Risk Reduction Strategy in place at LM level	Broad DRR strategy implemented with good technical quality plans at all levels (national, provincial, DM, LM) with the participation of participating development bodies	DRR strategy formulated with cooperation of development partners but technical; National and provincial activities, some at DM but no area specific strategy at LM level and no routine evaluation/update.	DRR strategy in process of being formulated with the incorporation of multi-sectoral development instruments and plans at some level are formulated but with no evaluation or update.	Initiatives to formulate a DRR strategy at the LM level but the process is not underway.	The IDP refers to a broad DRR/DRM strategy but there are no initiatives to make it relevant at LM level.
Statement of Intent: Develop Disaster Management Plans					
Indicator	5	4	3	2	1
Disaster Management Plans in place at DM level and implemented at LM level	Broad Disaster Management plan for prioritized hazards at DM level and implemented with good technical quality plans at all levels, with the participation of development partners	Disaster Management plans for prioritized hazard at DM level in cooperation with LM levels and development partners. Technical plans at LM and settlement level need improvement, limited implementation.	Disaster Management plans in process to being formulated with the incorporation of multi-sectoral development instruments and plans at some level are formulated but with no evaluation or update	Disaster management referred to in national and municipal plans or sectoral policies and there are initiatives for formulating a strategy	DM disaster management plans is in at provincial but limited at DM level
Statement of Intent: Improve access to water and water conservation and demand management (drought and water supply)					
Indicator	5	4	3	2	1

APPENDIX 10: Scoring Criteria

KEY OUTCOME 2: Reduce Vulnerability through Infrastructure					
Demand management and conservation strategy in place	WCDM strategy in place at DM and LM level with good technical plans in place at DM level and below; monitoring of WCDM occurs at LM level and outreach to settlement level. In place	Demand Management and Conservation Strategy formalized at DM and LM level and implemented; initiatives to implement at settlement level and to improve assurance of supply.	Demand Management and Conservation Strategy and implemented; no monitoring or losses and limited political will for pre-emptive restrictions or initiation of measures to improve assurance of supply.	The importance of formulating a WCDM strategy is described in the DM/WSA plans; current plan but limited implementation and monitoring at LM level conservation referred to in national and municipal plans or sectoral policies and there are initiatives for formulating a strategy	The importance of formulating a WCDM strategy is described in the DM/WSA plans but there is no initiative to formulate a strategy. No monitoring of losses in place.
Statement of Intent: Improve access to water/water conservation and demand management (drought and water supply) (cont.)					
Indicator	1	2	3	4	5
% of people with water systems in their homes	80-100%	60-79%	40-59%	20-39%	0-19%
Statement of Intent: Improve quality of drinking water					
Indicator	5 (95-100%)	4 (60-95%)	3 (50-60%)	2 (33.3-50%)	1 (>33.3%)

APPENDIX 10: Scoring Criteria

KEY OUTCOME 2: Reduce Vulnerability through Infrastructure

Water treatment works meet Blue Drop minimum requirements	Complies with 95-100% of Blue Drop requirements. Either sufficient information is available or will be available to support the scoring, at which point the Blue Drop Certification will be acknowledged. DWAF has confidence in the management ability of water services institutions involved in treating, monitoring and managing drinking water in the specific water supply system and will act responsibly when deviation in tap water quality is detected through efficient operational and compliance monitoring.	Good systems are in place to effectively manage the quality of drinking water in this specific supply zone. However, there are shortcomings, which prevent it from becoming a Blue Drop Certified system. There is proof that the municipality/institution has adequate processes in place to ensure water supply.	The municipality/institution has an average level of ability and understanding to manage DWQ according to most the regulatory criteria. However this is not sufficient to ensure full confidence from DWAF in the ability of the systems and those responsible for DWQ management.	While the municipality/institution might still be in the position to provide safe drinking water most of the time, DWAF has a lower level of confidence in the ability to sustain the provision of safe water. There is a concerted effort required to improve in the various areas of DWQ management to ensure the public's confidence in the quality of safe water supply at all times.	Inadequate DWQ management (probably including monitoring, treatment and planning) efficiency levels. Urgent intervention is required by the municipal/institutional management to ensure drastic improvement towards the point where the public and DWAF could have confidence in the manner DWQ is being managed. At the current level of performance an extreme low level of confidence would prevail.
Statement of Intent: Improve dwelling standards					
Indicator	5	4	3	2	1
Building codes in place at national level and protocol for monitoring dwelling standards in place at the LM level with effective implementation at the community/settlement level	Comprehensive building codes exist at national level. A protocol for monitoring dwelling standards based on national codes adapted to local conditions exist at the LM level and is effectively implemented at town/settlement level.	Comprehensive building codes exist at national level. Processes for monitoring dwelling standards at the town/settlement level based on national codes exist and a protocol for monitoring dwelling standards is being formulated at the LM level.	Comprehensive building codes exist at national level. Processes for monitoring dwelling standards at the town/settlement level based on national codes exist and there is a push to formulate a protocol at the LM level.	Comprehensive building codes exist at national level. Processes for monitoring dwelling standards at the town/settlement level based on national codes exist. A protocol for monitoring dwelling standards based on these codes is considered important but there is little initiative to develop at the LM level.	Comprehensive building codes exist at national level. Processes for monitoring dwelling standards at the town/settlement level based on national codes exist but a protocol for monitoring dwelling standards is not considered important and there is little initiative to develop this at the LM level.
Statement of Intent: Improve dwelling standards (cont.)					
Indicator	1	2	3	4	5

APPENDIX 10: Scoring Criteria

KEY OUTCOME 2: Reduce Vulnerability through Infrastructure					
Number of homeless people and shack dwellers	0-3%	4-6%	7-9%	10-12%	13+%
Statement of Intent: Improve Sanitation and or WWTW and operations and maintenance thereof					
Indicator	1	2	3	4	5
% of people with at least VIP level sanitation	80-100%	60-79%	40-59%	20-39%	0-19%
Indicator	5 (>95%)	4 (75-95%)	3 (50-75%)	2 (25-50%)	1 (<25%)
Waste water treatment works meet Green Drop minimum requirements	Complies with 95-100% of Green Drop requirements and Green Drop Certification is acknowledged. DWA has confidence in the management ability of water services institutions involved in treating, monitoring and managing waste water in the specific water supply system.	Good systems are in place to effectively manage the quality of waste water discharge in this area. However, there are shortcomings, which prevent it from becoming a Green Drop Certified system. There is proof that the municipality/institution has adequate processes in place to ensure adequate waste water treatment.	The municipality/institution has an average level of ability and understanding to manage the waste water quality according to most of the regulatory criteria. However this is not sufficient to ensure full confidence from DWA in the ability of the systems and those responsible for WWTW management.	While the municipality/institution might still be in the position to treat their effluent to an acceptable standard most of the time, DWA has a lower level of confidence in the ability to sustain this quality. There is a concerted effort required to improve in the various areas of WWTW management.	None or inadequate waste water quality management (probably including monitoring, treatment and planning) efficiency levels. Urgent intervention is required by the municipal/institutional management to ensure drastic improvement towards the point where the public and DWA could have confidence in the manner waste water is being managed. At the current level of performance an extreme low level of confidence would prevail.

Key Outcome 3 Scoring Template

KEY OUTCOME 3: Reduce Vulnerability and Increase Coping Capacity through Social Elements					
Statement of Intent: Improve availability of education to people of all ages					
Indicator	1	2	3	4	5
Literacy rates	80-100%	60-79%	40-59%	20-39%	0-19%
% of people who have complete grade 7 and higher	80-100%	60-79%	40-59%	20-39%	0-19%
% of people who have completed grade 12 and higher	80-100%	60-79%	40-59%	20-39%	0-19%
% of people who have completed tertiary education	28% +	21-27%	14-20%	7-13%	0-6%
Unemployment rates	0-4%	5-9%	10-14%	15-19%	20+%
Statement of Intent: Empower women to empower themselves					
Indicator	1	2	3	4	5
Female employment vs. males per sector groups (Group 1: Legislators, senior officials and managers; Professionals; Technicians and associate professionals; Group 2: Clerks; Service workers; Shop and market sales workers; Group 3: Skilled agricultural and fishery workers; Craft and related trades workers; Plant and machine operators and assemblers; Group 4: Elementary occupations)	50%+	40-49%	30-39%	20-29%	0-19%

APPENDIX 10: Scoring Criteria

KEY OUTCOME 3: Reduce Vulnerability and Increase Coping Capacity through Social Elements				
Women's highest level of education as Grade 7 and more	80-100%	60-79%	40-59%	20-39%
Statement of Intent: Improve socio-economic situation				
Indicator	1	2	3	4
Dependency ratio	1:1	1:2	1:3	1:4
% of people on/below the poverty line	0-5%	6-20%	21-35%	36-50%
% of people on/below the extreme poverty line	0-3%	4-7%	8-11%	12-15%
Statement of Intent: Establish community support systems				
Indicator	5	4	3	2
Existence of and number of community run projects	Community projects exist, the community perceives the benefits of their work, and they target a range of vulnerable groups (women, children, elderly, HIV/AIDS infected, unemployed)	Community projects exist and the community perceives the benefits but many vulnerable groups are excluded.	Community projects exist and target several groups but the community is relatively unaware of their work/benefits.	Community projects exist but target few groups and are not well known at the community level
Statement of Intent: Improve Security of Tenure				
Indicator	5	4	3	2
Policies on land ownership exist which make reference to gender equality	A policy on land ownership exists and makes reference to gender equality	A policy on land ownership exists and revisions are being made to include gender equality	Policy on land ownership exists but no reference to gender equality is made	A policy on land ownership is in the process of being formulated but there is no initiative to make reference gender
				1
				Discussion underway about security of tenure, management of common land and rights of women to land. No policies on land ownership exist

APPENDIX 11

SOURCES OF SCORING: INTERNATIONAL AND NATIONAL TARGETS, BLUE AND GREEN DROP REQUIREMENTS

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APPENDIX 11A: Scoring for Key Outcome 2 and 3: International and National Targets

Key Indicators	International Target	Source
Increase in % of people with water systems in their homes	Ensure that all communities have access to potable water.	The 1994 White Paper on Housing Policy and Strategy lays out government aims that all South Africans will have access to a permanent residential structure with secure tenure and potable water, and adequate sanitary facilities and domestic electricity supply.
Increase in % of people with at least VIP level sanitation	Ensure all communities have access to at least VIP level sanitation	1995 Draft White Paper on Sanitation stipulates that a basic level of sanitation is the VIP latrine and the provision of this basic level is the first step in meeting basic functional, health and environmental requirements.
Increase in literacy rates	Literacy rate of 90%	National goal to reduce the illiteracy rate by 50% by 2015 in line with the EFA goals set in Dakar in 2000. Illiteracy rate in South Africa is approximately 18% (adults over 15 years of age). South Africa has 9.6 million adult illiterate people and has committed R6.1 billion to a mass adult literacy campaign to run from 2008 to 2012. In particular the goal is to target women and provide equitable access to basic and continuing education for all adults. The literacy rate in some provinces (i.e. 58% in the Eastern Cape scoring gives a 40-60% a medium score, and 20-0% illiteracy (80-100% literacy) as a low vulnerability.
Decrease unemployment	12.5-13% unemployment	National aim to halve unemployment by 2014. The unemployment rate for South Africa is 25.2%. Still, unemployment would be considered high. The combined unemployment and underemployment in less developed countries is 30% and 4-12% in developed countries. The global unemployment average in 2009 was 8.7%. Rate of 12-13%, is still considered relatively high and the ultimate target will be much lower. The 13% target is used as a baseline for a vulnerability ranking of 3 (medium), while 0-4% signifies the long-term target for very low vulnerability ranking.
Increase in education enrolment (Targets for education enrolment are applied specifically to female education)	Primary education: 100% enrolment	The scoring for primary education is based on Millennium Development Goal (MDG) 2: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling. As the data only gives the highest level attained by community members above age 20 years, it should be considered that if a community has a high percentage of students that have a level of education less than Grade 7, the level of primary education within the community would be considered as quite low – as basic education in essence would be regarded as the completion of Grade 7.
	Secondary Education: 95% enrolment	There is a national view to expanding access to secondary education with a view to increasing enrolment rates to 95% by 2014 as well as addressing gender disparities. Attainment of Secondary Education shows that a certain percentage of the community has gained basic education, but with an increased percentage of the community that have not graduated with Grade 12 – it would be considered that the national view is yet to be accomplished.

APPENDIX 11A: Scoring for Key Outcome 2 and 3: International and National Targets

Key Indicators	International Target	Source
	Higher education: 20% participation rate	Since 2008, the Higher Education South Africa (HESA) target for higher education has been to achieve a 20% participation rate in higher education by 2016. On this basis 21-27% enrolment in higher education at the local level constitutes low vulnerability.
Decrease in no. of people below poverty line	Poverty rate of 25%	There is currently a national aim to halve poverty by 2014 to approximately 25%. Statistics South Africa has estimated that according to the consumption of foodstuff among low-income South Africans, it will cost R211 per month to sustain one person with the daily energy requirement of 2261 kilocalories (according to 2000 Income and Expenditure Survey data and 2000 prices). Poor households often spend most of their income on food, which is then taken as a national poverty line. However, food expenditure should be coupled with the other goods needed to meet basic needs (shelter, electricity, clothing, children's school fees, transport and medical services, etc.). Statistics South Africa has attempted to estimate the non-food component of the poverty line. Based on the assumption that households may forego spending on food to acquire essential non-food items, the cost of these items is estimated at R111 per month. Adding R211 and R111 gives an estimate of the minimum cost for essential food and non-food consumption per person per month, giving a poverty line of R322 according to 2000 prices (giving a per capita income of 1290 for a household of 4). According to 2006 prices, the minimum income necessary to sustain a household of 4 people is R431, equating to R1724 per month per household. The percentage of South Africans living on less than a 2007 benchmark of R462 was around 48% in 2005. The country aims to halve poverty by 2014. This gives the ranking of 25%-50% being in the medium to high vulnerability range. For the purposes of this study (as data is displayed according to a R1600 poverty line), the scoring will be according to R1600 per capita per month).
Decrease in no. Of people below extreme poverty line	R 648 per month	Extreme poverty lines can indicate movement in and out extreme poverty for households around the poverty line and the experience of chronic or severe deprivation. In terms of extreme poverty, the international comparison measure of US\$2 is used, making extreme poverty an equivalent of R162 per month. Income is given per household. Average household size is 4 persons and therefore the extreme poverty line is estimated at 648 per month per household, according to 2005 price estimates. As data used in this study is displayed with R400-R800 grouping, R800 is used as the extreme poverty line for the purposes of this study.
Decrease in no. Shack dwellers and homeless people	No homeless people by 2014.	The 1994 White Paper on Housing Policy and Strategy lays out government aims that all South Africans will have access to a permanent residential structure with secure tenure and potable water, and adequate sanitary facilities and domestic electricity supply. In 2004, the government unveiled a scheme to replace all informal settlements with low-cost housing by 2014. The new target is to have no homeless people by 2030. In his April 2010 address to the National Assembly, Tokyo Sexwale, Minister of Human Settlements stated that currently the housing backlog can only be cleared at a rate of ten percent per annum. Approximately 15% of the population lives in shacks nationally, leading to a vulnerability score of 5 for 13% or higher.

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Blue Drop Report-card Scoring Criteria

Criteria (& weighting)	Score	Symbol	Description	Requirements (& secondary weighting)
Water Safety Plan (5%)	100%	A	Complies 100% with the set criteria	1. A Risk Assessment (on the basis of the Water Safety Plan concept) must have been done, covering all areas of responsibility (from catchment to consumer) (30%) 2. The Water Safety Plan must detail roles and responsibilities, deadlines for management activities, and Management's commitment to fund implementation (30%) 3. Proof had to be presented on how findings of the Risk Assessment influenced the monitoring programme. It must also indicate plans for security improvement (40%)
	80% - < 100%	B	Partially complies, yet very good performance recorded	
	60% - < 80%	C	Possible outstanding issues noted, e.g. Managerial Commitment for implementation of safety plan not obtained; Risk Assessment lacking comprehensive element, etc	
	45% - < 60%	E	Water Safety Plan in place but requires significant improvement. Could also be that plan is not informing the monitoring programme	
	30% - < 45%	F	Risk Assessment done or effort noted to get a Water Safety Plan in place, yet far from the required standard	
	0% - < 30%	G	Not complying. No Water Safety Plan- implying DWQ related risks of this specific water supply system are not managed at all	
Process Control and Maintenance Competency (10%)	95% - 100%	A	Complies with all requirements	1. Treatment works complying with Regulation 2834 of Water Act. in terms of Classification and Registration (20%) 2. Process Controllers complies with skills requirements of Regulation 2834 of Water Act (40%) 3. Availability of skilled maintenance skills (10%) 4. Operations and Maintenance manual is in place (30%)
	80% - < 95%	B	Complies with all requirements except for 1	
	70% - < 80%	C	Not complying with 2 Requirements	
	50% - < 70%	D	Not complying with criteria No. 2 or complying with No.2 and none of the other	
	30% - < 50%	E	Not complying with criteria No. 1 & 2 or No. 2 & 4	
	12% - < 30%	F	Not complying with the majority of the requirements	
	0% - < 12% (& no info)	G	Not complying with any of the requirements or the complete lack of info	
Efficiency of Drinking Water Quality Monitoring Programme (15%)	90% - 100%	A	Complies with all requirements	1. Operational monitoring efficiency (20%) 2. Compliance monitoring efficiency (40%) 3. Adequate monitoring coverage or distribution network (20%) 4. Number of key analyses (e.g. E. coli) per population served (regulatory yardstick is a minimum of 1:10 000) (20%)
	70% - < 90%	B	Complies with all requirements except for 1	
	60% - < 70%	C	Not complying with requirement No. 2 and another requirement; Or not complying with any other 3 requirements	
	50% - < 60%	D	Only complying with Requirement No. 2 or any other 2 criteria	
	40% - < 50%	E	Not complying with majority of the criteria. Only complying with one requirement	
	10% - < 40%	F	Not complying with majority of the criteria. Only complying with a portion of a single requirement.	
	0% - < 10% (& no info)	G	Not complying with any of the requirements or the complete lack of info	

APPENDIX 11B: Scoring – Blue Drop Requirements

Criteria (& weighting)	Score	Symbol	Description	Requirements (& secondary weighting)
Credibility of Drinking Water Sample Analysis (5%)	100%	A	Fully complies with all requirements	1. Proof to be provided of the laboratory used (10) 2. Laboratory is either accredited or participates in an accredited Proficiency Scheme (obtaining an acceptable Z-score) (50) 3. Proof that analysis results are used to improve process controlling (30) 4. DWQ Data is fully verifiable on the Blue Drop System (BDS) (10)
	80% - < 100%	B	Complies with all requirements except for Requirement No.1	
	60% - < 80%	C	Complies with all requirements except for Requirement No.3	
	50% - < 60%	D	Not complying with Requirement No.2; Or not complying with Requirements 1 & 2	
	40% - < 50%	E	Only complying with Requirement No. 3	
	10% - 40%	F	Only complying with Requirement No.1	
	0% (& no info)	G	Not complying with any of the requirements or the complete lack of info	
Regular Submission of Drinking Water Quality Results to DWA (5%)	100% (12months)	A	Fully complied with criterion	1. Results must be submitted 12 months a year (100)
	0% (0 months)	G	No data submitted	
Drinking Water Compliance with the South African National Standard (SANS 241) (30%)	100%	A	Fully complies with the criteria	1. Provided adequate figures/information on monitoring data for compliance calculation (20%) 2. Complies with more than 99% of key micro bacteriological limits and more than 95% of key chemical limits (80%) <i>Penalties were introduced to ensure that inadequate sampling and DWQ results submission are taken into account as situations that could portray in inaccurate positive compliance.</i>
	80% – < 100%	B	Complying but penalty applied due to either lack of system specific data or irregular submission of data	
	60% - <80%	C	Complies with more than 99% of key micro bacteriological limits and more than 95% of key chemical limits but could not provide sufficient monitoring information	
	40% – < 50%	E	Provided sufficient monitoring information but did not comply with excellence limits of SANS 241	
	0% (& no info)	G	Did not comply with both sub-criteria or failed to submit sufficient data for assessment purposes	
Drinking Water Quality Failure Response Management (15%)	100%	A	Fully complies with the criteria	1. Proof provided of a Drinking Water Incident Management Protocol (45%) 2. Proof of Implementation - DWQ Failure Incident register (55%)
	60% - <80%	C	Have evidence to proof incident management control, but has no documented protocol	
	40% – < 50%	E	Has a documented protocol in place but not evidence to proof implementation	
	0% (& no info)	G	No complying with criteria or failed to submit sufficient information for assessment purposes	

APPENDIX 11B: Scoring – Blue Drop Requirements

Criteria (& weighting)	Score	Symbol	Description	Requirements (& secondary weighting)
Responsible Publication of DWQ Management Performance (5%)	100%	A	Fully Complies with Criteria	1. Annual Publication of DWQ Management performance (50%) 2. Evidence to be provided that wider audiences reached through the communication means (50%)
	85% - < 100%	B	Publishing some DWQ information but not fully accessible	
	75% - < 85%	C	Electronic means of communication but not accessible to all	
	50% - < 75%	D	Some form of making information available but not according to the expected norm	
	0% (& no info)	G	Not complying	
Efficacy of basic DWQ Asset Management (10%)	100%	A	Fully complies with Criteria	1. An annual Process Audit done on treatment works (20%) 2. An updated Asset Register to be in place (30%) 3. Treatment works operations should not exceed design capacity (20%) 4. Operations budget should make provision for Maintenance (30%)
	80% - < 100%	B	Complies with all criteria except for one of 4 aspects	
	70 % - < 80%	C	Partially complies with the listed requirements	
	50% - < 70%	D	Complies with at least 50% of the requirements	
	30% - < 50%	E	Complies with a portion of the requirements	
	20% - < 30%	F	An effort is noted to initiate the asset management processes	
	0% (& no info)	G	Not complying	

Drinking Water System Blue Drop Performance Rating

Score	Implication
100% Exceptional Drinking Water Quality Management	This score implies that the water services institutions complies 100% with all Blue Drop Certification Criteria. DWA has full confidence in the management ability of water services institutions involved in treating, monitoring and managing drinking water in the specific water supply system. This institution/municipality fully comprehends its responsibility to continuously act in a proactive/preventative manner to ensure safe water supply.
95-<100% Managing Drinking Water Quality with Excellence	Compliance with this scoring category implies that the specific water supply system qualifies for Blue Drop Certification. If sufficient information is available to support the scoring, Blue Drop acknowledgement will be issued. This would imply that DWA has confidence that the water services institutions (municipality) is capable of sustaining safe quality of water supply and will act responsibly when deviation in tap water quality is detected (which might pose a health risk) through continuous efficient operational and compliance monitoring.
80-<95% Very Good Drinking Water Quality Management (DWQM)	Scoring in this category implies that the municipality/institution have very good systems in place to effectively manage the quality of drinking water in this specific supply zone. However there are shortcomings, which prevent it from becoming a Blue Drop certified system. Improvement towards certification is within reach.

APPENDIX 11B: Scoring – Blue Drop Requirements

Score	Implication
60-<80% Good DWQM	There is sufficient proof that the municipality/institution has adequate processes in place to ensure safe water supply. However there is room for improvement towards Blue Drop certification, since portions of the requirements are not complied with as yet.
50-<60% Reasonable (Satisfactory) DWQM	The municipality/institution has an average level of ability and understanding to manage DWQ according to most of the regulatory criteria. However this is not sufficient to ensure full confidence from DWA in the ability of the systems and those responsible for DWQ management in this specific water supply system.
33.3-<50% Improvement Required in DWQM	While the municipality/institution might still be in the position to provide safe drinking water most of the time, DWA has a lower level of confidence in the institution's ability to sustain the provision of safe water. Therefore a concerted effort is required to improve in the various areas of DWQ management to ensure the public's confidence in the quality of safe water supply at all times.
.3% Significant Improvement Required in DWQM	This score is an indication of inadequate DWQ Management (probably incl. Monitoring, Treatment and Planning) efficiency levels. Urgent intervention is required by the municipal/institutional management to ensure drastic improvement towards the point where the public and DWA could have confidence in the manner DWQ is being managed. At the current level of performance an extreme low level of confidence would prevail.

References

Department of Water Affairs (2010). Blue Drop Report 2010: Version 1. South African Drinking Water Quality Management Performance

Green Drop Report Card Scoring Criteria

Criteria	Score	Symbol	Description	Requirements (& weighting)
Adequacy of Process Control, Maintenance and Management Skill	100% (10)	A	Fully complies with all requirements.	1. Treatment works complying with Reg. 2834 of Water Act., in terms of Classification and Registration. (20%) 2. Process Controllers are complying with skills requirements of Reg. 2834 of Water Act. (50%) 3. Availability of skilled maintenance skills. (10%) 4. Operations and Maintenance manual is in place. (20%)
	80%-90% (8-9)	B	Complies with all requirements except for 1.	
	70% (7)	C	Not complying with 2 Requirements.	
	50% (5)	D	Not complying with criteria No. 2 or complying with No.2 and none of the other.	
	30% (3-4)	E	Not complying with criteria No. 1 & 2 or No. 2 & 4.	
	10% - 20% (1-2)	F	Not complying with the majority of the requirements.	
	0% (& no info)	G	Not complying with any of the requirements or the complete lack of info.	
Efficiency of Waste Water Quality Monitoring Programme	100% (10)	A	Fully complies with all requirements.	1. Details of an effective Operational Monitoring Programme. 2. Details of an effective Compliance Monitoring Programme. 3. Proof of sufficient samples and determinands taken from sample sites.
	70% (7)	B	Complies with all requirements except for 1.	
	60% (6)	C	Not complying with requirement No. 2 and another requirement. Or not complying with any other 3 requirements.	
	30% (3)	E	Only complying with 1 Requirement. (1 or 2)	
	15% (1.5)	F	Not complying with majority of the criteria. Only complying with one requirement.	
	0% (& no info)	G	Not complying with any of the requirements or the complete lack of info.	
Credibility of Drinking Water Sample Analysis	100% (10)	A	Fully complies with all requirements.	1. Proof to be provided of the laboratory used. 2. Laboratory is either accredited or participates in an accredited Proficiency Scheme (obtaining an acceptable Z-score). 3. Proof that analysis results are used to improve process controlling.
	70% (7)	B	Complies with all requirements except for Requirement No.1.	
	60% (6)	C	Complies with all requirements except for Requirement No.3.	
	30% (3)	E	Not complying with Requirement No.2. Or not complying with Requirements 1 & 2.	
	15% (1.5)	F	Only complying with Requirement No. 3.	
	0% (& no info)	G	Not complying with any of the requirements or the complete lack of info.	

APPENDIX 11B: Scoring – Blue Drop Requirements

Criteria	Score	Symbol	Description	Requirements (& weighting)
Regular Submission of Waste Water Quality Results to DWA.	100% (12/12 months)	A	Fully complied with criterion	1. Results must be submitted 12 months a year.
	0% (<10 months)	G	Less than 12 sets of data submitted to DWA. No data submitted.	
Waste Water Compliance with License conditions / General Authorizations or Special Limits.	100% (35)	A	Fully complies with criteria.	1. Proof of waste water quality compliance data for the past 12 months and copy of standards used. 2. Provide figures per determinand; number of analysis per determinand & the number of non-complying analysis per determinand. 3. % compliance per determinand (measured against overall compliance %).
	80% (28)	C	Complies with most criteria, except for 1.	
	60% (21)	D	Does not comply with criteria 1 & 2.	
	20% (7)	E	Does not comply with criteria 3.	
	0%	G	Did not comply with both sub-criteria or failed to submit sufficient data for assessment purposes.	

Waste Water Quality Failure Response Management	100% (20)	A	Fully complies with criteria.	1. Proof of a documented Effluent Quality Incident Management Protocol (or protocol similar in function) specifying roles and responsibilities. 2. Provide evidence of implementation.
	60% (12)	C	Have evidence to proof incident management control, but has no documented protocol.	
	40% (8)	E	Has a documented protocol in place but not evidence to proof implementation.	
	0%	G	Not complying with criteria or failed to submit sufficient information for assessment purposes.	
Waste Water Treatment works capacity	100% (5)	A	Fully complies with criteria	
	80% (4)	B	Complies with all criteria except for one.	
	60% (3)	C	Not complying with 2 criteria or Criterion 2.	
	40% (2)	E		
	20% (1)	F	Only complies with 1 criterion.	
	0% (0)	G	Not complying with criteria or failed to submit sufficient information for assessment purposes.	

References

Department of Water Affairs (2009). Green Drop Report: Version 1: South African Waste Water Quality Management Performance.