

# Disaster Management Southern Africa



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**Front cover picture:** Natori B Village, Japan tsunami taken by Marianne Schwankhart

# Comment from the Editor



EDITOR  
SCHALK CARSTENS

Since the beginning of this year, we had witnessed extreme disasters occurring across the world. Of the two most disastrous, I would say, firstly is the tsunami/earthquake that occurred in Japan. The other major incident is the extreme drought that is currently affecting millions of people in the countries of North-East Africa.

We all know that Japan had to endeavour an extreme natural event which resulted in certain total destruction and enormous losses. The resilience of Japan, which is regarded to be a first world country, is tremendous. They have provided immediate relief and shelter in a very short time. The search and rescue efforts also commenced immediately where they started to deal with some of the most dangerous consequences of such a disaster as the nuclear meltdown.

Six months down the line we see that the Japanese Government is coping and working rapidly towards rebuilding the disaster affected areas. The Japanese Government had to rely on other countries' emergency responders to assist them with search and rescue efforts, but they themselves decided who they will allow to assist them and where this assistance was needed the most. One of these teams was Rescue South Africa, under the leadership of Mr Colin Deiner, which has recently been commended by the Japanese for an excellent job.

In total contrast, we have the drought that is now affecting millions of people in Sudan and Somalia. These countries are totally dependent on the assistance of foreign donors, the United Nation Organisation as well as NGOs who are currently providing the drought stricken areas with humanitarian relief.

As disaster management practitioners, we have to ask ourselves the question, why one country such as Japan can bounce back with such resilience from a disaster and the other country/ies really struggle to do so.

The answer to that question is, without a doubt, resilience. The more a country is prepared, the better they will

be able to overcome the hardship a disaster might bring. We in the southern African region might be in the same position as the countries described above. Certain countries might have shown that they can look after themselves in a disaster and others might not have the capacity to do so.

In South Africa we have shown our intent and we have a good track record, but after nine years after the promulgation of the Disaster Management Act, there is still a lot to be done. Some of the focus areas that we lack behind in and which will have to attend are:

- The lack of disaster management capacity (trained capacitated and knowledgeable practitioners).
- The lack of facilities and equipment – in a recent survey conducted by the National Disaster Management Centre (NDMC) - it was highlighted that just more than 30 municipalities indicated that they have provided for some facility that they will utilise as a Disaster Management Centre and only a few Provincial Governments have established such a facility.
- Some areas lack risk reduction initiatives in development. Each municipality should, as part of their Integrated Development Plan (IDP) have a disaster management section/chapter in the IDP. This is also an aspect that is lacking behind.
- How many authorities have proper disaster management plans in place that could cater for all the hazards in their respective areas? The answer here will also be – only a few!

I am however glad to say that the newly appointed senior management team at the NDMC is committed to change the above-mentioned negative outcomes. They have in a short period of time, since February 2011, embarked on a programme to enhance disaster management capacity in South Africa. Some of the deliverables are as follows:

- Review of the disaster management Act;
- Establish and revitalize the Disaster

Management Coordination Structures such as the National Disaster Management Advisory Forum and its sub workgroups;

- Developing the minimum standards for the establishment of the Disaster Management Structure in all spheres of government;
- The development of a Training Education and Research Strategy Plan;

We have to commend Moddy and her team for this sterling effort.

Before closing, I have also to mention the total commitment, dedication and support the South African Weather Services (SAWS) is providing to the Disaster Management fraternity. SAWS have already committed themselves to work very closely with disaster management in providing very effective severe weather warning systems. SAWS provide the warnings and disaster management authorities have to react on these warnings timeously provided. Through these warnings, many communities could in the past be evacuated in time, which resulted in many lives being saved. The weather service also committed themselves to flash flood pilot projects and has already completed the National Warning System Emergency Contingency Plan. Well done to the South African Weather Services Team. We congratulate you.

A heartfelt word of thanks to all who have contributed toward the electronic edition of the DMISA Journal. Special reference to Debbie Myer of Delinds Publications cc and Ronelle Pieters, our Assistant Editor. Without your hard work, commitment and support, this publication would not be possible.

## Classification of a local state of disaster in terms of the Disaster Management Act, Act 57 of 2002



ANTHONY R KESTEN

The Disaster Management Act, Act 57 of 2002, is very clear on the classification of a disaster. *Classification of a disaster is the responsibility of the National Disaster Management Centre (NDMC).* This responsibility is provided through section 23(1) of the Act. However, the declaration of the disaster at the municipal sphere still remains with that sphere of government. The classification of the disaster can only be, in accordance with section 23(1)(b) if the municipality has already declared a disaster in terms of section 55 of the Act. If a local disaster has not been declared in terms of the Act, the National Disaster Management Centre may or may not decide to classify it as an event or as a disaster.

It is not in the ambit or authority of officials at any level to overrule the political direction of the National Executive, the Provincial Executive or the Council of a municipality. Section 26 indicates that the National Executive is primarily responsible for the co-ordination and management of national disasters. Section 40 gives that responsibility to the Provincial Executive while section 54 gives that responsibility to the Council of a municipality. The Act further gives authority to declare a local disaster to the Council of a municipality (Section 55(1)), the declaration of a provincial disaster to the Premier of the province, after consultation with other MECs and the declaration of a national disaster to the National Minister responsible for disaster management.

A disaster can only be declared at municipal level by the Council of that municipality. Section 55(1) clearly indicates that the council of the municipality has this responsibility. Once the Council has declared the local disaster by notice in the provincial gazette, it is automatically classified as a local disaster "until" (in terms of section 23(7)) it is either reclassified as a provincial or national disaster.

The NDMC can only reclassify a disaster in terms of section 23(3). Section 23(1) cannot be taken into account if a local disaster has already been declared by a municipality. Section 23(1) only refers to an event that can be classified as a disaster. Therefore, once the



municipality has declared a local disaster, the NDMC cannot regard it (the disaster) as an event. The NDMC must at this stage only decide on whether the disaster remains a local disaster or is reclassified as a provincial or national disaster in terms of section 23(3).

It must be remembered that when a local disaster is declared this must be classified by the NDMC in terms of section 23(3), but section 23(4)(a) and (b) supported by section 54(1), still gives primary responsibility, with or without the assistance of national or provincial organs of state (section 54(4)), to the municipality.

In essence, the process of the declaration of a **local disaster** is simple.

1. If a "disastrous event occurs or is threatening to occur in the area of a municipality, the disaster management centre of the municipality concerned must determine whether the event should be regarded as a disaster in terms of this Act," (Section 49(1)).
2. The municipality must inform the Provincial and National Disaster Management Centre and may make a recommendation on the classification of the disaster. (Sections 35 and 49(2)).
3. If a serious "event occurs or threatens to occur", (Section 23) the NDMC must determine if the event should be regarded as a disaster in terms of the Act.
4. If an event occurs or threatens to occur and a municipality declares a disaster, in terms of section 55, then the event is a disaster and it is a local disaster. (Section 23(7)).
5. The NDMC may classify or reclassify the disaster only as local, provincial or national (section 23(3)) as this refers to the severity of the disaster.  
**Note:** The NDMC has no authority to declare any kind of disaster (Section 23(8)).
6. The municipality declaring a disaster does so by publication and with effect from the date on which the declaration is published in the provincial gazette.
7. The municipality has to inform the provincial and national disaster management centres of the

declaration in order for the official classification (related to severity), in terms of section 23(3), is made.

8. The local disaster remains at the classification "until" (section 23(7)); it is either "classified a local, provincial or national disaster."  
**Note:** the purpose of the classification is to designate "primary responsibility to a particular sphere of government for co-ordination and management of the disaster, but an organ of state in another sphere may assist the sphere having primary responsibility to deal with the disaster and its consequences." (Section 23(8))
9. A local disaster remains in force for 3 months (Section 55(5)(a))
10. It may be terminated earlier by Council and by notice in the provincial gazette before it lapses (Section 55(5)(b)).
11. It may be extended by one month at a time, before it lapses or the existing extension expires (Section 55(5)(c)).

### The maths of saving us from ourselves

The climate change debate is changing. Stage one was the *no it isn't / yes it is debate*, stage two was *woe is us, the end of the world is nigh* and now we begin to discuss and implement practical solutions.

For those who believe we have woken up too late, here is some reassuring maths from someone who woke up before almost anyone else.

In 1972 Professor Jorgen Randers co-authored a book "The Limits to Growth". Almost 40 years, a few new editions, 9 million copies in 26 languages later, he addressed a group of us in Cape Town on economic growth.

A physicist and economist by training, Prof Randers gave us this maths - the global GDP has grown on average over the last hundred years or so by 3,5% per annum - it is a safe assumption that this will hold true going forwards; and so by 2050 the GDP will have grown fourfold. That means four times as many gadgets, four times as many plane trips, four times as many potato chips ... you get the picture. At the same time, we need

to halve our current carbon emissions by 2050.

Include the growth - we must reduce carbon emissions by a factor of eight. Before you stick your head in a gas oven to get it all over with, know that this equates to an annual reduction of 5%. To put that into perspective, the Department of Energy told mining companies last year that they must cut electricity usage by 10% within 12 months, if they wanted guarantees of no power cuts. All complied.

### The 5% solution

For the first few years, the 5% solution will be achieved by tightening things up a little. Nineteen flights instead of twenty; lowering the hot water geyser thermostat by a couple of degrees; some energy efficient light bulbs; obeying the speed limits.

Then with money saved from one less flight and no speeding fines, think about solar water geysers, or just cold water in the company washrooms. Perhaps video conferencing to cut the air bills further, or working from home one day a month. And a worm-farm to turn garbage into compost.

Then a few years down the line, making your next car electric. Meanwhile government would be doing its bit by encouraging and rewarding a carbon light life - from upgrading public transport to generous tax incentives for local companies making low-cost solar water heaters.

### Creating shared value

Michael Porter, doyen of consultants for capitalism and business school case histories, had a Damascene moment on the road to our global financial meltdown. Capitalism needs an extreme makeover, he reasons, and "Creating Shared Value" can do this.

For too many corporates, capitalism 1.0 was squeezing your value chain until it was desiccated - squeeze some more, then find the next supplier, preferably in a low-cost, labour-exploiting environment. Capitalism 1.1 added a degree of corporate largesse with a bunch of noble values that for some like Enron didn't go much further than a plaque on the wall and the "About Us" on their website. The

business of making money was still removed from society and planet.

Capitalism 2.0 recognises that a corporate can increase its profits by helping suppliers and employees. Amongst the examples Porter gives are Nestlé and Johnson & Johnson.

To ensure continued supply of premium coffee for Nespresso, Nestlé helps growers with quality and productivity, ensuring they can produce more, better quality beans for everyone's benefit. Johnson & Johnson invests in a costly wellness programme for all their employees that includes such benefits as paying for courses that wean them off smoking. The net benefit in both cases far outweighs the costs - the bean-counters have seen that investing in people has greater returns than investing in machines.

"Creating Shared Value" will encourage retailers to source products nearer home - developing communities that can afford their products as well as saving the carbon of unnecessary freight.

The architects of globalisation discounted pollution as an externality - for someone else to pay. They ignored the someone else would be us, our children and children's children. The maths were flawed because they excluded all moral and future values. We were working on less than half of the equation.

### Green building maths

The tallest skyscraper in New York City is the Empire State Building. The second tallest is the new Bank of America building. It is a platinum rated green building and the bank's board enthusiastically endorsed the extra cost. The bankers have not become wild-eyed bunny-huggers - they are convinced by the maths. Energy savings amount to \$3-\$4 million p.a. - good but not good enough to justify the return on investment that the bankers sought. A number of studies show that green buildings increase productivity by up to 10% - with healthier, happier inhabitants. Bank of America took a more conservative view and found that increasing productivity by 1%, or five minutes per day, would translate into an extra \$10 million p.a. on their bottom line.

Suddenly it was a no-brainer.

### Nature's maths

The United Nations Environmental Programme (UNEP) estimates that the annual worth of ecosystem services is \$72 trillion - equivalent to the total GDP of all the nations on Earth. For every dollar we create in value, nature gives us another, for free. South African estimates are far more conservative - coming in at R73 billion - or 7% of our GDP.

Biodiversity nourishes far more than the soul - it gives us fresh water and food, fuel and medicines. It has created the eco-tourism industry; offers carbon sinks as well as some protection from the effects of climate change. Yet around the world, 60% of natural ecosystems are degraded, many dangerously so. Before these maths were done, to preserve biodiversity was isolated to environmentalists. Housing, mining and monocrop agriculture were considered far more important than a few disappearing flowers or rabbits.

Now we begin to understand that restoring ecosystems employs communities and develops sustainable prosperity. We have goldmines above the ground and under our seas. Goldmines that belong to the nation - that benefit all.

When we measure things differently, we will do things differently. The maths of a fast buck brought us to the edge of financial and environmental ruin. The maths of sustainability will take us back from the brink.

Accountants - please sharpen your pencils.

*Is'haaq Akoon*

*Ekurhuleni Metropolitan Municipality  
Environmental Officer: Environment  
Planning and Co-ordination*

### Some food for thought

In a 2004 the UNISDR defined "Disaster Risk Management" as follows:

*"The systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the impacts of natural hazards and related*

*environmental and technological disasters. This comprises all forms of activities, including structural and non-structural measures to avoid (prevention) or to limit (mitigation and preparedness) adverse effects of hazards."*

***In January 2009 the UNISDR redefined the term "Disaster Risk Management" as follows:***

*"The systematic process of using administrative decisions, organization, operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster".*

***The new definition also provides a clarifying COMMENT.***

*"Comment: This term is an extension of the more general term "risk Management" to address the specific issue of disaster risks. Disaster risk management aims to avoid or lessen or transfer the adverse effects of the hazards through activities and measures for prevention, mitigation and preparedness." (Research the UNISDR website and search for "terminology).*

Now, it is clear from both definitions that our South African use of the term "Disaster Risk Management" is skewed. So many of us have been and still are being disrespectful to the Constitution of South Africa as well as the Disaster Management Act by the constant incorrect use of the term.

It is most frustrating that disaster management officials use the term "Disaster Risk Management" so loosely when the world around us have embraced the *term to exclude response and recovery.*

Yet, when disaster strikes it is the **disaster management official** who now gives effect to the **Disaster Management Act.**

It is my humble view that we have to save ourselves from our egos or face international ridicule. We need to stop the incorrect use of terms as this confuses the very people we say we are training to become disaster resilient.

# Utilising Disaster Risk Management *as a sustainable spatial development planning tool*

ONE OF THE KEY WEAKNESSES OF DISASTER MANAGEMENT AND RISK ASSESSMENT AS IT STANDS CURRENTLY IS ITS DISLOCATION FROM THE BROADER ISSUES OF SUSTAINABILITY, RISK, RESILIENCE AND RELATED ISSUES, ESPECIALLY WHEN CONSIDERING IT FROM THE DEPARTMENTALISED APPROACH WITHIN GOVERNMENT. GREATER INTEGRATION IS NEEDED.

## Foreword

This paper is the pre-ambule for the development of a methodology to measure disaster risk and vulnerability within the context of a sustainability paradigm. It refers to how societal behaviour and spatial context of the built environment contributes towards making our living environment more or less risky to operate in. The outcome of the research would aim to influence policies and strategies that may align disaster management more closely with development planning and get the players in the game onto the same court, even if they may be playing and managing with different 'toolboxes'.

The aim of this paper is not to convert the reader to a certain way of thinking but rather to call on readers to daily action in their life and work to implement an approach of complete sustainability, integration and cooperation that may make a difference in the long term and give our children's children an earth that they could actually live on, sustainably.

## 1. Disaster management: a required global consideration

This is a time when globally, humanity is dealing with possibly the worst series of natural and man-made disasters: earthquakes in e.g. California, Mexico and Haiti; tsunamis in Indonesia, Sri Lanka and Sumatra; floods in England, Pakistan and Spain; a volcano erupting in Iceland therefore shutting down air traffic over much of Europe and impacting global air transport; wild-fires in Russia with Moscow residents having to wear breathing masks; mudslides in China; mutating flu strains causing widespread health concerns; and when we just seem to be overcoming these, other serious man-made disasters hit us in the form of oil spills in China and the Gulf of Mexico, as well as at the oil sands of Alberta Canada (Irurah, 2010, BBC News, The Moscow News, The New York Post, Reuters, 2010). This does not even consider the slow-onset disasters such as acid mine drainage (AMD) which is currently contemplated in the Gauteng Province of South Africa or climate change

and collapse of the world economy.

It is being questioned whether there has been an increase in the number of disasters, or only a worsening of their impact. "Data going back to 1900 shows that an average of 16 major earthquakes (the definition for magnitude 7 to 7.9 on the Richter scale) and one great earthquake (magnitude 8 or higher) have occurred worldwide each year" (Leadership online, 2010). On average, the figure for 2010 is not out of the ordinary. However the earthquakes struck in areas of high population and infrastructure density with low defences against such disasters. As Dr Michael Blanpied of the USGS stated (2010): "While the number of (disasters) is within the normal range, this does not diminish the fact that there has been extreme devastation and loss of life in heavily populated areas". This should be borne in mind when investigating methods to improve the management tools of our increasingly urbanised world that faces not only a "natural growth" factor, but also a strong policy-driven direction towards densification within existing urban edges.

The World Conference on Disaster Reduction (WCDR) convened in Kobe, Japan in 2005 identified five priorities in its action plan - the Hyogo Framework for Action (HFA):

- Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation;
- Identify, assess and monitor disaster risks and enhance early warning;
- Use knowledge, innovation and education to build a culture of safety and resilience at all levels;
- Reduce the underlying risk factors; and
- Strengthen disaster preparedness for effective response at all levels (Red Cross and Red Crescent Societies, 2005).

When looking at the disasters mentioned earlier, the capacity to respond to these five priorities seems to be seriously in doubt. Even more clearly, the means of prevention and mitigation seems



to have not been planned or developed adequately to date. As an example, in Kenya, after having gone through a very severe drought between 2007-2009, evidence pointed towards deforestation (and expansion of farmland into mountain forests - especially around Mau-forests - as the key contributing factor). This is now driving serious re-settlement and re-forestation policy and programmes, but also facing the highest possible social-political resistance by those affected by the resettlement. Drought was one result and the communities and economy were impacted negatively. But there was little political will to stop settlements or farming expansion into the forests (even though there were policies regulating such encroachment into forest reserves). Thus there was legislation without implementation and integration thereof into the daily lives of people. This means that it was not an absence of knowledge or understanding: it was a lack of social-political commitment and individual behavioural lapses to act on the knowledge to mitigate the disaster (Irurah, 2010).

Similarly, the floods that hit England and Wales in 2010 were not a new phenomenon - they have year-on-year floods, and apart from global warming which has its rightful place in the equation, the only other aspect that changed is the densification of urban areas and the paving-over of previously permeable areas. The surface hardening process, which is taking place at up to a 20% increase in impermeable surfaces per year for certain areas, is causing a massive overload to the existing stormwater management system during rain storms, thereby causing much of the massive flooding (BBC, 2010).

Assuming that there is a lack of understanding or knowledge of the "natural phenomena", is therefore not always valid. It relates to the decisions which provinces and municipalities are faced with when deciding where and what to build or upgrade. It relates to the statement made by the ISDR (2011) that there is 'no such thing as a 'natural disaster', only natural hazards', which indicates the emergence of human-induced risk. In essence, it means that hazards may well be a natural occurrence (e.g. floods occurring or volcanoes erupting), but the disasters that result from it are

based on human-induced risk, due to land being developed or upgraded, settled on, or infrastructure being placed in its path. It is not the land itself that is the origin of problems, but the way in which we interact with it and develop it, making ourselves and our cities receptors of the resultant risk, which is cause for concern. In this context, unpacking the terms "socio-political will" and "behavioural pitfalls" is the crucial question, and packaging that with the development planning process becomes important.

## 2. Local action

Closer to home in South Africa, the reality is as vivid and recognised as abroad. Disaster management in South Africa underwent a significant change with the implementation of the Disaster Management Act 57 of 2002 and the National Disaster Management Framework (South Africa, 2005). It placed South Africa at the forefront of a global paradigm shift from a purely response-oriented approach to disaster management to a more proactive approach, says the South African National Disaster Management Centre. A network of disaster management centres was to be set up in all municipalities, provinces and at national level.

In October 2009, however, the Democratic Alliance (DA) said that disaster management planning required urgent attention, adding that one province and 18 local governments did not have statutory mandated disaster management centres, while 43 municipalities - including Johannesburg - lacked proper plans. In November 2009, Deputy President Kgalema Motlanthe said at the time that a report had shown a need for improvement. The question to date is how far this improvement has taken place. As one of the steps towards improvement, in April 2010, the Department of Co-operative Governance and Traditional Affairs announced it was testing its 2010 Disaster Management Plan in partnership with the National Disaster Management Centre. With the publication of the South African Risk and Vulnerability Atlas the need for strategic and policy driven decision making that is based on sound scientific information is clearly highlighted and placed on the forefront of the agenda (DST, 2010). Even though

it tends to focus on aspects that are related to climate change, such as:

- socio-economic and settlement landscape
- water and floods
- agriculture
- health
- biodiversity
- commercial forestry
- land use and
- fire.

It alerts the need for a more scientifically based approach towards integrated development planning. Such a process will in turn enhance the sustainability of planning and its outcome in terms of working towards a scenario where we would be able to sustain our living on this earth.

The country's well-defined disaster management "skeleton" as well as generally well-developed and implemented disaster risk assessments and disaster management plans in some geographical areas gives us a firm base to build our planning processes on. The question remains as to how much of these disaster management-generated information, hazard and vulnerability hot-spots and resource requirements are directly pulled through and used in integrated development planning and on-the-ground spatial management of development projects.

## 3. The Gauteng city-region as focus area

It would be nice to investigate this project for the entire country or even continent. However, it is impractical to do this effectively in a reasonable time frame. Therefore a selection has to be done to limit the study area, even though the paper advocates cross-border and "un-bounded" (i.e. regardless of administrative boundaries) coordination. Research indicates that well-managed and well-governed global city regions play a vital role in a national economy. On the other hand, if not well-managed and -governed, city regions can produce a host of economic, social, structural and environmental challenges (OECD 2007; CUBES 2007; Robinson & Boulle 2008; State of the World's Cities 2008/2009). Disaster management sectors and principles can fulfil a core function in this concept of city-region management, since it encompasses all



aspects of society and the living environment.

The highest concentration of population in South Africa is located in the Gauteng area - in the City of Johannesburg, City of Tshwane and Ekurhuleni Metropolitan Municipality (with an estimated 11.2 million inhabitants) - as well as the coastal cities of Cape Town and eThekweni (DST 2010, CSIR 2006, StatsSA 2007). As a case study, the significance of Gauteng and its immediately surrounding area in national, regional and international economies can therefore provide a valuable base-line to be used for benchmark studies in other areas and regions. The Gauteng Provincial Government (GPG) in partnership with the Universities of Witwatersrand (WITS) and Johannesburg (UJ) established the Gauteng City-Region Observatory (GCRO) in order to build the region as a globally competitive entity where the activities of different parts of the region complement each other in consolidating the region as an internationally recognised global city region. The Gauteng City-Region's (GCR's) border is defined by the boundaries of municipalities and provinces that share socio-economic and ecological concerns. This "border" is easily defined or outlined on a map, since different aspects require different management viewpoints of the entity (e.g. political borders influence policy making on a housing-development level that may differ from the hydrological extent of a river or catchment that affects water management strategies in the region). Disasters also do not follow or adhere to man-made borders. The need for cross-border management becomes clear when it is considered that some municipalities do not always fall within a single province, but rather across two or more provincial borders. This makes for interesting and difficult administrative management, but also presents an opportunity for increased cooperation and awareness of everyone involved, should they choose to follow this integration-route.

#### **4. Sustainability through spatial planning and management - ever elusive?**

"As the relationship between development and urbanisation emerges more sharply, the concept of "urban management" has attracted

considerable institutional support at the international level. However, the concept itself is inadequately defined" (Stren, 1993). Over the years, various attempts were made to define this concept further and bring urban management, spatial planning and sustainable development closer together. In many instances this has been achieved, but still, we seem to be a distance away from a complete integrated, coordinated and cross-border cooperating platform.

Our choices going forward are all trade-offs between less-than-ideal circumstances and outcomes (Pieterse, 2010). The inheritance of our past social-spatial engineering forms the basis of many of the problems that we currently face. This "status quo" will be maintained for some time to come since lower-income and informal settlement developments keep on taking place on out-of-town marginalised lands and hazard-prone areas, with higher socio-economic vulnerability and reduced resilience. "The routine functioning of our real estate, land market and economic markets perpetuate it" (Pieterse, 2010). This is but one of the issues that we face before our risks can be prevented and mitigated and we can move towards real sustainable and acceptable quality of life.

This paper is the first in an envisaged series that not only investigates this situation and confirms or denies this hypothesis but also would attempt to find practical ways towards policy, strategy and actual implementation plans and stakeholder involvement for integration of the planning and disaster management spheres, both across disciplines and across administrative borders. It would thus attempt to ensure that disaster management gets the preventative and mitigation support in terms of planning to minimise the unnecessary disaster expenditure (i.e. remove the disasters) while increasing the resources that are required to deal with the aftermaths of inevitable disasters.

Imagine a world where dwellings are not built on marginalised lands such as dolomite, or in floodplains, or alongside hazardous facilities, or where air pollution is minimised to such an extent that health facilities can focus on other real issues instead, or where ecological breathing spaces such as wetlands can absorb some of

the impact of contaminated water and filter it as a part of the earth's own healing process. It may seem a far-off vision, but if the base-line development planning policies and processes can be affected by information from the disaster management spatial data position, which ideally should include all information such as environmental, social, infrastructure, economy, health, education, etc, we may just find ourselves better able to deal with the threats and affect responses where it is really needed. Translating from the global / anticipated risk to the specific / local risk / disaster and mitigation strategies is one of the key challenges to date. Similarly, responses in terms of mitigation / adaptation-strategies (risk-minimisation) as well as responsive strategies (disaster relief once it has happened) seem to be separable (in theory) (Ibrahim, 2010). But should they be? Coupling the two, or even understanding how one shapes / informs the other seems to be an extremely complex challenge.

#### **5. The role of spatial information to direct management choices**

All of the foregoing brings us to the question of where do our disasters occur and how do we prevent them from happening - the spatial data collection availability and sharing, related to all planning sectors. Since development takes place in a geographical "space", the management of spatial data is a critical component of integrating disaster management and development planning. Coordination and information sharing across spheres of government (e.g. between departments) as well as vertically between levels of government and cross-border between municipalities and provinces could greatly enhance spatial planning. It is a concern that still has to be fully explored; that the level of coordination and integration differs between municipalities, provinces and levels of government is not yet entirely smooth.

The nature and relations between Spatial Data Infrastructure (SDI) components clearly defines the role of policy as a critical aspect of the process (include figure of SDI). It is on this policy level where this research focuses. If we can get the policy right to integrate and coordinate, the sustainability factor should increase. (Source: Rajabifard et al, 2002)

SDI provides a lot of benefits, including the following:

- GIS requires large quantities of current and accurate digital data. It is not necessary for each organisation to try to possess all the data in their own Geographic Information System (GIS). The "gaming forces" can save significant time, money and effort when they share the burden of data collection and maintenance. Municipalities are a huge source of spatial information. Province also has good information. Both have good administrative GIS structures. Ideally, data should therefore be available easily at maximum one or two places to improve planning and risk reduction (*Is this the case - have you tried to get data together for a disaster risk assessment?*)
- Shared data allows more users to work with data and consequently estimate the quality of data. An increased number of users can find and correct errors in the data. For disaster management it is also important that a lot of people are familiar with the spatial data sets. This will reduce the number of mistakes that will be made (*How integrated is the availability of the data you need - can you go to one website or place to view it and know that the quality of the data is impeccable or at the detailed level you need?*).
- Sharing data of common interest will reduce duplication and it will enable the gaming forces to defray some of the costs of producing and maintaining the data. Mechanisms to facilitate the use and exchange of data are a major justification for developing and expanding a SDI (Williamson et al, 2003). (*However, how many of one data set is there currently available, e.g. roads?; schools? rivers? - which of the many available spatial data sets are the most accurate and which one should be used when planning our future cities?*).
- Sharing of spatial information in the preparation phase helps policy makers to develop high quality contingency plans because a complete overview of the spatial data availability will provide a better understanding. It also provides an overview whether the amount of

data is complete or insufficient and whether the data is up-to-date. (*Are we at this place yet?*)

- Sharing data would allow for producing overviews of the disaster risk hot-spots that should be avoided, areas of high vulnerability that should be supported, and areas of low resilience that should be addressed during development planning. The benefits will further come from gaining the trust of the citizens in their government. Thus the benefits of shared data go beyond the organisation involved in disaster management, or spatial planning.

It can be concluded that data sharing will 1) increase the efficiency of work and 2) provide a better method for communication and collaboration among the different "gaming forces". This is a very important conclusion for a common framework for shared decision support (Snoeren, et al, undated).

## 6. The way forward

The GCR reflects characteristics of large city-regions globally and can therefore gain benefits of those regions' experiences, and is a benchmark against which potential other city-regions that may be established can be projected. It also provides vast potential for more integrated, resilient and sustainable development on a regional scale, not only across municipal borders, but also across provincial borders and over physical topographies. Other city regions and potential city regions in South Africa such as Cape Town, Nelson Mandela Bay and Durban / eThekweni can integrate the South-African perspective into the global city region concept and bring a different perspective to this global aggregate.

Of interest is the focus not only on economic competitiveness but also on the manner in which the city region addresses and responds to socio-economic, political and spatial development challenges. This should all be viewed within a milieu of social, political, infra-structural, economical, and sustainability, vulnerability and community resilience environment. It is clear that disaster management in its entirety - from preventative and mitigative planning, to management of

development projects and reacting to widespread industrial, social or natural disasters can play a key role in the city-region concept and in promoting a drastic increase in the resilience and sustainability of a region as a whole. Added to this is real-time community-based data collection and information dissemination through technological items such as GPSs and the internet that will very soon become part of our daily lives. Disaster management as an overarching planning tool can play a significant role in improving spatial development planning, resilience of not only people but also projects, and integrating Inter-Governmental Policy development, decision making and relations.

It is not only in all of our work-related interests, but also in the interest of improved cross-border, cross-cutting, trans-disciplinary and vertically integrated development planning and achieving a sustainable future for our children and their children to actively engage in the sharing of spatial data, planning information and involvement of ALL stakeholders in our daily on-goings. Society needs to urgently move together towards an easier understandable and functioning operating environment where all the spatial development planning data that we need is available, based on disaster management principles and integrated across and within borders and levels of government.

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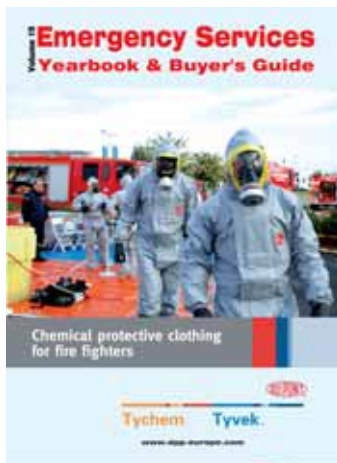
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# Drought risk assessment for extensive farming in the Northern Cape Province

## Introduction

Drought disaster risk assessment is the base for drought risk reduction planning. It provides a roadmap for future planning and policy formulation. The Northern Cape (NC) is the largest and also the most arid province in South Africa with a strong economic base in mining, agriculture and tourism. The NC has the second largest number of mines in South Africa after Gauteng and is the largest contributor to GGP in the Province, which reduces the provincial vulnerability to drought disasters. Agriculture with its downstream and upstream impact is second in terms of GGP contribution and consists of two main sectors, namely irrigation agriculture along the Vaal and Orange rivers, and secondly the extensive livestock industry on the arid hinterland.

Dry conditions are part and parcel of the climate of the NC and the farmers, both commercial and communal as well as small-scale experience dry periods on a regular base. Most farmers in the NC understand the challenges of drought and they are conscious about the fact that the next drought could follow soon after the

above average seasonal rains experienced in 2011. They have just come out of a dry period with certain farmers still suffering the aftermath of the 2010 drought.

## Drought risk assessment

The disaster risk assessment methodology as stipulated in the Disaster Management Act (Act 57 Of 2002) shown in Figure 1.4 was used as the framework drought risk assessment in the NC. Stage one consisted of the hazard and vulnerability assessment for droughts.

The main determinants for hazard assessment – in the case of drought – is water deficit for normal production because of either too little precipitation or too high evapotranspiration. Assessment of these factors was done based on historical meteorological data, on site inspections of affected areas or sectors, modelling of impacts and contributions from focus groups and stake holders.

Vulnerability assessment also forms part of phase one and susceptibility and capacity of different sectors were analysed using available data and data obtained

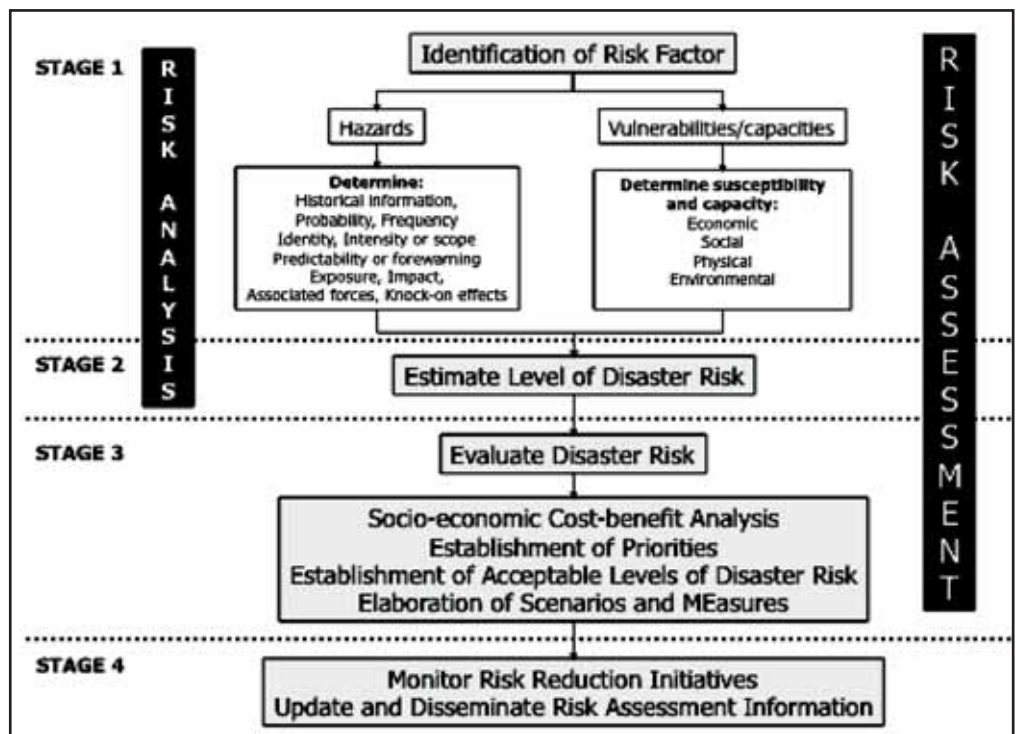


Figure 1: Disaster Risk Assessment Methodology (Source: NDMF, 2005)

during this research. The sectors included are farm workers and their families, farmers and/or land-owners, seasonal labourers and their families, and labourers and their families working in the secondary economy that depends on primary agricultural production. Also important are the people living in urban areas and utilising the communal land owned and managed by municipalities.

- Economic vulnerability** for drought refers to the vulnerability of the economy of communities, towns, districts, the province and also vulnerability of different sectors toward droughts. One can calculate direct economic loss during extreme droughts by the loss in production for instance of wool (kg/unit animal) or meat production (kg/ lamb weaned) or progeny (number of animals died) or additional feed and fodder purchases. Intangible elements of economic vulnerability such as progeny the next season are not immediately visible during and immediately after the drought disaster, but also have a huge impact on farm profitability. Other intangibles include loss of markets due to under-supply during extreme droughts, which might open the door for other suppliers to enter the market or consumers might move to alternative products if prices become too high during periods of under supply (NDMC (US), 2006). Other economic impacts for drought disasters include the possible loss of jobs, resulting in lower than normal turnover in small towns and communities (ECLAC, 2009). The economy of most towns in the NC depends on the agricultural sector and droughts which also impact on businesses in those towns.
- Environmental vulnerability** to drought refers to the susceptibility of the environment and more specifically the vegetation to the impact of a severe drought. Severe droughts could result in soil degradation through wind and soil erosion, bush encroachment and the distinction of certain species. Locusts in combination with drought could damage the vegetation cover to such an extent that it may take many years to recover to its original state (NDMC (US), 2006).
- Social vulnerability** to drought refers to the vulnerability of farmers,

the farm workers and the local community to the negative impacts of a severe drought. Severe drought might cause high stress levels amongst farmers, which impacts directly on the health of farmers and their families and the potential of the farmer to make good decisions (NDMC (US), 2006). Farm workers might be affected by losing jobs and the local community ultimately could be affected due to the economic slowdown of a small town.

The **second (sub)** phase consists of the estimation of disaster risk by combining the information obtained from the hazard and vulnerability assessments. Different equations for risk exists (Morimiya, 1992; UNDP, 2004; Wisner et al, 2004) but the adjustment of Wisner et al's equation proposed by Jordaan (2007) were used in this research.

$$R = H \times \sum (Vecon Venv VSoc) \sum Cecon Cenv Csoc$$

Where:

R = Disaster Risk for disaster

H = Probability and of hazard j with a certain magnitude

C<sub>H</sub> = Capacity or factors that impact on probability and impact or magnitude of hazard j

- Vecon = Economic vulnerability
- Venv = Environmental vulnerability
- Vsoc = Social vulnerability
- Cecon = Capacity to deal with economic vulnerability
- Cenv = Capacity to mitigate and limit environmental vulnerability
- Csoc = Capacity to mitigate and limit social vulnerability

The above-mentioned methodology served as the basis to calculate and prioritise drought risks. Figure 1.5 shows the framework for main risk factors, the factor components and examples of indicators considered for drought risk assessment in this research.

One of the main challenges in drought risk assessment is the identification of all the indicators and the weighting of these indicators in relation to each other. Meteorological drought impact is a key indicator to vulnerability, but methodologies to calculate impacts are not consistent and databases for assessing impacts are not readily available (Gbetibouo and Ringler, 2009). In the absence of quantitative and reliable analyses of estimated losses, drought impacts tend to be under-estimated. Executing

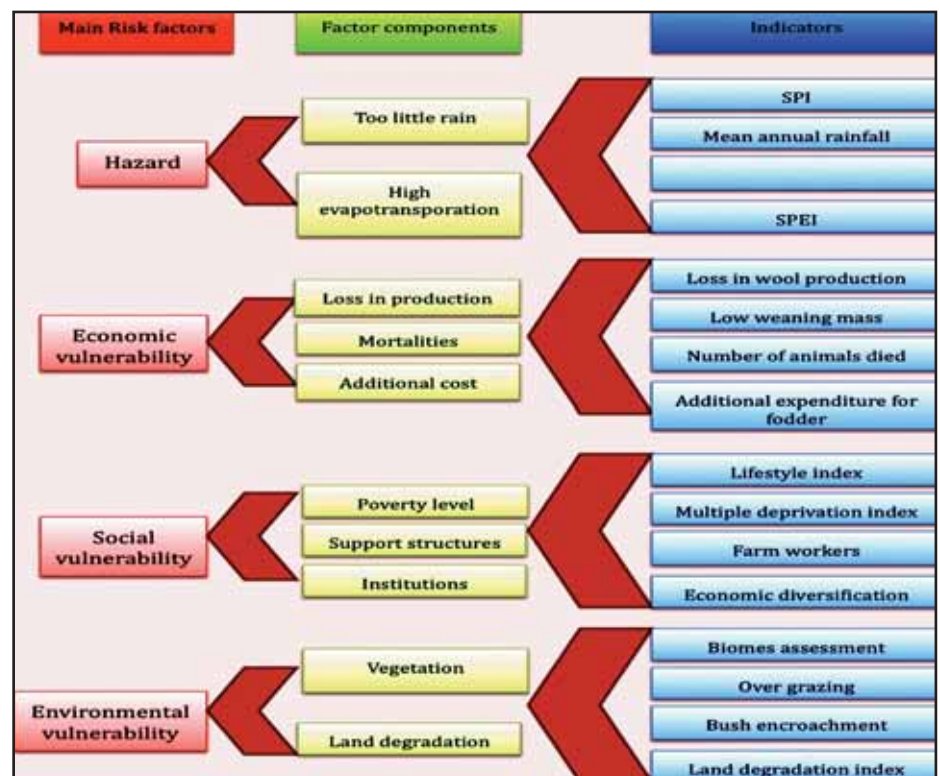


Fig 2: Framework illustrating Main Risk factors, factor components and indicators for drought risk assessment

cost-benefit analyses from such data then under-estimate the benefit of mitigation. This study provided and applied a rigorous methodology for drought risk assessment.

The drought disaster risk assessment was done with the focus of future risk reduction in mind and made use of available historical weather data to determine certain trends, cycles or patterns in the climate of the NC. Available climate data for the province is to a large extent out-dated but stretches from 1920 and was very useful as the 1927 and 1933 droughts were covered within the range of this data. The WR90 rainfall data was the most useful and historical trend and SPI indices could be analysed. Because of the link of the WR90 data to quaternary catchments, it was decided to use the tertiary catchments as the unit of analysing and reporting.

### Drought hazard

The start and end of a drought is often difficult to identify and quantify. Meteorologists and scientists developed a number of meteorological indicators for drought yet none of these satisfy the need under all conditions. Examples of these are (i) percent of normal precipitation, (ii) Palmer Drought Severity Index (PDI) (Palmer 1965; Alley, 1984; Karl & Knight, 1985), (iii) Rainfall Anomaly Index (van Rooy, 1966), (iv) Mean monthly rainfall deficit, (v) Zucchini-Adamson models (Zucchini, Adamson & McNeill, 1991), (vi) Relative drought resistance method (Roux, 1993), (vii) Rainfall deciles method (Erasmus, 1991), (viii) Roux expert system (Roux, 1991) (ix) PUTU suite of plant models (Fouche, de Jager & Opperman, 1985; Fouche, 1992), (x) ZA schrubland model

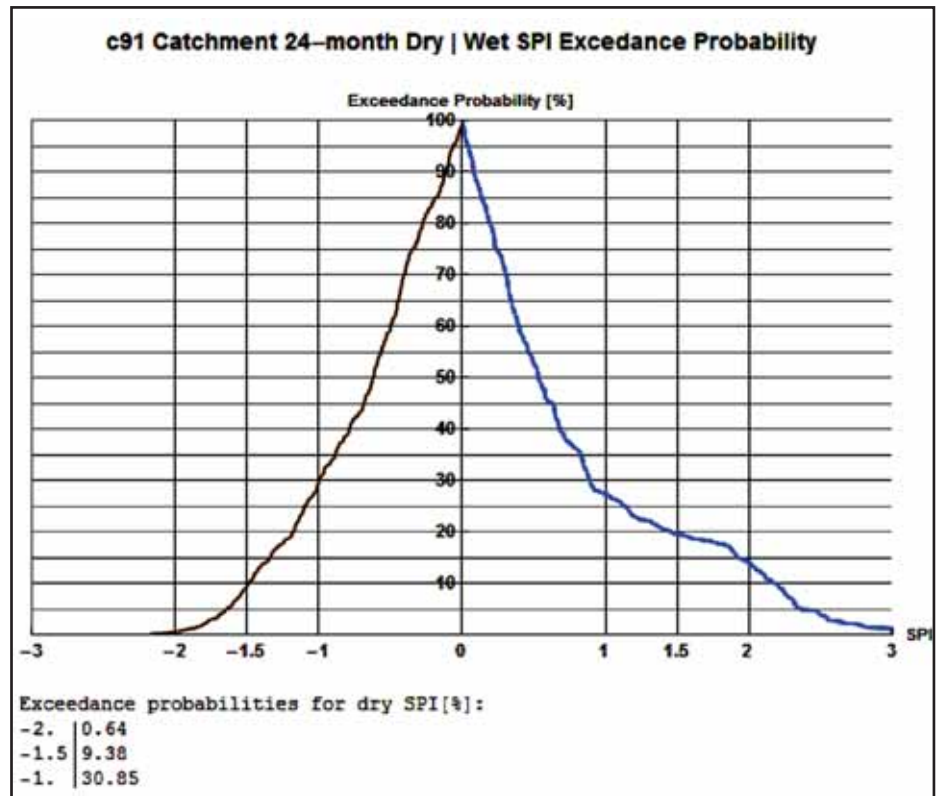


Figure 4: 24 month SPI exceedance probability for catchment C91.

(Venter, 1992) (xi) Crop moisture index (CMI) (xii) Surface water supply index (SWSI) (Shafer & Dezman, 1982) (xiii) reclamation drought index (xiv) deciles (Gibbs & Mather, 1967) (xv) Standard Precipitation Index (SPI) (McKee, Doesken & Kleist, 1993) (xvi) Standard Precipitation Evapotranspiration Index (SPEI) (Beguir, Vicente-Serrano & Angulo-Martinez, 2010) (xvii) NDVI which is not a meteorological index but rather an index measuring the impact of dry conditions on the vegetation, and others which is not relevant in the context of this study (du Pisanie, Fouche & Venter, 1998; Wilhite, 2000; WMO, 2006; Vasilaidis & Loukas, 2009).

The SPI was used as an indicator for drought in this study and one of the questions yet unanswered is when is a drought disastrous and when is it another dry spell? The SPI provided a quantifiable index indicating wet periods (0 to 3) and dry periods (0 to minus 3) for different time periods. McKee et al (1993), McKee et al (1995) and Hayes (1999) classifies different droughts according to SPI values as follows:

- Minus 1 to minus 1.499 - moderate drought
- Minus 1.5 to minus 1.999 - severe drought
- Less than minus 2 - extreme drought

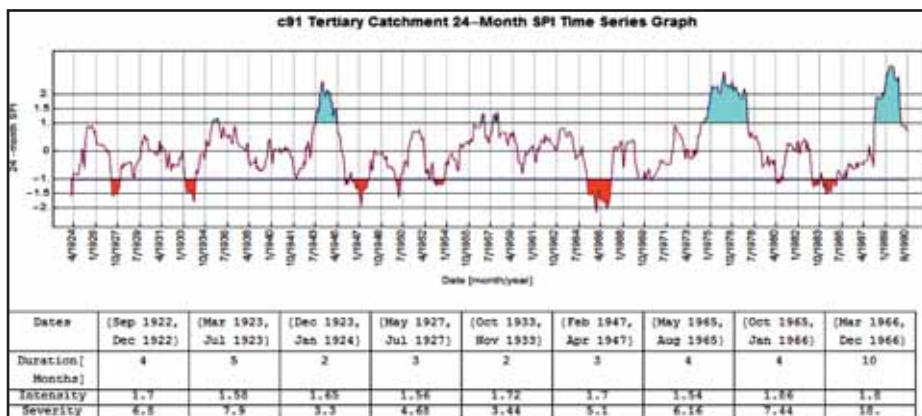


Figure 3: SPI and drought severity in tertiary catchment C91.

For the purpose of drought risk calculation in this study the 24 month SPI with values of below 1.5 was used as an indicator of disaster droughts. SPI calculations and exceedance probability was calculated for all 38 tertiary catchments in the Northern Cape. See Figure 3 for an example of drought severity based on the SPI calculation for the Barkley West area.

From the SPI data the exceedance probability was also calculated and used in the calculation for drought risk. An example of the results for exceedance probability for drought in

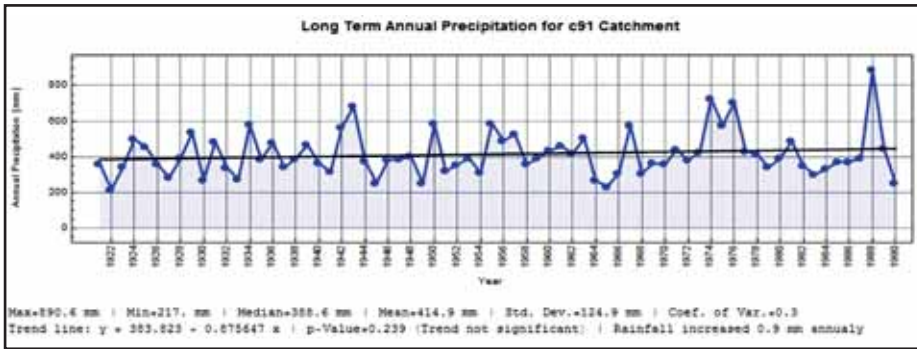


Figure 5. Long term annual mean precipitation for catchment C91

the Barkley west region is shown in Figure 4. From these results the probability for extreme droughts in Barkley West are 0.64%, 9.38% for severe droughts and 30.85% for moderate droughts.

The long term precipitation for all catchments was also calculated and analysed and the most important conclusion as far as rainfall is concerned is the fact that the province received on average more rain per annum than 100 years ago. The analyses show increases of between 0.1 mm per annum up to 1.1 mm per annum for certain catchments but the positive trend is not statistically significant in all catchments ( $p=0.239$  in the Barkley West example).

Figure 5 shows the result of mean annual precipitation for catchment

C91. The trend is positive ( $y=383.823+0.875647x$ ) with  $p$  value = 0.239 (not significant). The mean annual precipitation for C91 is 414.9 mm with median 388.6 mm and coefficient of variance 0.3. The mentioned data was calculated for all tertiary catchments, integrated and used in the equation for drought hazard risk (for detail equations refer to Jordaan, Sakulski & Jordaan, 2011).

Based on hazard data, a risk map was also constructed for the NC. Figure 6 shows the comparative drought hazard map for the NC. It is interesting to note that the region with the lowest drought risk is located in the northern part of the province. Lowest hazard risk is to a large extent associated with coefficient of variance and probability for  $SPI < -1.5$ . The

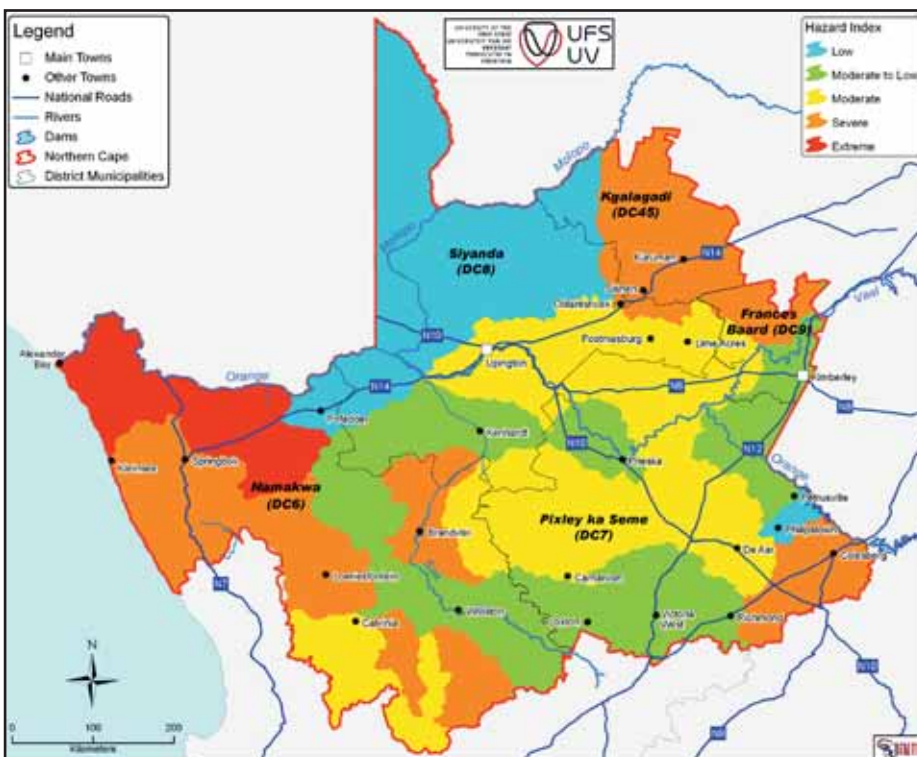


Figure 6. Drought hazard map for NC

highest drought hazard risk area is in the Richtersveld area. Note that the drought impacts are not considered in the hazard calculation.

The trend for evapotranspiration seems to be negative yet both trends for precipitation and evapotranspiration are not statistically significant. This does not mean that this trend will continue for the next 100 years. Also clear from the monthly rainfall analyses is the shift in peak rainfall patterns to later. A decline in precipitation was detected for the months September to November and an increase in precipitation from January to March.

Some catchments show a definite dry and wet cycle but the time-span for these cycles is not constant and one cannot use this as a basis for forecasting dry and wet periods. These cycles vary from 12 years to 20 years and differ from catchment to catchment. The precipitation analyses clearly show an increase in extreme weather events since the mid 1970s with most of the extreme toward wet cycles. The most extreme droughts were recorded during the 1920s and 1933 with drought severity above 50 in many catchments. This type of drought has never been experienced since 1933. The mid 1970s wet period was the wettest period experienced for 100 years and this contributed towards the higher than normal average precipitation towards the end of the 1900s. The increase in extremes is consistent with climate change predictions, yet we believe that 100 years of data is not sufficient to make any conclusions for future trends. In contradiction to IPCC forecasts we might see a decrease in mean precipitation over the next 100 years or the positive trend might continue.

Important is the fact that the deterioration of the graze land might not be the result of climate change or less rain or anything to do with weather. The fact that farmers have the perception of dryer conditions and more extreme droughts might be the result of over-utilisation and mismanagement of the natural resources such as grazing and ground water. This is evident on communal land where communal farmers experience severe droughts regularly during normal dry periods.

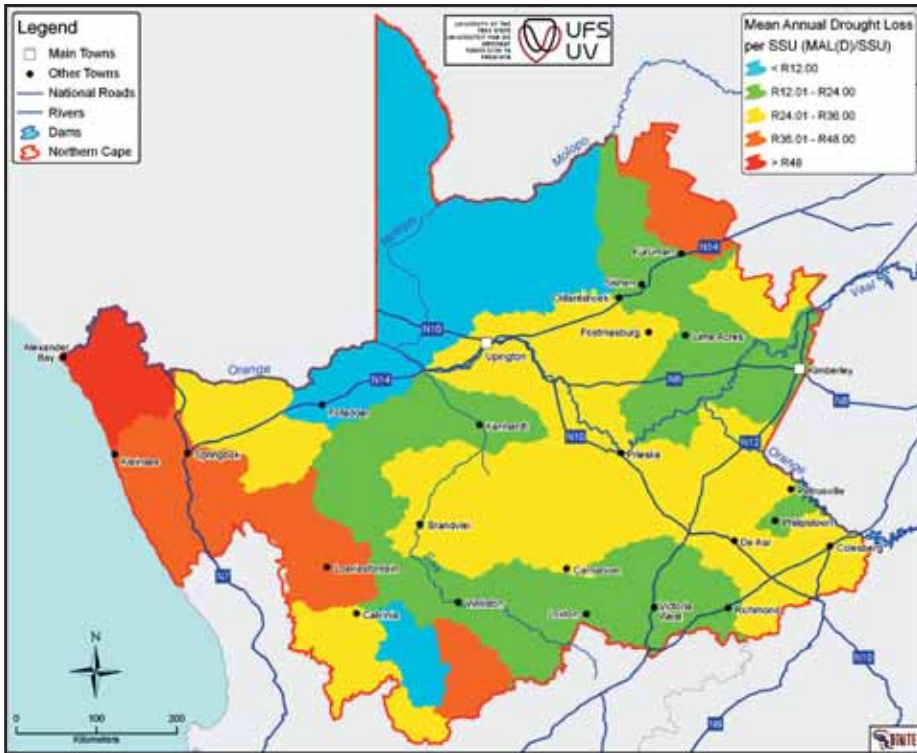


Figure 6: Drought hazard map for NC

Commercial farmers also acknowledge the impact of over-grazing and mismanagement and its contribution to drought.

### Vulnerabilities

The following equation was used for the calculation of vulnerabilities:

$$V = \sum_{i=1}^3 w_i V_i$$

$$V = fw_1 Vecon, w_2 Vsoc, w_3 Venv$$

Where:

Vecon = Economic vulnerability

Venv = Environmental vulnerability

Vsoc = Social vulnerability

w<sub>i</sub> = Weight of vulnerability

w<sub>1</sub> = 0.5 = Weight for economic vulnerability

w<sub>2</sub> = 0.2 = Weight for social vulnerability

w<sub>3</sub> = 0.3 = Weight for environmental vulnerability

**Social vulnerability** might not be the major contributor to drought risk and is in most cases the result of financial stress. Factors considered for social vulnerability included depravity index (Noble et al, 2010), services, education, alternative livelihood sources, institutions, regional diversification and support structures. The study found that farmers are in

general well educated and prepared for the impact of droughts, although they reported negative impacts such as depression and stress during droughts. Farm workers are to a large extent protected from the direct impact of drought through their employers. No evidence was found where farm workers on commercial farms were retrenched because of drought except in cases where the farmers also lost all or some of his/her land.

The small-scale farmers on the other hand are very vulnerable since they sometimes lose their total livelihood during droughts. Not only are small-scale and communal farmers socially vulnerable to droughts; their vulnerability is also exacerbated by factors such as (i) no land ownership, (ii) competition for limited over-grazed land, (iii) poor infrastructure, (iv) poor land management, (v) negative market forces, (vi) lack of economies of scale, (vii) high feed and fodder prices, (viii) no access to capital and other factors. Even under the same dry weather conditions, these farmers might experience severe droughts whereas commercial farmers might experience it as only a dry period.

Vegetation was the main determinant for **environmental vulnerability** but factors such as soil quality, slope, and land degradation

were also considered contributing factors to environmental vulnerability. The carrying capacity of the province was determined at the hand of the 1993 official carrying capacity and according to that the province has the capacity for 7,892,300 SSU. Data from the Department of Agriculture (2010), Cape Wools (2010) and the Red Meat Producers Organization (2010) shows a total of approximately 9,7000,000 SSU in the province (excluding game, donkeys, horses). If that is compared with the official carrying capacity for the province it shows that the province is over-stocked by more than 24% and that excludes game, donkeys, horses and other animals for which data is not readily available.

Economic vulnerability was determined using factors such as (i) production output per unit during drought stress, (ii) price sensitivity of products, (iii) on-farm diversification, (iv) alternative sources of income, (v) regional economic diversification, (vi) government support and (vii) entrepreneurship opportunities. Economic impact was also calculated as mean annual loss (MAL). The MAL for the Northern Cape adds up to R196 million per annum at mean R5.77 per ha and R27.10 per SSU. That is the amount of money farmers lose every year in production without taking into consideration price sensitivity for dry conditions. If the total province has the same drought with SPI index -2, the loss in production for that one year adds up to R1.8 billion plus R900 million for loss in production the following years. The highest MAL for a catchment is R69.30 per SSU in catchment D82 and the lowest MAL of R5.36 is for catchment D42. The high MALs is the result of higher probability for extreme droughts compared to very low probability for extreme droughts in catchments with low MAL. The implication of the MAL is that it provides a guideline on how much money should be saved during the good years in order to cover losses during droughts. It is also useful to compare different areas and the drought impact of different areas. The mentioned calculations were based on qualitative inputs from farmers regarding their losses during droughts. Further detailed research is needed in order to develop drought loss functions for different sectors. Fig 7: MAL for NC.



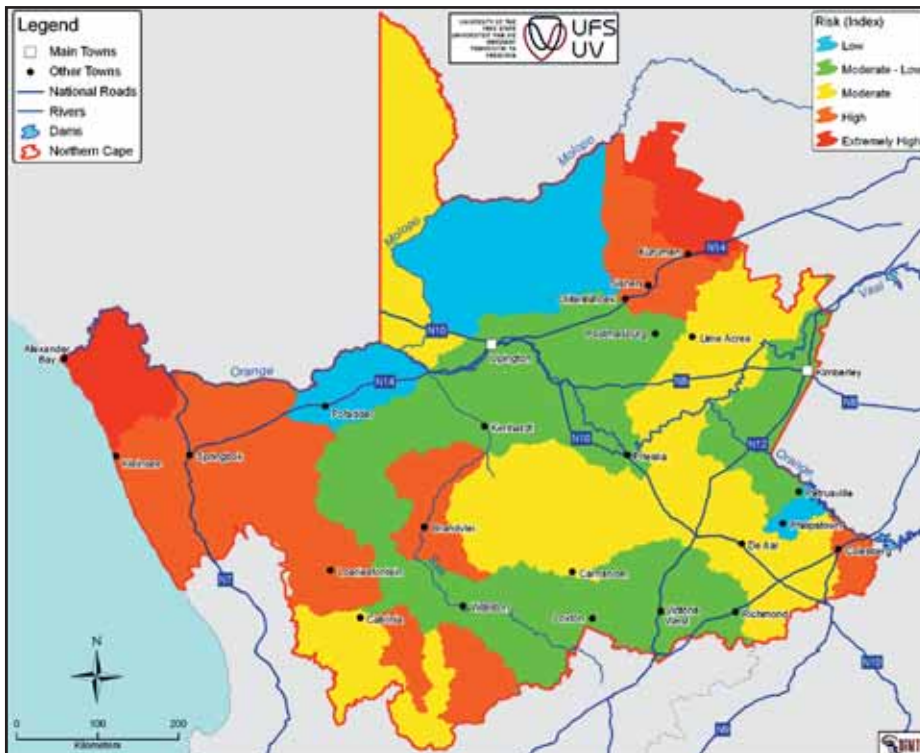


Figure 8: Drought risk map for NC

### Coping capacity

**Coping capacity** for drought was also determined by analysing the capacity of farmers, farm workers and rural towns to cope with droughts. Factors considered for equating coping capacity included (i) land ownership, (ii) farm diversification to provide own feed and fodder during drought, (iii) government support during drought, (iv) institutions in support during drought, (v) alternative sources of income, and (vi) non agricultural entrepreneurship opportunities. The following equation was used for the calculation of coping capacity.

$$CC = \sum i = 13wiccCC1$$

$$CC = f(w1CCfarm, w2CCfw, w3CCtown)$$

where:

CCfarm = Coping capacity of farmers and land owners

CCfw = Coping capacity of farm workers

CCtown = Coping capacity of rural towns

w = Weighting factors

### Drought risk

All the mentioned factors were used in the drought risk equation and a drought risk map was compiled for the

NC (Figure 8). According to these results the areas with the highest drought risk are located in the upper north west of the Kgalagadi district municipality and in the Richtersveld. The impact of drought such as vulnerability to the local economy and environment, land degradation and the lack of coping capacity finally became the determinants for drought risk in the two high risk areas. Farmers from these areas do not have land ownership rights and they cite the lack of land ownership as the main reason for over-exploitation and resultant land degradation.

### General remarks

Farmers in the NC acknowledged that they should implement their own risk reduction measures. The introduction of the "monitor farms" is an excellent initiative from Northern Cape Agri to set certain guidelines for drought monitoring. Farmers are concerned about the time span between applications for drought support and the declaration of areas as drought disaster areas. That includes the support from government. Both communal small-scale farmers and commercial farmers cannot wait until after the drought for the necessary support. The lack of proper contingency plans is of concern.

Farmers were also concerned about the methodology for drought declaration. At the centre of the problem here is that over-grazed lands are sometimes classified as drought stricken since the NDVI cannot make a distinction between poor vegetation and over-grazed vegetation.

Farmers reported the subsidy system for feed and fodder purchase as sufficient. The possibility of drought insurance and/or tax free saving schemes was also mentioned as tools to increase coping capacity

Farmers, commercial as well as small-scale subsistence all agree that drought loss is little compared to predator losses. Predators has not been regarded as a potential disaster until now, and, considering the feedback from farmers, the authorities should view this issue more seriously. Commercial farmers reported progeny losses amongst small stock as between 10% and 35% and communal small-scale farmers reported losses averaging 50%. Studies by van Niekerk (2010) and de Waal (2010) highlighted the significance of this problem

### Recommendations

A national policy dealing with all drought related issues should be implemented. Drought does not have borders and all provinces should be guided by a national policy and framework. Provinces should use risk assessment as a basis for the development of disaster management planning. Such a plan should include the necessary contingency plans; it must be approved and accepted by all role players; the MEC, the DG and Treasury must approve and sign it and contingency plans should be activated immediately after drought disaster declaration. Money and resources should be released as stipulated in the plan immediately after drought declaration.

Detailed research should be conducted regarding over-stocking in the NC. Problem areas and cases should be identified and measures put in place to enforce sufficient stocking rates.

The problems related to communal land should be addressed as a matter of urgency. The "tragedy of the commons" should not be accepted as a given. Strict measurement should be enforced on both the land-owners and

land users. Communal farmers should be assisted in a special way but their support should be coupled to certain preconditions designed to prevent a continuation of their problems. The extension officers should play an important role in the support to these farmers, specifically with regards to improved management principles.

Refine the methodology for drought disaster declarations. Implement the use of SPI and decide on a specific threshold for drought declaration, which is nationally uniform. More research is needed to determine the threshold for disaster drought, and the lack of drought loss functions make drought declarations based on economic considerations nearly impossible. Vulnerability is important in the determination of disaster risk but the methodology for drought declaration should limit the impact of "man-made" vulnerabilities such as over-grazing and poor management.

Conservation farming and the long-term advantages thereof should be supported and promoted. The land-care programme plays a positive role in this regard but commercial land-owners should be more involved at their level. Extension services should be the vehicle to promote this. Expand the capacity of extension services in order to advise at commercial farm level as well. The focus on small-scale farmers and the appointment of extension officers without proper training limit the influence of the Department in the commercial sector.

Disaster management and extension services within the department should work close together. Collaboration between government departments is essential for proper implementation of a drought risk reduction plan. Provincial disaster management and disaster management at the DoAFF should coordinate and plan together.

The role of district municipalities in agriculture and their responsibility with drought risk reduction and drought relief should be clarified. If it is expected from district municipalities to play a more important role in drought disaster relief, the communication between municipalities and the farming sector should be increased drastically. Currently there is too much distrust between them.

Investigate the possibility of index insurance against drought. The SPI can be used as a basis for such insurance.

Conduct research to determine loss functions for different drought severities.

Conduct further research in order to refine the methodology for disaster risk assessment



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# Climate change -

## Case Study - UGU Floods (2008)

Science has shown that climate change is already taking place (IPCC, 2001). Climate related disasters have increased in frequency and intensity as a result of climate change. The changing weather patterns are already noticeable, with a drastic and continuing rise in the small and medium-scale climate related disasters since the 1980s. Hence, Pettengell (2010) profoundly argues that Disaster Risk Reduction (DRR) needs to emphasise climate change analysis, which is an important component of adapting to climate change.

### So what is climate change?

A simple interpretation is that climate change is the result of escalating levels of greenhouse gas emissions that lead to increasing temperatures and changing rainfall patterns.

### How is climate change affecting South Africa?

- The average air temperature over South Africa will increase by an estimated 3°C over the next 100 years. Temperature increase implies extremely hot days.
- The country's rainfall is projected to decrease by 5-10 %
- Rainfall season- will also change:  
The rainfall season will begin later;  
The annual average rain falling over fewer days with an increase in extreme events.
- Winter rainfall region will become drier.

In light of the above, the probable implications might include:

- extensive drought and desertification
- water scarcity in Africa and elsewhere from decreased rainfall
- melting of glaciers in mountainous regions limiting available water
- communicable diseases may spike with an increase in insect vectors and more prevalent conditions favouring disease transmission
- unprecedented rains, storms and tidal surges

Ugu district municipality has six local municipalities: Umuziwabantu, Ezingoleni and Vulamehlo are located inland, and Umzumbe, Umdoni and Hibiscus Coast on the coast. In terms of physical development Ugu district municipality resembles a 'T' shape. Areas along the coast have well developed infrastructure and reasonable economic growth, while the large rural areas are characterised by poor infrastructure and high unemployment levels

Key demographic information about Ugu district municipality includes:

- Ugu district municipality has over 700,000 residents, which is about 7.5 percent of the population of KZN.
- 84 percent of the Ugu district municipality population resides in the rural areas while the remaining 16 percent are urbanised.
- The district municipality is mostly poor. More than 44 percent of households earn less than R1500 per month and almost 60 percent earn less than R2500 per month. The unemployment rate for the district is estimated at 30 percent.
- Urban areas tend to be wealthier and have access to better infrastructure, more economic opportunities and a greater range of municipal services than rural areas. Rural households depend largely on external income sources, e.g. state grants and remittances from relatives working in urban areas. The Hibiscus Coast, with the two largest towns, contains over 30 percent of the population and 60 percent of the district municipality's economic activity. Which cause more work for disaster management teams when disasters strike because of the high volume of unemployment and poor family mostly in rural areas.

### History of flood disaster in UGU

In 1987 major flooding caused numerous community deaths in all local municipalities under Ugu district municipality and at that time assistance only came from the SAP and protection services, as disaster management office was non-existent.



## Background

At about 23h30 on the 18th of June 2008, a coastal storm hit the Ugu District region on the southernmost part of KwaZulu-Natal. A heavy rainfall storm, accompanied by gale winds was experienced along the coast of the Ugu region from Port Edward up to Scottburgh including Umkomaas. The Ugu District Disaster Management Centre was activated at about 02h00, and all emergency services were advised of the looming emergency situation.

## Cause and consequences

Information from the South African weather bureau indicated that the South Coast region of KwaZulu-Natal was experiencing a coastal storm. An estimated 200mm of rain fell between midnight on the 17th and 08h00 on the morning of the 18th June 2008. The weather forecast to Saturday predicted the current conditions to remain unchanged until Saturday.

The major rivers that were affected in the Umdoni Municipality area were the Umzinto and Ifafa rivers and all the major rivers in Hibiscus, Umzumbe, Vulamehlo, Iziqola, Umuziwabantu were badly affected. Big trees had been uprooted blocking the flow of water causing overflow and washing the bridge away.

Tremendous damage was reported on a number of critical infrastructures in the area, including roads, bridges, public facilities, water and sanitation infrastructure, communication infrastructure, businesses, etc.

A number of roads were structurally damaged and storm water drains were blocked due to the debris carried by the run-off. The municipal maintenance teams and community volunteers were deployed to open up the storm water drains, repair the roads and clean-up the beaches. Most bathing beaches along the South Coast were damaged by the debris. A partnership programme for the beach clean up was entered into between Umdoni Municipality and the Correctional Services department which commenced on 13th September 2008.

- A total of 700 informal settlements were completely damaged and 378 were partially damaged
- A total of 683 houses were damaged in rural areas

- A total of 176 houses were damaged in urban areas

## Response and recovery

A total of 828 people at Umdoni were evacuated to the safe public facilities and municipal buildings as follows: 1378 tents were provided as well as food parcels and blankets. People from informal settlement were relocated to temporary houses.

- Umzinto Town Hall - 600 People
- Sezela Library - 29 People
- Scottburgh Hall - 100 People
- Amahlongwa - 50 People
- Malangeni MPCC - 27 People
- Zibuse Agricultural Office - 22 People

## Umdoni Municipality area fatalities and injuries

- 6 fatalities were reported and confirmed by SAPS
  - 3 were from Malangeni area
  - 1 were from Riverside Park
  - 2 were from Club Marina.

## Process of declaration

The municipal leadership of the district using information from the Ugu Disaster Management Centre in its interim technical assessment declared the Ugu Municipality to be in a state of emergency and within three days, the Ugu mayor called for a special council meeting where the flood damage was officially declared a disaster.

## Challenges

- Loss of pension cards, IDs and birth certificates
- Poor relief (food vouchers) by NGOs and SASSA as they did not at first report to the municipal Joint Operational Centre (JOC).
- Child headed family
- Social related areas
- Counseling
- Trauma counselling.
- Report back from counselling
- Damage to school uniforms and books
- Slow rehabilitation process

## Lessons learned

Though the Joint operation Centre we managed to work with all

government departments who are based at Ugu, e.g SASSA, Social Development, Home Affairs, Department of Health, Correctional Services, Department of Education, SAPS and Line function departments of the municipalities.

## Assessment findings

- The heavy rains caused river levels to rise
- Flood resulted in damage to property and infrastructure
- Low-lying flood plain areas and riverbank-adjacent infrastructure were severely affected.
- The mass of water released by the storm overloaded the storm-water and water management infrastructure

## The way forward

- Councillors must understand and support the disaster management office with enough budget for equipment and material needed during times of disaster occurrence.
- The disaster management office must plan for the risk that has been identified in their disaster management plan.
- The communication system must be improved as it normally fails when disaster strikes.

## Concluding remarks

Whilst examining the key drivers of climate change and its various threats, it is imperative that attention now focus on how society and nature can adapt in a changing climate!

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# Message of support:

## DMISA Conference 2011



S. MODIEGI SETHUSHA  
ACTING HEAD:  
NATIONAL DISASTER  
MANAGEMENT CENTRE  
(THE NDMC)

It gives me great pleasure to convey the message of support to the Disaster Management Institute of Southern Africa (DMISA) on behalf of the National Disaster Management Centre, a branch within the Department of Cooperative Governance.

In his book titled: *Environmental Hazards: assessing risk and reducing disaster (2000)*, Keith Smith has this to say:

“As the world population grows and owns more material possessions, and as the built environment expands and accommodate such changes, greater numbers of people and property are put at risk from the forces of nature. Many people in the poorest countries now have a fragile dependence on a degraded resource base which becomes progressively less able to withstand pressures from environmental forces. Human progress has also led to the emergence of ‘human-induced threats’.

It is my calculated decision to use this statement as our experience supported by scientific research in the disaster services

field has thus far demonstrated beyond reasonable doubt that hazard incidents and reported disasters are also increasing in South Africa and that hydro-meteorological hazards accounts for most of the disasters reported. I am therefore convinced that the scenario sketched by Smith (200) holds for our country since the country is also experiencing spatial expansion demanding social, economic and infrastructural services and that over the years, we have been observing increasing incidents of hazards of different severity and intensity levels all of which posed pressure on the national resources (i.e. fiscal, environmental and human capacity).

### South Africa is not spared from such reported hazards incidents and disasters

Since the promulgation of the Disaster Management Act 2002 (Act 57 of 2002) hereinafter referred to as the DM Act, the South African authorities at national, provincial and municipal levels have been managing risk within various hazard



scenarios and disaster incidents of various typology but all falling within the scientifically known categories, notably: Natural Hazards (hydro-meteorological, geo-physical and biological) and human-induced hazards (technological, structure collapse, social conflict, mass gathering and sporting events).

During the 2009/10 financial year alone, the NDMC classified and declared disaster incidents which cost government to an estimation of R300 million while during 2010/11 financial year, it classified and declared disasters amounting to an estimation of R600 million. This figure represents an increase in the funds spent for disaster incidents dealt with over the two financial years in question. It is also important to note that the majority of the disasters are local and provincial state of disasters. Noteworthy also is the fact that, this financial year alone, 2011/12, the centre has classified and declared a state of the national disaster which is calculated to an estimation of R3 billion. This is evident that as a country, we are not prioritizing risk avoidance and reduction. One of the themes during the 2007-2008 commemoration of the ISDR, "Hospitals safe of disasters", it clearly preached disaster risk reduction whereby the message was clear that

It should however be pointed out that, all these incidents and disasters were dealt with different levels of successes. It is also important to note that the country has also supported other countries facing disaster incidents such as Haiti, Japan and Somali and also the countries along the Horn of Africa through contributions to response and recovery measures. We are also in the process of exploring collaborative agreements with other countries on DRR issues. To this end, countries which have been engaged thus far are Botswana, Nigeria and France. We are exploring to come up with a long term structured framework for disaster risk management in collaboration with our neighbouring States within the SADC as called for under the DM Act, 2002 and its policy Framework 2005.

### Status quo analysis of the disaster risk management services and fire services nationally.

The DM Act 2002, read with the National Disaster Management Framework 2005, makes a clear pronouncement on the capacity and systems requirements for implementing an effective disaster risk management function nationally and in conformity with the Hyogo Framework for Action 2005-2015 and associated regional strategies, viz: AU: Africa Regional Strategy for Disaster Reduction 2004 and the SADC Multi-Sectoral Disaster Risk Management Strategy 2001.

From our current analysis, it has been revealed that the country is doing relatively well with regard to putting in place institutional mechanism for disaster risk management nationally. This can be exemplified by the fact that, to date, after thorough assessment, 6 out of 9 PDMCs, 5 out of 8 Metropolitan DMCs and 19 out of 44 District DMCs are functioning adequately. There is however lot of work to be done in those centres that are not functioning as expected. The NDMC has seen a need to develop and implement a measurement tool in order to measure the functionality of centres to support them with a view to bringing them to the optimal state of functionality. To this effect, a national workshop was held and a draft functionality criteria for national, provincial, municipal and sector disaster risk management functionality are being developed.

It is also important to take into consideration the fact that DRM is a shared responsibility which must be fostered through partnerships between various stakeholders and cooperative relationships between different spheres of government, private sector and civil society. Furthermore DRM is an inter-governmental process with each sphere of government playing a unique role and performing a specific set of responsibilities in the process. In this regard, the NDMC is engaged in a consultation process with relevant sector departments to effect the principle of cooperative governance as prescribed in Chapter 3 of the Constitution of 1996 with the aim to achieve the following:

- To ensure integrated and well coordinated planning
- To facilitate and ensure DRM institutionalization and mainstreaming within departments
- To encourage sectors to embark on Disaster Risk Reduction through their programmes
- To ensure that the sector department allocate / provide financial resources for disaster risk management

### Fireservices update

The NDMC through its Fire Services Coordination has commenced with the process of introducing a comprehensive fire services legislative framework following requests by stakeholders and the resolution by the Fire Brigade Board. The introduction of a new legislative framework will replace the current Fire Brigade Services Act, 1987 (Act No. 99 of 1987) which was enacted prior to the introduction of primary local government legislations such as the Municipal System Act, Structures Act, Disaster Management Act etc. Through this process, we will introduce the National Fire Services Framework in 2012 which will set standards for service delivery in fire services as well as form the basis for the development of a new fire services legislation which will be introduced in 2014/15.

The NDMC has commenced with the consultations of all fire services stakeholders from across the provinces on 22-23 August 2011 in Gauteng and 25-26 in North West respectively. We have received positive response from stakeholders in the above mentioned provinces and concrete proposals were presented on what the legislative framework must entail. The NDMC is also in the process of finalising an Urban Search and Rescue Policy (USAR) which seeks to bring about uniformity in the rendering of Urban Search and Rescue services across the country.

Since 2008, Fire Brigade Board has not been functional, and the NDMC is currently finalising the appointment of Fire Brigade Board (FBB) members and it is expected that the FBB will hold its meeting in October/ November 2011. The FBB will be chaired by the Minister and all MECs responsible for



the administration of fire services. Representatives of organised business, labour, Southern African Emergency Services Institute (SAESI) will form part of the FBB as fulltime representatives. The NDMC has also resuscitated its National Fire Services Advisory Committee and encouraging the provinces to do the same to ensure proper coordination and planning of fire services in the country. The structure's functionality will be closely monitored and will be meeting on quarterly basis to advance fire services issues.

### Disaster risk management services gaining strategic ground in South Africa

Following the 2009 national elections and the inauguration of the current administration, disaster risk management issues are increasingly gaining prominence in the political and strategic agenda of the administrative systems of the country. Following acknowledgement of the role of disaster risk management in the achievement of the government 12 priorities as spelled out in the Medium Strategic Framework (2009 – 2015) and the outcomes of the Delivery Agreement, various inputs were sought from the NDMC (through DCOG) to contribute in guiding various sector

departments on how disaster risk management issues should be factored within the relevant outcomes and associated outputs. Such departments included the newly established Department of Rural Development and Land Reform.

Additionally, since 2009 disaster management issues have been mainstreamed within the key focus areas of the Local Government Turn Around Strategy in 2009 as one of the focus areas in the Ten Points Plan for ensuring: "An effective, efficient and accountable system of local government". Various PDMCs and MDMCs are being supported to mainstream Municipal Turn Around Strategy priorities within municipal IDPs to ensure improved disaster risk management in the identified areas.

### Employing strategic partnerships for effective disaster risk management

Considering our understanding of the complexity associated with disaster risk, our analysis of the interdependencies determining disaster risk and vulnerability to disasters pointed to the need to explore strategic partnerships for collaborative management of disaster risk. To this effect various partnerships were put in place while some are being negotiated to strengthen disaster

risk management measures. Some of these partnerships are called for directly under the DM Act and Framework while others are determined as strategic measures for implementing certain disaster risk management projects. They can therefore be classified in three categories, viz: political, strategic and tactical level partnerships.

Those include, but are not limited to: the reconstitution of the Intergovernmental Committee on Disaster Management (at advanced level), the strengthening of National Disaster Management Advisory Forum (at the advanced stage), the Disaster risk management agenda item as part of MiNMEC and Technical MiNMEC meetings (achieved at national and in some provinces), strengthening of NDMAF Technical Task Team according to sector DRM mandates (14 Technical Task Teams in place as well as their Chairpersons forum chaired by the NDMC), MoU with Paraffin Safety Association of Southern Africa, draft with Rural development and Land Reform, draft with World Vision, draft with SAPS and draft with Defense and Military Veterans, MoU and contracts with the academia on education, research and strategic knowledge management collaboration are being finalized, viz: University of the Free State and North West University, MoU with the World Bank's Global Facility for Disaster Reduction and Response and Recovery (GFDRR) to support the NDMC to realize the status of a "Centre of Excellence" on DRR issues in the country and the region (at the advanced stage), reconstitutions of the National Fire Services Advisory Committee, MoUs on Urban Search and Rescue with Gauteng and the Western Cape PDMCS to improve the capacity of fire services of search and rescue issues.

### Challenges thus far

The implementation of the disaster risk management (services) function as summarized above has occurred within a challenging set of circumstances which we all had to deal with in our respective spheres of operation. Without attempting to be exhaustive with them key and notable ones related to:

- The apparent focus of response and

recovery measures as opposed to increased emphasis on disaster risk reduction for enhanced prevention, mitigation and preparedness,

- Capacity challenges in majority of the sectors both in terms of quantity (numbers) and quality (policy and application knowledge and expertise) about the implementation of the function,
- Political buy-in for enforcement of DRM measures especially where communities are found to be exposed to risky conditions necessitating relocation,
- Financial resources allocation for the function for DRR measures and for effective response when incidents and disasters strike,
- Delay in accessing funds when disasters have occurred resulting with multiple suffering of the affected communities,
- Delays in spending funds allocated for disaster recovery compromising recovery efforts,
- Dwindling levels of education, training and awareness raising in some provinces leading to the erosion of a culture of disaster risk avoidance necessary for effective risk reduction, and
- Unstreamlined accountability between the National, Provincial and Municipal Disaster Management authorities on the function. i.e. the Head of the NDMC does not have authority over his/her provincial and municipal counterpart and, ninth, the fact that the NDMC has and still is, operating without the head since August 2008 making national coordination and consistency difficult to sustain.

### NDMC strategic priorities going forward

The NDMC will be investing part of their time in advancing the following priorities;

- Building the identity and image of the centre
- Fostering strategic partnerships to promote sharing of fundamental resources fundamental to DRR and all facets of response and recovery
- Lobbying political buy-in
- Building capacity to ensure resilience



- Explore the funding mechanism that will assist in expediting the our response to disasters
- Create awareness among stakeholders on DRM

### NDMC key message in line with the 2011 DMISA conference theme

The NDMC is continually supporting municipalities through provinces to roll out the multi-hazards awareness campaigns inclusive of the global International Strategy for Disaster Reduction (ISDR) awareness campaign themes. There has to date, been various engagements with provincial and municipal stakeholders to support them in rolling-out their tailored campaigns with great success. In line with the 2010/11 ISDR campaign theme, the NDMC has collaborated with various provinces and municipalities in the roll out and implementation of the outcomes of the campaign. Work is at the advanced stage to ensure the commemoration of the International Day for Disaster Reduction in collaboration with the Western Cape Province to be held in the City of Cape Town from 10 – 12 October 2011.

The DMISA 2011 conference theme states: "*Evolving Disaster Risk: Challenges and opportunities for*

### *resilient communities*"

Our close analysis of the theme taking into account Smith (2000) statement as cited above and the disaster risk scenario in South Africa, we are fully convinced that the chosen theme resonates well with the legislative provisions and the implementation requirements of our statutes for achieving DRR in the country. This theme is also consistent with the 2011 Third Global Platform for DRR: viz: "Invest Today for a Safer Tomorrow: Increasing Investment in Local Action".

The NDMC therefore wishes to convey its full support to the conference objectives and would appeal for strengthened partnerships and collaboration post the conference to ensure that the outcomes of the conference and associated national and local priorities are realised. This will ensure that DRM occupies its rightful strategic position of supporting service delivery, poverty reduction and sustainable development objectives as spelled out in the Millennium Development Goals (MDGs).

I thank you all and wish you a Disaster Free Summer Season.



# Disaster simulation is key to improving disaster response



The Cape Winelands District has taken the bold step to invest in a multi-year comprehensive exercise programme, taking the lead in improving disaster preparedness and response through elaborate exercise regime development and implementation.

This year's earthquakes in New Zealand and Japan highlighted the need to be prepared for any incident. In the event of an earthquake, all role players need to be equipped to deal with the resulting devastation. The destruction can include large scale loss of life, fires, flooding resulting from dam wall breaks, disruption in water supply and sanitation, disease outbreaks and the total loss or damage to electricity supply and communications infrastructure.

Once-off exercises as well as annual exercises are valuable in evaluating and improving disaster response, but the Cape Winelands District has leaped ahead into a new level of preparedness by investing in a comprehensive simulation exercise programme which is currently in its first year of implementation. "We are serious about role-player involvement and the team effort required for integrated disaster response," said Mr Shaun Minnies from the Cape Winelands District Municipality Disaster Management Centre during a recent workshop in Robertson, "...and we are committed to investing considerable time and effort into this programme which should guarantee a significant improvement in preparedness and an exponential increase in learning

among tactical and strategic disaster management role-players."

Having the appropriate plan, vehicles, equipment and trained personnel in place does not guarantee the most co-ordinated response to emergency and disaster incidents. The most accomplished personnel may become confused, disoriented or frustrated in a real-life disaster situation, making the exercise and simulation of these incidents extremely valuable. According to Dr Elretha Louw, Director and Disaster Risk Management Skills Leader with Aurecon, practice indeed does make a little more perfect and, hence for this simulation exercise programme recommends extensive practice and simulation of emergency procedures in order to improve disaster preparedness".

The South African National Disaster Management Framework of 2005 requires that simulations of risks related to different scenarios must be provided for in order to ensure continuous situational awareness and the effective allocation of resources. In order to meet this requirement, the Cape Winelands District Municipality in South Africa, appointed Aurecon's Risk Management Team to develop a Comprehensive Simulation Exercise Programme (CSEP) in early 2011.

The development of the CSEP, as the first phase of this project, involved research into previous risk assessments within the Cape Winelands District Municipality as well as existing Disaster Management Plans. Participation by role players

from each of the local municipalities was vital in ensuring that the exercise scripts were tailored to the municipalities' specific needs. The overall simulation theme for the Cape Winelands District Municipality is an earthquake due to the probability of a seismic event occurring in the area. Secondary impact themes were identified for each local municipality within the district ranging from train derailment with resulting hazmat incident, dam failure and structural collapse. The aforementioned information has been incorporated within 49 scripted exercises including table-top, walk-through and simulation variations that can be conducted by the client and other role-players over a period of approximately 36 months.

The key principle of the simulation exercise programme is to empower participants rather than just testing agencies to ascertain weaknesses. The next phase of the project will see the local municipalities within the Cape Winelands District Municipality having table top exercises facilitated for each of their tactical and strategic teams. These exercises will graduate to combined exercises with tactical and strategic teams as well as integrated municipal exercises. The table top exercises provides for a safe environment in order for different disciplines to debate and work towards an integrated disaster response.

The same principle will be applied to the functional and simulation exercises. As the project continues, each of the exercises will get progressively more challenging and complex, working towards the ultimate goal of an integrated full scale simulation exercise in the district.

The Cape Winelands District Municipality is not blind to the challenges that face a project of this magnitude such as maintaining role player involvement, but they are confident that the benefits of participation will encourage involvement. The expected learning and improvement will be a valuable return on investment that ultimately reducing disaster risk and benefits all inhabitants of the Cape Winelands District.

# Design better to reduce growing disaster risk



THEUNS VAN DER LINDE,  
A SCIENTIST WITH CONSULTING  
ENGINEERS AND SCIENTISTS,  
SRK CONSULTING



Recent killer floods in areas of South Africa have put the spotlight firmly on the country's ability to foresee, prevent and respond effectively to disasters. It has also focused minds on the social conditions that make many citizens particularly vulnerable.

Neither is South Africa alone in facing these growing risks. Natural and human-induced disasters are in the top three threats to the security of urban dwellers in the 21st century, according to the United Nations Global Report on Human Settlements. The current design of buildings and towns, however, is not addressing these risks adequately.

"Whether we are talking about flooding or an unacceptably high level of crime, the environment in which a community lives does influence its vulnerability to disaster," said Theuns van der Linde, a scientist with consulting engineers and scientists, SRK Consulting.

Van der Linde pointed out that the way in which buildings and urban environments are designed should not only mitigate hazards and the effects of disasters, but also play a role in overall disaster risk reduction. And while various hazard mitigation techniques are already used in these designs, we now need a more clearly defined and structured approach to guide risk reduction initiatives.

He said the concept of Disaster Risk Reduction Through Environmental Design (DRRTED) proposes to use a comprehensive approach to consider all factors that might raise the disaster risk level in a community – by focusing not only on the hazards themselves but also on the vulnerability of the community and its resilience to the effects of the hazards.

## Structured approach

"The concept is not new, seeing that hazard mitigation techniques have been implemented for hundreds of years," he said. "Nor is the aim to replace existing guidelines or initiatives with a new 'science'."

For instance, there are various design guidelines and standards that aim to ensure safer urban environments. Some of

the current standards are required by legislation, such as the national building regulations, while other guidelines serve to present 'best practice'.

"One such document – the Guidelines for Human Settlement Planning and Design published in 2000 by the CSIR – is a set of guidelines, covering various aspects of settlement planning and design," said van der Linde, "including general planning guidelines as well as specific chapters on several other aspects such as storm water management, roads, water supply, sanitation, solid waste management and energy."

Rather, DRRTED would provide a framework in which various role players can consider their specific roles and responsibilities, and facilitate the risk reduction process by providing a structural approach to disaster risk reduction.

"This approach might provide some answers to the disaster risk challenges faced in various communities throughout South Africa, Africa and the world," he said.

Another field of study getting more attention globally, and to some extent in South Africa, is the field of Crime Prevention through Environmental Design (CPTED). The principle of CPTED is based on the assumption that through the application of sound design principles, the opportunities, causes and fear of crime can be addressed. According to the CSIR, the five basic principles of CPTED are:

- surveillance and visibility;
- territoriality and defensible space;
- access and escape routes;
- image and aesthetics; and
- target hardening.

"There are also some CPTED practitioners who believe that the principles should not only address crime prevention by limiting opportunities for crime to occur, but also address the underlying socio-economic factors that can cause people to turn to crime," he said. This aspect of CPTED - using the built environment to influence socio-economic aspects - forms part of the DRRTED principles.

## Linkages

Key among the proposed benefits of DRRTED is to establish linkages between the science of disaster (or risk) management and the sciences of architecture, engineering and urban planning and design; this could help find solutions for disaster challenges faced in urban environments.

He explained that the concept as yet did not provide answers to all questions relating to the creation of disaster-resistant urban environments, nor did it aim to replace or criticise existing risk reduction approaches.

Instead, it proposes one approach to confront the challenges associated with creating disaster-resistant buildings and urban environments. He hopes the concept will stimulate debate between academics, government officials and professionals alike.

The DRRTED approach may seek to provide answers to questions like these:

- How can urban planners use land-use planning guidelines to reduce the hazard level caused by fires?
- How can urban planners reduce the risk of flood damage and potential loss of life of urban developments along rivers with the aid of development guidelines for flood prone developments?
- How can engineers use foundations to reduce the vulnerability of buildings to the effects of earthquakes?
- How can architects use landscaping to facilitate the response of fire services during emergencies?
- How can urban planners use land-use planning guidelines to increase income opportunities in a specific area, thereby possibly reducing vulnerability?

## Hazard level

DRRTED aims to reduce the level of any specific hazard in a built environment, through various 'zones of influence'; each zone can be used to influence the level of disaster risk, and 'tools' can be put in place to reduce factors such as the spatial extent, intensity and frequency of that hazard.

Van der Linde said that specific environmental components each have a purpose and characteristic, but all

contribute to the overall built environment; because these components include both physical (hard) components and design decisions ('soft issues' such as land-use planning), the term 'environmental components' might be misleading. These aspects - or 'tools of influence' - could be seen as tools to influence the risk levels associated with a specific area, building or urban environment.

"A number of studies have been done to protect different types of buildings against various hazards, and compiled building regulations and codes are evidence of that," said Van der Linde. "However, it is important that various individual codes and guidelines should be integrated into a single framework in order to avoid overlapping standard, and identify gaps or room for improvement in the existing measures."

Various studies have been done to reduce the vulnerability of buildings, for example by using high quality building material, suitable structural design principles and ensuring buildings are constructed in appropriate areas.

## Socio-economic aspects

"These aspects are also incorporated in the various tools in the proposed DRRTED framework," he said. "However, the structural vulnerability aspects don't necessarily

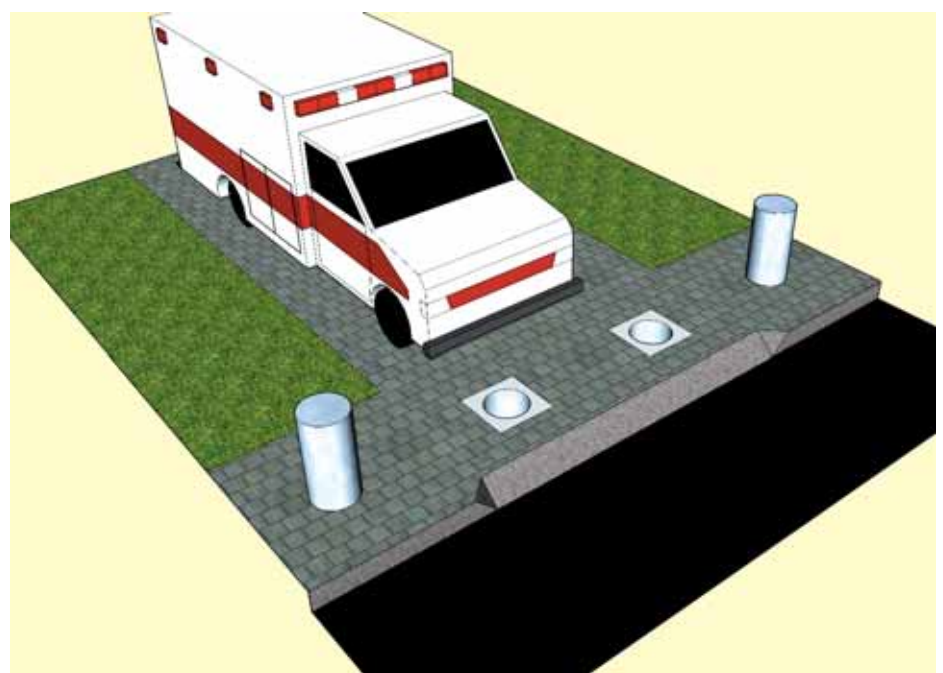
take the socio-economic impacts of environmental design into account. The socio-economic characteristics of a community often contribute just as much, if not more than the physical and structural characteristics, to the vulnerability of the community.

"The specific impact of the physical environment on the socio-economic characteristics of the community is a very important aspect to consider. Based on that, DRRTED also aims to identify quantitative and qualitative environmental design guidelines to improve the socio-economic resilience of a community."

In considering the impact of the built environment on the socio-economic characteristics of a community, it is important to take into account the functions of the environment. For example, the CSIR identifies the functions of 'hard open space' as having:

- social functions;
- economic functions;
- movement functions; and
- political or symbolic functions.

"Social functions include activities such as sports and recreation and also cultural entertainment," he said. "However, social functions also include activities such as lingering or resting, and providing a space for people to meet. It can be argued that a built environment conducive for social



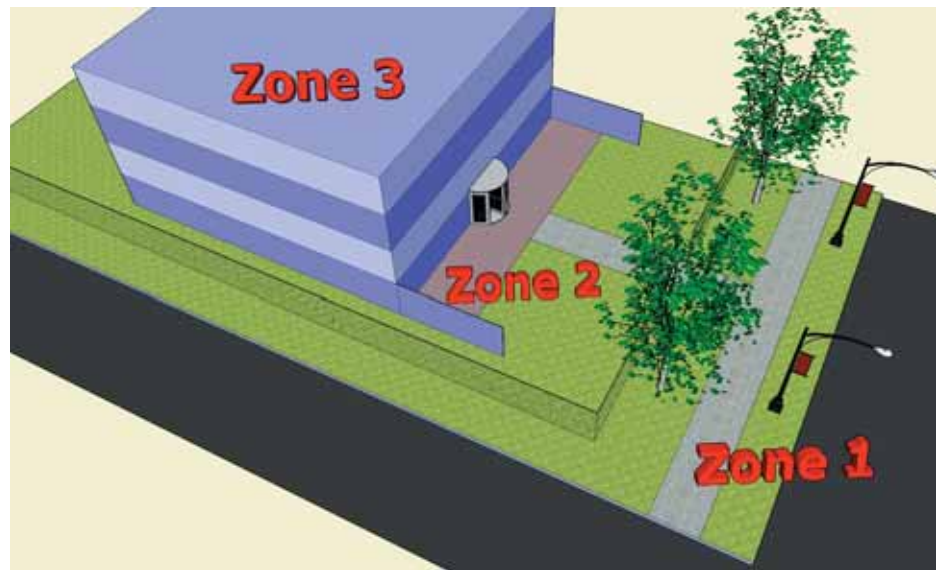
*Rising bollards can provide access for authorized vehicles.*

functions can directly or indirectly impact on the socio-economic characteristics of a community, and therefore also impact on the community's vulnerability."

In terms of the economic functions of the built environment, a number of South Africans' livelihoods depend on economic activities like street vending and informal trading. It can be argued, for example, that if the built environment can improve or increase informal trading opportunities, this can directly or indirectly influence the level of income of people employed in this economic sector. This in turn can change the socio-economic profile of a community.

"This specific component of DRRTED is a very interesting and important component, and merits additional research or investigation," he said.

DRRTED also focuses on improving the capacity and capability of responding to disasters. This can be done by using the built environment to aid response activities by facilitating access to and from disaster areas, facilitating access to resources, improving environmental components such as visibility, and also improving communication and information flow.



*DRRTED Zones of Influence*

### Way forward

Van der Linde said that more research is now necessary to refine this concept, and to make its application more practical; the intention is to investigate what role each of the components of the built environment can play in influencing the individual hazard, vulnerability or resilience factors to reduce disaster risk in a specific community.

He recommended that the research be funded by an organisation such as the National Disaster Management Centre and other funding institutions. The first step could include the refinement of the conceptual framework; this could be followed by a study to collect information on existing disaster risk reduction design guidelines, as contained in South African building regulations, for example, as well as international documents.

As with disaster management activities in general, research into DRRTED would require inputs from various experts including engineers, architects, urban planners, and social scientists.

"Continued research in the DRRTED field might lead to the development of a document, similar to the CSIR's Guidelines for Settlement Planning and Design, which can provide authorities, government officials, developers and professionals with qualitative and quantitative guidelines on how to create low disaster risk urban environments and buildings," he said. "The concept should not remain theory but must lead to practical solutions that can be implemented, while taking into account the various challenges in the South African context."



*Flood Hazard Reduction: Elevated Structures*