

AN INTEGRATED DISASTER RISK ASSESSMENT MODEL FOR LOCAL GOVERNMENT IN SOUTH AFRICA

1 INTRODUCTION

Alerted by heightening impact and intensification of disasters, the international disaster reduction community initiated various strategies as a means of counteracting and managing emerging and anticipated disaster situations. In this respect the international initiatives could be traced back to the International Decade for Natural Disaster Reduction (IDNDR) declaration (for the period 1990 to 2000) which was instrumental in raising the profile of deliberations around the social and economic causes of disaster risk. Subsequently, in the year 2000, the United Nations International Strategy for Disaster Reduction (ISDR) was formed, which replaced the International Decade for Natural Disaster Reduction. The strategic focus of the ISDR was to promote the issues of awareness, assessment and management of disaster risk. In addition, the Eight Millennium Development Goals proclaimed in 2002 highlighted disaster risk as a critical component of the development process that needs to be addressed by 2015 (UNDP, 2004). Further support for this international agenda on disaster risk reduction was from the numerous conferences, seminars and working groups keenly engaging and interrogating the pertinent concerns and challenging relating to disaster risk reduction. In particular, the World Conference on Disaster Reduction hosted in Kobe-Hyogo (Japan) in 2005 and the pronounced Hyogo Framework for Action 2005-2015 with clear milestones towards effective disaster risk reduction (Kobe Report, 2005; ISDR, 2005). Equally important is the ISDR Disaster Risk Reduction Model (ISDR, 2005) that emerged out of the global review of disaster reduction (ISDR, 2002) which provides an international framework for the practice of effective disaster risk reduction.

In South Africa the challenge is to identify, review, develop, modify and implement appropriate risk reduction strategies in a co-ordinated, effective,

efficient and economical manner for the whole of South Africa. As such, the Disaster Management Act of South Africa (2002) stresses disaster risk assessment which is identified as the first and most crucial step (according to the National Disaster Management Framework of South Africa) towards risk reduction (as outlined in sections 20, 33 and 47 of the Act). Furthermore, it is critical to acknowledge that the study of disaster risk assessment concentrates on the elements of hazard, vulnerability and risk that are dynamically related. The relationship of these elements can be expressed as a simple expression (Risk = Hazard x Vulnerability). This illustrates the concept that the greater the potential occurrence of a hazard and the more vulnerable the population, the greater the risk (Blaikie, *et al.* 1994; Alexander, 1993:7-10; Varley, 1994:1-30).

Therefore, a thorough analysis of disaster risk assessment will provide a complete and comprehensive picture of the society in question by tracing and examining the above factors and dynamics towards effective risk reduction. As such, the relevance and importance of disaster risk assessment as an effective risk reduction strategy becomes very evident. However, currently within South Africa there exists no model for ensuring the practice of effective disaster risk assessment, be it at national, regional or local level (South Africa, 2005). Also, what needs to be highlighted is the fact that although strategies for the reduction and prevention of disasters are universal, their applicability needs to take into account the particular characteristics of the threatened entity in such a way that a better understanding of the hazards, risk and vulnerabilities of that society can lead to the development of appropriate and adequate disaster reduction and prevention strategies. Therefore, to add merit to the above issue, the case-study/focus group approach (concentrating on a selected community and its environment) becomes a valuable tool in the process. After all, the focus on disasters is not only on the natural processes but also of their interaction with the human system. This inclusion of disaster risk in the broader perception of risk that people have to face in their daily lives requires a much more integrated and comprehensive approach to disaster risk reduction stemming from a systematic

approach to identifying, assessing and reducing of all kinds of risk associated with hazards and human activities.

According to Twigg (2004a:2-3) the modern disaster risk assessment approach recognises that a wide range of geological, meteorological, environmental, technological and socio-political hazards threaten society; individually and in complex interaction. Hence, disasters are no longer only seen as unfortunate once-off events to be responded to, but also as deep-rooted and longer-term problems that must be planned for. Therefore, there is a need to explore the relationships between natural hazards with other sources of hazards in the accumulation of risk as a precursor to developing an integrated and effective disaster risk assessment model for local government in South Africa.

The need for of an appropriate disaster risk assessment model cannot be overemphasised. Such a model will offer a simple, flexible and comprehensive structure/approach for conducting the process of disaster risk assessment. It will also serve to guide and enhance this process through improving disaster planning. Since understanding and reducing risks and vulnerability is undoubtedly the task of multi-disciplinary and multi-sectoral teams, it becomes apparent that an integrated model is the ultimate answer in facilitating and promoting effective disaster risk reduction.

The focus of this paper is to share research on the development of an appropriate disaster risk assessment model for local government in South Africa.

2 OVERVIEW OF THE RESEARCH

The study was undertaken as part of a Doctoral Degree. The research findings acknowledge disaster risk assessment as a pro-active disaster reduction mechanism directed towards disaster risk reduction.

The fundamental components and process of disaster risk assessment were analysed in the research highlighting that disaster risk assessment should be undertaken in a systematic manner so as to ensure and enhance the quality and validity of the process and its outcomes. After all, the results of the process are instrumental in shaping the disaster risk reduction strategies and interventions for implementation.

The national and international imperatives of disaster risk assessment and disaster risk reduction were interrogated as the basis for leading the comparative study of the three disaster risk assessment models. The comparison and evaluation of these models (that is the Community-Wide Vulnerability and Capacity Assessment (CVCA) Model, Community-Based Risk Reduction Model and the South African Disaster Risk Assessment Model) revealed the prominent characteristics, commonalities and distinction between these models. These findings further enunciated the important guiding principles and characteristics of a disaster risk reduction model and inform the development of the proposed disaster risk assessment model for local government in South Africa.

The research outcomes accentuate the conceptualisation and provide a review of the current disaster risk assessment practice within local government in South Africa (as represented by the selected focus groups; that is eThekwinin Metropolitan Municipality, Ekurhuleni Metropolitan Municipality, Bojanala District Municipality and Stellenbosch Local Municipality).

The four focus groups were subjected to field surveys, group questionnaires, discussions and interviews. As such, the questions covered were open and was accordingly adapted to the practices and experiences portrayed by the participants within the study. This openness enabled a comprehensive approach in the collection of data through qualitative evaluation drawing on both critical thinking as a means of being open to multiple possibilities and scrutinising

various possibilities to gain a fresh perspective (Strauss & Corbin, 1998; Denzin & Lincoln, 2000).

The research aimed to gather in-depth apprehension of the environment, events and activities (Woods, 1999; Silverman, 2000). Hence, smaller but focused samples were selected (as justified above) rather than large random samples. The important point in using these focus groups was to introduce informality in the discussion and data collection process so as to encourage true and natural responses. However, it was crucial that the process be content specific and content driven in order to guide the outcomes in line with the research objectives.

The study involved fieldwork where the researcher physically visited and worked with the people, settings, sites and institutions to observe and record activities and experiences within the environment (Marshall & Rossman, 1980). A period of a minimum of a week per institution was spent exploring the processes and meanings of events, activities and actions, and ascertaining how and why certain outcomes were achieved and not just focusing on what was achieved.

In effect, qualitative research is a descriptive, flexible, intuitive, inductive and an open way of doing research (Flick, 2009; Silverman, 2000; Shaw, 1999) enabling the researcher to construct abstractions, concepts and hypotheses from the details (Merriam, 1988; Creswell, 1994) offering substance and deep understandings of the complexities and challenges to the real world experiences (Smit, 2003). Delamont, *et al.* (1997) affirmed this thinking by categorically stating that a modest volume of high quality data analysed in great depth and with methodological precision will often be far better than a lot of data superficially analysed.

Hence the development of the disaster risk assessment model for local government in South Africa emanates from the crucial principles and lessons

drawn throughout the study. The primary pillars on which the model is developed is that of a vulnerability-driven, community-based, bottom-up approach as asserted in the legislative requirements promoting disaster risk assessment within South Africa.

3 DEVELOPMENT OF AN APPROPRIATE MODEL FOR SOUTH AFRICA

The culmination of the theoretical underpinnings together with the research findings and interpretations of the study ultimately influences the development of the disaster risk assessment model for local government. In addition, the legislative parameters (of the Disaster Management Act and the National Disaster Management Framework) are explored to further regulate and provide insight to ensure that an appropriate model is developed.

3.1 Legislative Implications for Disaster Risk Assessment within South Africa

The paradigm shift from merely “managing disaster events” to proactive risk reduction initiatives becomes evident as one draws reference to the disaster management legislative process in South Africa. Hence, a review of both the Disaster Management Act of 2002 and the National Disaster Management Framework of 2005, provides clarity about the legislative imperatives governing disaster risk assessment and the specific disaster risk assessment requirements to be adhered to by local government in South Africa.

Towards this end, the primary aim of the Green Paper on Disaster Management (1998) is to create and sustain a holistic disaster management structure and practice through risk management. The basis therefore is to establish a conceptual framework for disaster management and risk reduction practice. The intended outcome is directed towards identifying and recommending strategies to deal with disasters and risk in a more comprehensive manner.

The underlying principles of the White Paper on Disaster Management (1999) reinforced the concept of proactive disaster management through risk reduction programmes and emphasised the practice of integrated and co-ordinated disaster management through partnerships between different stakeholders and through co-operative relations between all spheres of government. Further, the Disaster Management Act and the National Disaster Management Framework, crystallise the issues around disaster risk reduction and disaster risk assessment by providing clear guidelines with respect to disasters, hazards, vulnerability and risk likely to affect South Africa. Also, aligned to international best practice, these legislative guidelines emphasise the implementation of risk reduction strategies to prevent and or mitigate the negative consequences of disasters.

The disaster management legislation promotes proactive, disaster risk reduction through effective and appropriate prevention, preparedness and mitigation measures. Also, high on the agenda, is the integrated, co-ordinated and multi-disciplinary approach to deal with disasters and risk in a more uniformed and comprehensive manner. Simply stated, it is a paradigm shift in the disaster management approach, from a reactive and relief-centred focus to a more holistic and integrated approach, placing strong emphasis on proactive disaster risk management. It can therefore be deduced that the primary goal is that of conserving development progress and minimising the loss of life, livelihood and destruction to property and infrastructure through effective disaster risk assessment.

The logical point of departure therefore, is the acceptance that disaster risk is complex and dynamic in nature. Especially, in light of the fact that vulnerability factors are often the common initiators of disaster risk, than external hazard processes; it is critical that society is aware of the causes and risk, and know the steps to be taken to safeguard themselves and their environment. This brings to the spotlight the role of government in ensuring that people live in a safe and

protected environment free of danger to their health or well-being (South Africa, 1996:11). It is unquestionable that the responsibility to provide a safe environment for its citizens lies with government. Therefore, it is necessary to consider the legislative provisions that guide government in its endeavour to promote effective disaster risk assessment.

Sections 20, 33 and 47 of the Disaster Management Act and Key Performance Area 2 of the National Disaster Management Framework, outline the need for disaster risk assessment to guide national, provincial and municipal disaster risk reduction efforts including disaster risk management planning. This implies that the National, Provincial and Municipal Disaster Management Centres must provide guidance to organs of the state, the private sector, non-governmental organisations, communities and individuals to assess and prevent or reduce the risk of disasters. The underpinning notion is the adoption of a more consistent and integrated approach to the identification and management of risk that would ultimately improve the relevance, design, quality and sustainability of risk reduction strategies and programmes in South Africa.

A sound approach therefore, will be to expound on this theory of a consistent and integrated system at the local government sphere where the actual disaster risk and its consequences are experienced. As such, the outcome of the study is the development of an integrated disaster risk assessment model for local government in South Africa.

Having clearly demarcated the legal imperatives for disaster risk assessment in South Africa, it becomes necessary to consider the specific requirements applicable to local government to ensure its efficient functioning.

3.1.1 *Analysis of the disaster risk assessment requirements for local government in South Africa*

Key Performance Area 2 of the National Disaster Management Framework (South Africa, 2005:25-38) and the Provincial Disaster Management Framework of the different provinces (in particular: KwaZulu-Natal, Western Cape and Gauteng) detail the specific requirements for implementing disaster risk assessment.

As such, it is incumbent upon all sectors of government to conduct disaster risk assessment. Each metropolitan, district and local municipality is required to undertake disaster risk assessments to identify priority disaster risk, reduce vulnerability and develop effective disaster management plans and risk reduction programmes for implementation.

Another crucial necessity is the active engagement of the vulnerable communities through a community-based disaster risk assessment approach. Municipalities must therefore include local communities in the development of their disaster risk profiles based on the needs and priorities of that community. Further, this community-driven process, rich in local and indigenous knowledge, is expected to add merit to the scientific and technical risk information of the community.

A third specification is for disaster risk assessment to be ground-truthed, as vulnerability factors are often the major catalysts of disaster risk in South Africa rather than external hazard processes. Therefore, the emphasis should be on the practical realities that exist within the community.

The fourth condition relates to the use of specialist and technical experts in undertaking the disaster risk assessment. In such instances, municipalities must provide clear terms of reference on the process, methodology and reporting structure to be adhered to by these specialists. In particular, the guiding principles should entail an inclusive process of consultation, skills transfer and capacity-building.

The fifth provision alludes to the quality assurance and validation mechanism. The completed disaster risk assessment process must be “externally validated”, by nationally recognised specialist. This validation process should ratify the methodologies and findings before any action and development plans, strategies and programmes based on the assessments, are taken. However, in the event of complex assessments (like those undertaken by metropolitan municipalities) a “Technical Advisory Committee” must be appointed. Such a committee should include experts in specialist fields who may be engaged throughout the disaster risk assessment process.

In addition, the risk assessment undertaken should include documented evidence of appropriate consultation including the technical consultation with the relevant disaster management centre, prior to implementation of the action plans and strategies. All completed disaster risk assessments of metropolitan municipalities must be subjected to review by the national, and the appropriate provincial disaster management centre. However, in the case of district and local municipalities, all submissions must be forwarded to the relevant provincial and municipal disaster management centre respectively, for validation.

From the above, the following important deductions may be argued. Firstly, that disaster risk assessment should be a systematic and planned process which comprises a series of activities within a structured framework over a defined period of time. This formal arrangement of activities requires appropriate planning, backed by political will to consider and secure the various resources and to fulfill the necessary administrative and procedural implications to inform disaster risk reduction plans and strategies.

Secondly, the emphasis on community participation alludes to a “bottom-up” approach where community involvement is central to the success of the risk assessment process and the subsequent risk reduction interventions. As

recognised role-players, the community derives a sense of ownership from the process. As such, their role and commitment towards risk reduction is enhanced through sharing their local knowledge and experiences. This serves as an important precursor to the development of the risk profile of the community.

Furthermore, as active participants in the entire process of disaster risk assessment, the community becomes more aware, informed and educated in disaster and disaster risk reduction issues. Thus creating and promoting an ethos of self-reliance and resilience within the community.

Thirdly, the relevance of risk assessment being “ground truthed” is reflective of governments’ commitment to addressing the real disaster risk issues by highlighting realities within communities. This enables a thorough review of the root causes of disaster risk by examining the existing social, economic, political, physical and natural conditions and their impact on the community. With this clear and practical approach of zooming into the community and their environment, the disaster risk assessment process and its outcomes are made more meaningful and accurate; adding value in terms of providing realistic solutions and interventions, to real priority areas identified within the community.

Fourthly, the reference to experts in specialist fields serves to affirm that risk assessment requires an integrated and co-ordinated approach led by a multi-disciplinary and multi-sectoral team. It is therefore crucial for disaster managers and practitioners to actively involve engineers, environmentalists, economists, sociologists and meteorologists in the risk assessment process. Such inclusion and collaboration will guarantee a more holistic and comprehensive perspective to the disaster risk assessment process.

Further, the formal requirement around skills transfer and capacity-building enforces the partnership concept. The risk assessment consultants and specialists are expected to work jointly with the relevant stakeholders, sharing

information and their expertise. This collaborative process is meant to strengthen commitment and support of all role-players whilst creating the platform for capacity building and skills transfer. Through an inclusive and transparent process, facilitated by means of awareness campaigns, training and workshop sessions, field surveys (and the like), and structured reporting the capacity and skills of the broader community and the disaster management practitioners and officials are further developed and sustained.

Finally, the external validation process implies that risk assessment be undertaken with rigour, based on accurate and reliable information. As such, the principles of objectivity and adherence to quality standards must be assured. Therefore, tracking of evidence in terms of the process instituted, methodology utilised and outcomes derived are quintessential to the quality assurance and validation of the findings. After all, any disaster risk reduction plan or strategy has serious financial implications, therefore, it would be considered 'fruitless' expenditure if unverified disaster risk assessment findings were to inform the planning process.

When these legislative requirements are compared to the international guidelines for disaster risk reduction they depict a proactive and optimistic perspective of disaster risk reduction in South Africa. Towards this end of effective disaster risk reduction, the following section will progressively build on and explore proposed disaster risk assessment model for local government in South Africa.

3.2 Proposed Disaster Risk Assessment Model for Local Government in South Africa

Substantive deliberations by recognised researchers (Smith, 2004; Cannon, 1994; Carter, 1991) on contextualising disasters clearly highlighted that disasters are not the inevitable consequence of natural hazards. Rather, it is the human dimension of disasters as aptly endorsed by Twigg (2001), and the result of a

whole range of social, political, cultural, economic, physical and even psychological factors that shape people’s lives and creates the environment in which they live.

The world over, it is acknowledged that lives are at risk everywhere, everyday (Wisner, *et al.* 2004; Smith, 2004; Twigg, 2004a; Twigg, 2004b; ISDR, 2005). Statistics and numbers alone do not reveal the true story but help in visualising the scale of the problem that disaster risk management teams have to confront. As a simple means of illustrating this point the World Disasters Report (2008b:209-211) noted the following data for the period 1998 to 2007:

Total number of people reported killed	Total number of people reported affected (in thousands)	Total amount of disaster estimated damage (in millions of US Dollars)
1, 134, 073	2, 817, 440	US \$ 966, 980

Table:1 Summary of World Disaster Impact: 1998 to 2007 (Adapted from World Disasters Report, 2008b).

The underlying principle is to recognise that while natural hazards may not be totally prevented, it is important to understand the causes, risks and implications for the community and their environment. By addressing the impact and consequences of the hazard/s, the focus is automatically on measures for reducing risks, reduction in loss of life and damage to infrastructure and managing the impact when they occur. This falls in line with the international call for renewed and improved measures towards disaster risk reduction (ISDR, 2007a and 2007b).

Finding a suitable theoretical framework that begins to capture such complex social and biophysical dimensions and includes temporal and spatial perspectives, is fundamental to risk and vulnerability analysis. Twigg (2002)

reiterate that vulnerability is too complicated to be captured by models and frameworks. There are many dimensions to vulnerability that is: economic, social, demographic, political and psychological; and there are various factors making people vulnerable, not just a range of immediate causes but a host of root causes too; creating this complex situation.

Wisner, *et al.* (2004:49-86) through the “pressure and release” framework offered a means to describe and examine the progression of factors that connect impacts of a hazard on people through a series of social factors that contribute to vulnerability. Using this framework, they illustrated for example, that vulnerability in specific contexts is linked to processes that are sometimes remote and lie embedded in wider economic and political spheres. Further, the model shows disasters as the result of two opposing processes: on the one side, there are those processes generating vulnerability and on the other, factors of physical exposure. Those processes contributing to vulnerability can be linked to several “root causes” (that is, political and economic systems) and “dynamic pressure” (that is, lack of investment and training). While the impact of the event will depend on the pressure generated from either side, the “release” idea conceptualises disaster reduction, therefore, in order to relieve the pressure, vulnerability has to be reduced.

As Wisner, *et al.* pointed out, the model is rather simplistic since the hazard is seen as isolated “from the conditions that create vulnerability”. Moreover, it does not provide for changes in vulnerability following a disaster event. The application of the pressure and release model is useful in visualising causal factors and processes that heighten peoples’ risk. However, the model could be integrated with a comprehensive livelihood analysis that will illustrate the composition of current livelihood strategies. As examples, one might cite the “pressure and release” and “access” models advanced by Blaikie, Cannon, Davis and Wisner that allow one to trace the “progression” of vulnerability by working back from the immediate to the root causes, and provide a framework for investigating vulnerable people’s access to assets, income and other resources in society

(Wisner, *et al.* 2004:87-124). The underpinning principle of this model is that poverty refers to basic unsatisfied needs and restrictions of access to resources while vulnerability implies the lack of capacity to sufficiently protect oneself to survive a disaster. Hence, the intention is to identify the limitations and facilities through which accumulation is achieved or the decrease in important capacities when faced with potential disaster (Sen, 1981; Winchester, 1992). This argument is based upon the fact that when confronted with an equivalent hazard or when facing the same potential for physical damage, the risk could be different depending upon the capacity of an individual, group or community to absorb the impact. An important aspect of vulnerability is the extent to which an individual, group or community can cope with physical extremes. Anderson and Woodrow (1989) clarified the physical (for example, food storage and emergency shelter) and non-physical (such as support from social groups, skills and knowledge) factors that allow people to cope as capacity. Though in many disasters physical assets may be destroyed, the non-physical elements that allow coping continue to be available even under the most demanding conditions (Harrell-Bond, 1986). These issues are at the core of the vulnerability driven approach. To echo the perspective of Weichselgartner and Obersteiner (2002), “know better and lose less”, the ultimate aim of disaster risk assessment is to move beyond an understanding of the hazard to a more comprehensive conceptualisation of the disaster risk towards a vulnerability driven perspective.

After all, disaster risk assessment focused on vulnerability as elucidated by Salter (1997:64) provides a flexible and holistic framework to better inform disaster risk reduction. This is the case because the underpinning emphasis is on the vulnerability factors that so greatly influence the disaster risk within society. More significantly, this thinking is further entrenched in the South African legal guidelines (South Africa, 2005:68; 76) that spells out that disaster risk in South Africa is predominantly influenced by the social, political, cultural, economic and environmental factors and not by external threats. As such, it is imperative for disaster risk assessment to explore the vulnerability factors so as to provide

insight and impetus for the development of effective disaster risk reduction interventions.

In essence, the vulnerability-driven approach resonates with the evolving nature and practice of disaster risk management (as illustrated by Salter, 1998; Jeggle, 2001 & 2007; and Comfort, 1998 in Chapter Four of the thesis) accentuating a proactive, vulnerability-specific domain (Haghebaert, 2007). This inevitably justifies the sense of direction to be adopted in proposing a practical model for local government in South Africa. The first critical step is to establish the relevant principles that should embody such a model.

3.2.1 *Core principles of the proposed disaster risk assessment model*

The next level of clarity required is in terms of the vital and distinguishing characteristics that should encompass the proposed model. In this regard, the international and national criteria guiding effective disaster risk assessment set the tone to be ascribed to in accomplishing the common agenda towards disaster risk reduction. In view thereof, it may be useful to tabulate these principles so as to ascertain the correlation that exists between them and appreciate their true value within this context. In particular, the important criteria emanating from the evolution of the disaster risk management practice, those promoting effective disaster risk assessment models (based on the leading international disaster reduction specifications and strategies, and the South African legal requirements are captured in Table 2 below.

Contemporary disaster risk management practice	Guiding criteria for effective disaster risk assessment models	South African legislative stipulations
Partnerships		Community-based disaster risk assessment
Multi-disciplinary	Multi-disciplinary and	Experts from specialist fields

approach	multi-sectoral approach	
Disaster risk reduction		Disaster risk reduction
Planning with communities		“Ground-truthing”
Communicating with communities	Community participation and resilience	Community participation and resilience
	Political commitment	Political will
	Adaptability (monitoring and evaluation)	Quality assurance and validation (monitoring and evaluation)

Table: 2 Criteria promoting effective disaster risk assessment practice

The above table provides a visual context to the critical and common elements required to facilitate successful disaster risk management. Hence, it becomes abundantly clear that these key issues, cutting across all three frameworks (as illustrated in the table above), should constitute the salient characteristics of the disaster risk assessment model for local government in South Africa.

As such, these features should represent the quintessence of any current disaster risk assessment tool enabling disaster risk reduction interventions and strategies. This positively influences the parameters of the proposed model for local government in South Africa.

In light of the above argument, five core underpinning principles have been chosen to encompass the proposed disaster risk assessment model being developed, as will be substantiated in the discussion that follows:

- **Community participation and resilience.** Bankoff, *et al.* (2004:126-127) articulate that the participation of people at risk is essential for effective disaster risk reduction. Local people have knowledge about their locality, the history of local disasters and how vulnerability to disasters has changed over time. They have the right to participate in decisions that affect their lives. People’s participation is basic because safety, stability of

livelihood, well-being and disaster risk reduction are their concerns and not solely that of “experts” such as government, scientists and aid agencies. Therefore, scientists and disaster managers should recognise the value of people’s perceptions as complementary. The success of participatory risk assessments depends upon the ability of the different role-players to discuss, reason and plan together.

Hence, Bankoff, *et al.* (2004:32-33) view the current emphasis on the importance of this local knowledge in disaster situations as a belated recognition. The previous assumption that a community’s own methods of coping with risk were too primitive, too ineffective or too inefficient to deal with the situation, only reinforced belief in the power of the technical fix, alluding to the ability of the external expertise to correctly identify the problems and introduce the appropriate solutions. However, the respect now accorded to coping practices forms part of a wider attempt to broaden local participation in the entire development process through bottom-up planning and to empower local people through encouraging community participation. Local knowledge is seen as the key to success as it is the only resource controlled by the most vulnerable, is already present at a potential disaster site, and in many cases constitutes a viable operational strategy for effective disaster risk assessment.

To further support this principle, the Asian Disaster Preparedness Center (ADPC) believes that community action for disaster risk management is a crucial element in promoting a "culture of prevention" and creating safer communities. Therefore, community based approaches have been an integral part of the various projects and programs of ADPC since mid and late 1990s (as reflected in the various cases alluded to in Chapter Four of the thesis, within the community-based risk reduction model). This participatory risk assessment is part of a capacity building process to transform communities at risk into resilient communities. Community

involvement also entails making the local communities aware of the root causes of vulnerability and what they can do about it. People's participation is not just the process of consultation and providing information to outsiders during assessments. If one is serious about addressing vulnerabilities, then people's participation should be made part of an empowerment process where the joint assessment of capacities and vulnerabilities builds awareness. Also, the disaster-pressure model developed by Blaikie *et al.* (1994, and revised in 2004) is a very effective instrument to encourage local people to analyse their conditions and to discover root causes of why they endure hardship. It raises people's awareness about the political origins of a disaster and their vulnerability. Hence, disaster vulnerability can only be reduced if conscious and organised communities and the public can pressurise governments in such a way that their interests are no longer ignored in government's decision-making and planning (Heijmans & Victoria, 2001:16) through their active engagement in these processes.

- **Supporting a multi-disciplinary and multi-sectoral disaster risk assessment approach.** As purported by Emmi and Horton (1995), risk assessment requires a diverse range of physical and socio-economic knowledge and expertise and is therefore multi-disciplinary in nature. To illustrate by means of an analogy, risk assessment is likened to a jigsaw puzzle (Bankoff, 2004:138). There are often missing pieces because the individuals assembling the picture, lack an awareness or understanding of the elements that are needed to comprise an integrated "whole". Assessors from social backgrounds may typically lack an understanding of engineering aspects of vulnerability; economists may be unfamiliar with environmental considerations, and so on. Improved inter-disciplinary and inter-sectoral teamwork is therefore required at all levels to tackle problems and to synthesise issues of disaster risk assessment (Burby, 1998:275-276). This further emphasises the need for an integrated and

systematic approach in assessing vulnerability and risk, establishing integrated planning processes through information and working collaboratively with stakeholders (including experts and specialists from different disciplines and sectors), and developing appropriate disaster risk reduction strategies.

- **Ensuring flexibility and adaptability within the disaster risk assessment framework.** As succinctly noted by John Holmes within his keynote address of the Global Platform for Disaster Risk Reduction in 2007, climate change adaptation is the key driver of the increased urgency of risk reduction efforts across the world (Holmes, 2007). Further, the Intergovernmental Panel on Climate Change (IPCC, 2001) highlights the concerns around global warming; where hundreds of millions of people are expected to be placed at increased risk from climate-related hazards. That is, increased flooding, droughts, heat waves, more intense storms, and rising sea levels, are some of the common challenges awaiting society.

Dilley (in Kreimer & Arnold, 2000:45) contextualises the above argument by elaborating that hazards related to climate and weather affect more people and cause more economic damage worldwide than any other type of natural hazard; for example over the past three decades disasters triggered by: cyclones; droughts; and floods occurred five times more frequently and killed or affected seventy times as many people, and caused twice as much damage (IPCC, 2001; Kreimer & Arnold, 2000) when compared to earthquakes and volcanoes (the two major geological hazards).

However, on a more positive note, this growing understanding and awareness, makes it possible to invest in proactive measures to prepare

for them and to minimize their impacts in high-risk areas. This is achieved through a flexible and adaptable framework which facilitates institutional, procedural and administrative change and adaptation in line with the dynamic and ever-transforming technological, climatic, environmental, and societal conditions and preferences.

- **Promoting political will and commitment within the realm of disaster risk management.** Christoplos, Mitchell and Liljelund (2001:195) echo the importance of this principle by propagating that disaster risk management depends on political will. Political will relies on political leadership amid shifting set incentives and pressures. The political costs of redirecting priorities from visible, development projects to addressing abstract long-term threats are great. It is hard to gain votes by pointing out that a disaster did not happen. However, disasters as indicators of failed development also provide opportunities for reformers who can draw attention to failure of current development models.

In consonance with the above frame of thought, McNaughton (2009:17) clarifies the fact that disaster risk reduction focuses on long-term goals. It is therefore not always treated with the urgency that other more visible and immediate projects are afforded. Furthermore, the results may also be difficult to quantify. As described by former UN Secretary-General, Kofi Annan, building a culture of prevention is certainly not easy; especially when the costs of prevention have to be paid in the present and its benefits lie in the distant future.

Holmes (2007:5) emphatically argues that it is crucial to convince those who control governments' purse strings and those who write and enforce legislations, construct buildings and the like, that acting today helps to save lives and reduce costs in the future. Hence, disaster risk reduction

has to become a top priority for government, the business sector, community leaders and the local communities.

- **Maintaining an iterative process as a means of promoting completeness to the disaster risk assessment process.** Smith (2001:59) substantiates that in practice, very few studies have followed risk assessment through to ask what happened after the assessment was undertaken and to ascertain whether the recommended actions taken were effective. The general lack of such feedback is one of the most serious deficiencies in the disaster risk reduction practice.

Allowing for a continuous feedback loop between the various phases of the disaster risk assessment process is absolutely necessary. Such a mechanism plays a pivotal role in assuring quality in the process and in its outputs. In effect this iterative process ensures that monitoring, reviewing and evaluation is undertaken throughout the risk assessment process.

To elucidate the relevance and practicality of these five principles within an appropriate framework may be depicted as follows (Figure 1 and 2 below).

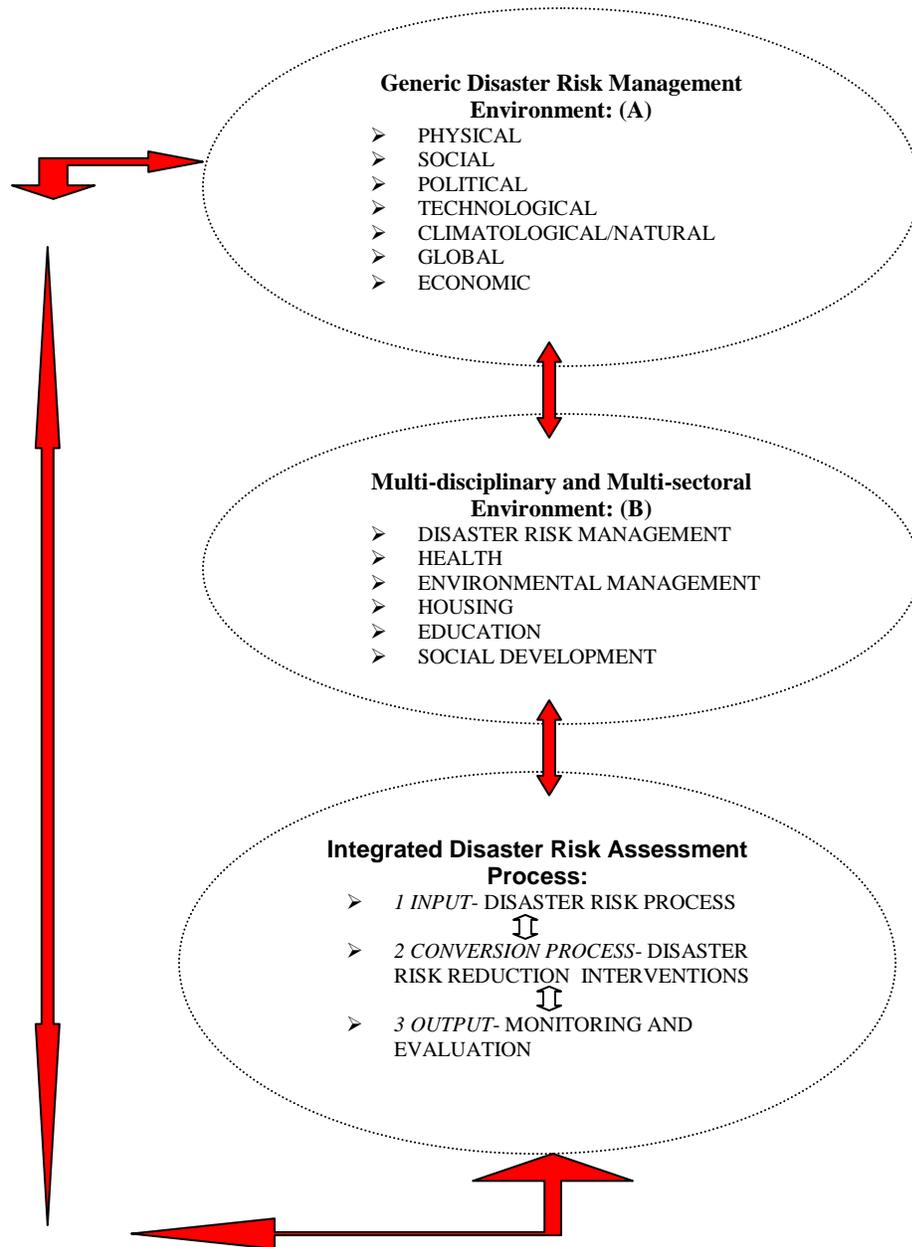


Figure: 1 Flow Process of the Proposed Model in Figure 2.



Figure: 2 Integrated Disaster Risk Assessment Model for Local Government in South Africa

To substantiate these illustrations, the prominent elements of the above model are clarified below:

- Three levels of interaction:

The outer-level representing the generic (broader) disaster risk management environment (A),

The middle-level denoting the different disciplines and sectors (B),

The inner-level which exemplifies the integrated disaster risk assessment process (C).

- The Arrows:

Within the respective levels, indicating the integrated and co-ordinated influence and functioning within the specific environment,

Across the different levels, expressing the link and influence between environments,

Within the inner-level, tracing the iterative process of integrated disaster risk assessment.

Also, the arrows are two-directional, indicating a continuous flow within an iterative domain.

- The broken lines demarcating the various levels of environment, reflect influences (through various factors, activities and actions) permeating between environments and also incorporating the notion of adaptability (flexibility).
- The numbers 1, 2, and 3 represent Input, Conversion Process and Output (respectively).

The inter-relationship of the various objects within and between the outer-levels (A) and the middle-level (B) is demonstrated through the use of two-directional arrows. This confirms that the components of the generic environment (which is the outer-level, A) whilst constantly impelling each other, have a ripple effect onto the different disciplines and sectors (featured in the middle-level, B) and *vice-versa*. Thus linking on and initiating the process within the system (referring to the inner-level, C) and the output feeds back into the environment in an iterative fashion. This connection is further encouraged through the permeable structures (expressed by the broken lines) distinguishing and enclosing the three levels of functioning within the model.

Such a structure also symbolises flexibility, promoting ease of change and adaptation that is essential in this constantly transforming environments.

The visible inter-relatedness and inter-dependence within and between all three levels (reflected by the two-directional arrows) affirms the merit of a co-ordinated and integrated perspective in dealing with the influences and their consequences, thereby recommending a holistic approach towards disaster risk reduction. This implies that the disaster risk assessment process must employ a multi-disciplinary and multi-sectoral style in interrogating the impact of the evolving environments (refer to the outer-level, A) on the risk levels of the specific community or society under review. Hence, this diverse team of experts and specialists (in their respective fields and sectors, B) together with the community and other respective stakeholders must jointly plan and co-ordinate the unfolding of the disaster risk assessment process. This alludes to the integrated and uniformed measure of community-based disaster risk assessment being put into practice.

Another level of integration is when the recommendations of the disaster risk assessment process are translated into disaster risk reduction interventions. Challenging the immediate implementation of these strategies which are to be pursued with the continuous review, monitoring and evaluation of these actions. The ultimate quest is to assess the appropriateness and effectiveness of the interventions in practice. Verifying as to whether the desired effects or results are being attained and also to trace all possible discrepancies that may have emerged and modifications that may be required due to the constantly changing environments. If warranted, all amendments and variations must be ensued through the iterative and collaborative process; and administered without further delays, closing the feedback loop from the system into the environments.

In effect, the underlying principles of the model are enunciated within context, verifying the relevance and application thereof. In particular, the concept of integrated and co-ordinated disaster risk management is prominent across three planes that is, within the levels, between the levels, and within the actual system (from the input phase, through to the conversion process and to the output phase). Further, the multi-disciplinary and multi-sectoral team functioning collectively depicts

the issue of uniformity and highlights the integrated and holistic perspective of disaster risk assessment. In addition, the community involvement (together with other relevant stakeholders) through strong political commitment and endurance, displays dedication to an inclusive and transparent process thus signifying the community-driven method that is community-based disaster risk assessment.

Finally, the iterative process epitomises the thoroughness as well as the systematic and methodological measure conceded to in the process. Strategically complemented by the rigorous review, monitoring, evaluation and feedback system throughout the process. Thus ratifying the inherent quality-driven and adaptable mechanism that guarantees appropriate, realistic and practical outcomes towards effective disaster risk reduction.

In essence, the above analysis forms the crux of the proposed, integrated disaster risk assessment model for local government in South Africa. Distinctively asserting the legislative specifications in terms of a pro-active, co-ordinated, integrated, uniformed and community-based disaster risk assessment and disaster risk reduction perspective. Further-more the model is simple, practical, flexible and easy to apply; guided by a comprehensive structure. However, it is important to stress that the structure of the model is generic and adaptable therefore it is envisaged to be adopted across all spheres of government.

More importantly, the model is reflective of and encapsulates the essence of the national and international imperatives of disaster risk reduction; thus illustrating the relevance and appropriateness of the model and signifying its effective application. A thorough disclosure of the guiding principles in the development of the model will assist in conceiving the rationale for this model.

3.2.2 *Operationalisation of the model*

Disaster risk management exists and functions within a broader, generic environment closely interacting, influencing and being influenced by the various dynamics within these environments thereby functioning as a system. Such a system brings together the different interactions, influences and outcomes in a structured and cohesive form.

The above background justifies the adoption of the systems approach in the development of the proposed disaster risk assessment model. In essence the systems concept of the environment and disaster (as adapted from Alcántara-Ayala, 2002) together with the divergent perspectives of disaster and the various environments contributes to the theoretical framework of this model. As such the following exposition will provide a clearer discernment into the pragmatic nature of the model.

<i>Model phase</i>	<i>Principles and issues</i>	<i>Checklist for compliance (YES/NO)</i>
1. community and government initiate the disaster risk assessment process	<ul style="list-style-type: none"> • political commitment • valid, reliable, timely, accurate and comprehensive information 	<p style="text-align: center;">to:</p> <ul style="list-style-type: none"> • identify priority risk • reduce vulnerability • develop effective disaster management plans • pro-actively formulate disaster risk reduction programmes for intervention • respond to disaster situation
2. establish a core planning team	<ul style="list-style-type: none"> • diverse team of experts • multi-disciplinary and multi-sectoral perspective • community participation • inclusive team 	<p style="text-align: center;">of:</p> <ul style="list-style-type: none"> • experts from different disciplines • representative from different sectors of government • community representative • identified specialist • political-office-bearers
3. planning team to jointly develop a process map of activities	<ul style="list-style-type: none"> • co-ordinated planning • systematic process • project management approach • shared vision and goals 	<p style="text-align: center;">by:</p> <ul style="list-style-type: none"> • identifying/selecting a project leader • defining the terms of reference (specifications)

	<ul style="list-style-type: none"> • iterative process 	<p>of the planning team</p> <ul style="list-style-type: none"> • categorising the disaster risk assessment process according to different phases • assigning team members with specific responsibilities and functions • attaching time-frames, resources and criteria to assess progress made in the various activities
4. define and map out the profile of the community and the environment	<ul style="list-style-type: none"> • community driven • dynamic environment • flexibility and adaptability • information 	<p>through:</p> <ul style="list-style-type: none"> • historical and existing data base • developing the disaster risk profile of the community • a community driven process • identifying the needs and resources of the community • determining the important facilities and critical infrastructure available in the community
5. engage in the community based disaster risk assessment process	<ul style="list-style-type: none"> • bottom-up approach • partnership • community participation • community resilience • systematic • iterative process • information 	<p>by:</p> <ul style="list-style-type: none"> • workshop sessions on the disaster risk assessment process • information and data gathering process within the community • highlighting the important roles and responsibilities of the community within the disaster risk assessment process • determining and setting up communication and

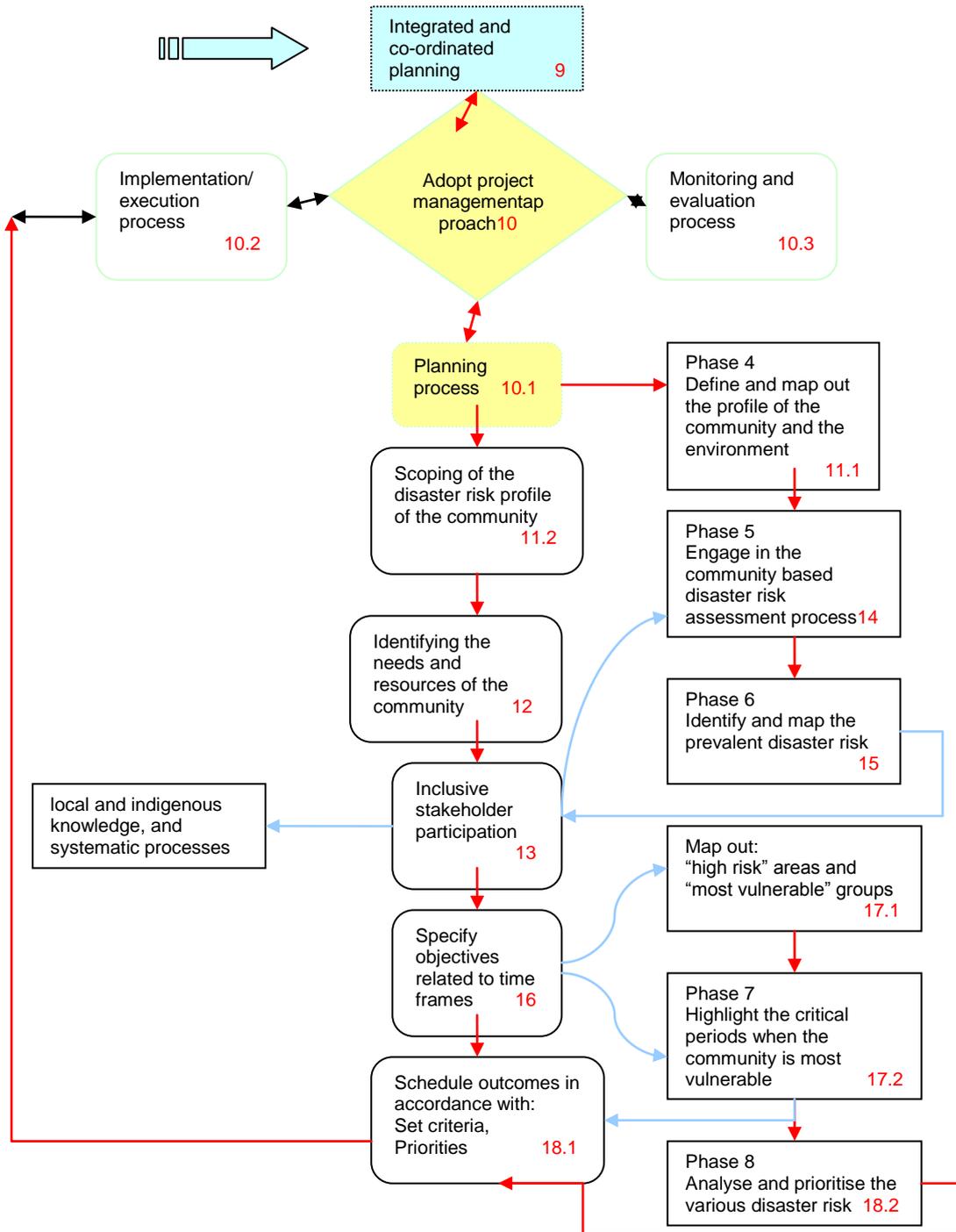
		<p>network channels between the community and the planning team</p> <ul style="list-style-type: none"> investing in training, awareness campaigns and robust advocacy programmes
6. identify and map the prevalent disaster risk	<ul style="list-style-type: none"> political commitment multi-disciplinary and multi-sectoral approach community participation indigenous knowledge flexibility and adaptability systematic 	<p>by:</p> <ul style="list-style-type: none"> embarking on field visits/surveys of the community mapping out proclaimed “high risk” areas in the community mapping out the “most vulnerable” groups within the community visual representation through the use of appropriate codes, symbols and colour schemes
7. highlight the critical periods when the community is most vulnerable	<ul style="list-style-type: none"> community participation information co-ordinated planning flexibility and adaptability 	<p>as:</p> <ul style="list-style-type: none"> an indicator for planning purposes influenced by the natural and/or environmental (physical) conditions instigated through the social dynamics of the community means of establishing patterns of frequency, duration and time frames the process of differentiating the different levels of vulnerability
8. analyse and prioritise the various disaster risk	<ul style="list-style-type: none"> systematic information partnership monitor and evaluate 	<p>through:</p> <ul style="list-style-type: none"> categorising the risk according to set criteria reviewing the new

		<p>information and data collected with the historical data to trace emerging risk trends</p> <ul style="list-style-type: none"> • rank the identified “high risk” areas • rate the “most vulnerable” groups
<p>9. core planning team to develop and implement disaster risk reduction plan</p>	<ul style="list-style-type: none"> • co-ordinated planning • shared vision and goals • integrated approach • iterative process • reliability and validity • systematic • community resilience • flexibility and adaptability • political commitment 	<p>by:</p> <ul style="list-style-type: none"> • firstly ratifying the findings of the disaster risk assessment process • engaging in the external validation process of the disaster risk assessment outcomes • acknowledging the existing capacity of the community • recognising the available resources within the community • operationalising the objectives and strategies into detailed action plans • promptly effecting the approved disaster risk reduction strategies and programmes of interventions
<p>10. monitor and evaluate disaster risk reduction interventions</p>	<ul style="list-style-type: none"> • reliability and validity • flexibility and adaptability • political commitment • community participation • community resilience 	<p>to:</p> <ul style="list-style-type: none"> • determine the effectiveness and relevance of the applied disaster risk reduction measures • identify gaps in the planning and implementation process • institute corrective actions within a reasonable time span • modify, amend and

		<p>update the disaster risk reduction programmes to meet the needs and demands of the changing environment</p>
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Table: 3 An Operational Guide to the Application of the Integrated Disaster Risk Assessment Model

The summary of fundamental issues tabulated above reflects the simple and practical nature and structure of the integrated disaster risk assessment model intended for its universal relevance and application. The flow process articulated in Table 3 may be illustrated as follows (refer to Figure 3):



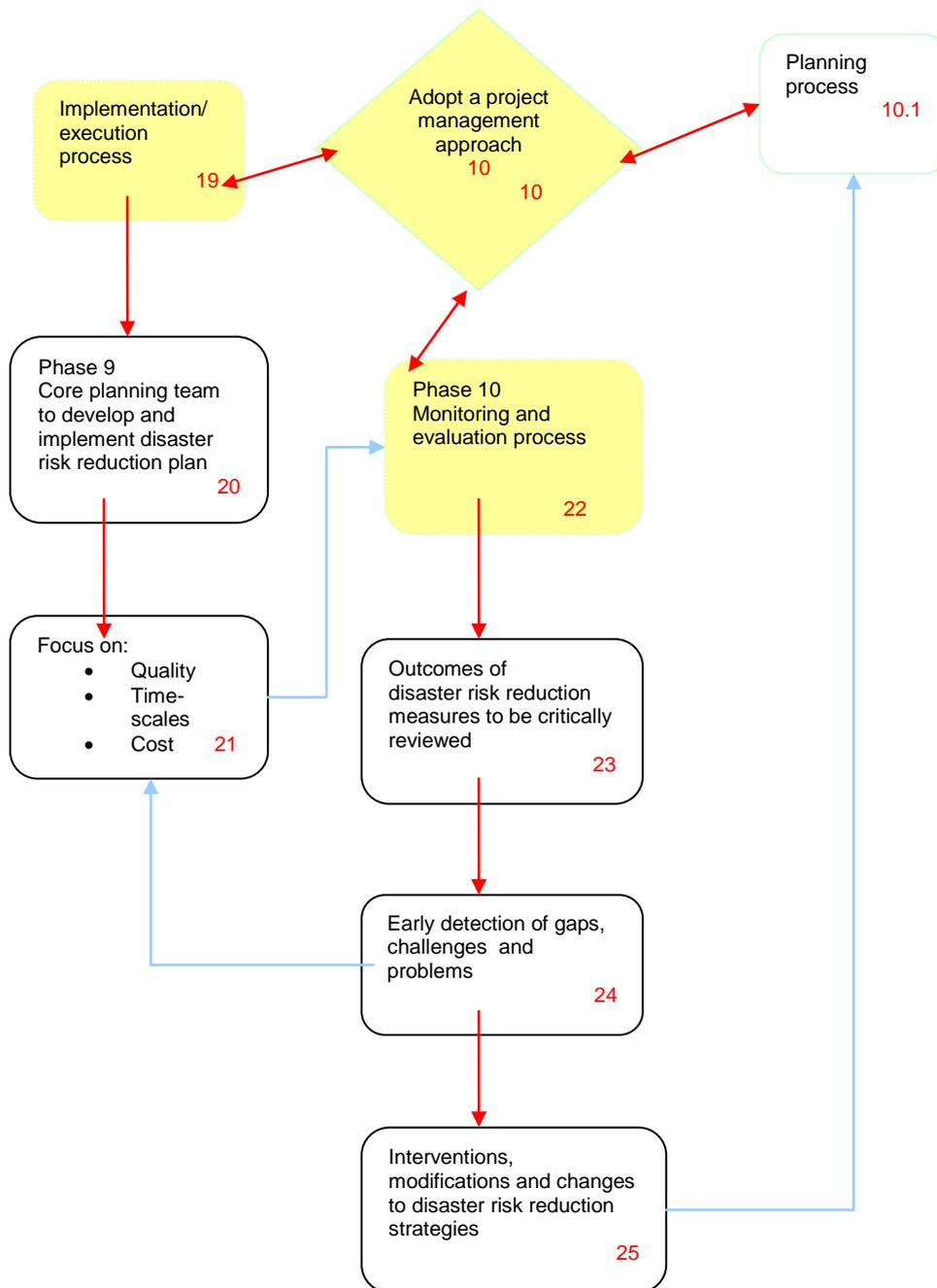


Figure: 3 Implementation Process of the Integrated Disaster Risk Assessment Model

The flow process of activities outlined in Figure 3 construes a systematic, integrated, and iterative approach to the practice of disaster risk assessment.

Towards effective operationalisation and application of the model, the following recommendations highlighted.

4 RECOMMENDATIONS

The integrated disaster risk assessment model is a purposive perspective that holistically and comprehensively addresses the various concerns, challenges and gaps obstructing the pursuance of effective disaster risk management and disaster risk reduction actions.

In this regard, the model focuses on the following fundamental elements:

- encouraging community participation and resilience;
- facilitating a multi-disciplinary and multi-sectoral team;
- promoting an adaptable and flexible framework;
- advancing political will and commitment;
- maintaining an iterative process;

towards achieving effective disaster risk reduction. Hence, this approach is intended to integrate, complement and enhance existing disaster risk reduction strategies.

In corroborating the above viewpoint, the arguments presented recognise the value of a disaster risk assessment model as:

- promoting a co-ordinated, uniformed and standardised approach in undertaking disaster risk assessment in line with the requirements of the Disaster Management Legislation;
- providing proper guidance, structure and logic to improve disaster risk assessment planning and facilitation processes;
- adding value to the process by integrating and co-ordinating the various activities across different disciplines and sectors;
- facilitating the sharing and harmonising of resources towards the attainment of common goals; and
- fostering the principles of co-operative governance by encouraging and supporting stakeholder participation.

However, the reality is that there are certain anticipated challenges that need to be addressed before such a tool is successfully implemented.

At the outset, appropriate structures, systems and processes will have to be developed, improved upon and implemented to support such a mechanism. The existing formal and informal structures, systems and processes will have to be adapted to incorporate the distinct principles of the integrated disaster risk assessment model. The emphasis should be on effectively operationalising these institutional arrangements through clear terms of references and a detailed exposition of the assigned functions and responsibilities facilitating the prompt implementation thereof.

In addition, appropriate procedures (such as reports and action plans) should be administered to verify whether the institutional arrangements are supporting and maintaining the required outcomes in accordance with the approved mandate. If necessary, the appropriate amendments to these arrangements can be made without delaying the implementation process.

Resource planning, provisioning and acquisition need to be completed by means of an integrated and co-ordinated planning process pursued by a multi-disciplinary and multi-sectoral team. This should encourage the optimal utilisation of limited resources through a shared and common vision of disaster risk assessment and disaster risk reduction. Further, the progressive inclusion of disaster risk assessment into development and disaster risk management plans linked to the Integrated Development Plan of the municipality as a strategic measure to unlock more resources and giving prominence to the disaster risk management activities, are essential. In effect, this process should advance the positioning of disaster risk assessment and disaster risk reduction onto the political agenda together with the other important service delivery and development issues.

Sufficient awareness campaigns, training and development of all stakeholders, to advocate and effectively implement such an approach are prerequisite that should be satisfied or achieved prior to implementation. The primary goal should be to prepare all stakeholders with the relevant knowledge and information so as to promote and sustain their decisive and active engagement throughout the disaster

risk assessment process. As such, justifying the notion of effective stakeholder participation and demonstrating the principles of co-operative governance.

Lastly, a paradigm shift for those who firmly believe in maintaining the status quo of the current disaster risk assessment practice through the policy process formally adopting the implementation of the integrated disaster risk assessment model across all sectors of government. This in turn will enforce the implementation of the model thereby assisting in promoting and securing senior management support, for the disaster risk management functions and impacting positively on the disaster risk assessment process and its outcomes.

In essence, the efficient practice of the disaster risk reduction interventions and strategies should be ensued soon after its finalisation (without prolonged delays) to enhance its relevance and appropriateness; whilst maintaining the continuous (on-going) monitoring, review and evaluation of these interventions and its impact so as to assure and uphold the applicability and currency of these disaster risk reduction strategies.

The above recommendations should be viewed from a logical, practical and cost-effective perspective pronouncing its ease of implementation and effectiveness in the disaster risk management environment as reflected in the concluding remarks.

5 CONCLUSIONS

The lack of a uniformed, structured and co-ordinated framework to guide the disaster risk assessment practice within local government provided impetus to engage in the study. Hence, the development of an integrated disaster risk assessment model for local government in contributing to a standardised, structured, uniformed and co-ordinated manner in promoting pro-active disaster risk assessment and disaster risk reduction practices; is paramount.

The model informs and guides co-ordinated and integrated disaster risk assessment and disaster risk reduction planning and implementation by linking and converting the results of the disaster risk assessment process into appropriate disaster risk reduction actions to be applied. More importantly the comprehensive, yet generic

and flexible structure of the model encourages its portability and adaptability across all sectors of government nationally, regionally and internationally, by all those engaging in disaster risk assessment and disaster risk reduction activities.

The effective and successful implementation of the developed model warrants the necessary policy intervention by government to be mandated into practice. It is at this stage of implementation that further research to the study may be undertaken focusing on a critical review of the application of the model for further improvements to disaster risk assessment and disaster risk reduction approaches nationally, regionally and internationally.

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