The requirements for the development of a spatial information system for the Tlokwe Local Municipality water catchments area

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Preface

The success of this study is possible as the result of the continuous and unselfish support of many including:

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Abstract

The problem facing the Tlokwe Local Municipality is that it is Constitutional and legislatively obliged to avoid and/or mitigate the impact of potential disasters within its boundaries, through the effective management of potential disaster risks and disasters. The lack of effective risk management tools is especially concerning in the context of the water catchment management of the Mooi River, which is the main water supply of the Tlokwe local Municipality. The Mooi River is exposed to many potential catchment related hazards that could affect the municipality of which the origins are both anthropogenic and natural. Although, many of the impacts on the catchment arise beyond the boundaries and the control of the municipality, this does not relieve the municipality from the responsibility to develop tools to manage the risks.

The aim of the study is to assist in addressing the above stated problem through establishing the requirements for a conceptual model for an effective spatial information system that will assist the municipality in effectively managing the potential disaster risks and disasters that may arise in the Mooi River Catchment area that could impact on the Tlokwe Local Municiaplity. The aim gives rise to three-research questions that are formulated as research objectives that are used to identify the conceptual model requirements.

The first is to identify and conceptualise the constitutional and legislative obligations in respect of disaster risk management in general and specifically those governing the disaster disk management in the water catchment area for the Mooi River. The study of this objective not only highlight the constitutional and legal obligations that the local municipality is subject to, but provides legislatives remedies that the local municipality can utilise to assist with disaster risks reduction.

The second is to identify and conceptualise the generic hazards that are related to water catchment areas (including the related groundwater compartments) and those specific in the Mooi River catchment area. In this section, potential anthropogenic and natural hazards are listed, a methodology for risk and vulnerability analyses is provided, and a concise study of quaternary catchment C23D is provided.

The third is to identify and conceptualize the requirements for an effective conceptual model of GIS for Disaster Risk Management in the Tlokwe Local Municipality. An overview of a GIS is provided. The essential components of a generic information

system namely, people, software, hardware, procedures and processes, data and telecommunications or networks are discussed.

The information and system requirements cumulating from the analyses of the three research questions, serve as the drivers of the goal, outcomes and transformation process of the system as well as the requirements for the conceptual model. In this section: a comparison of the Systems Development Life Cycle (SDLC), Framework for Applied Systems Thinking (FAST), problem solving and the phases addressed in this study; the identification of the conceptual model requirements; and a concise systems conceptualisation of an effective GIS is provided.

As the, mini-dissertation focuses on the needs for a conceptual model, the additional activities required before the system can be implemented are identified and formulated as recommendation that provide the opportunity for future research.

Keywords

Anthropogenic Hazards
Disaster Management
Disaster Management Related Legislation
Disaster Management Spatial Information System
Disaster Risk Management
Disaster Risks
Dolomite Compartment
GIS and Disaster Management
Mining Hazards
Mooi River Catchment
Natural Hazards
Vulnerabilities
Water Catchment Area
Water Resource Related Legislation
Waterborne Hazards

List of abbreviations used in the study

ASCE:	American Society of Civil Engineering
CDC:	Centres for Disease Control and Prevention
CFIA:	Canadian Food Inspection Agencies
CGER:	Commission of Geosciences, Environment and Resources
CODESA:	Conference for a Democratic South Africa
D.I.G.:	Disaster Interest Group
DEAT:	Department of Environmental Affairs and Tourism
DFID:	Department for International Development
DMC:	Disaster Management Committee
DMF:	Disaster Management Framework
DOH:	Department of Health
DOPW:	Department of Public Works
DSS:	Decision Support System
DWA:	Department of Water Affairs
ESRI:	Environmental Systems Research Institute
FAST:	Framework of Applied Systems Thinking
FEMA:	Federal Management Association: USA
FSE:	Federation for Sustainable Environment
GIS:	Geographic information systems
GIZ:	Deutsche Gessellschaft fur Technische Zusammenarbeit
GPS:	Global Positioning System
GRASS:	Geographic Support Analysis Support System
ICT:	Information and communication technology
IDP:	Integrated Development Plan
IFRC:	International Federation of Red and Cross Red Crescent societies
IMCAMD:	Inter-Ministerial Committee on Acid Mine Drainage
ISSG:	Invasive Species Specialist Group
Kml:	Key Mark-up Language
MDG:	Millennium Development Goals
MDMC:	Municipal Disaster Management Centre
MDMCE:	Municipal Disaster Management Committee
MDMF:	Municipal Disaster Management Framework
MILE:	Municipal Institute for Learning
MIS:	Management Information System
NDMF:	National Disaster Management Framework
NEMA:	National Environmental Management Act 48 of 2003.
NGI:	National Geo-spatial Information
NNR:	National Nuclear Regulator
NOAA:	National Oceanic and Atmospheric Administration
NWA:	National Water Act 36 of 1998
PDMF:	Provincial Disaster Management Framework
POP's:	Persistent Organic pollution
ren:	Roentgen Equivalent Man
SANDIS:	South African Weather and Disaster Information Services
SA-SAMS:	South African School Administration and Management System
SDLC:	Systems Development Life Cycle
Sv:	Sievert
TERI:	The Energy and Resource Institute

UN:	United Nations
UNCCC:	United Nations Convention on Climate Change
UNCCD:	United Nation Convention to Combat Desertification
UNCSD:	United Nations Conference on Sustainable Development
UNDP:	United Nations Development Programme
UNEPA:	United Nations Environmental Protection Agency
UNFCC:	United Nations Framework Convention on Climate Change
UNISDR:	United Nations International strategy for Disaster Reduction
UNMC:	United Nations Millennium Campaign
USGS:	United States Geological Survey
WHO:	World Health Organisation
WWF:	World Wildlife Fund
WWW:	World Wide Web

Table of Contents

Figures

Tables

Maps