FRANCES BAARD DISTRICT MUNICIPALITY

DISASTER MANAGEMENT OPERATIONAL PLAN

COMPILED BY

RURAL METRO
EMERGENCY MANAGEMENT SERVICES (PTY) LTD

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1. INTRODUCTION

The Disaster Management Operational Plan (DMOP) aims to address potential disaster risks as identified in the disaster risk assessment and does not address the response to any incident. Stated in another way, the operational plan is the activation of the response plan where any incident escalates to the status of a disaster.

A disaster is usually described as a result of the combination of conditions of vulnerability; **insufficient capacity** or **measures** to reduce or cope with the potential negative consequences. Therefore, when a municipality's capacity becomes insufficient to cope with such event, those phenomena becomes a disaster for the municipality. Additional resources will be requested, in the case of the district municipality, from the province. Where the provincial government does have sufficient capacity, the phenomena will be handled as a disaster on a provincial level, as the province will request additional capacity and resource from the national government.

The first step when developing an emergency response plan is to conduct a risk assessment to identify potential emergency scenarios. An understanding of what can happen will enable you to determine resource requirements and to develop plans and procedures to prepare your business.

At the very least, every facility should develop and implement an emergency plan for protecting employees, visitors, contractors and anyone else in the facility. This part of the emergency plan is called "*protective actions for life safety*" and includes building evacuation ("fire drills"), sheltering from severe weather such as tornadoes, "shelter-in-place" from an exterior airborne hazard such as a chemical release and lockdown. Lockdown is protective action when faced with an act of violence.

A plan should be established, resources should be on hand, or quickly, available to prepare a facility. The plan should also include a process for damage assessment, salvage, protection of undamaged property and clean-up following an incident. These actions to minimize further damage and business disruption are examples of property conservation.

2. PROTECTIVE ACTIONS FOR LIFE SAFETY

During a hazard within a building such as a fire or chemical spill, occupants within the building should be evacuated or relocated to safety. Other incidents such as a bomb threat or receipt of a suspicious package may also require evacuation. If a tornado warning is broadcast, everyone should be moved to the strongest part of the building away from exterior glass. If a transportation accident on a nearby highway results in the release of a chemical cloud, the fire department may warn to “shelter-in-place.” To protect employees from an act of violence, “lockdown” should be broadcast, and everyone should hide or barricade himself or herself from the perpetrator.

Protective actions for life safety include:

- Evacuation
- Sheltering
- Shelter-In-Place
- Lockdown

Your emergency plan should include the abovementioned protective actions.

2.1 EVACUATION

Prompt evacuation of people requires a warning system that is accessible and / or be heard throughout area of jurisdiction. Send out evacuation messages during planned drills to prepare communities for evacuation procedures.

Make sure that there are sufficient exits available at all times.

- Check to see that there are sufficient exits from hazardous areas especially in townships where there are no access and exit routes.
- Fire Brigade Department must approve sufficient exit routes for high-risk fire buildings to ensure enough escape routes on every floor of every building. Building or fire codes may require more exits for larger buildings.
- Verify that all exits are marked with exit signs and there is sufficient lighting so people can safely travel to an exit. Remove everything that might blocks an exit.
- Follow all exits to ensure that the predetermined exit routes reach a safe place away from the potential threat. This leads to a safe area as an assembly area for evacuees.

Appoint an evacuation team leader and assign persons to direct evacuation of the area or building. Organise and assign ward councillors and community members in wards and assign at least one person to each are or floor to act as an “area warden” or “floor warden” to direct people to the nearest safe exit. Assign a backup person in case where the area or floor warden is not available. Determine beforehand if there is any special need, requirement or assistance to evacuate or to move to shelter. Assign a “buddy” or aide to assist persons with disabilities during an emergency. Contact the fire department to develop a plan to evacuate persons with disabilities.

In the case of building evacuation, it might be useful to have a list of employees and maintain a visitor log at the front desk, reception area or main office area. Assign a person to take the lists to the assembly area when the building is evacuated to account for everyone and inform the fire department accordingly. A fire, chemical spill or other hazard may block an exit, so make sure the evacuation team can direct employees to an alternate safe exit.

2.2 SHELTERING

Plan for each area, according to the potential risks that might occur in that area and allocate appropriate shelters for people to move. In the case of a tornado, shelters may include basements or interior rooms with reinforced masonry construction. Evaluate potential shelters and conduct a drill to see whether shelter space can hold all the people that needs to be evacuated. In many cases, there may be little time to shelter when a disaster is approaching, early warning is important. It is good practices to monitor news sources in case a disaster warning is broadcast. Subscribe to free text and email warnings, which are available from multiple news and weather resources on the Internet.

2.3 SHELTER-IN-PLACE

A tanker truck crashes on a nearby highway releasing a chemical cloud. A large column of black smoke billows into the air from a fire in a nearby manufacturing plant. If, as part of this event, an explosion, or act of terrorism has occurred, public emergency officials may order people in the vicinity to “*shelter-in-place*.” Develop a shelter-in-place plan. The plan should include a means to warn everyone to move away from windows and move to the core of the building. Warn anyone working outside to enter the building immediately. Move everyone to the second and higher floors in a multi-storey building. Avoid occupying the basement.

Close exterior doors and windows and shut down the building's air handling system. Have everyone remain sheltered until public officials broadcast that it is safe to evacuate the building.

2.4 LOCKDOWN

An act of violence in the workplace could occur without warning. If loud "pops" are heard and gunfire is suspected, every employee should know to hide and remain silent. They should seek refuge in a room, close and lock the door, barricade the door if it can be done quickly. They should be trained to hide under a desk, in the corner of a room and away from the door or windows. Multiple people should be trained to broadcast a lockdown warning from a safe location.

3. INCIDENT STABILISATION

Stabilizing an emergency may involve many different actions including firefighting, administering medical treatment, rescue, containing a spill of hazardous chemicals or handling a threat or act of violence. When you dial the local emergency number, you expect professionals to respond to your facility. Depending upon the response time and capabilities of public emergency services and the hazards and resources within your facility, you may choose to do more to prepare for these incidents. Regulations may require you to take action before emergency services arrive.

Prepare an emergency plan that includes prompt notification of emergency services, protective actions for life safety and accounting of all employees.

3.1 DEVELOPING THE EMERGENCY PLAN

Developing an emergency plan begins with an understanding of what can happen. Review the Risk Assessment. Consider the performance objectives that have been established for the municipal's program and determine how much to invest in planning beyond what is required by regulations.

Assess what resources are available for incident stabilization. Consider internal resources and external resources including public emergency services and contractors. Public emergency services include fire departments that may also provide rescue, hazardous materials and emergency medical services. If not provided by your local fire department, these services

maybe provided by another department, agency or even a private contractor. Reach out to local law enforcement to coordinate planning for security related threats.

Document available resources. Determine whether external resources have the information they would need to handle an emergency. If not, determine what information is required and be sure to document that information in your plan.

Prepare emergency procedures for foreseeable hazards and threats. Review the list of hazards presented in Figure 1 (Hazard Classification) to develop hazard and threat specific procedures as proposed in this manual.

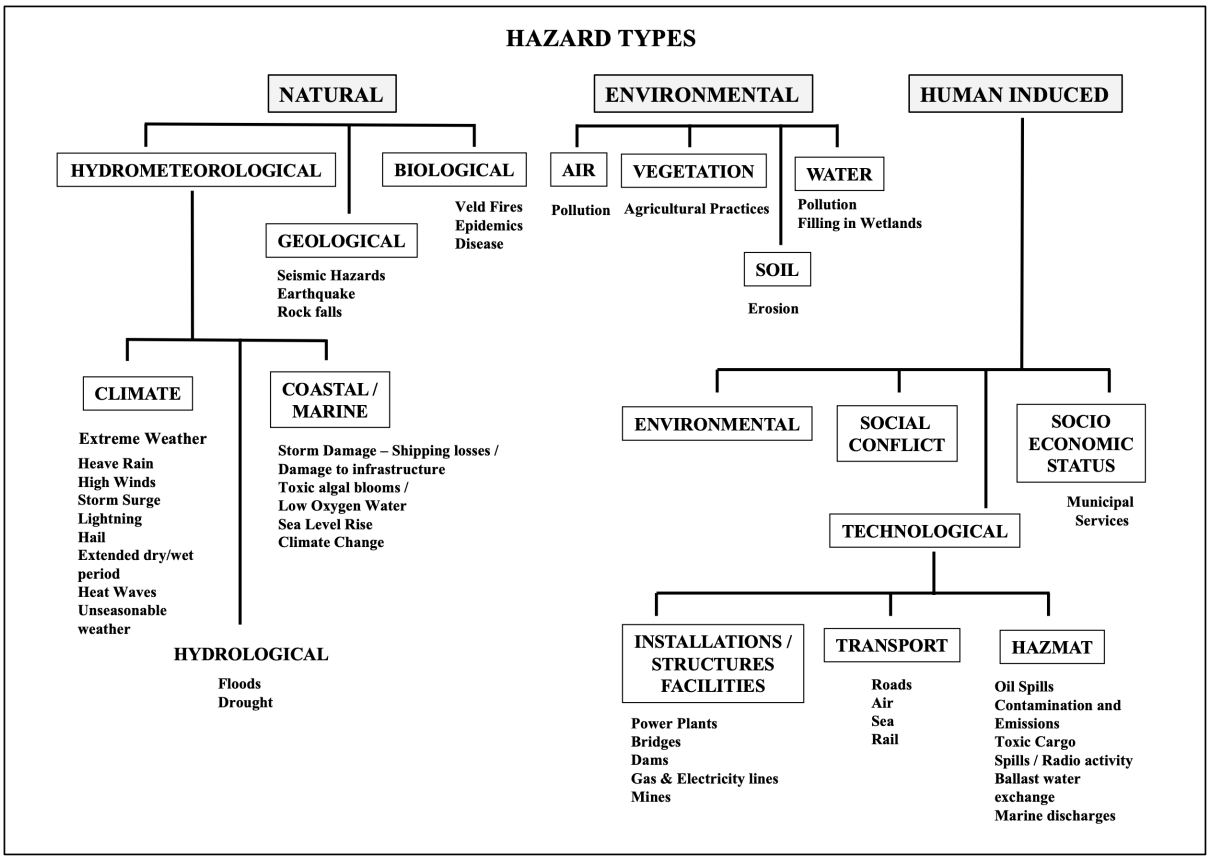

Figure 1: Hazard Classifications

3.2 WARNING, NOTIFICATIONS AND COMMUNICATIONS

Plans should define the most appropriate protective action for each hazard to ensure the safety of employees and others within the building. Determine how to warn communities and building occupants to take protective action. Develop protocols and procedures to alert first responders including public emergency services, trained employees and management. Identify the communication method with management and employees during and following an emergency.

3.3 ROLES AND RESPONSIBILITIES OF BUILDING OWNERS AND FACILITY MANAGERS

Assign personnel the responsibility of controlling access to the emergency scene and for keeping people away from unsafe areas. Others should be familiar with the locations and functions of controls for building utility, life safety and protection systems. These systems include ventilation, electrical, water and sanitary systems; emergency power supplies; detection, alarm, communication and warning systems; fire suppression systems; pollution control and containment systems; and security and surveillance systems. Personnel should be assigned to operate or supervise these systems as directed by public emergency services if they are on-site.

3.4 SITE/ FACILITY PLANS AND INFORMATION

Public emergency services have limited knowledge about the municipal facility and its hazards. Therefore, it is important to document information about all facility. That information is vital to ensure emergency responders can safely stabilize an incident that may occur. Documentation of building systems may also prove valuable when a utility system fails—such as when a water pipe breaks, and no one knows how to shut off the water.

Compile a site-plan for wards and plans for each floor of each building. Plans should show the layout of access roads, parking areas, buildings on the property, building entrances, the locations of emergency equipment and the locations of controls for building utility and protection systems. Instructions for operating all systems and equipment should be accessible to emergency responders.

Provide a copy of the plan to the public emergency services that would respond to your facility and others with responsibility for building management and security. Store the plan with other emergency planning information such as the Fire Brigade, Ambulance and Police Services.

3.5 TRAINING AND EXERCISES

Train members of the community and personnel so they are familiar with detection, alarm, communications, warning and protection systems. Review plans with staff to ensure they are familiar with their role and can carry out assigned responsibilities. Conduct evacuation, sheltering, sheltering-in-place and lockdown drills so employees will recognize the sound used to warn them and they will know what to do. Facilitate exercises to practice the plan, familiarize personnel with the plan and identify any gaps or deficiencies in the plan.

4. TEN STEPS FOR DEVELOPING THE EMERGENCY RESPONSE PLAN

1	Review performance objectives for the program
2	Review hazard or threat scenarios identified during the risk assessment
3	Assess the availability and capabilities of resources for incident stabilization including people, systems and equipment available within your business and from external sources
4	Liaise with public emergency services (e.g., fire, police and emergency medical services) to determine their response time to your facility, knowledge of your facility and its hazards and their capabilities to stabilize an emergency at your facility
5	Determine if there are any regulations pertaining to emergency planning at your facility; address applicable regulations in the plan
6	Develop protective actions for life safety (evacuation, shelter, shelter-in-place, lockdown)
7	Develop hazard and threat-specific emergency procedures
8	Coordinate emergency planning with public emergency services to stabilize incidents involving the hazards at your facility
9	Train personnel so they can fulfil their roles and responsibilities
10	Facilitate exercises to practice your plan

Acknowledgement:

Drought Management Plan (DMP)
August 2005
Department of Agriculture
A discussion document for public comment

https://www.gov.za/sites/default/files/gcis_document/201409/2005dmp.pdf

5. GUIDELINES FOR POTENTIAL DISASTERS IN THE FBDM AREA OF JURISDICTION

5.1 DROUGHT

The root causes of vulnerability to drought disasters in South Africa remain low average rainfall, poverty and inequitable development. Rapid population growth and urbanisation, inequitable patterns of land ownership, lack of education and subsistence agriculture on marginal land lead to deforestation and environmental degradation, malnutrition and unemployment, all of which heighten vulnerability.

5.1.1 VISION AND STRATEGIC OBJECTIVES OF THE DROUGHT MANAGEMENT PLAN

The vision contained in the DMP is to develop an effective, integrated risk and disaster management system for plant and animal husbandry and price and income systems to minimise the impact of droughts. Reducing drought risk and managing drought entail –

- setting up a system of information management, and monitoring and evaluating drought situations to detect biophysical and social vulnerabilities and suggest counter action;
- compiling drought indicator maps so as to provide updated information on, for example, whether drought is emerging or subsiding;
- compiling regular rangeland / vegetation indicator maps to enable those farming to make pro-active strategic decisions;
- implementing and improving early warning systems; and
- establishing and implementing priority programmes for risk reduction, including preparedness, mitigation, response, recovery and rehabilitation

5.1.1.1 DROUGHT MITIGATION

The priority of drought mitigation is the protection of the critical resources and systems on which communities depend. Drought mitigation has four basic components:

- Awareness
- Avoidance
- Early warning
- Rehabilitation

5.1.1.2 NATIONAL DEPARTMENT OF AGRICULTURE

The National Department of Agriculture makes the following strategic interventions to reduce drought risk:

- Setting up and maintaining a comprehensive National Drought Plan and a system of information management, monitoring and evaluation;
- Compiling veld indicator maps to enable livestock farming communities to make informed decisions;
- Conducting research in drought-prone areas;
- Assisting provincial departments of agriculture with drought assessments;
- Implementing and improving early warning systems;
- Developing and implementing priority risk and disaster management programmes for risk reduction;
- Sourcing allocated funds from National Treasury for disaster drought assistance programmes and service delivery;
- Outlining the criteria for drought assistance; and
- Participating actively in risk and disaster management forums at regional, provincial, national and international levels
- Monitoring, prediction and early warning are on-going processes based on on-going collection, evaluation and assessment of physical and social indicators of vulnerability

5.1.1.3 PROVISIONAL DEPARTMENTS OF AGRICULTURE

The provincial departments of agriculture (PDA) have the competence to handle disaster programmes and projects. PDA must use their resources (capacity and funds) to coordinate and monitor drought activities. The Department of Provincial and Local Government plays a crucial role in mobilising resources. A PDA should –

- lead education and awareness campaigns;
- conduct drought assessments and compile reports;
- appoint and pay service providers to deliver services to affected farming communities;
- ensure that farming communities implement risk reduction measures;
- measure vulnerabilities of communities so as to target priority assistance;
- ensure enough capacity for drought management;
- implement disaster assistance schemes for affected farming communities;
- determine and establish the severity and magnitude of drought in the province;

- prepare and review drought disaster management operational plans;
- ensure that farming communities' timely de-stock in seasons of decreased veld and forage production;
- compile drought indicator maps to review the drought situation in the province;
- design its own model(s) to identify drought disasters within the Disaster Management Framework prescribed by the Disaster Management Act (57 of 2002); and
- prepare a provincial disaster management plan

Provinces should abide by the following norms and standards:

- All risk and disaster information dissemination must comply with the norms and standards of Advisory Services (Extension Services);
- Information must be of high quality and emphasise risk reduction;
- Early warning information must reach beneficiaries through community libraries, the internet (AGIS), agricultural development centres, Extension Services points, information days, farmers' days, etc.;
- All agents of information must keep all information in hard copies and electronic format;
- Monitoring and evaluation must be effective; and
- Extension services for handling drought disasters must be well coordinated

5.1.1.4 LOCAL GOVERNMENT

Local government plays a critical role in drought management, particularly in the mobilisation of local resources. Local government should –

- act as conduit for information concerning drought disasters in the municipal area;
- act as an advisory body on drought disaster issues;
- incorporate early warning systems in its planning;
- make recommendations regarding assistance and initiate and facilitate efforts to make assistance available;
- establish disaster management centres within the municipal area; and
- prepare a municipal disaster management plan
- The highest priority is the protection of the critical resources of farming communities. Because of the variety of factors that cause and exacerbate drought, the government has adopted a multi-sectoral approach to intervention

5.1.1.5 FARMING COMMUNITIES

Any assistance to farming communities will be in accordance with the Disaster Management Framework. In order for farming communities to qualify for this assistance, they should have:-

- applied prevention and mitigation strategies, e.g. the planting of drought-tolerant crops, de-stocking and the use of available insurance products;
- followed good farming practices; and
- utilised early warning information in their planning

Farming communities must report their drought damages to their local authorities and Advisory Services. The following will be considered when stock farmers apply for assistance:

- A valid and updated stock card must be shown for each animal;
- A register of all stock must be kept, at least for the past 12 months and updated quarterly;
- A farm plan must be in place and grazing capacity must be adhered to (overgrazing will lead to the forfeiture of assistance);
- Fences, whether privately owned or erected with government assistance, must be maintained and secured at all times;
- The maximum number of livestock to be considered for feeding during a drought disaster will be 50 cow units (linked to the protection of the natural resources); and
- Livestock must be removed from high-lying areas during cold weather

Livestock will be replaced provided the Minister of Agriculture recommends replacement and the natural disaster was beyond farmers' control.

5.1.2 DROUGHT RESPONSE AND RECOVERY

Influencing the cause of the disaster (research and development);

- Modifying the disaster hazard (suitable breeds and combinations for specific biomes, drought-resistant cultivars and food security programmes must be in place to provide for disaster situations and limit water wastage and losses); and
- Developing plans and providing training to reduce vulnerability to drought, focusing on the diversification of crops and animals, and good farming practices

5.1.2.1 RESPONSE AND RECOVERY

Issues that should be addressed include:

- Appropriate research plan;
- Drought predictions;
- Early warning and monitoring systems;
- Decision support tools for drought management;
- Establishment of soil-crop-climate norms for agriculture in a reasonably homogeneous farming area (RHFA);
- Establishment of norms and standards for veld and animals in RHFAs;
- Development of responsive farming plans;
- Improvement of research, including that on climate change; and
- Determination of the impact of global environmental change on drought disaster characteristics and agricultural production

5.1.2.1.1 RECOVERY

Drought usually results in major setbacks such as loss of livestock, crops and natural resources, which in turn negatively affect on-going development. If farming communities have responded appropriately to mitigate drought disasters, production capacity will be restored much quicker than would otherwise be the case. Therefore, only farming communities who have acted responsibly and proactively should be assisted; dependency should not be induced by supporting those farmers who have left the success of their endeavours to chance.

Some strategic issues to be considered for implementation include:

- Development and implementation of appropriate drought management plans at local, provincial and national level, linked to information systems;
- Development of systems to share drought disaster management information with stakeholders;
- Establishment and maintenance of monitoring systems as part of a broader system to mitigate, prevent and respond to drought disaster; and
- Provision of support to improve institutional and organisational development with special focus on human resource capacity. The goal is to improve programme planning, implementation, monitoring and evaluation

Actions for implementation:

- The following mechanisms will be employed to put the plan into action:
- Design priority programmes for disaster mitigation;
- Set key performance indicators;
- Set service delivery standards;
- Design management and administrative structures;
- Design information and communication systems;
- Design monitoring and evaluation systems; and
- Secure human and financial resources

5.1.3 IMPLEMENTATION TOOLS

The plan embodies the principles and guidelines contained in the following documents:

- The Constitution;
- The White Paper on Agriculture, 1995;
- The White Paper on Disaster Management, 1999;
- The Disaster Management Act (57 of 2002);
- The Strategic Plan for the Department of Agriculture; and the Conservation of Agricultural Resources Act (43 of 1983)

5.1.4 DECLARATION OF A NATIONAL STATE OF DISASTER

A declaration of drought is limited to a natural disaster. The involvement of Advisory Services and local government in a province's assessment is crucial to advise the National Department of Agriculture on the scale and extent of the damage caused by drought. Provincial departments will then be informed about the financial assistance required to normalise the situation. Key determinants will be considered during the assessment, such as veld, livestock, fodder and crops, weather and climatic conditions, and water supply systems so as to ascertain whether the disaster was beyond the farmers' control or not. The following considerations apply to the declaration of drought:

1. In the event of a national disaster, the Minister of Agriculture and Land Affairs may, in terms of the Disaster Management Act (57 of 2002), by notice in the *Government Gazette*, declare a national state of disaster if –

a) existing legislation and contingency arrangements do not adequately provide for the national executive to deal effectively with the disaster, or
b) other special circumstances warrant the declaration of a national state of disaster

2. If a national state of disaster has been declared in terms of subsection (1) the Minister may, subject to subsection (3), and after consulting the responsible cabinet member, make regulations or issue directions or authorise the issue of directions concerning:-

a) the release of any available resources of the national government, including stores, equipment, vehicles and facilities;
b) the release of personnel of a national organ of state for the rendering of emergency services;
c) the implementation of all or any of the provisions of a national disaster management plan that are applicable in the circumstances;
d) the evacuation to temporary shelters of all or part of the population from the disaster-stricken or threatened area if such action is necessary for the preservation of life;
e) the regulation of traffic to, from or within the disaster-stricken or threatened area;
f) the regulation of the movement of persons and goods to, from or within the disaster-stricken or threatened area;
g) the control and occupancy of premises in the disaster-stricken or threatened area;
h) the provision, control or use of temporary emergency accommodation; the suspension or limiting of the sale, dispensing or transportation of alcoholic beverages in the disaster-stricken or threatened area;
i) the maintenance or installation of temporary lines of communication to, from or within the disaster area;
j) the dissemination of information required for dealing with the disaster;
k) emergency procurement procedures;
l) the facilitation of response and post-disaster recovery and rehabilitation;
m) other steps that may be necessary to prevent an escalation of the disaster, or to alleviate, contain and minimise the effects of the disaster, or steps to facilitate international assistance.

3. The powers referred to in subsection (2) may be exercised only to the extent that this is necessary for the purpose of –

a) assisting and protecting the public;
b) providing relief to the public;
c) protecting property;
d) preventing or combating disruption; or
e) dealing with the destructive and other effects of the disaster

4. Regulations made in terms of subsection (2) may include regulations prescribing penalties for any contravention of the regulations.
5. A national state of disaster that has been declared in terms of subsection (1) –

a) lapses three months after it has been declared;
b) be terminated by the Minister by notice in the *Government Gazette* before it
c) lapsed in terms of paragraph (a); and
d) may be extended by the Minister by notice in the *Government Gazette* for one month at a time before it lapses in terms of paragraph (a) or when the existing extension is due to expire

5.1.5 NATIONAL ASSISTANCE IN THE EVENT OF LOCAL AND PROVINCIAL DISASTERS

When a municipality or a province requests the national government to financially contribute to post-disaster recovery and rehabilitation in the event of a local or provincial disaster, the following factors may be taken into account:

- Whether any prevention and mitigation measures were taken or initiated by the municipality or province, and if not, the reasons for the absence of such measures;
- Whether the disaster could have been avoided or minimised had prevention and mitigation measures been taken;
- Whether it is reasonable to expect that prevention and mitigation measures should have been taken or initiated in the circumstances by the municipality or province;
- Whether the damage caused by the disaster is covered by adequate insurance, and if not, the reasons for the absence of inadequacy of insurance cover; and
- The magnitude and severity of the disaster, and whether or not available financial resources at local level, or if it is a provincial disaster, at provincial level, are exhausted

5.1.6 DROUGHT COPING STRATEGIES

Two types of measures can be used in strategies applied to mitigation of drought impacts. These are:

- Proactive measures; and
- Reactive measures

Proactive measures are defined as all measures, conceived or prepared by conscious and systematic actions that may help in the alleviation of consequences. Reactive measures are basically improvised once there is drought and there are visible impacts already under way

(Yevjevich, 1980). Reactive measures include the alternative of doing nothing. The difference between proactive and reactive measures is in the approach, which is planning versus improvisation of various ad hoc measures. The decrease of various drought impacts in proactive measures should sufficiently exceed their cost in comparison with the effects of implementing reactive measures.

Proactive strategy measures have three basic phases:-

- The first phase is the pre-drought preparation of various measures and is intended to make the water users more resistant to water shortage and deficit of prolonged duration. Experiences from previous droughts (*types, impacts, active measures undertaken, reactive measures etc.*) are important
- The second phase of proactive strategy are the measures and contingency plans undertaken during the ongoing droughts and relate to changes in water supply and water demand that decrease the impacts of drought
- The third phase of proactive strategy are the post drought measures undertaken to minimise the spread of drought impacts beyond unavoidable geographic areas and their economic and social sectors involved

Drought coping strategies are composed of a mix of drought mitigation measures. Measures are of physical / technological and non-technological nature. The non-technological measures consist of economic, social, institutional, political and other measures intended to decrease impacts or distribute losses equitably.

Drought mitigation measures are classified in three groups (Yevjevich V, 1980):

- Supply-oriented,
- Demand-oriented, and
- Minimisation of impacts and losses

Supply-oriented measures are intended to augment supply during droughts. These measures can be divided into,

- better use of existing water supplies,
- development of new supplies, and
- use of complex or unconventional approaches for increasing supplies
- Demand-oriented measures are intended to decrease demand during droughts

These are divided in,

- active, consisting mainly of legal constraints, public pressure, economic incentives for reduction of water use;
- reactive, that is, recycling and production adjustments; and
- impact analysis of demand- oriented measures that increase the total demand reduction

Impact-minimisation measures are related to water users, water user environments, and various economic, social and administrative factors, which minimize impacts of the adjusted supply-demand during severe droughts. These measures are divided in,

- anticipation of drought, with forecasting and warning, and
- spread of risks and losses (*such as self-protection, disaster aid and various adjustments*). They represent measures that permit an organised approach to required matching of supply and demand through acceptable impacts

5.1.7 DEVELOPMENT OF NEW SUPPLIES IN DROUGHTS

Construction of new surface reservoirs, further development or new development of ground water, new conveyance structures, and any new conservation measures belong to existing water supplies as soon as these measures are completed. New supplies are measures that are not normally used in non-drought periods but can be used or play a role in drought mitigation.

Saltwater conversion

This drought mitigation measure may serve as a new water supply in the following ways:

- by continuously using the full capacity of saline or brackish water conversion plants at full capacity during drought and only partially or occasionally used in non-drought periods;
- by having contingency, mobile equipment for saline or brackish water conversion in critical droughts or other emergency purposes that is used on a temporary basis; and
- use of simple solar distillation equipment for individual houses in isolated areas

Mining ground water

The use of deep waters (*fossil or renewable*), may be used as a drought mitigation measure when: fossil water is economically accessible, it is not highly loaded with minerals, and

feasibility exists to eventually replace fossil water in times of regional water surplus through artificial recharge.

Rainfall augmentation

Rainfall augmentation through cloud seeding is feasible when adequate meteorological conditions prevail which rarely occur during drought. Dry season conditions considerably reduce the possibility of inducing rainfall, which is the crucial season for drought relief. Conditions for rainfall augmentation through cloud seeding are considered favourable although limited to a local scale in areas where cold and wet air masses are swept upward over mountains than is the case with air masses over flat lands (Cunha et al, 1980).

The rainfall augmentation projects carried out at Bethlehem and Nelspruit were inconclusive and showed that there is little evidence that precipitation, hail, lightning or wind can be modified artificially to any significant degree except on a local scale (Department of Water Affairs, 1986).

From a sustainable development point of view, the author is highly convincing that rainfall augmentations through cloud seeding is NOT an option. It is because of these human interferences that the climate patterns on the glob is constantly changing. **HAARP** (High Frequency Active Auroral Research Program) is a little-known, yet critically important U.S. military defence program, which has generated quite a bit of controversy over the years in certain circles. Others go so far as to claim that HAARP can and has been used for weather modification, to cause earthquakes and tsunamis, to disrupt global communications systems, and more.

"Who control the weather control the world" Paul Chehade

The methods include the enhancing of storms and the diverting of vapour rivers in the Earth's atmosphere to produce targeted droughts or floods. Scientist Dr. Nicholas Begich-actively involved in the public campaign against HAARP-describes HAARP as:

"A super-powerful radio wave-beaming technology that lifts areas of the ionosphere (upper layer of the atmosphere) by focusing a beam and heating those areas.

Electromagnetic waves then bounce back onto earth and penetrate everything-living and dead."

Dr. Rosalie Bertell depicts HAARP as ***"a gigantic heater that can cause major disruption in the ionosphere, creating not just holes, but long incisions in the protective layer that keeps deadly radiation from bombarding the planet."***

Such a development in our international environment, using specialised technology to influence global weather patterns can have devastating results, increasing the vulnerability of countries and communities.

"Is it a co-incidence that 41% of drought disasters were in Africa, indicating that lower-income countries are still being overwhelmed by drought?"

Dew and fog harvesting

Artificial mist collection devices are used in the form of nets with small meshes mounted on frames with proper orientation and slope in such a way as to intersect the air masses and cause water vapour condensation. These devices are placed at suitable places where air moisture is high such as mountain sides. The amount of water harvested by these techniques is usually small and only feasible where the air masses contain large amounts of water vapour, as with certain coastal and inland mist belts.

5.1.8 ALTERNATIVE WATER SUPPLY ENHANCEMENTS

CONNECTION AND EXTENSION OF WATER SUPPLY GRIDS

Integration of water conveyance grids or networks represents a potential drought mitigation measure, regardless of various complexities of connection between grids, and the extension of existing grids to incorporate adjacent grids. This results in the connection of a number of sources. The larger the area covered by a water supply network, or the area of interconnected networks, the smaller the probability of a drought covering the entire area. This enables the shift of water from a surplus subarea to a deficit subarea, analogous to the areal shift of surplus electric power in energy deficits. This measure is attractive in the water supply of large, adjacent, metropolitan urban and suburban areas, or in areas having large aerially spread regional schemes and may be applicable where large dense rural settlements are in close proximity. This may be also done on a temporary basis by installing temporary pipe links and temporarily installing pumps at suitable sites of emergency.

Enlargement of conveyance capacities

Conveyance capacities of open channels or pressure pipes may be increased during droughts to convey more water from other sources to alleviate shortages. This can be done by installing additional conveyance structures, enlarging or lining existing canals or by reinforcing the pumping capacity of flow under pressure in existing pipelines.

Transportation of water

The transportation of water by trucks and train is commonly practised as an emergency measure and this was extensively done in the 1992/93 drought. However, it is limited due to the high cost and the availability of tankers. The other form of transport that has been used is by sea through tankers and towing of collapsible containers (Cunha L V et al, 1980). Proposals of towing icebergs from the polar regions have been made although this has not been done practically (Cunha L V et al, 1980).

Conjunctive use of all sources of water

This measure is a way of mitigating drought impacts by dividing drought deficits among the various sources of water (*surface, subsurface, saline and other sources*). This provides for added flexibility in coping with droughts. Pretoria (de Kock, 1988) and Verwoerdburg (Olivier, 1988) in 1987/88 supplemented that their water supplies with dolomitic ground water.

5.1.9 DEMAND ORIENTED MEASURES

The basic objective is to trim water use, provided legal economic and consent conditions permit it. This assumes a flexibility in water demand, which can be decreased during droughts without significant impacts. Demand-oriented measures may be divided into three groups (Yevjevich et al, 1978): (1) active; (2) reactive; and (3) impact analysis of demand-oriented measures. However, these measures are imposed, in the final count, by inadequate water supply.

5.1.9.1 ACTIVE MEASURES OF DEMAND REDUCTION

These may be divided into those that are implemented by pressure (coercion) and those that are produced by inducements of various kinds (incentives) in order to reduce the demand pressure on reduced supplies.

Legal restriction and public pressure

This type of measure is achieved by direct or indirect coercion. It includes rationing, legal limitations and sanctions, and economic, social and political pressure. An appropriate institutional system is a basic prerequisite for implementation of this type of measure. Proper authority and responsibility are needed for effectiveness and the system may exist and activated during drought or created ad hoc. During the 1983/84 drought, certain restrictions were imposed by the City of Pietermaritzburg such as prohibiting use of hose pipes in washing of motor vehicles, watering of gardens, use of sprinklers and these became more restrictive as the drought worsened and rationing was introduced (Ackerman,1985). Similar restrictions and rationing were also implemented in Durban (City Engineer of Durban, 1985). The Rand Water Board had to introduce quotas to municipalities supplied (Hobbs, 1985).

Economic incentives for reduced water use

This is based on economic incentives not to use water beyond a necessary minimum, or on the penalties in the case of exceeding an allocated amount. Pricing is the economic inducement used whenever feasible. However, in the absence of individually metered consumers, it is difficult to exert economic control. Tariff designs should not encourage wasteful consumption. Tariff policies are useful in restraining demand when it is likely to outstrip resources.

5.1.10 REACTIVE MEASURES

These are consequences of intentional or unintentional active drought mitigation measures or are imposed by physically forcing demand to match reduced supply.

Recycling systems

Portable water recycling equipment of low investment can be used as a drought mitigation measure. Other types of recycling water may be temporarily implemented to just fit the water quality tolerance of the same or the next user, in a sequence of water users along a river.

User production adjustments

This results from capacities of many water users to adjust either production or water use quantities in order to decrease water demand during droughts. Adjustments are often flexible, especially in water use in households. These measures are the most important reserve left for

mitigation of impacts of most severe droughts, when the lack of sufficient supplies forces users to adjust their water consumption to the upper limits of economic and social tolerances.

5.1.11 ANTICIPATION OF DROUGHTS

Drought can be anticipated by one of two methods: (1) forecast of droughts through the classical approaches of looking into the future; and (2) analysis of data by finding how often and how long droughts occurred and lasted in the past. However, it is often much easier to assess whether an ongoing drought is worsening such as through reservoir levels and other physical and social indicators.

Drought forecast and warning

At present, there are no reliable ways of forecasting the occurrence of and projecting the extent of drought.

Measures of implementing forecast and warning

Drought is a slow and creeping natural disaster. Usually, no urgency is conceived in drought and sometimes when it is perceived it is too late for any preventative or pre-drought measures. The education of people may be considered a special drought mitigation measure. To store water and to start conservation needs time. The lead-time in drought warning is usually short and the pre-drought supply-demand aspects of drought mitigation may not result in significant effects in most cases.

5.1.12 SPREAD OF RISKS AND LOSSES

The spread of risks and losses in disasters is an old practice in any society. The larger the spread, the more acceptable are the risks and losses.

Drought insurance

This is not widespread and existing schemes are functions of political, socio- economic and cultural systems. These have limited use in water supply.

Individual Protection

Savings in various forms by individuals or groups is another form of protection against drought. Diversification of activities is also another way of spreading risks and losses.

Disaster aid

Disaster of specific impacts attracts relief and rehabilitation programmes by social and political necessities. This is a drought mitigation measure of spreading risks and losses across local, regional, national, and international levels. These programmes take various forms such as, grants, human subsistence aid, technical assistance, and similar disaster aids. The problem resides with the proper selection of such a mix of disaster aid that fits the general and specific conditions of each drought and each area covered.

Agricultural adjustments

A mix of drought tolerant/resistant and common crops and or livestock represents a spread in risks and losses. Water conservation practices are also drought mitigation measures.

5.1.13 DROUGHT POLICY OPTIONS

The various policy elements that are identified from the preceding discussions are as follows:

1. A focus on the provision of basic infrastructure for water supply to rural communities through an approach which is community controlled and has strong community participation
2. Development of an institutional framework in the water industry including support structures within and for rural communities
3. Establishment of a national drought plan that takes into account rural communities
4. Establishment of a permanent disaster relief body
5. Capacity building in the rural communities
6. Development of early warning systems
7. Accelerated development of water supply to rural communities through the Reconstruction and Development Program.
8. Conservation of the environment, particularly those elements that influence the water resources of catchments.
9. Decentralisation of structures, services and decision making
10. Application of proactive measures to deal with drought focusing on risk management rather than crisis management
11. Use of appropriate, affordable and sustainable technology in water supply
12. Research and development of alternative water supplies
13. Application of supply-oriented measures for drought mitigation
14. Application of demand-oriented measures for drought mitigation

15. Cost recovery, tariff setting and financing of schemes
16. Community and public participation including education on drought issues
17. Creation of a disaster fund
18. Ensuring there is adequate stock of equipment and spares at a regional level such as hand, diesel, electric and wind pumps and engines.
19. The general standardisation of equipment.
20. Creation of enabling climate for the promotion of rural development
21. The training of adequate personnel to serve in the various sectors and levels involved in the water supply industry and the development field
22. Systems approach (integrated development) to rural development

The drought policy options with respect to provision of water to rural communities subject to recurring drought proposed can be divided into two types. These are short-term and long-term policies. The short-term policies tend to address one to a few of the policy elements listed above and in turn may form components of the longer-term policies. The long-term policies tend to encompass more policy elements. The short- term policies will tend to be reactive whereas long-term policies will tend to be pro-active.

5.1.13.1 SHORT-TERM POLICIES

The short-term polices suggested are:

1. Creation of Strong Disaster Relief Policy

This would focus on the alleviation of distress and the provision of water to communities during drought. This entails the creation of permanent structures that would have to be formalised nationally and regionally as suggested in 9.3. This would require the creation of a disaster fund and the building of capacity in both government and non- governmental agencies such as the equipping of government departments most directly involved with the necessary facilities e.g. the Department of Water Affairs with drilling rigs. The disadvantages with this approach are:

- lack of adequate capacity on the ground to provide disaster relief especially when drought is extensive;
- lack of capacity in industry to provide goods services at short notice as for example hand pumps and spares;
- it is difficult to plan and implement public works programmes that will be sustainable after the drought; and

- does not take into account the use of pre-drought measures that can minimize the impacts and hence the scale of the disaster relief
- The advantages of this are:
- it is faster to implement relief and there is less suffering since institutions and structures will be in place;
- post drought recovery would be easier and faster especially if there is a strong component of post drought recovery in the relief strategy; and
- fewer resources are used in development when drought is not taken into account and development funds could stretch further

2. Accelerated Development of Rural Water Supply

In view of the different levels of development of infrastructure in the country, its accelerated development, in particular in those areas where the supply of water is an acute problem, the RDP could provide the drive for the accelerated development of the infrastructure. This would be by using appropriate and sustainable technology and should be labour intensive. The advantages of this policy are:

- provision of badly needed infrastructure and at the same time employment in the short-term
- financing of projects maybe more readily available

The disadvantages of this approach:

- due to the accelerated nature of implementation, there it would be difficult to have enough time for capacity building,
- the approach would tend to be a provision rather than a promotion approach,
- the capacity to carry out this programme that is, funds, personnel and other resources may limit the rate of implementation

5.1.13.2 LONG-TERM POLICIES

The long-term policies suggested are:

1. **The creation of an appropriate institutional framework for water supply.**

This is especially with regard to rural water supply. This would be an evolutionary process and hence a long-term process. Once the top tier structure is identified, it would be responsible for setting the policies regarding water supply. This would address most of the policy elements

such as provision of infrastructure, setting of tariffs, capacity building, drought mitigation measures etc. This would have the advantages of:

- providing adequate input in the design of programmes and projects by those best qualified in this field
- considerably reduced costs of disaster relief during droughts; emergency reactions may be well developed by these institutions;
- The disadvantages would be a tendency to view water supply in isolation to general development as whole

2. The implementation of a systems approach to rural development

This would call for a holistic approach to rural development where not only issues relating to water are addressed but also the wider issues of development resulting in the upliftment and improvement of the socio- economic framework in which these rural communities operate. This would represent the development and conjunctive use of water resources, the development of water infrastructure and the development of institutional capacity including backup, which would be integrated into the general development process. Included in this process would be a strong disaster relief component.

The advantages of this approach are:

- improved sustainability of the water supply schemes; local level monitoring and rapid response is possible;
- considerably reduced costs of disaster relief during droughts; emergency reaction can focus on the alleviation and minimisation of the economic impacts;

The disadvantages of this approach are:

- the requirement to set up the necessary institutional arrangements to facilitate the development process;
- the long term nature of development which means that in the interim there will be need to set up a strong focus on the disaster relief process;
- the development process will require enormous investment of resources

Acknowledgement:

Development of drought response policy options for the cost-effective provision of water supply to rural communities subject to recurring droughts.
by
Development Services and Technology Programme Division of Water Technology
CSIR

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Effective Provision of Water Supply to Rural Communities Subject to Recurring Droughts"
WRC Report No 506/1/94
ISBN No 1 86845 122 4

DG Hazelton
I Pearson
AW Kariuki

http://www.wrc.org.za/wp-content/uploads/mdocs/506-1-94.pdf

5.2 FIRE

5.2.1 FIRE RISK MITIGATION STRATEGIES FOR COMMUNITIES

Some relevant measures of the status of a community with respect to fire risk include;

- the average age of structures in the community
- community design (particularly lot size, density and internal road systems)
- communitywide compliance with defensible space provisions
- general property hygiene (i.e., community "pride in appearance")
- presence of community fuel breaks or other fire defence projects, and
- community involvement in fire prevention education and outreach.

Given the status of a community and its inherent risk due to weather, topography, and vegetation type(s), mitigation strategies at the community scale generally include:

- Improving road access, generally and specifically for emergency response and evacuation
- Improving water supply and water delivery infrastructure
- Enforcing defensible space regulations and generally reducing risks due to accumulations of trash and other flammable material on commercial and residential properties
- Reducing hazardous fuels
- Public education and fire prevention measures
- Different emphasis should be placed on different strategies based on site-specific or community risk assessments.

5.2.1.1 IMPROVING ROAD ACCESS

There are many aspects to the issue of roads and adequacy of access, but at the community scale, facilitating emergency response and evacuation in the event of a fire is essential. Steep terrain and narrow, steep roads, poorly maintained roads, locked gates, and dense roadside vegetation can all impair the movement of equipment in to fight a fire and movement out by affected people. In the worst of cases, "traffic jams" caused by the combination of poor access and heavy traffic can contribute to the spread of fire and fatalities. Many fatalities were attributed to residents being unable to evacuate due to impaired access. The responsibility for evacuation rests with law enforcement and the county Office of Emergency Services.

Alerting residents when fire is eminent may not always be sufficient; they must be informed in advance to the degree possible about favoured community ingress and egress routes and about the option of "sheltering in place" until a fire passes.

There are many dirt-surfaced roads in rural areas that are not maintained, and many might have locked gates where they traverse private properties. Although law enforcement and firefighters may have keys or combinations for these locks, that may not be the case for evacuating residents. Consequently, any designated community ingress and egress route must be free of these obstacles.

Evacuation of animals, particularly livestock and horses can be an especially vexing problem during a wildfire emergency. The availability of stock vehicles, accessibility on narrow country roads, potential conflicts with fire-fighting equipment transport, and evacuating residents can all cause ineffective rescue attempts. After a wildfire there are often lost or abandoned animals needing care and shelter. Pre-planning for large animal evacuation is an important part of pre-fire planning.

All of these considerations in regard to emergency response and evacuation imply a need for adequate pre-planning and education at the community and individual property owner level on the part of all parties involved with wildfire prevention and abatement in the FBDM area of jurisdiction.

5.2.1.2 IMPROVING WATER SUPPLY AND DELIVERY INFRASTRUCTURE

Rural communities in FBDM area of jurisdiction depend on a variety of water supplies and associated infrastructure. In many instances, water supply is the responsibility of the individual property owner who may or may not have a storage facility (e.g., tank, pond, or swimming pool) that can provide a source of water for fighting a fire. In other cases, communities and groups of properties depend on inherited water delivery systems such as flumes and ditches. Flumes and ditches are susceptible to failure and obstructions, particularly during large fires where they may be physically burned or impacted by falling trees.

Water supply and infrastructure is considered a serious potential constraint on response to wildfire in FBDM (see the socio-analysis of water supply services in the FBDM area of jurisdiction). The objective of appropriate prevention and mitigation projects to mitigate water

supply and infrastructure might include *amongst others*, reducing of water loss to seepage and evapotranspiration, protect drinking water quality, and to reduce operations and maintenance costs. Meeting these objectives will thereby contribute to the municipal's overall water conservation efforts and protect the supply from impacts of wildfire and associated hazards.

5.2.1.3 ENFORCING DEFENSIBLE SPACE REGULATIONS

Enforcement of policies, codes and ordinances can have an important impact on risk. For example, the extension of defensible space provisions from 9m to 30m from a structure had a positive effect that was triggered in part by the requirements of insurance companies. Strategies might include provisions for defensible space treatments beyond a property line onto adjacent property. Special attention must be given to overgrown and un-managed vegetation on vacant stands, plots owned by absentee landowners. Location of these lots and taking action to get them cleaned up is of great importance to many local community members.

5.2.1.4 REDUCING HAZARDOUS FUELS

Reducing hazardous fuels in vulnerable areas might not only contribute to fire mitigation but can also create incentives for job creation in communities if and where funds are available. Awareness initiatives is deemed necessary among communities that have not been as active in this regard and to encourage increased efforts to reduce hazardous fuels.

Fuel treatment types

A general description of fuel treatments are provided below:

Mechanical Harvest

Whole-tree yarding (transport to a lumberyard) is typically used for fuel treatments. Under a whole-tree yarding harvest system, individual trees are directionally felled using a mechanical cutting head attached to a tractor or similar unit.

Smaller trees are cut, gathered in bunches, and left as "doodles" in the harvest unit; these smaller trees are not typically bucked or limbed within the unit. A rubber tired, track laying, or

similar machine is then used to yard these doodles to the landing. At the landing, trees are limbed and bucked to specified lengths. Bucked log sections are loaded onto a log truck and transported to the mill; limbs are typically either chipped and hauled away to a cogeneration (power) plant or burned at the landing.

Mastication

Mastication is implemented using a mastication head attached to an excavator, small tractor, or other type of machine. The mastication head is used to chip or shred ladder fuels from brush and small trees in place. Shredded material is either incorporated into the duff layer during operations, left on site, or reduced using a prescribed burn following post-treatment evaluation. Mastication is typically implemented in areas of high brush cover or that need ladder fuel treatment where biomass removal is not feasible. An example of a mastication project pre- and post-treatment are shown in photos 1-3.

Photo 1:

A rotary masticator chipping small trees and shrubs on the Grizzly Flat Fuel Reduction Project

Photo 2 (left) and 3 (right):

Before and after mastication treatment on the Grizzly Flat Fuel Reduction Project

Chipping:

As an alternative to mastication, vegetative material may be chipped on site with the chips left as mulch or potentially hauled away. Chipping can be done using several types of machines that are both hand- or machine-fed.

Under burning:

Under burning involves the use of intentionally lit fires used to burn surface and small ladder fuels within a designated unit under an approved burn and smoke management plan. Under burning may occur in conjunction with other mechanical treatments or as a stand-alone treatment where fuels, access, and topography allow.

Hand-thinning:

Hand thinning is typically used on trees up to 22cm in diameter but most effective for trees up to 15cm in diameter or shrubs. The treatment is completed by an individual or teams using chainsaws, with cut material either chipped, hauled, or piled and burned.

https://www.edcfiresafe.org/wp-content/uploads/2017/02/Chapter-4.pdf

5.2.2 FIRE RISK MITIGATION STRATEGIES FOR INDIVIDUAL PROPERTY OWNERS

There are three general classes of property land in the FBDM area of jurisdiction that is developed with residential, commercial, or industrial uses; agricultural land (e.g., crop fields, pasture); and undeveloped land. The focus of fire prevention is therefore on protecting and defending developed land and infrastructure from wildfire and facilitating safe evacuation of residents through identified community ingress and egress routes. It should be acknowledged, however that unmanaged undeveloped land can contribute very significantly to community risk.

Confining the discussion to developed land, there are numerous factors affecting risk of ignition and losses during a wildfire. These include lot size, density and setbacks between buildings, the age of the structure and building materials, and defensible space. Some of these factors are unalterable, at least until a fire occurs. Therefore, the focus of mitigation strategies is on those things that an individual property owner can do to reduce risk.

These include:

- Implementing defensible space measures,
- Providing adequate access for emergency vehicles,
- Providing signage to identify the property,
- Ensuring that structures are compliant with current building codes for structures

5.2.2.1 IMPLEMENTING DEFENSIBLE SPACE

Effective defensible space consists of three components:

- an essentially fuel-free zone adjacent to the home,
- a treated secondary zone that is thinned and cleaned of surface fuels,
- and-if the parcel is large enough- a transitional third zone that is basically a managed forest area

These components are designed to work together in a proven and predictable manner:

- Zone 1 keeps fire from burning directly to the home;
- Zone 2 reduces the adjacent fire intensity and the likelihood of torching, crown fire, and ember production; and
- Zone 3 does the same at a broader scale, keeping the fire intensity lower by maintaining a more natural, historic condition

Defensible space has important implications not only for personal and property safety, but also for insurance coverage. The consequences of being uninsured or underinsured provide a strong incentive for property owners to implement defensible space.

5.2.2.2 PROVIDING ADEQUATE ACCESS FOR EMERGENCY VEHICLES

Emergency access to developed properties requires specified standards of road width, clearance, curvature, and grade. Although these standards are generally applied to new developments, existing roads in rural areas and even portions of developed towns in the FBDM area of jurisdiction do not meet these standards. As with community ingress and egress routes, inadequate roads can create bottlenecks to emergency responders that can lead delays in fire response, delayed evacuation, and potentially to losses of human life and property. Individual property owners can take steps to improve access to their properties by clearing roadside vegetation, maintaining surfacing, and if feasible, adjusting width and curvature. In cases where groups of homes or neighbourhoods are served by inadequate emergency access, a

coordinated effort is required. This may require seeking additional grant funding or forming a community road association that levies an assessment on individual properties for the purposes of improving and maintaining roads where funding is not immediately available.

5.2.2.3 PROVIDING SIGNAGE TO IDENTIFY PROPERTIES

Using signs to properly identify a property can be the difference between saving and losing a home during a wildfire. Signs may also be used to advise residents and others about current risk of wildfire, road conditions, and distances to emergency response stations. In the latter case, local agencies and law enforcement may bear the responsibility for signage.
The municipal must prescribe the specific sign ordinance language and specifications.

> *All buildings shall have a permanently posted address, which shall be placed at each driveway entrance and visible from both directions of travel along the road. In all cases, the address shall be posted at the beginning of construction and shall be maintained thereafter, and the address shall be visible and legible from the road on which the address is located.*
>
> *Address signs along one-way roads shall be visible from both the intended direction of travel and the opposite direction.*
>
> *All such numbers shall be placed in a horizontal sequence to be easily visible and legible from the road upon which the premises front. When the house is a substantial distance from a road, numbers shall be placed on a mailbox or post in a horizontal sequence, in a location adjacent to the driveway access intersection with the road. When the mailbox is on a road other than the road on which it fronts, then the house and road name shall be clearly marked on the mailbox, to ensure proper mail delivery, and a post displaying the house number shall be installed adjacent to the driveway access intersection with the road.*

5.2.2.4 COMPLYING WITH CURRENT BUILDING CODES

Researchers have generally agreed that the potential for a structure to ignite during a wildfire is largely dependent on the building design and materials, flammability within 30m of the structure, and the susceptibility to ignition by firebrands. Building Code implemented in the

FBDM area of jurisdiction require specific standards intended to improve the resistance of a building to ignition from either direct flame contact or airborne embers. These measures may determine whether or not a structure survives a fire when the number of structures at risk exceeds suppression capabilities. Risk, therefore, depends on whether or not structures meet current codes.

New developments within the municipality must meet the current building code standards. Retrofitting existing structures to improve their resistance to wildfire would include:

- Replacing exterior windows and skylights with tempered glass
- Replacing vents with vents approved for use
- Replacing combustible roofs with non-combustible, fire-resistant roofing
- Treating wood with fire-retardant chemicals
- Replacing combustible siding with non-combustible siding

All of the mitigation strategies recommended for individual properties require an awareness on the part of the property owner that he or she needs to take steps to reduce risk; knowledge of the strategies that may be applied; commitment of time and money to implement the strategies; and in the case of defensible space, commitment to maintain the desired condition. For all of these, effective public education and engagement play an important role. The local Fire Brigade can provide that service as well as other assistance such as methods for disposing of green waste.

https://www.edcfiresafe.org/wp-content/uploads/2017/02/Chapter-4.pdf

5.3 FLOODS

The four phases of an emergency flood management plan are: mitigation, preparedness, response and recovery. These four phases are applicable to all natural disasters. Flood mitigation approaches fall into two main categories, namely structural and non-structural. For many decades' engineers overwhelm the terrain of flood mitigation through structural measures. Researchers agree that flood damage over time increased significantly. Even acknowledging that the frequency and the probability of occurrences increased, rising flood damages and flood claims are the consequences of unsustainable development practices. Areas not suitable for development are developed. Adding structural measures to protect those developed areas only worsen the situation when those structures failed.

5.3.1 FLOOD MITIGATION

Mitigation activities are intended to significantly reduce or even eliminate the risk of flooding before it occurs. A vulnerability analysis is deemed necessary, which includes hydrologic and hydraulic modelling programs to estimate flood risk. The modelling is conducted to produce maps that indicate where flood-prone areas are located, which can then be confirmed with past observations and used to evaluate alternatives to minimize flooding.

Implement Geographic Information Systems (GIS)

By using GIS, capabilities to develop infrastructure and natural resources databases you can document historic and existing conditions of storm water management systems and natural streams alike. This information can serve as the foundation for hydrologic and hydraulic modelling, and even provide an inventory of data to use for levee certification.

Implement mitigation projects

Projects that focus on improving storm water management or reducing flood risk from a major river can be effective ways to mitigate flooding. These projects include traditional and innovative practices and can consist of levees, floodwalls, impoundments, improved conveyances, and wetland restoration, acquisition of flood-prone properties and even storm water harvest and reuse. Water resources engineers can combine their proven experience with new data and tools to identify the best flood mitigation practice for every community.

To ensure sustainable development, it is recommended rather to follow a non-structural mitigation option to reduce the impacts of floods. These include, *amongst others;*

- Flood proofing and elevation
- Diverting flood water through dams and reservoirs
- Dikes
- Levees
- Flood walls
- Channel alterations
- High flow diversions
- Storm water management
- Coast- or river-line protection
- Watershed management

- Integrated water resource management
- Regulations
- Development and redevelopment policies
- Safe citing in flood prone areas

Public outreach and educational programmes are also effective non-structural measures in mitigating flood risk.

5.3.2 FLOOD PREPAREDNESS

Preparedness activities are intended to achieve a sense of readiness for the flooding emergency. There are a number of ways to get ready and ensure preparedness:

Develop a plan

While it may seem like a no-brainer, emergency preparedness plans should be tailored to address the specific needs of the community. Communities are required to develop a hazard mitigation plan and update it every five years, but that does not mean you are covered. Engage neighbouring communities and all parties expected to contribute to the response process so they can provide useful feedback and understand their role.

Practice makes perfect

Conduct an emergency exercise to identify deficiencies in your plan, and update it accordingly. Like the planning process, engage neighbouring communities who can provide mutual benefits by sharing and/or swapping critical resources. Games have even been developed to make this activity more enjoyable and effective.

Utilize emergency warning systems

Learn what information is available to help you predict flooding conditions. With an extensive network of stream and precipitation gauges throughout the country, it is likely that publicly available information can be used to help your community.

Flood insurance

Flood insurance can be a useful tool to at least cover flood losses. However, flood insurance will only redistribute the risk to somebody else and might create a fall sense of security. Many

countries, including South Africa is rigid when it comes to floodplain development policy by not allowing any development within the 50-year flood line. It is rather wise to take into account the river morphology to determine the specific flood risk for within an area, which might differ considerably. With such an approach, the real risk will be rather determined and be addressed. It might be that some areas it is suitable to develop in the 20-year flood line, while in other areas it might only suitable to develop outside the 100-year flood line.

It is recommended that the DMC within the district conduct such studies in partnership with the Department of Water Affairs.

Document existing infrastructure

Ensuring that the minor and the major storm water systems are well maintain will contribute to lower flood levels. The preventative measure prevented numerous homes from flooding while helping to save money.

Provide proper maintenance

Make sure drainage structures are cleared to allow water to be intercepted and conveyed as intended. This may mean removing various objects from storm sewer inlets, clearing culvert ends, among other activities. Of course, all of these actions should be carried out with proper equipment and safety precautions.

Stockpile materials

Your community's emergency response plan should identify materials needed to respond to several types of emergencies. In the case of flooding, these materials typically include pumps, sandbags and clay for temporary levees, but it should also include food, water and clean-up kits.

5.3.3 FLOOD RESPONSE

The response phase of emergency flood management involves providing immediate assistance such as emergency relief and search and rescue. The specific activities of this phase depend on the community's characteristics, but the primary goal is to meet people's basic needs until recovery begins.

5.3.4 FLOOD RECOVERY

Typical recovery actions bridge the gap between emergency and normalcy. These actions can include providing temporary housing, reconstruction, event counselling and education. The following two activities are often forgotten in the midst of recovery, but can be very beneficial to the community:

The Disaster Management Act makes provision for various funding arrangements to recover communities back to their original stage as it was before the flood incident.

Document the flood

After the floodwaters have receded and it is safe to do so, mark high water lines and survey them to document the maximum flooding condition. Interview residents and business owners to collect information about their experience with the flood and the impact it had on them. Photographs taken during the flood can also be useful, but should only be taken from a safe location. All information collected can be used to justify the need for financial assistance, public education on the severity of the event and improve the accuracy of flood modelling.

5.4 WATER POLLUTION

Industrialization, in any society, is a major initiator of development and urbanization. Although the merits of industrialization are innumerable, it has been identified as a major threat to the environment as it releases various toxic chemicals, gases; solid wastes as well as microbes of various kinds into our immediate environment—land, air, and water. Of particular interest is water pollution, which has become a global challenge, developing nations being highly affected due to their drive for development.

All organisms, including man need water for their survival. Water resource managers had strongly depended on wastewater treatment in ensuring that the quality of water is sustained, preserved, and maintained for optimal use. By 2025, an estimated around 5 billion people out of a total population of around 8 billion will be living in areas of water stress [Arnell NW. Climate change and global water resources. Global Environmental Change. 1999;9:S31-S49]. One of the major environmental issues affecting humanity is the increasing worldwide contamination of freshwater systems as a consequence of industrial and chemical compound materials being emptied into their pathways/runways, majorly in form of micro-pollutants.

South Africa has currently its own unique challenges regarding water resource management. Not only does it become more and more scarce, but the quality of our water resources deteriorating at a rapid rate. The FBDM and its officials are well aware of the poor water quality of the Vaal River. This calls for an urgent new way of managing a scarce commodity. As illustrated in Figure 2, it is clear that 73% of water is used in rural areas for flushing toilets. Only 19% of our water in rural areas are used for bathing or showering and only 8% of the water is used in rural area for washing and drinking.

South Africa is one of few countries in the world that is using expensive water for sanitation and bathing, bearing in mind that only 8% water in rural areas and 14% of water in urban areas are used for drinking water.

An immediate relief can be implemented if all spheres of government distinguish between water for human consumption (*drinkable water*) and water suitable for all other uses (*sanitation, washing, bathing, gardening etc.*).

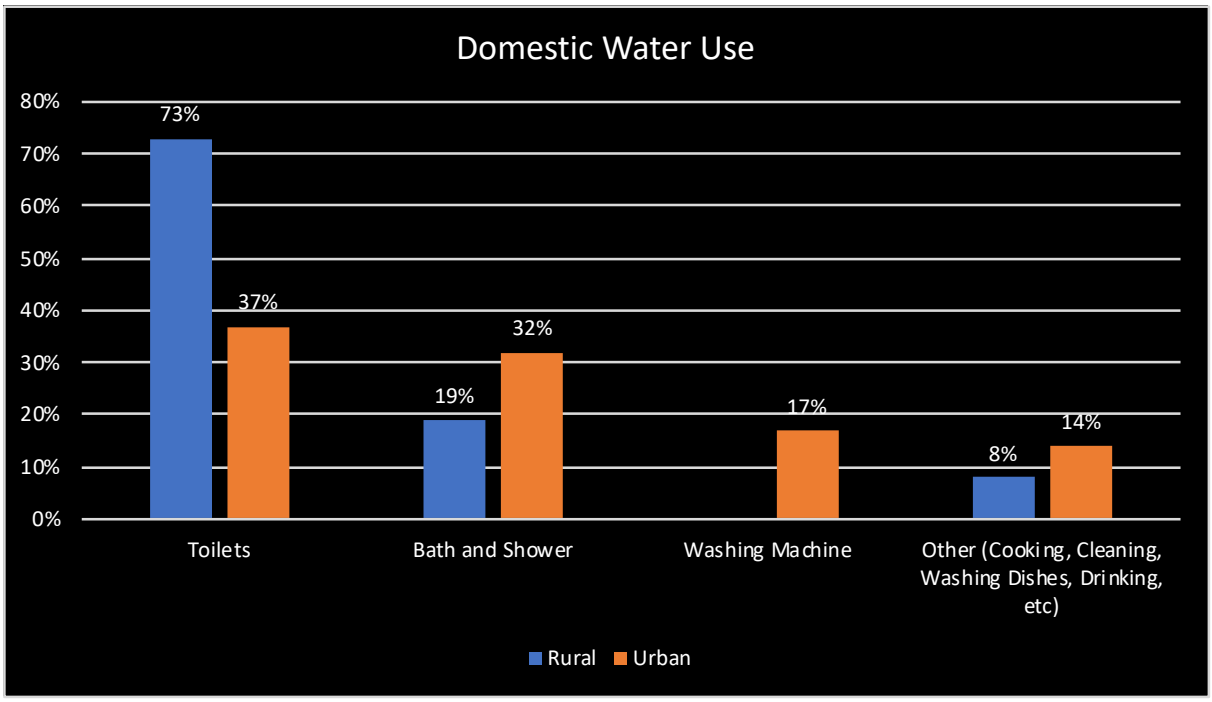

Figure 2: Domestic Water use in South Africa, 2018

5.4.1 GUIDING PRINCIPLES FOR WATER POLLUTION CONTROL

The guiding principles of the policy document put the political intentions into more practical terms by setting a more detailed conceptual framework that supports the overall policy objectives. It is recommended that these principles should be clarified by a short narrative interpretation. The following guiding principles provide a suitable basis for sound management of water pollution.

Prevent pollution rather than treating symptoms of pollution

Experience has shown that remedial actions to clean up polluted sites and water bodies are generally much more expensive than applying measures to prevent pollution from occurring. Although wastewater treatment facilities have been installed and improved over the years, water pollution remains a problem, including in industrialised countries. In some situations, the introduction of improved wastewater treatment has only led to increased pollution from other media, such as wastewater sludge. The most logical approach is to prevent the production of wastes that require treatment. Thus, approaches to water pollution control that focus on wastewater minimisation, in-plant refinement of raw materials and production processes, recycling of waste products, etc., should be given priority over traditional end-of-pipe treatments.

An increasing proportion of water pollution originates from diffuse sources, such as agricultural use of fertilisers, which cannot be controlled by the approach mentioned above. Instead, the principle of "best environmental practice" should be applied to minimise non-point source pollution. As an example, codes of good agricultural practice that address the causes of water pollution from agriculture, such as type, amount and time of application of fertilisers, manure and pesticides, can give guidance to farmers on how to prevent or reduce pollution of water bodies.

Use the precautionary principle

There are many examples of the application and discharge of hazardous substances into the aquatic environment, even when such substances are suspected of having detrimental effects on the environment. Until now the use of any substance and its release to the environment has been widely accepted, unless scientific research has proved unambiguously a causal link

between the substance and a well-defined environmental impact. However, in most cases it takes a very long time to establish such causal links, even where early investigations suggest clear indications of such links. When, eventually, the necessary documentation is provided and action can be taken to abandon the use of the substance, substantial environmental damage may already have occurred.

Examples of such situations include a number of pesticides, which are now being abandoned because contamination of groundwater resources has been demonstrated. The examples clearly show that action to avoid potential environmental damage by hazardous substances should not be postponed on the grounds that scientific research has not proved fully a causal link between the substance and the potential damage (UNECE, 1994).

Apply the polluter-pays-principle

The polluter-pays-principle, where the costs of pollution prevention, control and reduction measures are borne by the polluter, is not a new concept but has not yet been fully implemented, despite the fact that it is widely recognised that the perception of water as a free commodity can no longer be maintained. The principle is an economic instrument that is aimed at affecting behaviour, i.e. by encouraging and inducing behaviour that puts less strain on the environment. Examples of attempts to apply this principle include financial charges for industrial wastewater discharges and special taxes on pesticides (Warford, 1994).

The difficulty or reluctance encountered in implementing the polluter-pays-principle is probably due to its social and economic implications (Enderlein, 1995). Full application of the principle would upset existing subsidised programmes (implemented for social reasons) for supply of water and removal of wastewater in many developing countries. Nevertheless, even if the full implementation of the polluter-pays-principle is not feasible in all countries at present, it should be maintained as the ultimate goal.

Apply realistic standards and regulations

An important element in a water pollution control strategy is the formulation of realistic standards and regulations. However, the standards must be achievable and the regulations enforceable. Unrealistic standards and non-enforceable regulations may do more harm than having no standards and regulations, because they create an attitude of indifference towards rules and regulations in general, among both polluters and administrators. Standards and regulations should be tailored to match the level of economic and administrative capacity and

capability. Standards should be gradually tightened as progress is achieved in general development and in the economic capability of the private sector. Thus, the setting of standards and regulations should be an iterative and on-going process.

Balance economic and regulatory instruments

Until now, governments in most countries for controlling water pollution have heavily relied upon regulatory management instruments. Economic instruments, typically in the form of wastewater discharge fees and fines, have been introduced to a lesser extent and mainly by industrialised countries.

Compared with economic instruments, the advantages of the regulatory approach to water pollution control is that it offers a reasonable degree of predictability about the reduction of pollution, i.e. it offers control to authorities over what environmental goals can be achieved and when they can be achieved (Bartone *et al.,* 1994). A major disadvantage of the regulatory approach is its economic inefficiency. Economic instruments have the advantages of providing incentives to polluters to modify their behaviour in support of pollution control and of providing revenue to finance pollution control activities. In addition, they are much better suited to combating non- point sources of pollution. The setting of prices and charges are crucial to the success of economic instruments. If charges are too low, polluters may opt to pollute and to pay, whereas if charges are too high they may inhibit economic development.

Against this background, it seems appropriate, therefore, for most municipalities to apply a mixture of regulatory and economic instruments for controlling water pollution. In developing countries, where financial resources and institutional capacity are very limited, the most important criteria for balancing economic and regulatory instruments should be cost-effectiveness (those that achieve the objectives at the least cost) and administrative feasibility.

Apply water pollution control at the lowest appropriate level

The appropriate level may be defined as the level at which significant impacts are experienced. If, for example, a specific water quality issue only has a possible impact within a local community, then the community level is the proper management level.

If environmental impacts affect a neighbouring community, and then the appropriate management level is one level higher than the community level, for example the river basin level.

On a wider scale, the appropriate management level may be the national level for major water bodies where no significant water pollution impacts are anticipated for neighbouring states. Where significant impacts occur in several nations, the appropriate management level is international (e.g. an international river basin commission). The important point is that decisions or actions concerning water pollution control should be taken as close as possible to those affected, and that higher administrative levels should enable lower levels to carry out decentralised management. However, in considering whether a given administrative level is appropriate for certain water pollution control functions, the actual capacity to achieve these functions (or the possibility of building it) at that, level should also be taken into account. Thus, this guiding principle intends to initiate a process of decentralisation of water pollution control functions that is adapted to administrative and technical feasibility.

Establish mechanisms for cross-sectoral integration

In order to ensure the co-ordination of water pollution control efforts within water-related sectors, such as health and agriculture, formal mechanisms and means of co-operation and information exchange need to be established. Such mechanisms should:

- Allow decision makers from different sectors to influence water pollution policy
- Urge them to put forward ideas and plans from their own sector with impacts on water quality.
- Allow them to comment on ideas and plans put forward by other sectors. For example, a permanent committee with representatives from the involved sectors could be established
- The functions and responsibilities of the cross-sectoral body would typically include at least the following:
    - Co-ordination of policy formulation on water pollution control.
    - Setting of national water quality criteria and standards, and their supporting regulations.
- Review and co-ordination of development plans that affect water quality
- Resolution of conflicts between governments bodies regarding water pollution issues that cannot be resolved at a lower level.

Encourage participatory approach with involvement of all relevant stakeholders

The participatory approach involves raising awareness of the importance of water pollution control among policy-makers and the general public. Decisions should be taken with full public consultation and with the involvement of groups affected by the planning and implementation of water pollution control activities. This means, for example, that the public should be kept continuously informed, be given opportunities to express their views, knowledge and priorities, and it should be apparent that their views have been taken into account.

Various methods exist to implement public participation, such as interviews, public information sessions and hearings, expert panel hearings and site visits. The most appropriate method for each situation should take account of local social, political, historical, cultural and other factors. In many countries in transition, for example, only professional and scientific experts usually participate and other groups have mostly been excluded from the process. Public participation may take time but it increases public support for the final decision or result and, ideally, contributes to the convergence of the views of the public, governmental authorities and industry on environmental priorities and on water pollution control measures.

Give open access to information on water pollution

This principle is directly related to the principle of involvement of the general public in the decision-making process, because a precondition for participation is free access to information held by public authorities. Open access to information helps to stimulate understanding, discussions and suggestions for solutions of water quality problems. In many countries, notably the countries in economic transition and the developing countries, there is no tradition of open access to environmental information. Unfortunately, this attitude may seriously jeopardise the outcome of any international co-operation that is required.

Promote international co-operation on water pollution control

Trans-boundary water pollution, typically encountered in large rivers, requires international co-operation and co-ordination of efforts in order to be effective. Lack of recognition of this fact may lead to wasteful investments in pollution load reductions in one country if, due to lack of co-operation, measures are introduced upstream that have counteractive effects. In a number of cases (e.g. the Danube, Zambezi and Mekong rivers), permanent international bodies with representatives from riparian states have been successfully established, with the objective of strengthening international co-operation on the pollution control of the shared water resources.

https://www.who.int/water_sanitation_health/resourcesquality/watpolcontrol.pdf

5.5 EPIDEMICS

Epidemic risk is driven by complex factors. In many settings, such a risk is increasing as globalization, urbanization, and demand for and trade in animals and animal products is contributing to spreading disease faster within and across multiple countries. The degradation of the physical and built environment in a variety of country settings also increases the risk that pathogens and their vectors would mutate and spread across countries. Poverty, overcrowding, population displacement, weak health systems, inadequate access to safe water and sanitation, and the health status of specific populations are all contributing factors to epidemics and emerging disease outbreaks.

New and more intense factors amplify the transmission of diseases, either because they increase contacts between people, or between animals and people. In an era of rapid global change, many of these factors are almost inevitable. Among them are the fast and intense mobility of people, with increased transport and international travel, and greater inter-connectivity between megacities, which are major transport hubs for aircraft, trains, road vehicles and ships. At the same time, globalization means increased trade among countries as well as greater movement of people within and between them. For decades, more and more people have been migrating from the countryside into cities, in search of better jobs and improved living standards. The unprecedented levels of urbanization and swelling populations of city dwellers inescapably pose greater risks of infectious disease transmission.

These risks apply at least equally to densely populated areas on the periphery of cities, where rural areas overlap with them. Here, close and repeated contacts between people and livestock, domestic animals and wildlife raise the likelihood risk of new epidemics. To make matters worse, these peri-urban areas tend to be poorer, and local people have less access to health care facilities. The double jeopardy here is that their infections may go undetected and untreated, while the options for detection, prevention and control are reduced. The Ebola outbreak in 2014 has dramatically demonstrated this.

The current outbreak of the Coronavirus and a few public health emergencies including the 2001 Anthrax crisis in the United States, the SARS epidemic, and the 2009 H1N1 epidemic have highlighted the importance of communication preparedness and response and other interventions that seek to promote disease mitigation measures. Health risk communication

has emerged as an important component of disease outbreak preparedness and control as there is 'a significant communication demand in identifying serious health risks such as potential epidemics, … preparing at-risk publics to confront health risks, and coordinating responses when these serious health crises occur'. *Risk communication* is grounded within health communication principles and theories and includes the management of decision risks, implementation risks, and risks related to existing environmental, health, political, or social circumstances. For instance, in the health sector, risk communication addresses pandemics, natural disasters, bioterrorism, resource contamination, etc.

Within this context, risk communication takes into account the participation of a variety of stakeholders to make sure that all interventions are informed by 'an interactive process of exchange of information and opinions among individuals, groups, and institutions' and are also inclusive of vulnerable and underserved populations as well as address key factors that may prevent the adoption and sustainability of key disease mitigation measures.

More recently, *emergency risk communication* has been integrating principles from risk and crisis communication in preparing for, responding to, and recovering from epidemics, emerging disease outbreaks, and other hazards. Within this context, health risk communication aims at behavioural and social results as well as to create the kind of sustainable change that may help prevent or control epidemics and disease outbreaks. Similarly, *health promotion* (defined as 'the process of enabling people to increase control over, and improve their health… a commitment to dealing with the challenges of reducing inequities, extending the scope of prevention, and helping people to cope with their circumstances… create environments conducive to health, in which people are better able to take care of themselves'; Ottawa Charter for Health Promotion) for epidemic prevention and control is a key function of epidemic readiness and interventions.

5.5.1 EPIDEMICS OF RUMOURS: A NEW RISK TO HEALTH

A new word has entered the public health vocabulary: "infodemics". These can be defined as the rapid spread of information of all kinds, including rumours, gossip and unreliable information. They are spread instantly and internationally through the growing popular use of mobile phones, social media, the internet and other communication technologies. A proliferation of web-based "experts" with diverse and often contradictory views can generate confusion, anxiety and even panic in times of serious infectious outbreaks. False or misleading information is dangerous. It can cause widespread public reluctance to adopt well-founded

infection control measures promoted by health authorities – and thus delay essential interventions.

This is why health authorities, agencies, physicians and professional health personnel increasingly employ risk communication, a set of sophisticated skills. It is more important now than ever to learn and apply them. The latest and most accurate information must be conveyed frequently, and uncertainties related to an epidemic must be acknowledged in order to maintain credibility and public trust.

5.5.2 STAGES

There are five crucial stages, namely;

Anticipation:

In this first stage of response, emergence cannot be predicted, but it can certainly be anticipated, and the anticipation of risks enables a focus on the most likely threats. Anticipation encompasses forecasting the most likely diseases to emerge, and the quick identification of the drivers that will worsen the impact or facilitate the spread. Preparedness plans, based on lessons learned from experiences, should contain a variety of scenarios to allow for a reactive response to the unexpected.

Early detection:

Emerging and re-emerging diseases include new ones about which there is little scientific knowledge. These, therefore, often require investigation into their sources at the same time as the use of coordinated, rapid-containment measures. New diseases require new interventions. In addition, because they appear irregularly or rarely, there is a need for constant vigilance, proactive risk assessment and the development of new management tools.

Early detection allows the rapid implementation of containment measures, which are the key to reducing the risk of amplification and potential international spread. Early detection begins at the health care setting, so health care workers must be trained to recognize potential epidemic disease, report quickly an unusual event (such as an unusual cluster of cases or deaths). Their role is also to reduce the risk of community transmission by isolating severely ill patients; to prevent household transmission by protecting health care givers at home; and to reduce the mortality rate. Health care workers must also know how to protect themselves and employ infection prevention and control measures and how to avoid outbreaks amplified in health care facilities.

Once a new disease is recognized by the health system, early laboratory confirmation is essential. When this cannot be done at country level, the affected countries must be confident they can count on the support of a network of more sophisticated regional or global laboratories. It is critically important for global health security that there is a system for safely taking samples and shipping specimens to relevant laboratories in full compliance with biosafety and biosecurity regulations.

Containment:

Effective and rapid containment of emerging diseases is just as vital as early detection in order to avoid a large-scale epidemic. Rapid containment should start as soon as the first case is detected regardless of the etiology, which is most likely to be unknown. It requires skilled professionals to safely implement the necessary countermeasures. Pre-training of these professionals is essential to guarantee the safety and efficiency of the operations.

Control and mitigation:

Once the infectious disease threat reaches an epidemic or pandemic level, the goal of the response is to mitigate its impact and reduce its incidence, morbidity and mortality as well as disruptions to economic, political, and social systems.

Elimination or eradication:

Control of a disease may lead to its elimination, which means that is sufficiently controlled to prevent an epidemic from occurring in a defined geographical area. Elimination means that the disease is no longer considered as a major public health issue. However, intervention measures (surveillance and control) should continue to prevent its re-emergence.

Eradication of a disease – much more difficult and rarely achieved - involves the permanent elimination of its incidence worldwide. There is no longer a need for interventions measures. Three criteria need to be met in order to eradicate a disease: there must be an available intervention to interrupt its transmission; there must be available efficient diagnostic tools to detect cases that could lead to transmission; and humans must be the only reservoir.

Response hints

The following response tips are used to organize ideas and to make sure no important point is overlooked. Specific hints are listed for each disease, which will help keep focus on essential elements of each response. They are organized into four main blocks:

- Coordinating responders (C)
- Health Information (HI)
- Communicating risk (C)
- Health Interventions (HI)

The checklists will help you assess what is important and necessary for the response. The outbreak response varies depending on the disease. For some diseases, treatment is essential; for other diseases, vaccination is vital.

An outbreak is by definition an exceptional event that often requires extra human and financial resources and may rely on additional partners, agencies and other sectors. Strong coordination is essential at all times to ensure that all those resources and partners are working effectively together to control the outbreak. WHO is often expected to lead the international response to support national health authorities.

Effective coordination requires a **dedicated physical space** (usually an emergency operation centre); **various tools to ensure optimal organization of meetings** and filing of documentation (such as a list of contacts, and a meetings tracking system); **a joint plan of action** regularly updated as the situation evolves, to describe the interventions needed and the distribution of roles and responsibilities among stakeholders; and finally **tools to ensure communication between the various stakeholders** engaged in the response (phone numbers, a dashboard, maps, and a directory).

5.5.4 COMMUNITY ENGAGEMENT

1. Disease outbreaks affect the social fabric of communities. A community is a social network, and infectious diseases outbreaks are deeply linked to the social life, the structure of society and people's interactions. They spread through personal and social contacts and links at home or during professional and recreational activities.

2. Communities are the main actors in preventing, identifying, responding and recovering from the physical, psychological, social and economic impacts of epidemics. Communities are not passive subjects of interventions.

3. Epidemics are by nature rapidly evolving. The time pressure is particularly challenging for community engagement. The beginning of the outbreak is a crucial time to build the necessary trust with the population who can break the transmission cycle. Any outbreak response that builds on existing and trusted community engagement systems and work with trusted individuals and interlocutors are more likely to succeed.

4. Community understanding of diseases and their spread is complex, context-dependent and culturally mediated. Thus, a one-size- fits-all approach is neither desirable nor effective.

5. Communities are multi-layered, and power dynamics exist between individuals, groups and networks. Social scientists can help analyse these dynamics and work with specialists in health education, health promotion and local communities. There are simple tools that can assess relevant perceptions and beliefs for any outbreaks response. Together they can design the messages and interventions necessary to raise awareness, and adapt or change behaviours to meet the demands of a new infection. Embedding social scientists in response teams will also help to monitor how people adapt public health measures to different social contexts, and whether these are implemented in a way that respects social and cultural systems.

6. Community engagement helps strengthen and ensure resilience to future outbreaks: when people have already learned how to implement their own solutions, they will be better able to deal with the next outbreak.

7. The approach and messaging directed towards each community has to evolve with the epidemic and incorporate new messages and communication methods as it unfolds. These messages must also proactively detect misinformation and rumours. Effective community engagement limits the opportunities for misunderstandings and the proliferation of rumours, and it mitigates the spread of fear and anxiety.

8. Identify people that the community trusts and build relationships with them. Involve them in decision-making to ensure interventions are collaborative, contextually appropriate and that communication is community-owned.

9. Two-way communication should be achieved through the most socially- acceptable and effective channels. Messages must be “translated” into local language, local context and to match the education levels and preferences (e.g. visual, written or oral cultures) of the target population. All communication with communities should be transparent, timely, easy-to-understand, acknowledge uncertainty, address affected populations, link to self-efficacy, and be disseminated using multiple platforms, methods and channels.

10. Disease creates fear, which often leads to practices that further amplify the epidemic. These can be both individual and collective. They can relate to the transmission of the disease, or the stigma, and extreme stress on the ties that bind communities.

List of Virus disease https://www.who.int/emergencies/diseases/managing-epidemics-interactive.pdf https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4005587/ https://www.who.int/emergencies/diseases/managing-epidemics-interactive.pdf

5.6 HAZMAT

Hazardous materials is one of the most detailed and intensive response categories you will ever experience as a firefighter. A verified hazardous materials response is a labour-intensive and resource-demanding critical incident potentially affecting large amounts of people and geography. Even with the advent of specialized teams — hazmat trailers and sophisticated identification and mitigation tools — firefighters are still finding themselves exposed to undue risk when such expert response is delayed or non-existent.

All spills are different, and while it is impossible to foresee the specifics around a potential incident, having a spill response plan in place ahead of time can help avoid injuries, lessen the environmental impact, and reduce the potential financial risk.

It is important for employees to think logically about hazmat spills. If handled properly, a spill may be nothing more than a brief nuisance. However, if handled improperly, a spill can seriously disrupt work and cause bodily harm or property damage. A spill response plan should help employees decipher between the smaller spills that require minimal response and the larger incidences where emergency procedures need to take place immediately.

A written hazmat spill response plan should detail what initial steps must be taken when a spill occurs, instructions for how to respond to the spill clean up and information around residue disposal. Specific elements of the plan should include:

- Emergency contact information (both internal and external)
- List of appropriate protective clothing and safety equipment and materials required for spill clean-up (e.g., gloves, respirators, etc.), along with an explanation of their proper use
- Directions for evacuation zones and procedures
- Information about fire suppression equipment, including where it is and how to use it
- Locations of disposal containers for spill clean-up materials
- Information about any first aid procedures that might be required

It is important that the plan be reviewed and updated regularly with any new information. This is especially true if any new chemicals have been introduced to the facility.

5.6.1 Initial Hazmat response steps

1. Isolate area
2. Control access
3. Establish command and communications
4. Establish emergency decontamination
5. Identify the materials labels and placards properties and characteristics
6. Identify product container integrity
7. Identify product amount
8. Confirm formal hazmat response (timeline and equipment)
9. Determine staging locations and full decon setup — warm zone entry and exit

5.7 SOCIO-ECONOMIC CONSIDERATIONS

As indicated in the disaster risk assessment, basic municipal services and poverty is the most critical components that needs immediate attention in the FBDM area of jurisdiction.

5.7.1 BASIC SERVICE DELIVERY

During the 2006 survey, poverty was the highest threat in the FBDM area of jurisdiction, followed by drought, epidemics and water pollution (see the disaster risk assessment report). Results of the 2020 risk assessment indicated that municipal (*access to clean drinkable water, proper sanitation, access to refuse removal and access to electricity*) services are currently the biggest threat and risk in the FBDM area of jurisdiction. Even the storm water management systems increased in risk above epidemics and disease from the 2006 survey.

Research and development for alternative resources for basic service delivery has been well established the past ten years. It is therefore highly recommended that municipalities started to implement new innovations in this regard, e.g.;

- Distinguish between normal domestic, industrial water use from drinkable water for humans and animals. Only 25% to 30% of our water resources is allocated for domestic use. Of this 30% domestic use, only 8% (in rural areas) and 14% (in urban areas) are used for cooking, cleaning, washing and drinking. **In Rural areas,** 73% of water is used for toilets, 19% for bathing. In the case of urban areas, 37% of water is used for toilets, 32% for bathing and 17% for washing machines. It is clear from this, that only a small
- amount of water is used for drinkable water. Henceforth the distinction between drinkable water and all other water use is becoming a necessity
- Water harvesting (rainwater and storm water) for normal household usage
- Recovery and purification of sewage water for normal household usage
- New innovation and more cost-effective sewage and wastewater systems

The potential threat and risk from basic service delivery can only be dealt with, within the line departmental functions of the municipality. If any potential hazard and or threat came to a stage of activating the operational plan of the municipality it indicates the lack of being proactive. The municipality is already well aware of the challenges facing to provide sustainable basic service delivery in their area of jurisdiction and would be unnecessary to emphasise or to discuss it again.

Henceforth, the following guidelines are provided to reduce the level of risk for the municipality;

- The execution of a detailed analysis of the status quo of basic service delivery in the FBDM area of jurisdiction
- The status quo analysis to be executed in each line department responsible for service delivery at each local municipality
- Prioritising of all basic service delivery threats and risks
- Distinguish between short term (*one to three years*), medium term (*three to five years)* and long term (*five to ten years*) items to be fixed, to be replaced and maintained and / or to be replaced and upgraded
- A detailed research and development analysis of new innovation ideas, initiatives and projects available for a better sustainable way of providing basic service delivery in municipalities
- Distinguish between capital replacement items and operational maintaining items of all basic service delivery items per line department
- Drafting of detailed operational and capital budgets for basic delivery services at each local municipality in the FBDM area of jurisdiction
- Compilation and integration of a detailed basic services delivery plan in the IDP of FDBM
- Budgeting and allocating of appropriate funds within the IDP to line departments to reduce the risk of basic service delivery at each local municipality
- Drafting of a sustainable maintenance plan for service delivery for FBDM to address short term, medium term and long-term objectives and activities
- A clear distinction to be made between restoration of poor maintenance activities and the restoration of long-term outdated infrastructure
- Drafting of a detailed basic service maintenance plan for FBDM and its local municipality
- Drafting of a detailed basic service, new innovation and capital budgeting projects for FBDM and its local municipality
- Appointing a professional project manager to facilitate, co-ordinate, and to implement the municipal service delivery plan for FBDM at each local municipality

5.7.2. POVERTY

Poverty is the scarcity or the lack of a certain (*variant*) amount of material possessions or money. Poverty is a multifaceted concept, which may include social, economic, and political elements. Absolute poverty, extreme poverty, or destitution refers to the complete lack of the means necessary to meet basic personal needs such as food, clothing and shelter.

Providing basic needs can be restricted by constraints on government's ability to deliver services, such as corruption, tax avoidance, debt and loan conditionality's and by the brain drain of health care and educational professionals. Strategies of increasing income to make basic needs more affordable typically include welfare, economic freedoms and providing financial services.

According to the United Nations Fundamentally, poverty is the inability of having choices and opportunities, a violation of human dignity. It means lack of basic capacity to participate effectively in society. It means not having enough to feed and clothe a family, not having a school or clinic to go to; not having the land on which to grow one's food or a job to earn one is living, not having access to credit. It means insecurity, powerlessness and exclusion of

Individuals, households and communities. It means susceptibility to violence, and it often implies living in marginal or fragile environments, without access to clean water or sanitation.

The World Bank stated that poverty is pronounced deprivation in well-being and comprises many dimensions. It includes low incomes and the inability to acquire the basic goods and services necessary for survival with dignity. Poverty also encompasses low levels of health in addition, education, poor access to clean water and sanitation, inadequate physical security, lack of voice, and insufficient capacity and opportunity to better one's life.

Distinguish can be made between absolute and relative poverty

Absolute poverty, extreme poverty, or abject poverty is "a condition characterized by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information. It depends not only on income but also on access to services.

For a few years starting 1990, the World Bank anchored absolute poverty line as $1 per day. This was revised in 1993, and through 2005, absolute poverty was $1.08 a day for all countries on a purchasing power parity basis, after adjusting for inflation to the 1993 U.S. dollar. In 2005,

after extensive studies of cost of living across the world, The World Bank raised the measure for global poverty line to reflect the observed higher cost of living. In 2015, the World Bank defines extreme poverty as living on less than US$1.90 (PPP) per day, and moderate poverty [citation needed] as less than $2 or $5 a day (but note that a person or family with access to subsistence resources, e.g., subsistence farmers, may have a low cash income without a correspondingly low standard of living – they are not living "on" their cash income but using it as a top up).

Relative poverty views poverty as socially defined and dependent on social context, hence relative poverty is a measure of income inequality. Usually, relative poverty is measured as the percentage of the population with income less than some fixed proportion of median income. There are several other different income inequality metrics, for example, the Gini coefficient or the Theil Index.

Economic aspects of poverty focus on material needs, typically including the necessities of daily living, such as food, clothing, shelter, or safe drinking water. Poverty in this sense may be understood as a condition in which a person or community is lacking in the basic needs for a minimum standard of well-being and life, particularly as a result of a persistent lack of income. The increase in poverty runs parallel sides with unemployment, hunger, and higher crime rate.

Death

One third of deaths – some 18 million people a year or 50,000 per day – are due to poverty-related causes. People of colour, women and children, are overrepresented among the global poor and these effects of severe poverty.

Hunger

Rises in the costs of living make poor people less able to afford items. Poor people spend a greater portion of their budgets on food than wealthy people do. As a result, poor households and those near the poverty threshold can be particularly vulnerable to increases in food prices.

Education

Research has found that there is a high risk of educational underachievement for children who are from low-income housing circumstances. Often this process begins in primary school for some less fortunate children.

Shelter

Poverty increases the risk of homelessness. Slum-dwellers, who make up a third of the world's urban population, live in a poverty no better, if not worse, than rural people, who are the traditional focus of the poverty in the developing world, according to a report by the United Nations

The world is suffering severely from the consequences of poverty. The constantly increasing rates of poverty on the globe confirms that historically worldly programs to date are not successful, nor did it at any stage uplift communities out of poverty. It furthermore confirms the complexity of the problem, henceforth, this will not be the responsibility of one-line department alone, nor will it be the sole mandate of any municipality alone as well.

This action will call for extraordinary leadership and initiatives to bring together all the custodians, e.g. private sector, organised business, NGO's, churches amongst others to identify the point of departure for FBDM. Again, it is recommended to address poverty into a holistic, integrated and sustainable way, within the Land Economic Development (LED) strategy. Having said this, officials of government must bear in mind that once the perception went out that everything will be forced into a socialist system, taking from the rich and give to the poor, such poverty reduction initiative would be very difficult