

Disaster management system in South Africa.

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Background

- **South Africa's total population was estimated at 55 908 900 in 2016, with the annual rate of growth of 1.19-1.24 % (StatsSA, 2016).**
- **The country has reached a medium level of human development, as the human development index was equal to 0.666 in 2015 (UNHDI, 2016).**
- **The Gini coefficient for South Africa was the highest in the world at 64.8 in 2011, making it the most unequal country in the world (WB, 2017a).**

Background II

- **Unemployment is high and the social disparities are above the global average.**
- **Public health and disaster management are often affected by disaster profile of the country and limited quality of the lifelines available in many of its parts.**
- **Disaster risk management capacity is often limited at the local government level (SALGA, 2011).**

Definition of Terms

- **Disaster: “An occurrence disrupting the normal conditions of existence and causing a level of suffering that exceeds the capacity of adjustment of the affected community” WHO 2002**
- **<https://www.westerncape.gov.za/general-publication/disaster-management-definitions>**

Disaster Management vs Disaster risk Management

- Disaster risk Management is “ an integrated multisectoral and multidisciplinary administrative, organizational and operational planning process and capacities aimed at lessening impacts of disasters” (Disaster Management Act, 2002)

Disaster Risk

- In terms of disaster management, *Risk* (designated as *Ri* in further text) is defined as follows:
- “Potential danger to human population, lifelines and/or buildings from exposure to disaster hazards” (Tandlich et al. 2013a,b);
- In South Africa the disaster hazards are natural, manmade and complex/Natech.

Disaster Hazards I

- **Natural hazards that can trigger disasters include (Prevention Web, 2011):**
 - **Floods;**
 - **Drought;**
 - **Tornadoes;**
 - **Fires;**
 - **Epidemics.**



Copied from: <https://www.groundup.org.za/article/floods-bring-hardship-and-loss-johannesburg-immigrant-community/> (website accessed on 26th August 2021; available under cc licence from [ground up.org.za/copyright](https://www.groundup.org.za/copyright))



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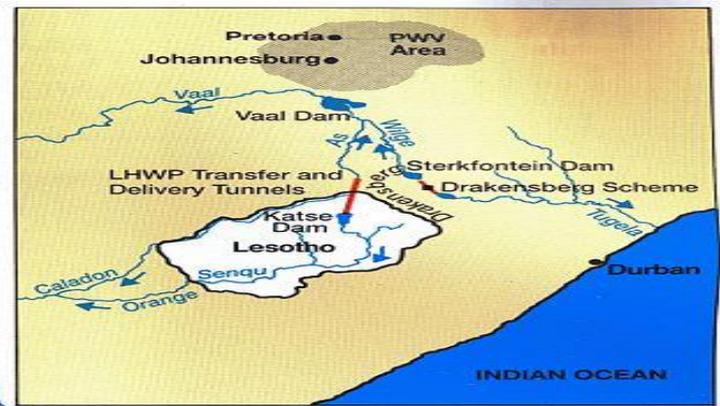
Disaster Hazards II

- **Manmade hazards that can trigger disasters include:**
 - **Industrial accidents;**
 - **Crime and related violence;**
 - **Transport accidents;**
 - **Urban migration into metropolitan areas due to lack of rural development.**

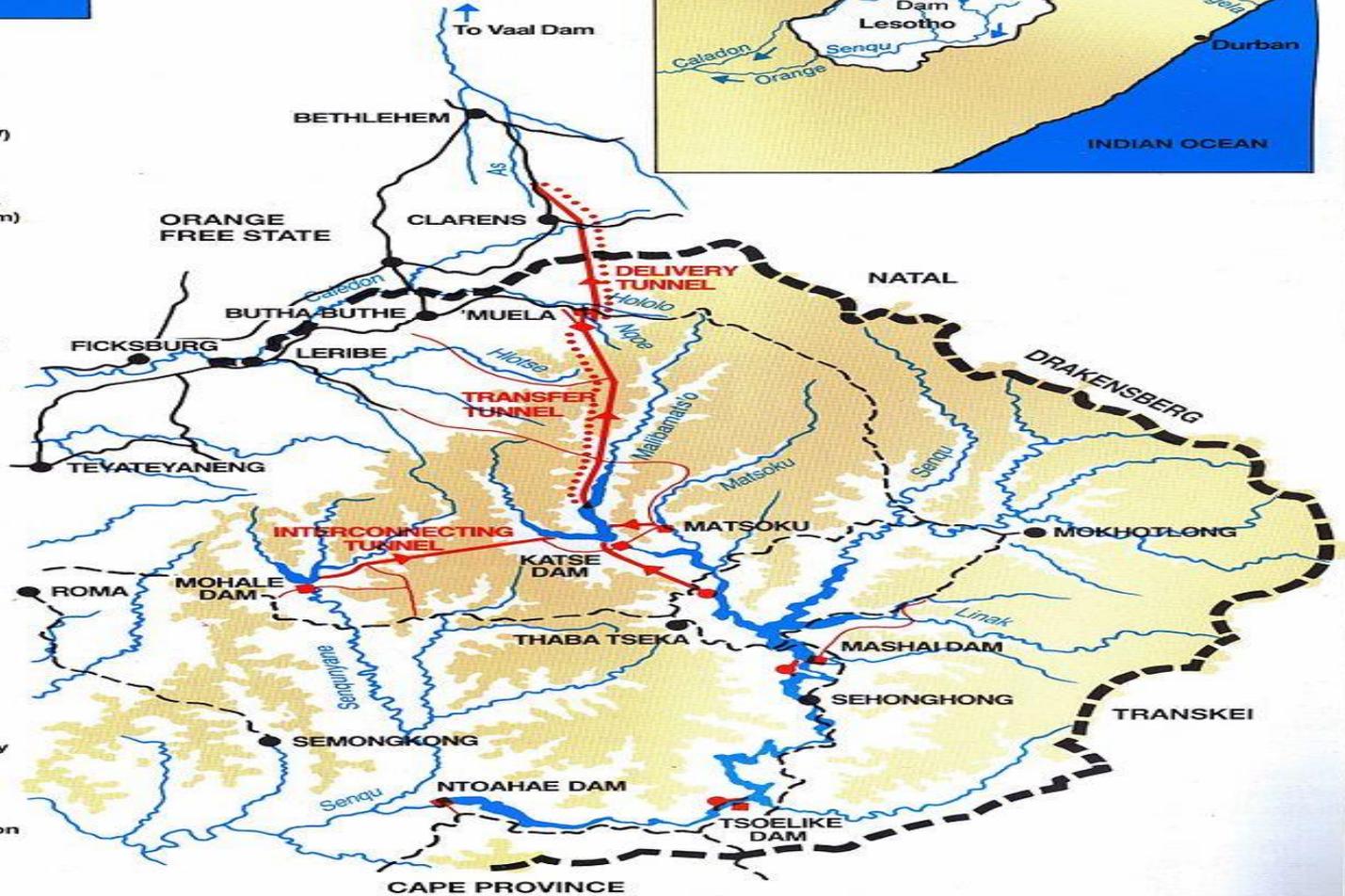
Disaster Hazards III

- **Complex hazards that can trigger disaster include (Hoossein et al., 2016):**
 - **Dwelling being built under the flood line in the urban areas;**
 - **Outbreaks of WASH-related diseases when water supply and sanitation are compromised due to human factors;**
 - **Fires in informal settlements due to illegal electricity connections.**

Rainfall distribution in South Africa can be accessed as a figure at the following link: <https://edctanks.co.za/page-12.html> (website accessed on 4th march 2018).



- PHASE IA**
- Katse Dam (1 950 million³)
 - Transfer Tunnel (45km)
 - 'Muela Power-station (72MW)
 - 'Muela Dam
 - Delivery Tunnel (36km)
- PHASE IB**
- Mohale Dam (958 million m³)
 - Interconnecting Tunnel (30km)
 - Matsoku Wier and Transfer Tunnel (6,4km)
- PHASE II**
- Mashai Dam (3 306 million m³)
 - Second Transfer Delivery Tunnel from Katse Reservoir to As River Outlet
- PHASE III**
- Tsoelike Dam (2 224 million³) and pumping station
- PHASE IV**
- Ntoahae Dam and pumping station



- LEGEND**
- Paved road
 - - - Gravel road/Track
 - - - International boundary
 - Reservoir
 - Dam
 - Hydropower station
 - Pumping station
 - River
 - 3000m-2500m elevation
 - Tunnel Phase IA
 - ... Tunnel Phase II
 - Access road

Lesotho Highlands water project schematics at the following link:

https://en.wikipedia.org/wiki/Lesotho_Highlands_Water_Project#/media/File:LHWP_map_resized.jpg

(website accessed on 26th August 2021).

El Niño and La Niña episodes

- Alternating cold and warm phases of ocean and atmospheric temperatures.
- El Niño means The Little Boy in Spanish
- La Niña means The Little Girl in Spanish
- El Niño results in warm sea and atmospheric temperatures which affect rainfall and temperature, thus causing droughts and low rainfalls.
- La Niña is cooling of sea and atmospheric temperatures and results in floods and cold weather.

Floods

- **Annual probability in South Africa has been estimated at 83 % (Zuma et al., 2012):**
 - **Largest death toll was 104 in the 1994 Lainsburg floods;**
 - **Local floods are common and damage is generally most pronounced;**
 - **Impacts can be of Natech/complex character.**

Droughts

- **Common as South Africa is a semi-arid country:**
 - **El Niño hit the entire Southern African subcontinent in 2015;**
 - **Crop yields are down;**
 - **Water levels are down in the dam systems supplying large metropolitan areas;**
 - **Water supply restrictions are in place.**

Droughts II

- **City of Cape Town is the most affected:**
 - **The total population is about 5 million;**
 - **The “day zero” when the municipal drinking water supply will be completely stopped is approaching (e.g. Cape Town, 2017a);**
 - **Domestic users are restricted to 50 litres/capita/day (The South African, 2018);**
 - **Business users must cut consumption by 45 % and agricultural users by 60 % to pre-2015 levels (Cape Town, 2017b).**

City of Capetown

- <http://theconversation.com/why-cape-towns-drought-was-so-hard-to-forecast-84735>

Manmade Disaster Risks

- **Industrial accidents such as mine accidents;**
- **Transport accidents are problematic as the death rates are 525 deaths per 100000 citizens;**
- **Violence and crime rates are endemic around the country.**

Disaster Risk Definition

- ***Ri*** can be defined in many ways, e.g. using in Eq. (1; UNISDR, 2007; Tandlich et al. 2013a,b).

$$R_i = \frac{Haz \times Vul \times Exp}{Pr ep} = \frac{Haz \times Exp}{Re s} \quad (1)$$

- ***Haz*** stands for a disaster-related hazard or threat to human population from falling debris or infectious diseases;
- ***Vul*** is the population's vulnerability to health related disasters or their effects in the “disaster-prone/affected area”

Disaster Risk Definition 2

- In Eq. (1), *Res* are the values of resilience of the said human population to the epidemic in question.
- *Prep* represents the preparedness or ability of the disaster management systems to deal with the health outcomes/effects of a said disaster.
- *Exp* is the probability of an outbreak of the particular disaster related infectious disease

Mitigation

Preparedness

Response

Recovery

Adapted from: <http://eijournal.com/print/articles/disaster-management>
(website accessed on 27th March 2017).

Disaster Management system

- **Disaster Management System (DMS) responds to the disaster profile of the country;**
- **DMS must be integrated at all levels of government;**
- **DMS must account for the population characteristics and must involve all relevant stakeholders in the country;**
- **Transition from apartheid to democracy must be considered in its structure.**

DMS II

- **Legislative framework is as follows:**
 - **Disaster Management Act no. 57 of 2002;**
 - **Disaster Management Amendment Act no. 16 of 2015;**
 - **Disaster Management Framework of 2005;**
 - **Hyogo and Sendai Frameworks;**
- **Competencies are mirrored at the provincial and local government level.**

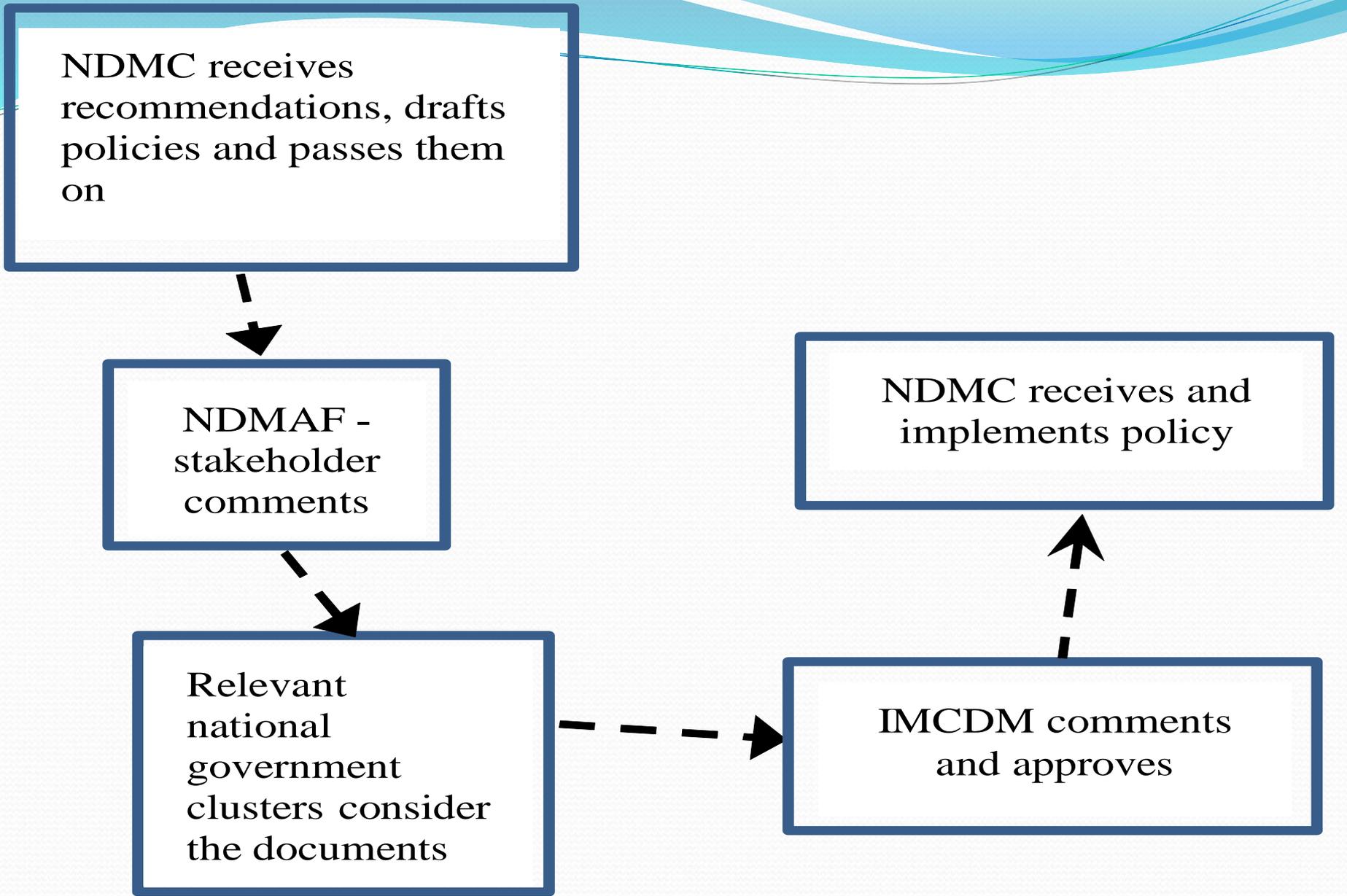
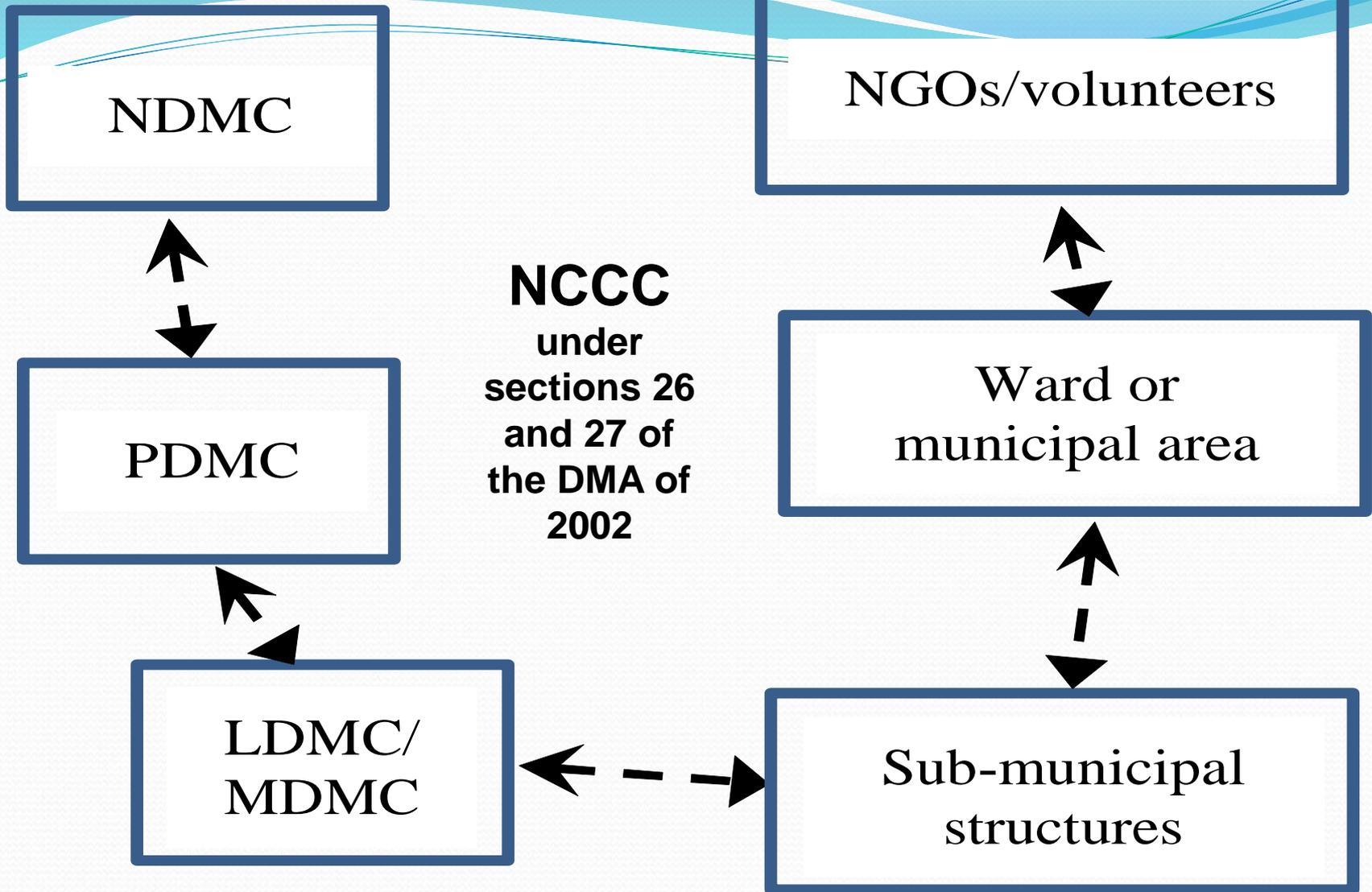


Figure was adapted from: Disaster management policy cycle in South Africa (adapted from Ngqwala et al., 2017).



Description of the mutual relationship between National Disaster Management Centre (NDMC), Provincial Disaster Management Centres (PDMCs) and Local/municipal disaster management centre (LDMC/MDMC) in South Africa (adapted from Ngqwala et al., 2017).

NDMC

- **National Disaster Management Centre is (DMA, 2002):**
 - **Central organ of state in the disaster management in the territory of South Africa;**
 - **Execution and coordination of all activities;**
 - **Management of communication, data collection and recovery budgets;**
 - **All done following the principles of cooperative governance.**

Databases

- **There are various databases operated by:**
 - **Veldfire indices;**
 - **Flash flood index developed by the South African Weather Service;**
 - **National Register of Disasters (discontinued);**
 - **Public availability of data a problem in contradiction with Hyogo and Sendai Frameworks.**

IMCDM

- **Inter-ministerial Committee on Disaster Management is:**
 - **Committee composed of the ministers of South African national government that oversees disaster management;**
 - **Oversight and legislative guidance of the NDMC activities;**
 - **Composed of Ministers of Local Government and Traditional Affairs, Health, Defence, etc.;**
 - **Only constituted/gazetted in 2016.**

PDMC and MDMC

- **Provincial and Municipal Disaster Management Centres:**
 - **Are state authorities that carry out the disaster management roles similar to NDMC;**
 - **Jurisdiction is limited to a given province or municipality;**
 - **All done following the principles of cooperative governance;**
 - **At local level, it can just be a single officer.**

Ward structures

- **Execution of the disaster management functions on the ground:**
 - **Links to the community;**
 - **Maintenance of links and collection of data about the components of the risk equation;**
 - **Involvement of all stakeholders;**
 - **Community and participatory approach to disaster management.**

NDMAF

- **National Disaster Management Advisory Forum is (Ngqwala et al., 2017):**
 - **Multi-stakeholder crisis management platform;**
 - **Intersection of government and non-governmental stakeholders in disaster management;**
 - **First established in May 2007;**
 - **Legislated in Disaster Management Act.**

NDMAF II

- **NDMAF is:**
 - **Constituted by the oversight minister, i.e. Minister of Local Government and Traditional Affairs (Minister);**
 - **Membership is appointed by the Minister;**
 - **NGOs, Unions, National Department representatives, academic institutions, traditional leaders;**
 - **National platform for disaster risk reduction.**

PDMAF and MDMAF

- **Provincial and municipal equivalents of NDMAF:**
 - **Provide input in the legislation in disaster management at local and national level;**
 - **Membership is appointed by the provincial ministers responsible for disaster management;**
 - **Has been established in approximately 5 provinces of South Africa;**
 - **MDMAFs execution varies.**

NGOs/volunteers

- **Non-governmental stakeholders (Hoossein et al., 2016):**
 - **Local in context and experience;**
 - **Critical for first response as local government capacity is often inadequate;**
 - **Legislated as volunteer units that can be involved in functions which are based on needs of a particular municipality.**

NGOs/volunteers II

- **Non-governmental stakeholders can assist with the following functions (Hoossein et al., 2016):**
 - **Firefighting;**
 - **Waste management;**
 - **Drinking water provision**
 - **Drought management.**

NGOs/volunteers III

- **Most important disaster management providers:**
 - **Gift of the Givers;**
 - **Al-Imdaad;**
 - **South African Red Cross;**
 - **Local NGOs in various provinces.**

Some cities - node system

- **City is located in the Southwestern part of South Africa (Ngqwala et al., 2017):**
 - **Warehouses with essential supplies at ward level for the response part of the disaster management cycle;**
 - **Response by trained volunteers and NGOs;**
 - **Service command posts in the field answer to the official disaster management system;**
 - **Central service command at municipal level coordinates all ward level responses.**

Cape Town - MDMC

- **City of Cape Town has had to most developed disaster management system in Southern Africa (Hoossein et al., 2016; Ngqwala et al., 2017):**
 - **Central Disaster Command Centre in place;**
 - **MDMC, MDMAF and volunteer unit are operational;**
 - **Strategic communication links to PDMC and NDMC are in place and work as a two-way system.**

Academic institutions

- **Tertiary education sector fulfils various functions:**
 - **Research into the components of disaster risk, policy and related matters;**
 - **Capacity building for local government;**
 - **Interlinking and support for professional organisations in disaster management;**
 - **Mostly public institutions and subject-driven.**

Academic institutions II

- **Programmes are at public or private universities:**
 - **African Centre for Disaster Studies at NorthWest University in Potchestroom;**
 - **RADAR Honours programme in disaster risk science university of Stellenbosch;**
 - **University of Venda – Bachelor degree in disaster management;**
 - **Stenden South Africa – Bachelor of Business Administration.**

DMISA

- **Disaster Management Institute of Southern Africa is the:**
 - **Regulatory authority which registers disaster management professionals;**
 - **Input into legislation and practice of disaster management in South Africa;**
 - **Continuous professional development of the disaster management professionals;**
 - **Workshops and conferences organised annually.**

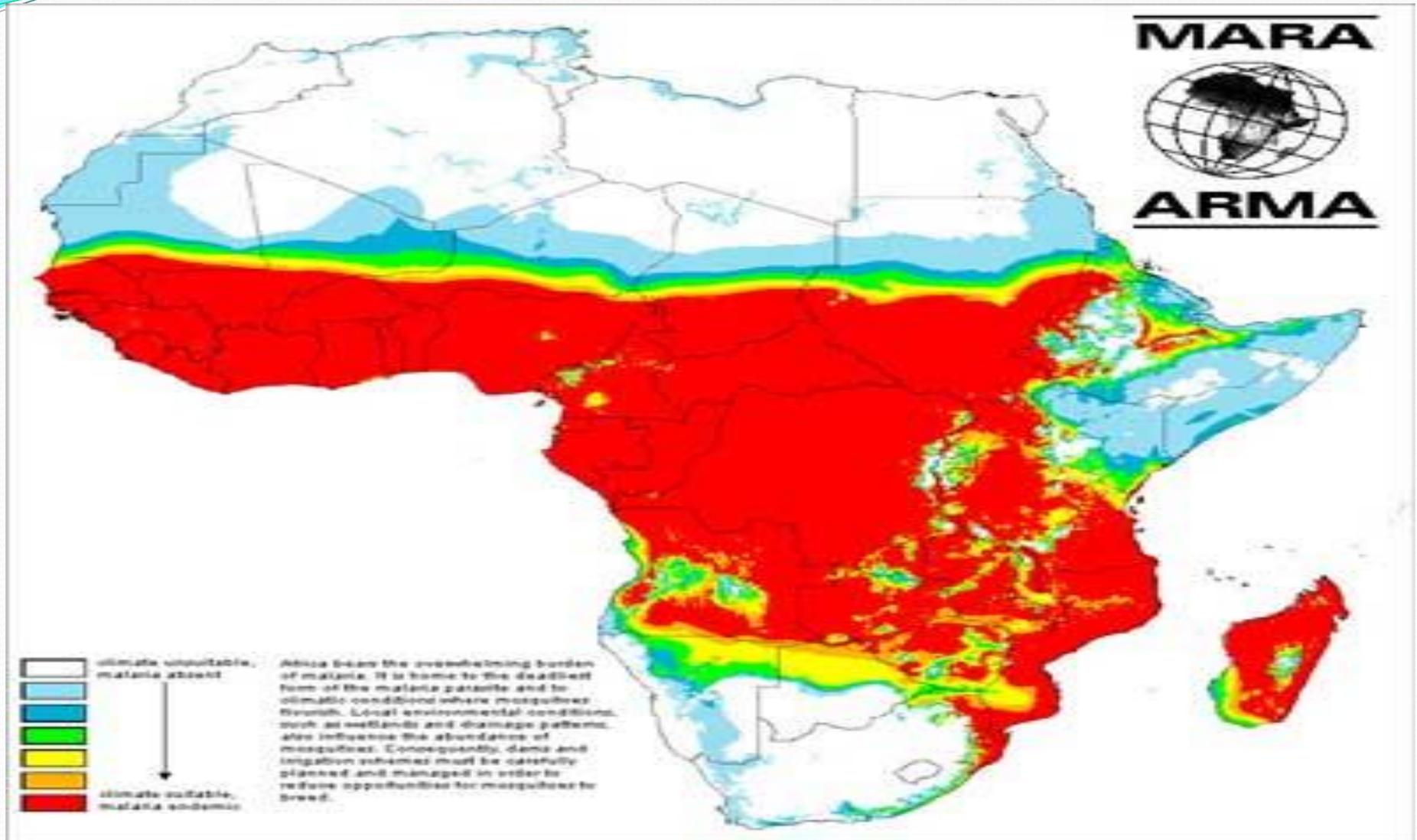
Transmission of diseases

- **Inhalation – intake of infectious dose through the respiratory tract;**
- **Consumption of contaminated drinking water or contact with contaminated water via swimming or boat transport;**
- **Transmission via vectors – insects transmit the infectious particles;**
- **Close personal contact , e.g. between disaster victims and rescue personnel.**

Malaria

- Endemic/persistent in the equatorial region of Africa and in sub-saharan Africa.
- Causative agents are the protozoan in nature:
 - *Plasmodium falciparum*;
 - *Plasmodium vivax*;
 - *Plasmodium ovale*.

Malaria in Africa



Adapted from: <https://www.who.int/heli/risks/vectors/malariacontrol/en/index2.html>
(website accessed on 26th August 2021).

Malaria – human effects

- **Parasite is dormant with no clinical symptoms from 9-40 days to 12 months after human contact with infected vector;**
- **Symptoms include headaches, fever, sweats, nausea, vomiting, back ache, dry coughing;**
- **Diagnosis is done via a blood test where a smear is examined microscopically for the presence of the protozoa;**
- **Treatment - artemisinin combination therapy.**

Malaria – human effects II

- **Most at risk are pregnant women and newborns;**
- **Endemic areas are in the Limpopo Province in the Northeast of South Africa;**
- **Around 30000 deaths per year in South Africa;**
- **Prophylaxis therapy is common, but a long-term solution.**
- **Prevention measures to put in place.**

WASH and disasters

- **Abbreviation means water, sanitation and hygiene;**
- **It is related to the provision and supply of improved drinking water and improved sanitation;**
- **It can be compromised during disasters;**
- **It is significant in parts of South Africa;**
- **Death rates below the world average of 2-4 % of infected persons**

WASH and disasters II

- **Other hygiene-related diseases which are epidemics:**
 - **Measles;**
 - **Hepatitis A and B;**
 - **Salmonella;**
- **Preventable, but occur as the water and sanitation infrastructure is often dysfunctional.**

WASH and disasters III

- **Renewed significance is stressed by the effects of climate change:**
 - **Large metropolitan areas such as Cape Town are running out of water;**
 - **Dry taps are coming in June or July 2018;**
 - **5 million people to be provided with water at 180 collection points at 25 litres/capita/day;**
 - **Military and police to control order.**

HIV/AIDS

- **Massive epidemic in Southern Africa;**
- **South Africa has one of the highest HIV-positive rates in the world;**
- **Disaster management angle applies due to the wide-ranging implication for economic and social conditions in the country;**
- **Co-infections with tuberculosis is the highest in the world, this complicates treatment.**

References

City of Cape Town (Cape Town, 2017a). Weekly dashboard: Day Zero stays stable but not enough residents are saving water. Available at: <http://www.capetown.gov.za/Media-and-news/Weekly%20dashboard%20Day%20Zero%20stays%20stable%20but%20not%20enough%20residents%20are%20saving%20water> (website accessed on 30th December 2017).

City of Cape Town (Cape Town, 2017b). Level 6 water restrictions. Available at: <http://www.capetown.gov.za/Family%20and%20home/residential-utility-services/residential-water-and-sanitation-services/Residential-water-restrictions-explained> (website accessed on 30th December 2017).

Disaster Management Act no. 57 of 2002 (DMA, 2002). Available at: <http://www.ndmc.gov.za/portals/0/WebDocuments/Guidelines/DM/downloads/SJ%206%20DM%20Act%2057-02.pdf> (website accessed on 8th May 2015).

Hoossein, S., Tandlich, R., Whittington-Jones, K., Laubscher, R. K., Madikizela, P., Zuma, B. M. (2016). Disaster Management policy options to address the sanitation challenges in South Africa. *Journal of Environmental Health* 78(7): E1-E7.

Ngqwala, N. P., Srinivas, C. S., Tandlich, R., Pyle, D. M., Oosthuizen, R. (2017). Participatory multi-stakeholder platforms for effective disaster management in South Africa. *Journal of Disaster Research* 12(6): 1192-1203.

Prevention Web (2011). South Africa - Disaster Statistics. Available at: <http://www.preventionweb.net/english/countries/statistics/?cid=160> (website accessed 10th November 2011).

South African Local Government Association (SALGA, 2011). Disaster Risk Management Status Assessment at Municipalities in South Africa, Pretoria, South Africa. The Legatum Prosperity Index (2011). South Africa. Available at: <http://www.prosperity.com/country.aspx?id=ZA> (website accessed 9th November 2011).

References II

- Statistics South Africa (StatsSA, 2016a). Mid-year population estimates 2016. Statistics South Africa, Pretoria, South Africa. Available at: http://www.statssa.gov.za/?page_id=1854&PPN=P0302&SCH=6688 (website accessed on 28th December 2017).
- Tandlich, R., Chirenda, T. G., Srinivas, C. S. (2013a). Gender aspects of disaster management in South Africa. *Journal of Disaster Risk Studies* 5(4): Article 84.
- Tandlich, R., Hoossein, S., Whittington-Jones, K., Moyo, F. (2013b). Emerging issues in environmental security and disaster management in South Africa. Accepted for publication in the peer-reviewed proceedings from the 4th virtual scientific conference on Scientific Reflection on New Trends in Management, held on 23rd September 2013 and organised by the Czech and Slovak National Police Academies.
- The South African (2018). Cape Town water restrictions: Residents now told to use just 50 litres a day. Available at: <https://www.thesouthafrican.com/cape-town-water-restrictions-50l-a-day/> (website accessed on 1st march 2018).
- United Nations Human Development Index (UNHDI, 2016). Table 2: Trends in the Human Development Index, 1990-2014. Available at: <http://hdr.undp.org/en/composite/trends> (website accessed on 28th December 2017).
- World Bank (WB, 2017a). Gini index (World Bank Estimate). Available at: <http://data.worldbank.org/indicator/SI.POV.GINI> (website accessed on 10th January 2018).
- Zuma, B. M., Luyt, C. D., Chirenda, T. G., Tandlich, R. (2012). Flood disaster management in South Africa: legislative framework and current challenges. Published in the peer-reviewed proceedings from the 2012 International Conference on Applied Life Sciences (ICALS2012) Konya, Turkey from 10th until 12th September, 2012, pp. 127-132 (ISBN 978-953-51-0725-5).