**Internal Assessment Criteria**

**KM-01-KT01 Sectorial context of the South African water scene.**

**Q1. Describe the water resources characteristics that make South Africa unique including the challenges faced by a Water Resources Management Practitioner**

**Solution**

* Water resource characteristics in South African Context. South Africa lies in a semi-arid region of the world and its water is an essential and scarce resource which is poorly distributed in terms of growing socio-economic requirements. As the population grows and the economy develops, the water which is available has to be shared between a wider range of users while their impact on its quality increases.
* The options for water management are limited by the topography of the country and by weather patterns which are beyond human control. Droughts and floods are common and may strike anywhere unexpectedly. Rainfall, and to a greater extent runoff, is spread very unevenly across the country, not only geographically but also from season to season.
* On average over the longer term, most of the runoff is generated in the eastern part of the country. The greater part of the interior and the western portion of the country is arid or semi-arid. Sixty-five per cent of the country receives less than 500 mm of rain annually, which is commonly for successful dry land farming. Twenty-one per cent of the country receives less than 200 mm. In this context, South Africa is vulnerable to the impact of potential climate change.
* In the absence of natural lakes, the major part of South Africa’s water supply is abstracted from rivers. On average only about 9% of the rainfall reaches the rivers, a small proportion compared to many other parts of the world. The total annual runoff from all rivers averages about 50 150 million cubic metres. Because of flow variability and high evaporation, only about 33 000 million cubic metres each year can be exploited economically using present methods.
* **Other information:**
* What is the climatic condition of SA regarding water availability
* Geographic distribution of water and the hydrological cycle,
* Different sources of fresh water in South Africa,
* South Africa’s water distribution in different WMAs and variable climatic variation throughout the country,
* How the fresh water is distributed among different water user sectors,
* How South Africa shares rivers with neighbouring countries,
* Legislation that governs the management of water in South Africa.
* **Challenges faced by water resource management practitioners.**
  + The water availability and demand with regards to socio-economical use.
  + Water availability and infrastructure to balance the needs.
  + To ensure even distribution of water between a water abundant and a water deficient area.
  + The concept of water quality and quantity.
  + Management of surface vs. ground water.
  + Prioritization of water allocation.

**KM-01-KT03 A systems management approach to water resource management**

**Internal Assessment Criteria**

• Describe the difference between water management area boundaries and other administrative boundaries and explain the importance to manage water resources on a catchment basis.

* Explain the need for, complexities and challenges of inter-basin water transfers

• Describe the dynamics and inter-linkages between surface water and groundwater resources.

**Solution**

**Q1. Describe the difference between water management area boundaries and other administrative boundaries and explain the importance to manage water resources on a catchment basis.**

* Based on the NWRS-1, 19 water management areas (WMA) were proposed.
* Leading to the establishment of the corresponding 19 Catchment Management Agencies (CMAs).
* However, since 1999, 8 of the 19 CMAs have been gazetted, of which two are operational(i.e. Inkomati CMA in Mpumalanga and the Breede-Overberg CMA in the Western Cape).
* The management model, viability assessments wrt WRM, available funding, capacity, skills and expertise in regulation and oversight was reviewed.
* It is proposed that the **19 WMAs be consolidated into 9 WMA** in order to improve integrated water systems management (Fig 1).
* There are nine planned Water Management Areas, (WMAs,) that will be decentralized to CMAs, namely
* Limpopo, Olifants, Inkomati-Usuthu\*, Pongola-Mzimkulu, Vaal, Orange, Mzimvubu-Tsitsikama, Breede-Gouritz\* and Berg- Olifants.
* Currently only two CMAs\* are operational.
* Improved management of integrated systems which were previously split across the WMAs;

- Distribution of scarce technical skills over a smaller number of institutions;

- Improved balance in revenue streams supporting more sustainable institutions;

- Facilitates the faster establishment of CMAs, and

- Larger CMAs enables improved cooperation and coordination on regional, provincial, and international levels.

The responsibility and authority for water resources management rests with CMAs and, at a local level, WUAs.

* These institutions are representative of water users and facilitate effective participation in the management of water resources in their areas and will ultimately enable the DWS to withdraw from its role of operator to that of sector leader, policymaker, regulator and performance monitor.
* The responsibility and authority for water resources management rests with CMAs and, at a local level, WUAs.
* These institutions are representative of water users and facilitate effective participation in the management of
* water resources in their areas and will ultimately enable the DWS to withdraw from its role of operator to that of sector leader, policymaker, regulator and performance monitor.
* The responsibility and authority for water resources management rests with CMAs and, at a local level, WUAs.
* These institutions are representative of water users and facilitate effective participation in the management of
* water resources in their areas and will ultimately enable the DWS to withdraw from its role of operator to that of sector leader, policymaker, regulator and performance monitor.
* **Administrative boundaries: International:**
  + The responsibility and authority for water resources management rests with CMAs and, at a local level, WUAs.
  + These institutions are representative of water users and facilitate effective participation in the management of
  + water resources in their areas and will ultimately enable the DWS to withdraw from its role of operator to that of sector leader, policymaker, regulator and performance monitor.
* **Provincial level**
  + The responsibility and authority for water resources management rests with CMAs and, at a local level, WUAs.
  + These institutions are representative of water users and facilitate effective participation in the management of
  + water resources in their areas and will ultimately enable the DWS to withdraw from its role of operator to that of sector leader, policymaker, regulator and performance monitor.
* **District Municipality**
  + Municipalities are responsible for basic water supply and sanitation services, e.g. City of Cape Town Water and Sanitation.
  + They may be designated Water Services Authorities (WSAs), e.g., Amajuba District Municipality.
  + The Department of Water Affairs have been measuring and monitoring the overall performance of water services authorities through the Regulatory Performance Measurement System (RPMS) and drinking water quality through the Blue/Green Drop Certification Programmes.
* **Water Boards**
* Water boards distribute raw and potable water across vast distances, (via regional water supply schemes), a role mandated and controlled by the Minister of the DWS.
* The WS Act added new responsibilities, in that water boards or any other WSPs must be formally appointed by the recipient municipalities to provide such services, where required.
* Not all municipalities depend on water boards for regional bulk water supply infrastructure, but can do so as long as they operate within the norms and standards of the WS Act, National Water Act and related regulations and strategies.

**Local municipality**

The functions of local government are defined by the Constitution of South Africa (Act 108 of 1996) which states that:

152 (1) The objects of local government are –

a) To provide democratic and accountable government for local communities;

b) To ensure the provision of services to communities in a sustainable manner;

c) To promote social and economic development;

d) To promote a safe and healthy environment;

e) To encourage the involvement of communities and community organizations in the matters of local government.

Arising from s156, it is clear that municipalities have executive authority w.r.t the following matters from Schedule 4 and 5 part B, as they impact on IWRM:

* municipal planning,
* storm water management systems in built-up areas,
* water and sanitation services limited to potable water supply systems and domestic waste-water and sewage disposal
* systems,
* local sport facilities,
* refuse removal, refuse dumps and solid waste disposal.

**Q2. Explain the need for, complexities and challenges of inter-basin water transfers**

South Africa lies in a semi-arid region of the world and its water is an essential and scarce resource which is poorly distributed in terms of growing socio-economic requirements. As the population grows and the economy develops, the water which is available has to be shared between a wider range of users while their impact on its quality increases.

The options for water management are limited by the topography of the country and by weather patterns which are beyond human control. Droughts and floods are common and may strike anywhere unexpectedly. Rainfall, and to a greater extent runoff, is spread very unevenly across the country, not only geographically but also from season to season. On average over the longer term, most of the runoff is generated in the eastern part of the country. The greater part of the interior and the western portion of the country is arid or semi-arid. Sixty-five per cent of the country receives less than 500 mm of rain annually, which is commonly for successful dry land farming. Twenty-one per cent of the country receives less than 200 mm. In this context, South Africa is vulnerable to the impact of potential climate change.

In the absence of natural lakes, the major part of South Africa’s water supply is abstracted from rivers. On average only about 9% of the rainfall reaches the rivers, a small proportion compared to many other parts of the world. The total annual runoff from all rivers averages about 50 150 million cubic metres. Because of flow variability and high evaporation, only about 33 000 million cubic metres each year can be exploited economically using present methods.

South Africa is however reaching the limits of what can be achieved to make water available to everyone by traditional methods. The water needs of the nation will not be met sustainably unless managerial and technological innovation are brought to bear on all facets of water management. Further augmentation of water supplies is already being achieved or at least investigated from sources such as effluent re-use and rainfall stimulation by cloud seeding.

Other less conventional sources could include importation of water from better-watered neighbours to the north, desalination of sea water and even harvesting icebergs from Antarctica. Water from such sources could very well be more expensive than from existing sources, and some are technically untried. The current low growth of the economy puts many of the options out of financial reach although it also reduces need for them by slowing the growth of demand. It is however recognised that the application of most of the “novel” options lies some way in the future, and in the meantime energies must be devoted to making the best use of the currently available resources. It is in this context that inter basin transfers must be reviewed.

**Inter-basin transfers of water**

Most of the major centres of economic and social development of South Africa are located in areas where water is not naturally found in abundance. Accordingly, an extensive system of inter-basin water transfer schemes has been developed, by which water may be conveyed from areas of relative abundance to areas of need where water is relatively scarce. (Table 1 provides some details of source / recipient rivers, current rates of transfer, and the purpose to which the transferred water is put.)

The existing schemes have a combined transfer capacity equal to a little less than 8% of the total available surface water in South Africa. Economic activity in all nine provinces is already supported to some extent by water imported from elsewhere. The central Gauteng province, upon which South Africa’s economy is centered, is the most dependent. With few exceptions, Inter-Basin Transfers have international connotations, inasmuch as they either take water out of an international river, or add water to one.

It is not the purpose of this paper to review the detailed technical approaches to such IBTs. It is however important to note that, beyond the mere ability to augment average supplies to water short regions, they provide diversity of supply which increases the reliability and resilience of supply systems. In an environment of substantial variation, the contribution to risk reduction of such diversity may be as important as the quantum of water transferred.

**Q3. Describe the dynamics and inter-linkages between surface water and groundwater resources.**

The boundaries of these water management areas take into account:

* catchment and aquifer boundaries,
* financial viability,
* stakeholder participation, and
* equity considerations.

As a result, not aligned with provincial or local government boundaries.

Ground water is relatively limited in SA compared to world averages.

* It plays an important in the development of the country.
* Most farms, rural areas and villages are dependent on it.
* Available groundwater is estimated at 1 km3/year.
* There are no ground water sources large enough to supply larger urban areas or irrigation schemes with water.
* Two fundamental aspects to note regarding groundwater utilisation:
* Sustainability or recharge of the source, and the interaction between groundwater and surface water.
* Ground water can only be abstracted on a sustainable basis, i.e. at a rate less than, or equal to, the long term average recharge of the source through infiltration and rainfall (Figure 1).
* Should the abstraction rate exceed the average recharge rate, ground water levels will drop and springs and boreholes will run dry (e.g. Limpopo and Mpumalanga Provinces).
* In addition, further exploitation of groundwater may also result the reduction of the surface flow.
* Groundwater contamination needs to be well monitored and controlled.
* Therefore, through informed and judicious, combined management of both surface and groundwater, greater efficiency in overall resource utilisation can often be achieved.