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The Management of Waste Water Treatment Plants in South Africa: Challenges and Prospects

Ramokhojoane P. Motsoeneng

Department of Public administration and Management, University of South Africa, E-mail:motsorp@unisa.ac.za

Abstract: The provision of basic sanitation, particularly the management of waste water treatment plants in South Africa has come under scrutiny from scholars and practitioners in recent times. Economic and socio-political challenges in relation to service delivery have also drawn attention. This paper aims to explore challenges on the management of wastewater treatment plants in South Africa. The author argues that the management of wastewater is in a state of disrepair. This is as a result of ailing infrastructure, use of old technology and lack of skilled staff with technical knowledge on treatment of waste water. Through the review of literature and related documentary sources this paper provides a descriptive and analytical approach.

It offers mechanisms to improve the management of waste water treatment plants.

Key words: Sanitation, management, service delivery, provision

INTRODUCTION

Municipality is the closest sphere of government to the people and therefore play an important role in delivery of services. Among services municipalities provides is water and sanitation. The power to deliver water and sanitation services falls, in terms section 24 and 27 of the Constitution of the Republic of South Africa, 1996 on local government. The legislative framework for effective management of local government consists of Local Government: Municipal Systems Act 32 of 2000; Local Government: Municipal Structures Act 117 of 1998 and Municipal Finance Management Act 56 of 2003 . The United Nations declared access to basic water and sanitation a basic human right and in South Africa this right is enshrined in chapter 2 of the Constitution

According to Section 1 of the Water Services Act of 1997 water services include supply of water and sanitation. The Act defines sanitation services as the collection of excreta, removal, disposal or purification of human excreta, domestic wastewater, sewage and effluent resulting from use of water for commercial

purposes. In this regard the existence of wastewater treatment plants plays a significant role in the provision and management of sanitation services.

This article examines the management of wastewater treatment plants in South Africa .The research questions that the study attempts to address are: Is the necessary conditions in place for effective management of waste water treatment plants? To find out how wastewater treatment plants are managed and what measure can be taken to improve how treatment plants are managed? Review of literature and analytical approach is followed in this research. The article highlights the importance of effective management of wastewater treatment plants in the delivery of basic sanitation services. The article proceeds by providing a background on sanitation services .The article then provides context of the article. Discussion on the effect of inadequate treatment of wastewater is provided. This is followed by a discussion on constraints in the management of wastewater treatment plants. The article the discusses necessary conditions for efficient management of wastewater treatment plants. The article concludes by presenting its findings and conclusions and recommendations.

BACKGROUND

This section provides historical overview on sanitation. The Department of Water Affairs now known as Department of Water and Sanitation inherited huge sanitation backlog of 21 million household. In the absence of a well-coordinated and coherent water supply and sanitation efforts of the Water affairs Department were doomed to fail. As a point of departure the department consolidated all previous structures into a new coordinated structure (Jeenes and Steele 2010:9).*White Paper on Water Supply and Sanitation Policy* (1994) was compiled to set out policy in provision of sanitation services. (Republic of South Africa 2002:3). The White Paper on Water Supply and Sanitation Policy was identified as a key priority and development of an integrated implementation strategy for clearing the backlog in support of local government sanitation provision (Jeenes and Steele (2010:10). Pursuant to their goal of reducing the sanitation backlog the then Department of Water Affairs and Forestry developed Community Water Supply and Sanitation Programme (CWSS) with the primary objective of extending water supply and sanitation to all South Africans (Jeenes and Steele 2010: 9).

The primary responsibility for provision of sanitation services remained with the Department of Water Affairs now known as Department of Water and Sanitation. In 1995, the National Sanitation Task Team (NSTT) was established to facilitate integrated interdepartmental approach to provision of sanitation services with the objective of developing a coherent framework for addressing sanitation backlogs. The National Sanitation Task Team with the assistance of other stakeholders which included Mvula Trust, a non-governmental organisation established in 1993 with funding from European Union and Development Bank of South Africa. Focusing on delivery of water and sanitation to the rural areas of South Africa, undertook a consultative process which led the compilation of the Draft White paper on Sanitation. Subsequently Parliament endorsed the *White Paper on Basic Household Sanitation* in September 2001(Jeenes and Steele 2010:8).

According to Roux and Nyamukachi (2005:690) by 2004 the national sanitation backlog in South Africa was reduced by a mere 3 million from 21 million to 18 million. This figure was a signal that a lot of work remains to be done to provide adequate sanitation services in South Africa. By the year 2010 considerable progress was made and 77 percent had access to basic sanitation. However, the maintenance

of sanitation infrastructure poses a serious challenge defined by Brikke (2000:42)"as tasks and activities that should take place to ensure that the service is provided as per design criteria for at least the duration of the expected life of the infrastructure. Lack of operation and maintenance of infrastructure indicates unsustainable service delivery (Brikke 2000:42).

According to Thompson and Nleya (2008) while Millennium Development Goals on access to water and sanitation were achieved rapid urbanisation became a serious challenge. The need to expand municipal infrastructure to accommodate population growth remains a serious challenge for many municipalities across South Africa resulting in more serious backlogs in other service delivery areas(Republic of South Africa 2012:10). The situation demanded restructuring of local government to meet the rising demand so that local government could meet its developmental mandate of providing basic sanitation as provided for in the (Constitution of the Republic of South Africa, 1996). This problem was exacerbated by lack of institutional capacity within municipalities in South Africa and influx of foreign nationals. The next section will discuss the legal framework on wastewater treatment plants.

LEGAL FRAMEWORK ON WASTE WATER TREATMENT PLANTS IN SOUTH AFRICA

Constitution of the Republic of South Africa, 1996

In this section a discussion on legislation impacting on WWTP is provided .In South Africa the following is a legislative framework that regulates the management of WWTP.The constitution of the Republic of South Africa, 1996,The municipal structures Act ,The Municipal Systems Act ,National Water Act and other policies applicable to Local government. Section 24 of the Constitution provides that every person has the right to an environment that in not harmful to their well-being. The constitution mandates the local government with the responsibility to ensure provision of a safe and healthy environment to its communities. This mandate also includes the duty of local government to protect pollution of water resources resulting from untreated wastewater effluents.

Local Government: Municipal Structures Act 117 of 1998

The Municipal Structures Act provides for powers and functions of municipalities in section 84 (2).These powers and function include *inter alia* water*, sanitation and sewage purification services .Since the amendment of the Act the functions* shifted to include direct service provision and not only coordination of services as it was the case previously. According to Kgopo (2013:23) the amendment of the Municipal Structures Act caused confusion among local and district municipalities with regard to their powers and functions and this has resulted in hampering of delivery of service including the management and operation of WWTP.Kgopo (2013) contends that the amendments in the Act does not impede local municipalities from performing functions of district municipalities except for those defined in Section 84(1) or the Local Government Municipal structures Act. The Act provides that the MEC for local government subject to other legislative provision adjust powers and functions between local and district municipalities if the municipality in which powers are vested lacks capacity to perform that function or exercise that power. If the provision of basic services by a local or district municipality collapses due to incapacity,the MEC in the province may, after written notice to the district or local government and with immediate effect allocate functions and powers

necessary to restore or maintain those basic services to a local or district municipality which falls within its area of jurisdiction as the case may be.

It is clear from the above that provision to adjust powers and function between local and district municipality requires cooperation between different municipalities .Such cooperation is critical for the delivery of services including services provided in relation to WWTP. Section 156 of the Constitution provides that municipalities have executive and legislative powers to administer affairs listed in schedule 4B of the constitution. These functions include building regulations,municipal planning,stormwater management, water and sanitation services ,domestic wastewater and disposal. Kgopo (2013:25) notes that none of the above mentioned functions are allocated exclusively to local government.

The constitution also prescribes the role that local government should play to fulfil its constitutional obligation which includes inter alia, provision of sustainable services, promotion of safe and healthy environment and encouragement of community participation in matters of local government through vehicles such as integrated development planning. These objectives which include provision of sanitation services require local government to develop policies and by laws .Municipalities are also required to develop regulations pertaining to environmental pollution for effective administration of local government matters.

Local Government: Municipal Systems Act

The primary purpose of the Act is to regulate municipalities and to provide mechanisms to enable municipalities to achieve the vision of a developmental local government .while the municipal structures act focus on structure and classification of municipalities, municipal systems Act focus on among ther things on management and protection of the environment(Republic of South Africa,2000). The Act states that it is the duty of the municipality to provide environmentally safe and heathy environment. The Act also recognises the physical structure is needed to provide particular services .This included the need to maintain, upgrade proper infrastructure to treat effluent before is discharge to the environment. Failure to maintain and upgrade infrastructure will potential impact on water quality and harm the environment .The sustainable treatment of waste water depends on proper management and maintence plans (Republic of South Africa 200).

National Water Act of 1998

The National water Act is the primary legislation regulating the management or water resources in South Africa. The Act recognises the scarcity of water resource and provides for its protection and conservation in a sustainable manner. The Act empowers the minister of Water and sanitation to regulate and prescribe standards, quantity and quality of wastewater discharge to the environment or into the water resources (Republic of South Africa1998). This includes preventing contamination of water resources, WWTP are one of sources that cause contamination of water resources through discharge of untreated effluent into water resources. The Act also provides that any person wishing to discharge wastewater is required to have a licence unless exempted by the Act.In the even that the person does not meet requirements ,they must apply to Department of Water and Sanitation for a licence to discharge .The Act further provides responsible authority may give directive to a person who has failed to take remedial action to rectify water pollution .Failure to comply with the directive may result in criminal sanctions be imposed (Kgopo 2013) .

Water Service Authorities

Water service authorities (WSA) provides for parameters within which water services maybe provided. According Kgopo (2013:30) the water service authorities have the ultimate responsibility to ensure supply and access to sanitation services in their area of jurisdiction. This responsibility extends to how effluent is managed, transported and discharged at a WWTP.The WSA have the responsibility to ensure collection treatment and discharge of wastewater and are required by legislation to comply with national standards relating to functioning of WWTP.It is the duty of Water Service Authorities to ensure that all personnel working in the plants are competent and certified and have all required equipment to discharge their function as per legislation. The next section will provide context to the article.

CONTEXTUALISATION

Literature in the field of Public Administration on the topic of sanitation that publications are limited to debates on delivery of toilets facilities without providing a comprehensive debate on the management of waste water treatment plants. It is therefore, the intention of this research to explore such areas of the discourse on sanitation from Public Administration perspective.

Research conducted by Osec (2011) shows that treatment of wastewater in South African municipalities is in state of dire disrepair. The research further shows that few municipalities (7%) comply with international standards or guidelines (green drop) as a result serious interventions are needed to improve the situation. At the centre of challenges with management of waste water treatment plants (municipalities) is the shortage of trained and skilled staff, particularly operators, mechanical and electrical maintenance engineers. Lawless (2007) contends that such shortages impact negatively on planning, maintenance of equipment and forces the municipalities to rely on external consultants. This has been exacerbated by population growth and industrialisation that put pressure on existing sanitation infrastructure. Lack of enforcement of legislation particularly to restrain private waste water plants to comply with guidelines has been singled out as a major problem in this sector. This state of affairs raises concerns about the conditions of sanitation infrastructure in South Africa and also how sanitation is managed. Lawless (2010) states that the focus of government infrastructure projects was more on building toilets without improving waste water treatment infrastructure including recruiting more engineers and training staff on the use of equipment.

In his analysis of on the impact of poorly maintained WWTP plants Mema (2010) notes that ageing wastewater infrastructure in most municipalities can no longer cope with the needs of a growing population. He contends however that building more facilities is not the solution until such time underlying factors have been adequately addressed. These underlying issues include poor maintenance, shortage of skilled staff, and lack of financial resource to effectively manage plants. The lack of political will to address sanitation challenges has also been cited as posing a serious obstacle in dressing sanitary challenges in municipalities. Mema (2010) further note that underlying factors alluded to above are not exclusive to Eastern Cape about but common problems that have been presented in many literature sources on sanitation in South Africa. Although government is committed to provide adequate sanitation to all communities, municipalities do not have adequate capacity to deliver on the commitment. Among capacity challenges facing municipalities is that municipal infrastructure grants received from National treasury cannot subsidies sustainable service provision, particularly; in low income rural municipalities with low tax base (Eales 2010:2).

The (2010) strategic review report challenges on the management of wastewater treatment plants revealed that there is lack of enforcement of municipal by laws and other regulations governing WWTP.For instance the Department of Water and Sanitation does not adequately monitor compliance of private wastewater plants as required by the Water Act of 1997. At institutional level it has been established that municipalities do not have the capacity to manage these plants as per regulations. For municipalities with little revenue collection the cost of maintaining equipment has posed a serious problem and the fact that residents could not afford or did not pay municipal tariffs has put a strain on municipal finances and therefore its ability to provide sustainable services. Theft of equipment such as pumps and illegal connections remains some of the challenges facing municipalities. With regard to technical or operational challenges badly designed and inadequate infrastructure, leakages, poor maintenance has been indicated in the report as some of the major problems (Water Research Commission 2010). The next section will focus on the effect of non-treatment of effluent in waste water treatment plants.

THE EFFECT OF INADEQUATE TREATMENT OF WASTE WATER TREATMENT

According to Kgopo (2013:9) it is critical that wastewater is treated before is discharged into the water sources such as rivers and lakes. If not adequately treated it has both cost and health implication on the quality of water for human consumption but it also impacts on ecology, health and the economy of the country. These impacts are discussed below.

Health impact

Inadequately treated effluent water contains pathogens which can cause health problems to people and animals. Potential health risks from polluted water include contaminants such as nitrates found in drinking water. Kgopo (2013:10) further notes that occasional spillages of raw sewage into the aquatic system are more harmful than inadequately treated effluent. He also state that operationally defective wastewater treatment plants which cause spillages are greater risk to health communities in surrounding such areas.Socially,the negative impact of defective waste water treatment plants is that they can lead to closures of recreational areas such as park as a result of faecal discharge into those areas.

Ecological impact

According to Du Preez (unknown date) in Kgopo (2013) most of the drinking water in South Africa is obtained from Surface water ie reservoirs and rivers .Cyanobacteria has found in many rivers and reservoirs systems in South Africa because of high levels of eutrophication by inadequate treatment of effluents discharged in the country's chatchments.These pathogens have also been associated with the death of many livestock in south Africa.The discharge of untreated effluent into water resource not only poses a health risk but it has a negative effect on the ecosystem (Iginosa and Okoh 2009 in Kgopo 2013).The effect of such effect on the ecosystem include the increase in the number and the amount of sediments found in water which affect the light needed by plants.Iginosa and Okoh (2009) in Kgopo (2013) state that the sediments damage fish gills and respiratory structures of other aquatic species. They further argue that in extreme circumstances the impact could lead to the total collapse of the ecosystem in the functioning of

the natural systems of water resources. Apart from ecological impact the discharge of untreated effluent have economic impact which is discussed below.

Economic impact

According to Kgopo (2013:11) there are costs associated with discharge of untreated effluent into water resources. Kgopo (2013:11) argues that the cost of monitoring and managing people and the effect of odours affect the value of properties located close to the odours. Over and above that litigation can be brought against the government due to sewage spillages due to damaged drainage systems and these cases can be very expensive to the state.

CONSTRAINTS IN THE MANAGEMENT OF WWTP

According to a report on status of sanitation (2012) high staff turnover which includes lack of training and staff retention is a serious challenge in most of the municipalities in South Africa (Republic of South Africa). The report further notes that Water Service Authorities are under-capacity to plan implement and manage infrastructure effectively. Based on assessment undertaken by department of Water and Sanitation the majority of Water Service Authorities the level of vulnerability (based on assessment of 16 indices)is very high with 80% of WSA classified in this manner (Republic of South Africa,2012).Although programmes to improve capacity are in place in municipalities ,they are generally short term interventions with little done to transfer skills and build capacity within WSA.Easles (2010) also notes that financing of operations and maintenance of infrastructure remains a challenge. Unless something is done infrastructure and poor quality service will continue to deteriorate.Easles (2010) further notes that financial instruments for funding operation and maintenance (equitable share) is often not allocated for this purpose.Easles (2010) further notes that insufficient financial planning and management lead to inadequate budget allocation for maintenance , at times inappropriate use of allocated funds. Lack of technical capacity which includes qualified engineers and other technical staff results in poor planning ,for example new network is implemented without taking into account the increasing capacity(Mema 2010).

FINDINGS

This article investigated the challenges management of wastewater treatment plants in South Africa.it has been stablished by the author that the majority of WWTP do not comply with operation standards set out by the Department of Water and Sanitation .among other things established by this article is that municipalities lack the capacity to effectively plan and maintain infrastructure effectively .This is as a result of the inability of municipalities to provide training of staff employed in wastewater treatment plants and the qualified and more experienced staff is not retained.

One of the serious concerns that is raised was the lack of financial planning and funding to maintain and operate infrastructure .it was also revealed that funding meant for maintenance and operation of plants often not allocated for that specific purpose, this is so because of inadequate budgeting .It is worse for municipalities with small tax base because municipal infrastructure grants is the only main source of funding it was also discovered that when ne network is provided increasing capacity is not taken into account and this has put a lot of strain on existing infrastructure.

Conclusion

The flowing from the above findings, the following conclusion can be made .There is a need to improve capacity at local government level through continuous training of personnel. The municipality need to continuously monitor compliance of the plants in terms of Green drop assessment done by the Department of Water and Sanitation. Furthermore the need to improve effective use of and management of funding allocated to sanitation services delivery. Improved support for municipalities and a more coordinated effort between local, provincial and national government will assit.

NECESSARY CONDITIONS FOR EFFICIENT MANAGEMENT OF WWTP

In order to ensure that WWTP are efficiently managed the following conditions and processes should be in place. The building inspectors should ensure that municipal by laws and other regulations are complied with. Plant operators must be certified with the Department of Water and Sanitation and they must be fully trained to operate WWTP and they should be competent on all aspect of operation of WWTP. The effective maintenance and operation of WWTP depend on the management practices and operators responsibilities. Technical guidelines for pant operators and maintenance of operators for sustainable management of the pant have to be complied with all the time. These guidelines have to explicitly state the responsibility of management.

The management and operation of WWTP should be the responsibility of both district and local municipality in case of category C municipalities. Municipalities should have in place action plan and implementation programme for maintenance and continuous improvement of WWTP.All plants should have power backup facilities in case of power outages to mitigate against spills (i.e generators). Detectors could be installed to alert of any spillage that might occur. A documented plan must also be made available within the facility. This plan must be able guide actions to be taken in emergency situations. It is important that operators undertake routine maintenance of all equipment used at the plant .This will assit management to identify aging infrastructure

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