

Comparing developments in water supply, sanitation and environmental health in four South African cities, 1840–1920

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Clean water and adequate sanitation are basic urban infrastructure services we often take for granted. In 2000 Kofi Annan, Secretary-General of the United Nations said:

... more than one billion people lack access to safe drinking water, while half of humanity lacks adequate sanitation ... No single measure would do more to reduce disease and save lives in the developing world than bringing safe water and adequate sanitation to all.¹

Service delivery problems in South Africa's municipalities are currently one of the major hurdles the government of President Jacob Zuma has to grapple with. Complaints about water supply and sanitation often contribute as much as 60 per cent to the discontent of urban residents with the lacklustre performance of local authorities.² Many of these problems are directly related to a phase of unprecedented urbanisation in Africa, a continent which is currently urbanising faster than any other in the world.³

Problems of service delivery in South Africa's bustling urban environments today are far from new. Since the nineteenth century (and in some cases even earlier), managers and engineers in the early towns have been struggling with such issues. As they developed a sense of familiarity with the local environment and its natural resources, municipalities were able to overcome some of these obstacles. Nevertheless, many of today's "crises" of water supply and sanitation, bear a remarkable resemblance to those of yesteryear.

South Africa has a long tradition of local government, with considerable experience in the field of potable water supply and sanitation development. In fact, aspects of environmental health in the country's water sector go back to the 1850s when municipal authorities in the Cape Colony, following the example of developments in the UK, began introducing measures to secure consistently clean

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1. K. Annan, *We the Peoples: The Role of the United Nations in the 21st Century* (United Nations, 2000), p 60, at [<http://www.unmillenniumproject.org/documents/wethepeople.pdf>], accessed 3 February 2010.
2. C. Gouws, S. Motloung, I. Moeketsi, J. Tempelhoff and G. van Greuning, "'I Hate it when People Don't Like Me': SIBU and the Crisis of Water Service Delivery in Sannieshof", North West Province CuDyWat, Research Report 2/2009 (North-West University, Vaal campus, Vanderbijlpark 2009), p 19.
3. "Rapid Urbanization a Major Challenge for Africa", UN-HABITAT, available online at [<http://www.unhabitat.org/content.asp?cid=7953&catid=5&typeid=68subMenuId=0>] accessed 25 February 2010.

water supplies and efficient sanitary services. By the beginning of the twentieth century, despite an extraordinary rate of urbanisation and industrialisation that dwarfs today's economic development in many parts of the country, it was possible for local authorities to deal with the increased demand for water and sanitation.

In this article a comparison will be made of four South African urban centres in the period 1840 to 1920. Developments in Cape Town (the oldest city in the country); Grahamstown (a British settler urban development); Durban (a typical colonial port city); and Johannesburg (an industrial city in the interior of South Africa); will be scrutinised. The objective was to look at unique developments in four urban centres in the second half of the nineteenth century and record the findings. These centres are situated in different parts of South Africa and there were specific cultural drivers determining development in each. At the time they were situated in different political units. Johannesburg lay in the independent Boer republic of the Transvaal; Durban was on the coast in the Natal Colony; and Cape Town and Grahamstown were in the Cape Colony. The early population growth in each of these towns was remarkable. In 1850, Cape Town had 25 600 inhabitants; by 1920 there were 181 240.⁴ Durban's population grew from about 2 000 in 1850 to approximately 146 300 residents in 1921.⁵ Johannesburg, which had 15 000 inhabitants in 1889, mushroomed to a population of 288 100 by 1921.⁶

The development of Grahamstown, the fourth urban centre studied in this comparative analysis, was somewhat different from the others. Even in the nineteenth century, by comparison with many of the new urban centres of the day, Grahamstown was a small town. It had a mere 8 072 inhabitants in 1865 and this had climbed slowly to 14 900 by 1921.⁷ Its growth was stifled by external factors. The discovery of diamonds in Griqualand West and the subsequent development of Kimberley in the ten years from 1865 to 1875 was responsible for a decline in Grahamstown's population from 8 072 to 6 903 in this period.⁸ This being so, for the purposes of this discussion, it can be considered a typical small town in the Cape Colony. It had a strong British character and developed, in terms of local governance and municipal infrastructure, in line with the colonial style of local municipal government and infrastructure that prevailed in the nineteenth century.

Municipal governance was introduced in Cape Town, Grahamstown and Durban when they were accorded municipal status in 1840, 1836 and 1854 respectively. Johannesburg, founded in 1886 after the discovery of gold on the Witwatersrand, acquired a republican-styled municipal system in 1897. For the purposes of this comparative discussion the end dates vary in each case study because of the different dates on which their local water supply systems were enhanced. In the

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4. N. Worden, E. van Heyningen and V. Bickford-Smith, *Cape Town, the Making of a City: An Illustrated Social History* (David Philip, Cape Town, 1998), p 177; V. Bickford-Smith, E. van Heyningen and N. Worden, *Cape Town in the Twentieth Century: An Illustrated Social History* (David Philip, Cape Town, 1999), p 71.
 5. L. Kuper, H. Watts and R. Davies, *Durban: A Study in Racial Ecology* (Jonathan Cape, London, 1958), p 53.
 6. "South Africa: Historical Demographical Data of the Urban Centres", available online at [<http://www.populstat.info/Africa/safricat.html>], accessed 12 April 2007.
 7. "South Africa: Historical Demographical Data".
 8. J. Davidson, "Coping with Marginality: Tourism and the Projection of Grahamstown, 1870–1955", *South African Historical Journal*, 105, 42, 2000, p 176.

case of Cape Town the line is drawn at 1917 with the decision by the town fathers to begin the construction of the Steenbras scheme. In Durban, 1917 was the year of a major flood that forced the authorities to reconsider aspects of development in the municipality's water sector. In discussing Johannesburg, the closing date is 1916 when construction work began on the Vaal Barrage. Grahamstown's developments are of relevance until the mid-1910s.

The main issue explored in this study is: How did these municipalities deal with the growing problem of providing water for their residents? The question of race and water infrastructure development forms a sub-discourse of its own and although not a prime focus of discussion here, is given some attention. The development of sanitation, also a sub-field, features prominently in the contemplation of the racial divide and the evolution of urban environments. Here Maynard Swanson's "sanitation syndrome" is important. His theoretical thesis equates black living areas in nineteenth-century Cape Town with threats to public health. Local governments frequently encountered serious epidemics and often officials were afraid of their "spill over" effect on the white residents. African settlements were seen as nests of disease and this assumption was used as a basis for implementing a policy of segregated settlement areas.⁹ Then too: What was the impact of such issues on the infrastructure of the four towns? The answer is to be found in a combination of health, racial issues and the local environment. The interweaving of these factors varies according to the conditions in each town, and will be explored in the case studies below.

Water history is a relatively new field of investigation in South Africa.¹⁰ Early histories of South African cities seldom provided details on the development of the local water supply, sanitation and environmental health.¹¹ However, since the 1970s local history has made considerable inroads into academic endeavour, and water and health issues have begun to enjoy somewhat more attention in the form of articles and other publications.¹² It was the rise of environmental history in South Africa, particularly in the 1990s that paved the way for giving increasing attention to issues of water as a natural resource and the implications of the aquatic environment on health. In recent years there has been a dedicated focus on local and regional water history. For example, Johann Tempelhoff has written a detailed history of Rand Water, a

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9. M. Swanson, "The Sanitation Syndrome: Bubonic Plague and Urban Native Policy in the Cape Colony, 1900–1909", *Journal of African History*, 17, 3, 1977; M. Vaughan, *Curing their Ills: Colonial Power and African Illness* (Polity Press, Stanford, 1991).
 10. J.W.N. Tempelhoff, "Recent Trends in South African Water History", *TD – The Journal for Transdisciplinary Research in Southern Africa*, 4, 1, 2008, pp 273–296.
 11. For example H.W.J. Picard, *Grand Parade: The Birth of Greater Cape Town, 1850–1913* (Struik, Cape Town, 1969); M.S. Appelgryn, *Johannesburg: Origins and Early Management 1886–1899* (Unisa Press, Pretoria, 1984); G.A. Leyds, *A History of Johannesburg: The Early Years* (Nasionale Boekhandel, Johannesburg, 1964).
 12. For example T.S. Bodill, "History of the Port Elizabeth Water Supply, Parts 1–5", *Looking Back*, 21, 4, 1981, pp 128–131; 22, 1, 1982, pp 17–24; 22, 2, 1982, pp 43–47; 22, 3, 1982, pp 79–81; and 22, 4, 1982, pp 117–120. See also K.S. Hunt, "The Story of Grahamstown's Water Supply", *Annals of the Grahamstown Historical Society*, 2, 2, 1976, pp 8–21; A. de V. Minnaar, "Graaff-Reinet's Water Problems", *Contree*, 7, 22, 1987, pp 23–30; G.N. Vernon, "The Water Supply of East London", *Coelacanth: The Journal of the Border Historical Society*, 19, 2, 1981, pp 49–52; K.C. Wall, "A New History of South Africa from a Water Resources Viewpoint", *The Civil Engineer in South Africa*, 25, 5, 1983, pp 265, 267, 269, 271; K.C. Wall, "Water, Civil Engineers and Multipurpose Metropolitan Government for the Old Cape Peninsula Municipalities", *SAICE Journal*, 40, 3, 1998, pp 1–8.

water utility established in 1903, that provided water to Johannesburg (essentially today's southern Gauteng Province). Later its bulk water supply services were extended to large parts of Mpumalanga, North West Province and the Free State.¹³ David Raymer, an engineer who studies the development of water infrastructure in historical contexts, has recently published a book on the water supply in Port Elizabeth and Uitenhage.¹⁴ Nancy Jacobs, one of a new generation of environmental historians, has done research on the history of Kuruman in the Northern Cape. Environmental issues such as the legal aspects of water are central in her study on the development of a modern Western-style community in what is a water-stressed region of the South African interior.¹⁵ There is also a new book by the Water Research Commission dealing with the rivers and wetlands of Cape Town. Although there is a strong focus in this study on the environment, some chapters deal explicitly with the development of water supply in Cape Town.¹⁶

Cape Town

In 1840, when the colonial authorities established the municipality of Cape Town, the local water supply only comprised public fountains and pumps in various parts of the city. There were a number of regulations on the management of these pumps. For example, the size of the vessels used to take water from the fountains and pumps was controlled and water could only be taken at set times of the day.¹⁷ From the 1840s until the 1870s, with the marked increase in population, there was a decline in the per capita water supply of the city.¹⁸ The municipality tried to address this by building two storage reservoirs in the 1850s, but this still did not meet the demand. The fact of the matter was that there was simply not enough water for all the city's residents at any given time.

Seeking other solutions, in the 1860s the municipality began to buy water rights in the town area to augment its supply. This was followed by the laying of an extensive water pipe network to many parts of the city.¹⁹ Although these measures brought some relief, the crucial problem remained – a water supply that could meet the water needs of a growing number of residents. The poor people of Cape Town were the worst affected because they were still relying on public pumps and fountains that were sometimes closed down at very short notice. The lack of water became so critical by 1872 that the average daily consumption was limited to about six litres per person for a population of some 30 000 people.²⁰ Something had to be done. The task of assessing the water supply and reporting back to the municipality was given to

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13. J.W.N. Tempelhoff, *The Substance of Ubiquity: Rand Water 1903–2003* (Kleio Publishers, Vanderbijlpark, 2003).
 14. D. Raymer, *Streams of Life: The Water Supply of Port Elizabeth and Uitenhage* (Self published, 2008).
 15. N.J. Jacobs, *Environment, Power, and Injustice: a South African History* (Cambridge University Press, Cambridge, 2003).
 16. C. Brown and R. Magoba (eds), *Rivers and Wetlands of Cape Town: Caring for Our Rich Aquatic Heritage*, Report TT 376/08 (Water Research Commission, Cape Town, 2009).
 17. Worden, Van Heyningen & Bickford-Smith, *Cape Town, the Making of a City*, p 120.
 18. Mäki, *Water, Sanitation and Health*, pp 50–56.
 19. Picard, *Grand Parade*, p 85.
 20. Western Cape Provincial Archives, Cape Town (hereafter CAD): 3/CT, 4/1/4/298, F134/4, C.R. Barlow, Report on Cape Town's Water Supply, October 1914, p 4.

John G. Gamble, the Cape Colony's hydraulic engineer. He proposed the tapping of the Backwater Stream on Table Mountain by constructing a tunnel through the Twelve Apostles range and installing a pipeline from the tunnel to reservoirs.²¹ However, construction work on this system only began in the 1880s.

As far as sanitation was concerned, conditions in Cape Town were still rudimentary in 1840. The covering of drains improved the situation, but without proper water supply, there was not much that could be done. After 1860, newspapers and local medical practitioners began to draw attention to possible health hazards and insisted on improvements. Unfortunately not all the doctors agreed about the dangers of cesspools and most of the residents did not see any problem with dumping their refuse into the open gutters or into the bay.²² In 1875 there was a series of articles in the *Cape Monthly Magazine* about the need for street improvement and an increased water supply. And finally, in the early 1880s there was a political battle between those wanting improvements to the water supply and sanitation and those who called for better control of basic economic issues.²³

The cost of construction of reservoirs and pipelines was a major issue. The wealthier property owners and those who had been resident in the city for some time complained that the proposed developments were too expensive. The "reformers" who wanted improved water provision and sanitary conditions eventually won this tussle in 1881. The slow process of putting these into effect then began, including the introduction of new by-laws, which gave the municipality effective control over the city's water supplies and sewage disposal. There were three municipal amendment acts which inter alia restricted municipal franchise rights; raised the property qualification for the franchise to £100; introduced a system of plural voting designed to favour businessmen and property owners; and provided for the appointment of Cape Town's first municipal health and sanitary officials.²⁴

By the end of the 1880s, it was clear that the water supply could be substantially improved by the construction of what came to be called the Molteno Reservoir. This meant that the planning of a proper sanitation drainage system could begin. A Parliamentary Select Committee was appointed and in successive reports recommended a comprehensive drainage scheme.²⁵ The first proposal was put forward in 1889,²⁶ but ratepayers did not authorise the council to borrow the necessary funds.²⁷

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21. J.G. Gamble, *Report on the Water Supply of Cape Town* (Saul Solomon, Cape Town, 1875).
 22. Mäki, *Water, Sanitation and Health*, pp 202–208.
 23. V. Bickford-Smith, *Ethnic Pride and Racial Prejudice in Victorian Cape Town: Group Identity and Social Practice, 1875–1902* (Cambridge University Press, Cambridge, 1995), p 45.
 24. CAD, Cape Parliamentary Papers: A13-1881, Report of the Select Committee of the House of Assembly on Cape Town Municipal Bill; A9-1885, Report of the Select Committee of the House of Assembly on Cape Town Municipal Act Amendment Bill; A8-1890 Report of the Select Committee of the House of Assembly on Cape Town Municipal Act Amendment Bill; A16-1892, Report of the Select Committee of the House of Assembly on Cape Town Municipal Amendment Bill.
 25. Bickford-Smith, *Ethnic Pride*, p 59. On water supply in the municipal politics of Cape Town see D. Grant, "The Politics of Water Supply: the History of Cape Town's Water Supply 1840–1920." MA dissertation, University of Cape Town, 1991.
 26. E. Pritchard, *Cape Town's Sewerage* (no publisher, London, 1889).
 27. Town Council of Cape Town, *Mayor's Minute, Year Ending 11 August 1890* (Townshend, Taylor & Snashall, Cape Town, 1890) pp 2–3.

New plans were drawn up and another report was submitted in 1891. This time the council received the necessary authorisation, but after adopting the plan certain problems materialised. Apparently the estimate of the costs involved had been far too low. Finally, in 1896, the plans were finalised after certain modifications by the city engineer and work could begin.²⁸ The system took almost 10 years to complete.

The building of the Molteno Reservoir was the first step towards harnessing the waters of Table Mountain. The town fathers thought that the new tunnel and pipeline would be enough to address the problem. However, it soon became clear that storage reservoirs were also needed at the top of Table Mountain and the Woodhead Reservoir was completed in 1897.²⁹ Construction work on the nearby Hely-Hutchinson Reservoir started in 1898 and it came into use in 1904. While the building of this second reservoir was underway, the government appointed a commission to study the water supply situation in the Cape Peninsula.³⁰ This commission also investigated the municipal structure and recommended a merger between Cape Town and six neighbouring small municipalities in the peninsula; sanitation and water supply were key issues of concern. Although the municipalities involved did not agree on all aspects of the proposed joint water supply, the matter was urgent and needed immediate attention. A number of alternatives were scrutinised but a final decision was not taken.³¹

The water supply to the area again became a critical topic of debate at the time of Cape Town's municipal elections in 1904. This time the voters who opposed expenditure on water supply won the day. The city's more affluent residents saw no need for yet another expensive scheme so soon after the completion of the Hely-Hutchinson Reservoir.³² The following year water consumption almost reached the maximum capacity the city could provide. The colonial government was approached again for help, and a second commission was appointed to inspect the water supply and the municipal situation in the Cape Peninsula. This commission came to the conclusion that arrangements would have to be made to organise a water supply from beyond the confines of the Cape Peninsula. It also reiterated the recommendation that a municipal merger was a potential solution. Again, the small outlying municipalities were not ready for this and insisted that they wanted to retain their independence.³³ Cape Town now concentrated on building a new storage reservoir and the filtration of Table Mountain's water. There were also renewed negotiations with the smaller municipalities about co-operation or amalgamation of water supply services but these deliberations led nowhere. The municipalities concerned still refused to budge.³⁴ In

28. Mäki, *Water, Sanitation and Health*, pp 217–220.

29. T. Murray, "Past Master 19: Thomas Stewart", *Civil Engineering*, 16, 10, 2008, pp 36–38.

30. City of Cape Town, *Minute of His Worship the Mayor for the Mayoral Year Ending 11 September 1902* (Townshend, Taylor & Snashall, Cape Town, 1902) pp 110–111.

31. Mäki, *Water, Sanitation and Health*, pp 72–74.

32. W.D. Baxter, *Turn Back the Pages: Sixty-Eight Years at the Cape* (Juta, Cape Town, 1954), p 38.

33. Mäki, *Water, Sanitation and Health*, pp 76–78.

34. City of Cape Town, *Minute of His Worship the Mayor for the Mayoral Year Ending 20 September 1909* (Cape Times, Cape Town, 1909), pp 34–35; City of Cape Town, *Minute of His Worship the Mayor for the Mayoral Year Ending 19 September 1910* (Cape Times, Cape Town, 1910), pp 67–68; City of Cape Town, *Minute of His Worship the Mayor for the Mayoral Year Ending 19 September 1911* (Cape Times, Cape Town, 1911), Appendix 2, p xxxvi.

1910 a Peninsula Municipal Union Society was formed to promote the merger and in the end, the marked deterioration of the water situation finally persuaded seven of the eight smaller municipalities to join forces with Cape Town in 1913. The water supply and sanitation systems were key issues in this step.³⁵

Thereafter, the search continued for ways to augment the water supply in the area. Initially, the existing local sources were examined.³⁶ The options of upgrading these were finally abandoned in 1916 and the potential of the Bergriviershoek valley, the Wemmershoek valley, and a scheme involving the Steenbras River were studied. One recommendation was that the cheaper Steenbras scheme should be developed. This created some controversy, because the Wemmershoek scheme also had strong support and would provide water of a better quality. The city was divided on the issue and finally, in July 1917, the Steenbras scheme won a narrow victory in a referendum held to determine the opinion of the residents of Cape Town and surrounding areas.³⁷ The dam was eventually completed in 1921.

By the beginning of the twentieth century, with the upgrading of the water supply, the people of Cape Town enjoyed improved sanitary conditions. However, this could not be said of all the residents. In the areas where black people and poor whites were living, the conditions were as bad as ever, if not worse. According to the first Peninsula Commission, nearly all the houses in the peninsula were connected to the waterborne sewerage system by 1902.³⁸ But the homes (many of them mere shacks) in the poorer areas continued to be overcrowded and the rudimentary sanitation was hazardous for the health of the residents.

By way of summary, the development of Cape Town's water supply was a constant battle against a shortfall caused by rapid urban population growth. This problem was even greater in the small outlying municipalities. Many of them experienced a population growth in excess of 100 per cent between 1890 and 1910. Only Green Point, Wynberg and Kalk Bay built their own water supply and wastewater treatment works at the time. Other municipalities had a combined enterprise for the provision of water, but no common sewerage system. In the early twentieth century the demand for water forced municipalities to start looking for supplies beyond the peninsula. Problems of local governance, of which water and sanitation formed an important part, eventually forced the unification of the smaller local authorities in the area with Cape Town municipality in 1913. In Cape Town lack of finances had the most telling impact on water supply prior to the 1880s when the power of the municipality to accept loans was limited. Thereafter no water supply schemes were rejected solely for financial reasons.

35. Mäki, *Water, Sanitation and Health*, pp 80–83.

36. City of Cape Town, *Minute of His Worship the Mayor for the Mayoral Year Ending 13 September 1915* (Cape Times, Cape Town, 1915), pp 38–42; City of Cape Town, *Minute of His Worship the Mayor for the Mayoral Year Ending 11 September 1916* (Cape Times, Cape Town, 1916), pp 35–46.

37. CAD: ACLT, 534, 11956, Report of Board of Engineers on Augmentation of Water Supply; together with Report to the Board on Hydro-Electric Possibilities of Steenbras and Palmiet, 7 December 1916.

38. CAD: CCP, G21-1903, Report of a Commission upon Certain Matters Affecting Cape Peninsula Municipalities and the Cape Divisional Council, 1903, p 52.

Grahamstown

Grahamstown was established in 1812. Situated inland, its water management problems were somewhat unique. Municipal finance had a heavy impact on the way the local water supply was developed. When decisions had to be made, the cheapest alternative was virtually always chosen, or a decision was postponed in the hope that expenditure could be kept to the absolute minimum. For instance, after the establishment of the municipality in 1836, the laying of a water pipe network was discussed but it was thought to be too expensive; furrows were dug instead. A drought and concerns about public health because of the unhygienic furrows, forced the municipality to lay water pipes in High Street in 1844–1845. In the early 1850s there were also some improvements made. By 1850, a superintendent of water affairs was appointed to monitor all water-related matters and during 1853 fire hydrants were attached to the network as a precaution against fire damage. In addition, the pipe network was extended to other main streets.³⁹

During the 1850s it was realised that storage space was required to keep the supply of water steady in time of drought and in the 1860s three reservoirs were built in the vicinity of the town centre. The importance of the first, Grey Reservoir, is underlined by the appointment of the first city engineer to supervise construction work. The next two reservoirs, named the Douglas and the Hamilton reservoirs, were built a few years later. Municipal finances were again of crucial importance. A final decision on development was taken not because of the drought, but after a threat from the officer commanding the local military garrison that arrangements would be made to relocate the garrison unless the water supply was improved.

A point was eventually reached when the military agreed to assist the local authority. Most of the construction work on the town's water facilities was then completed with the help of the garrison's soldiers.⁴⁰ The redeployment of the garrison to King Williamstown in 1870; the lure of the diamond fields at Kimberley; and the new railway policy of the Cape colonial government; all reduced Grahamstown's revenue significantly in the 1870s.⁴¹ When the water supply came up again for discussion there were two alternatives for a new water storage scheme, but ultimately the Cradock Road scheme was chosen and the reservoir was built with the help of the railway authorities. The location of this reservoir caused heated debate in the public sphere and local municipal officials were also at loggerheads. In addition, there was tension between the municipality, divisional council and railway authorities on who was paying for the work to be done and which portion of the construction work was the responsibility of each of the stakeholders.⁴²

39. Mäki, *Water, Sanitation and Health*, pp 91–93; K.S. Hunt, "The Development of Municipal Government in the Eastern Province of the Cape of Good Hope, with Special Reference to Grahamstown, 1827–1862", *Archives Year Book for South African History*, 24 (Government Printer, Parow, 1961), pp 189–196.

40. Mäki, *Water, Sanitation and Health*, pp 96–100.

41. On the reasons for Grahamstown's stagnation see H.L. Watts, "Grahamstown, a Socio-Ecological Study of a Small South African Town." PhD thesis, Rhodes University, 1957.

42. M. Gibbens, "Two Decades in the Life of a City: Grahamstown 1862–1882." MA dissertation, Rhodes University, 1982, pp 145–146; CAD: CGR, 3/1/59, 12498, Memorandum of Agreement, 13 September 1878; CAD: CGR, 3/1/59, 12498, C.B. Elliott – Maintenance Engineer, Port Elizabeth, 25 August 1882.

In the 1880s the search was begun for new water sources further afield. Several possibilities were examined and the city council opted for the Slaaikraal scheme. However, because of the expense and questions about the water purity, it took more than 10 years to realise these plans. It was only after the drought of 1896 that the final decision was taken to build the reservoir. This facility, known as the Milner Reservoir, proved so successful that a second reservoir, the Jameson Reservoir, was completed in 1906.⁴³

In the early twentieth century Grahamstown had constant problems with leaks in the main lines leading to the city centre. Furthermore, heated debates on the purity of the water did nothing to help the situation. Two water purity debates in 1907 and 1912 caused particular controversy. In both cases, the local medical officer of health (MOH) condemned the water as undrinkable and a danger to the public health. Dr James Bruce-Bays' condemnation in 1907 led the city council to inspect the filtration of the water supply.⁴⁴ Various difficulties slowed down the process and in 1912 when Dr F.A. Saunders passed similar judgement, he was forced to resign.⁴⁵ Later analyses proved that Saunders had indeed been correct, and outside pressure finally pushed the council to build a filtration plant in 1914. Two years later, Dr G.C. Purvis declined to be responsible any longer for the purity of Grahamstown's water. He complained about the safety of the water supply and the fact that the Board of Works was not doing anything despite his and the town engineer's reports demanding action.⁴⁶ It appears that the MOHs were constantly at loggerheads with the city council.

The water supply to the nearby black residential settlements received countrywide attention after the Tuberculosis Commission appointed by the government published its report in 1914. The report painted a bleak picture of the conditions in Grahamstown's townships and put the full blame on the city council.⁴⁷ The findings were discussed in municipal circles but no significant improvements followed because the town council did not want to spend money for improvements that only benefited black residents.⁴⁸ In the late 1910s, the debate on water supply, driven by persistent drought and the demands for a waterborne sewerage system, continued, again focusing on finding a new water source for the city. However, nothing came of the various investigations until 1926.

In nineteenth-century Grahamstown, leaking cesspools were the most urgent sanitary concern. The first investigation of this problem was undertaken in 1879 and in 1881 a recommendation was made to replace it with the pail system. However, financial constraints delayed implementation and nothing was done until the Cape Colony passed the Public Health Amendment Act in 1897. This legislation defined the duties and powers of local authorities concerning matters such as water supply, buildings, prevention of diseases, abattoirs, locations and offensive trades. It also made possible the appointment of an MOH. In 1901 the act indirectly led to the end of

43. Mäki, *Water, Sanitation and Health*, pp 104–106.

44. *Grocott's Penny Mail*, 19 July 1907; Corporation of Grahamstown, *Minute of His Worship the Mayor for the Municipal Year Ended 30 June 1908* (Grocott & Sherry, Grahamstown, 1908), pp 2–3.

45. *Grahamstown Journal*, 5 September 1912; *Grocott's Penny Mail*, 6 September 1912.

46. *Grocott's Penny Mail*, 20 March 1916.

47. CAD: UG 34–14, Report of the Tuberculosis Commission, Cape Town, 1914, pp 125, 133.

48. Mäki, *Water, Sanitation and Health*, pp 112–113.

the cesspools when a pail system was introduced. Emptying the buckets was contracted out just as the emptying of the cesspools had been. This system caused many problems and there was ongoing criticism from residents about inefficient work and nightmen refusing to carry out their duties. The task was still contracted out for economic reasons until 1921, when the municipality took over this service.⁴⁹

In Grahamstown at the beginning of the twentieth century there was a growing awareness of the link between filth and disease, particularly in the long neglected black townships. But municipal authorities turned a blind eye to the health hazards in these areas and when they were reminded of their negligence, they denied the allegations, saying that those making the accusations knew nothing of local conditions and circumstances. The city council only admitted fault when presented with overwhelming evidence – as was the case with the Tuberculosis Commission report in 1914. Sanitation in the black residential areas remained abysmal until well into the twentieth century, partly because the municipality did not have the financial resources for improvements. Indeed, in all matters concerning sanitation, the final decision was made in terms of municipal finance; even more so than with issues of water supply. The removal of cesspools and municipal refuse, improvements in townships and the upgrading of the sewerage system were all postponed for economic reasons.⁵⁰

In sum, Grahamstown municipality was small and its financial resources limited. Most of the improvement schemes were either postponed or rejected because of financial straits and decisions were made only after all other alternatives had been explored. The city council was constantly searching for cheaper alternatives. Despite the fact that the population growth was quite modest there were overcrowded houses and unsanitary streets, largely because of prevailing conditions of poverty.

Durban

Port Natal was established in 1824 on the eastern seaboard of South Africa, where there was plenty of water, although it was not of the best quality. The town's name was changed to Durban in 1842. In 1854, the year when the municipality was established, Bishop John Colenso complained that the water was the greater devil in Durban, because wells were not sunk deep enough to prevent pollution by organic material. The only remedy, he said, was to drink rainwater or the water from the Umgeni River four miles away.⁵¹ Originally most of the wells were privately owned, but by 1877 there were eighteen public wells.⁵² When Durban began to grow, this water supply reached its limit and as early as the 1860s, there were plans to pipe water from nearby rivers. However, this scheme was considered too expensive. Even in the 1870s all such schemes were rejected as being beyond the limited means available.⁵³ The first improvements to the water supply were in 1879, when drilling operations in

49. Mäki, *Water, Sanitation and Health*, pp 228–239.

50. Mäki, *Water, Sanitation and Health*, pp 237–240.

51. J.W. Colenso, *Ten Weeks in Natal. A Journal of a First Tour of Visitation among the Colonists and Zulu Kafirs of Natal* (Macmillan, Cambridge, 1855), p 14.

52. See report on town wells, in Durban Corporation, *The Mayor's Minute for the Year Ended 31 July 1877* (Robinson & Co., Durban, 1877), Annexure D, p 12.

53. Durban Corporation, *The Mayor's Minute for the Year Ended the 31 July 1878* (Robinson & Co., Durban, 1878), pp 9–10.

the Botanic Gardens proved successful. Currie's Fountain, as it came to be called, was Durban's main water source for the next eight years.

By the 1880s, Durban had grown to such an extent that it became necessary to appoint a borough engineer.⁵⁴ The schemes to supply water from nearby rivers were only initiated in 1882 after the appointment of the first incumbent, John F.E. Barnes. He submitted plans for drawing water from three nearby rivers and the town council selected the Umbilo River as the most suitable. This scheme meant that the highest part of the borough could also be supplied with water; it was also financially the most feasible plan.⁵⁵ The Pinetown Waterworks was opened in 1887 but serious droughts in the years 1888 to 1890, combined with an increasing demand for water, forced the town council to begin planning to augment the supply. The actual work was left to the next borough engineer, John Fletcher.⁵⁶ Within five months of his appointment, he submitted his proposals. Then followed in rapid succession: the pumping of water from Umhlatuzana to Umbilo in 1890; the construction of the Umlaas temporary pumping plant in 1891; and the Umlaas gravitation scheme in 1894. In addition, Fletcher began to improve both the drainage and sewerage systems. He also made his mark on Durban's water supply in a number of other ways. Year after year in his annual reports he warned the council of the increasing water consumption and the need to plan ahead. He also removed water meters for domestic consumption; according to him metering was necessary only in places where water was used for making a profit, such as hotels and factories. His view changed when he realised how much water was used for gardening.⁵⁷

There was consensus in Durban on the need for improvements as far as sanitation was concerned. In the 1880s and 1890s, when the main drainage and sewerage schemes were constructed, no one voiced any opposition and the borough engineer had relative freedom to go ahead. However, the waterborne sewerage system had to be postponed until the Umlaas water scheme was built to guarantee sufficient water to flush the sewers. Once this had been done, the new system became operational in 1896. There was also an outlet for waterborne household sewage, which was discharged into the sea during the first few hours of the ebb tide.⁵⁸

An interesting development in Durban, in contrast to Grahamstown, was that the town officials claimed that Africans and Indians benefited from the improved sanitary system.⁵⁹ While in Grahamstown it was commonly held that blacks would simply not appreciate the advantages of sanitation, in Durban from the 1870s onwards there was increasing attention from the white residents of "other" races settling within

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54. On the history of the City Engineer's Department in Durban see R. Lynsky, *They Built a City: Durban City Engineer's Department 1882-1982* (Concept, Durban, 1982).
 55. W.P.M. Henderson, *Durban: Fifty Years' Municipal History* (Robinson & Co., Durban, 1904), pp 226-227.
 56. On John Fletcher, see H. Mäki, "John Fletcher and the Development of Water Supply and Sanitation in Durban, 1889-1918", *Journal of Natal and Zulu History*, 27, 2009, pp 60-82.
 57. Mäki, *Water, Sanitation and Health*, pp 126-129.
 58. A.C. Bjorvig, "Durban 1824-1910: The Formation of a Settler Elite and its Role in the Development of a Colonial City." PhD thesis, University of Natal, 1994, pp 327-328.
 59. 'Borough Engineer's Official Report for the Year 1897-98', in Durban Corporation, *Mayor's Minute with Departmental Reports, Appendices and Balance Sheets for the Municipal Year Ended 31 July 1898* (Robinson & Co., Durban, 1898), p 25.

“their” city.⁶⁰ The building of a waterborne system soon led to the expansion of the sewer network to the suburbs. The municipality also took over the night soil collection in central Durban from the contractors, and public conveniences were provided in the town.

People fleeing the ravages of the Anglo-Boer War of 1899–1902 flocked into colonial Natal and many went to Durban. This placed the local water supply under severe pressure. The base supply was sufficient to cope with the situation, but more storage space was needed. Consequently a temporary dam was built in 1901 at Camperdown.⁶¹ Added to this, the Clear Water Reservoir was built near the Umlaas filters in 1903, and in the mid-1910s, two new service reservoirs were constructed. Durban’s location in one of South Africa’s heaviest rainfall areas also caused problems. The flooding of the Umbilo River in 1905 and again in 1917 caused severe damage to Durban’s water supply. Umbilo Waterworks were destroyed by the flood of 1905 and had to be abandoned after eighteen years of service. The 1917 flood made it all too clear that besides a new dam, the services of a specialised water engineer who could upgrade the water supply system were urgently needed. On a more personal level, the flood was the direct cause of John Fletcher’s resignation after 29 years of service. He fell from his horse while working on the repairs caused by the flood damage and never fully recovered from his injuries.

In Durban, as in Cape Town, financial constraints played a crucial role in the city’s water infrastructure prior to the 1880s; thereafter the situation improved. In the 1880s the first borough engineer was appointed and the council was given the freedom to accept loans for financing large projects. Thereafter, finance only became an issue in the prioritisation of the various schemes. Population growth became of concern during and after the Anglo-Boer War, but the municipality managed to cope with this by damming more rivers and building new storage reservoirs.

Johannesburg

Of the four urban case studies, Johannesburg is the youngest city. It was founded in 1886 when rich gold deposits were discovered on the Witwatersrand, at the time within the borders of the Boer republic of the Transvaal. The development of Johannesburg’s water supply posed two main obstacles. Firstly, there was a struggle between the private concessionaires and the local authorities for control of the water supply. Secondly, a major challenge was to find a reliable water source with sufficient capacity to supply the rapidly growing mining town.

The first problem that arose is linked to the development of Johannesburg municipality. The republican government saw the new town as a mining camp which would simply be abandoned when all the gold had been mined. They were to be proved very wrong. In 1897 Johannesburg acquired municipal status. For the first ten years of its existence, a sanitary board with limited powers was responsible for local

60. See for example M. Swanson, “‘The Asiatic Menace’: Creating Segregation in Durban 1870–1900”, *International Journal of African Historical Studies*, 16, 3, 1983, pp 401–421; and B. Maharaj, “Apartheid, Urban Segregation and the Local State: Durban and the Group Areas Act in South Africa”, *Urban Geography*, 18, 2, 1997, pp 135–154.

61. Bjorvig, “Durban 1824–1910”, pp 325–326.

administration. The board had no control over the water supply, which had been granted (by the Kruger government) as a concession to a private company in 1887.⁶² The Johannesburg Waterworks Estate and Exploration Company controlled Johannesburg's water supply for 15 years but it did not enjoy a monopoly. The most important competitor was the Braamfontein Water Company, which managed the water supply to the northwestern suburbs of Johannesburg.⁶³ Most of the other competitors seem to have been business-oriented ventures; some were probably started just to force the Waterworks Company to buy them out of the market. Other initiatives failed when they fell foul of the government or were unacceptable to the Waterworks Company.⁶⁴

On several occasions the sanitary board envisaged starting its own water supply system, but lack of funds and government resistance wrecked these plans. The board's position was difficult; it could only make proposals to the Waterworks Company and hope that they would be taken into consideration. When a town council was set up in 1897 there was some optimism that the situation would improve. The council had more power than the sanitary board and it initiated negotiations with the Waterworks Company about taking over the management of the water supply. It was only due to the unfortunate murder of Woolf Joel, the chairman of the corporation under which the Waterworks Company operated, that these negotiations came to an end.⁶⁵

Real change only took place after the Anglo-Boer War. The British officials at the helm of administration of the Transvaal Colony (the former Boer republic) were acutely aware that the whole water supply system of the Witwatersrand area had to be revamped. The result was the establishment of the Rand Water Board as a bulk supplier for the region's municipalities and mining companies. It took over the assets of the earlier water companies but gave reservoirs and distribution mains inside the municipal area to Johannesburg, which could then control its own water supplies to the residents and decide how the network would be developed.⁶⁶

The other obstacle to be overcome was the question of supply. At first water had been drawn from local streams and wells but these soon became polluted. The Waterworks Company collected water from springs and stored it in reservoirs, built inside the town area, but from the outset it was clear that a better source had to be found. Various schemes were investigated during the late 1880s and early 1890s. In 1899, local engineers suggested the Vaal River as one possibility.⁶⁷ Sourcing water from the Klip River, Vierfontein, and Wonderfontein, were other options. The first important source was found in Zuurbekom; pumping of water began there in 1898 and it was soon realised that this would meet all Johannesburg's needs.⁶⁸ In the early

62. Tempelhoff, *The Substance of Ubiquity*, pp 28–30.

63. A.P. Cartwright, *Corner House: The Early History of Johannesburg* (McDonald, Cape Town, 1965), p 186.

64. Mäki, *Water, Sanitation and Health*, pp 154–157, 159–161, 172–173.

65. Appelgryn, *Johannesburg*, p 124.

66. J.P.R. Maud, *City Government: The Johannesburg Experiment* (Clarendon Press, Oxford, 1938), p 57; Tempelhoff, *The Substance of Ubiquity*, pp 58–66, 77.

67. See for example J.W.N. Tempelhoff, "On Labum's 'Mystery' Query – A Prehistory of the Vaal River as Water Source of the Witwatersrand (1887–99)", *Historia*, 45, 1, 2000.

68. Leyds, *A History of Johannesburg*, p 54.

twentieth century, the boreholes in Zwartkopjes augmented the supply but this source soon dwindled. The local population explosion, the growing needs of the mining companies and the drought of 1910 caused a crisis in the water supply. In 1913, after two years of examining more than 20 possible schemes, Rand Water Board's management selected the Vaal River as the new source. The construction of the Vaal Barrage, however, was delayed until 1916, due to the First World War (1914–1918), and the project was only completed in 1923. After that, the bulk of Johannesburg's water came from the Vaal River.⁶⁹

Johannesburg faced many of the growing pains experienced by other major cities. Because of the spiralling population, health and adequate sanitary conditions soon posed a major hurdle. Wells were polluted, there were no drainage systems, and health conditions were deplorable; the sanitary board could barely cope. The use of pails was started virtually as the mining camp began, so the cesspool phase was avoided. The pail collecting service was apparently quite a colourful event, remembered by many of the city's early residents.⁷⁰

The first two town engineers, W.H. Miles and Charles Aburrow, both recognised the acute sanitary problem and tried to solve it.⁷¹ Aburrow devised a plan for a waterborne sewerage system in 1895,⁷² but unfortunately, in 1898 Kruger's government came up with the idea of granting a concession for the sewerage service. The council managed to forestall this move, but because of the Anglo-Boer War, Aburrow's plans had to be aborted.⁷³ In the final months of the war and immediately after peace was signed, the sanitary situation grew rapidly worse. The water supply had been disrupted and many residents had to rely on polluted wells and other sources of water. However, the situation changed for the better after the town council was established in 1902. The waterborne sewerage system was built in 1903 and the storm water drainage system in 1904. This improved the situation in the central part of the town but in the suburbs it was quite another matter; pail collection continued.

Another development was the town council's decision to turn Johannesburg into a "whites-only" zone by moving all the black people and those of Asiatic descent to townships outside the municipal boundaries. There was much debate about the expropriation of the so-called "unsanitary area", land in the town where black people had previously been settled. Residents of the so-called "coolie location", for example, were removed to Klipspruit. These removals marked the beginning of the later township system in Johannesburg. It also had all the distinctive characteristics of the

69. Mäki, *Water, Sanitation and Health*, pp 185–188.

70. Maud, *City Government*, p 23; C. Robertson (ed), *Remembering Old Johannesburg* (Ad Donker, Johannesburg, 1986), pp 64, 73; J. Wentzel, *A View from the Ridge: Johannesburg Retrospect* (David Philip, Cape Town, 1975), p 105.

71. On the City Engineer's Department in Johannesburg see G. Grant and T. Flinn, *Watershed Town: The History of the Johannesburg City Engineer's Department* (Johannesburg City Council, Johannesburg, 1992). On early town engineers in Johannesburg see H. Mäki and J. Haarhoff, "Municipal Engineers in Johannesburg and Pretoria before 1910", *TD – Journal for Transdisciplinary Research in Southern Africa*, 5, 2, 2009, pp 230–247.

72. Harold Strange Africana Library: Johannesburg Municipal Archives, JARCH 200A, Report of the Public Works Department, Johannesburg, 1895, pp 15–16.

73. Maud, *City Government*, pp. 45, 58.

“sanitation syndrome”, associated with Cape Town in the final years of the nineteenth and the dawn of the twentieth century.⁷⁴

By the early 1900s the local water supply was reasonable and the construction of a waterborne sewerage system in the town centre had improved sanitation. But there were problems with housing, there being far too few homes to accommodate the rapidly increasing population. The sanitary conditions in the local black settlement areas and the slums near the mining sites were still shockingly bad. The sewerage network was slowly extended into the suburbs and at the same time the pail system was introduced to the new areas. The main sanitary improvement, however, according to the white officials, was the residential separation of the people of colour from the white residential areas; Africans and coloureds were removed to Klipspruit and then to other township areas.⁷⁵

To sum up: Johannesburg is a prime example of population growth negatively affecting the development of water supply and sanitation. Only ten years after its establishment, it had become the most populous urban centre in southern Africa. This caused enormous problems in supplying the residents with water, and more especially in upgrading sanitation. Without proper water supply, a waterborne sewerage system was unthinkable and because water supply was in the hands of private companies, geared only to profit, it remained largely inadequate. The companies only supplied certain areas and were reluctant to expand their networks. Furthermore, in the republican period sanitary matters received little attention because the sanitary board was dependent on the central government for funding. This parlous situation only improved after the establishment of the Rand Water Board and the expansion of Johannesburg’s municipal area. The construction of the waterborne sewerage system was started at about the same time but even this did little to improve conditions in the worst areas – the locations and backyard slums. And yet, as compared to the other case studies in this investigation, in respect of its financial status, Johannesburg was soon in a class of its own.

Health and segregation

From as early as the 1850s the development of the water supply and sanitation of Cape Town, Grahamstown, Durban and Johannesburg were the direct result of an ever-growing demand for more water. Health considerations also became an important priority. Because of these two issues, a very specific racial distinction was made in planning and service delivery in these four South African urban centres. People of colour, especially Africans, became a group apart when it came to the provision of water and sanitation.

In the mid nineteenth century the miasmatic theory on the origin of disease still had some support. It posits that diseases are born in wet, dirty soil when organic material decays.⁷⁶ This theory may perhaps have played a part in early segregation

74. Mäki, *Water, Sanitation and Health*, pp 263–269.

75. H.L. Dugmore, “‘Becoming Coloured’: Class, Culture and Segregation in Johannesburg’s Malay Location, 1918–1939.” PhD thesis, University of the Witwatersrand, 1993, pp 101–102.

76. On the miasmatic theory see for example, D. Porter, *Health, Civilization and the State: A History of Public Health from Ancient to Modern Times* (Routledge, London, 1999), p 82.

policies. Certainly by the early nineteenth century there was an ideological link between blackness, dirtiness and disease.⁷⁷ Black people were thought to be more susceptible to prevailing sicknesses than whites.⁷⁸ Even in the early twentieth century there were still white health officials who saw black slums as seedbeds of infection. Diseases like the plague, tuberculosis and smallpox were said to originate in these poverty-stricken slum areas.⁷⁹

In the 1870s the municipality of Durban attempted to remove Indians who were living within the town limits, and to establish an Indian township. This, it was argued, would remove the “breeding haunts and nursery grounds of disease, misery and discomfort” that were believed to be a menace to the town. Two decades later, in the early 1890s, the Durban city fathers tried again to impose residential segregation upon Indians.⁸⁰ The metaphoric equation of “coolies” with urban poverty and disease became a steady refrain among whites and the preoccupation of health officers in South Africa long before 1900. According to Maynard Swanson “fear of epidemic cholera, smallpox and plague both roused and rationalized efforts to segregate Indians and Africans in municipal locations” especially in Natal and Transvaal.⁸¹ In the Cape Colony, as well as in Durban and Johannesburg, epidemics were used as an excuse to promote “segregationist solutions to social problems”.⁸² Black people were seen as carriers of infectious diseases and this provided the rationale for the removal of African housing to the perimeter of the “white” towns.⁸³

In the Cape in 1895 the colonial MOH pointed to a problem which was increasingly to preoccupy health reformers. It was claimed that in the principal towns in the colony, of every thousand deaths 21,53 were white people. The blame for this “shocking” statistic was placed on the shoulders of local authorities and the poor sanitary services they provided. The role of poverty and the need for health education came to the fore in the early twentieth century only after basic sanitary improvements had become more common.⁸⁴ A public health department was set up in 1897 in the Cape, while in the Transvaal it only came to be organised after 1902. By 1910 most towns had municipal medical officers and hospitals.⁸⁵ In 1899, Cape Town’s MOH recommended the appointment of female sanitary inspectors and ordered a campaign against tuberculosis. He estimated that tuberculosis caused one out of every nine deaths among whites and one out of every seven among black people. The infant

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77. H. Deacon, “Racial Segregation and Medical Discourse in Nineteenth-Century Cape Town”, *Journal of Southern African Studies*, 22, 2, 1996, pp 289–291.
78. R.M. Packard, “Tuberculosis and the Development of Industrial Health Policies on the Witwatersrand, 1902–1930”, *Journal of Southern African Studies*, 13, 2, 1987.
79. See for example R.M. Packard, *White Plague, Black Labour: Tuberculosis and the Political Economy of Health and Disease in South Africa* (University of California Press, Berkeley, 1989); and S. Pamell, “Race, Power and Urban Control: Johannesburg’s Inner City Slum-Yards, 1910–1923”, *Journal of Southern African Studies*, 29, 3, 2003.
80. Durban Corporation, *Mayor’s Minute with Departmental Reports, Appendices and Balance Sheets for the Municipal Year Ended 31 July 1891* (Robinson & Co., Durban, 1891), p. 3.
81. Swanson, “The Sanitation Syndrome”, p 390.
82. Swanson, “The Sanitation Syndrome”, p 387.
83. Swanson, “The Sanitation Syndrome”, p 387.
84. C. Simkins and E. van Heyningen, “Fertility, Mortality, and Migration in the Cape Colony, 1891–1904”, *The International Journal of African Historical Studies*, 22, 1, 1989, p 82.
85. S. Marks and N. Andersson, “Typhus and Social Control in South Africa: 1917–1950”, in R. MacLeod and M. Lewis (eds), *Disease, Medicine, and Empire: Perspectives on Western Medicine and the Experience of European Expansion* (Routledge, London, 1988), p 260.

mortality rate was reported to be 155/1 000 among the whites and 261/1 000 among the coloured population.⁸⁶

Bubonic plague hit Cape Town in 1901. At the time the city was slum-ridden and whites were in daily contact with their black servants. The outbreak of the plague led to a call for a location where Africans could be housed under controlled conditions. Ndabeni township was rapidly constructed and soon housed 7 000 African residents.⁸⁷ The plague led to the establishment of African townships in other towns too. In Port Elizabeth, for example, the old settlements were demolished and a new township, named New Brighton, was built six kilometres from the town centre.⁸⁸ When the plague hit Johannesburg, local authorities removed people from the inner town “coolie location” to the new township of Klipspruit.⁸⁹ Outbreaks of diseases like smallpox in 1882, and bubonic plague in 1901, forced the government out of its reluctance to pay for the building of hospitals in the townships. As the new century progressed and there was improved state revenue, the government also gave attention to segregating institutions such as prisons.⁹⁰

Conclusion

Based on these four case studies, some generalisations on the development of municipal services in South Africa can be made. Issues such as public health, the physical environment, the existing social framework, the availability of experts and population growth, all influenced the progress made in local governance.

The physical environment includes the availability of water. When a settlement was established in a place where there were abundant water sources, building water supply infrastructure was easier, as seen in the case of Durban. Once the necessary by-laws had been passed, financial issues solved and appointments made of efficient staff with the necessary expertise, the schemes were able to move ahead rapidly. Where there were problems with the availability of water the process was slower, as seen in the case of Johannesburg. The mushrooming population; a social framework that did not support the settlement; and the scarcity of water, all contributed to a worst-case scenario. Johannesburg also provided an example of private enterprise as a solution to the provision of water. Here it was a case of a particular policy laid down by the republican government, which favoured privatisation and awarded a concession to a private company. The Johannesburg Waterworks Company was far from successful and failed to meet the needs of the

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86. E.W. Slinger, *Cape Town's 100 Years of Progress: A Century of Local Government* (Pennon, Cape Town, 1968), p 14; J.R Shorten, *Cape Town* (John R. Shorten, Cape Town, 1963), pp 272–273.
87. P. Maylam, “The Rise and Decline of Urban Apartheid in South Africa”, *African Affairs*, 89, 354, 1990, p 61.
88. A.J. Christopher, “Apartheid Planning in South Africa: The Case of Port Elizabeth”, *The Geographical Journal*, 153, 2, 1987, p 197; Swanson, “The Sanitation Syndrome”, pp 400–407.
89. P. Maylam, “Explaining the Apartheid City: Ten Years of South African Urban Historiography”, *Journal of Southern African Studies*, 21, 1, 1995, pp 24–25.
90. V. Bickford-Smith, “South African Urban History, Racial Segregation and the Unique Case of Cape Town?”, *Journal of Southern African Studies*, 21, 1, 1995, pp 73–74. On segregation in other institutions in Cape Town see Deacon, “Racial Segregation and Medical Discourse”.

public. For example, it refused to make water available to some working-class areas until the municipality had paid for the water.

At an organisational level, Cape Town already had some infrastructure and water supply management before the municipality began its work in 1840. The appointment of the first town engineer in 1854 was probably linked to the building of the new reservoirs. In Grahamstown, the first town engineer also took office in the 1850s and was involved in the construction of the Grey Reservoir. This appointment was terminated when the reservoir was completed and the post was not filled again until 1879. In Durban, the borough engineer was appointed in 1882, a full 28 years after the establishment of the borough. The sole reason for his appointment was the need for a qualified engineer to supervise the construction of a drainage system and waterworks. In Johannesburg, the first town engineer was appointed soon after the founding of the town in 1889.

An analysis of the circumstances impacting upon the development of the water supply reveals that population growth was of primary importance. Grahamstown is the only case where this did not have a direct effect on water supply. In Johannesburg growth was phenomenal; within a mere ten years it became the biggest urban centre in southern Africa. The sanitary board and its successors were hamstrung; they could do very little before the establishment of the Rand Water Board. The Johannesburg Waterworks Company did not even try to solve the water supply problem; it was quite happy supplying water to central Johannesburg and refused to spread the network into outlying areas. In Cape Town and in Durban the increase in population also forced the hand of the town fathers. In Durban it became an issue during the Anglo-Boer War, but the municipality was able to manage the crisis because it had rivers to dam and could build more storage reservoirs. Cape Town could cope with the immigration until the 1900s; use was made of water from Table Mountain, but by that time, the growth of outlying councils made the water supply to the Cape Peninsula problematic. The result was that these municipalities were forced to merge with Cape Town in 1913; water supply and sanitation issues thus became centralised.

A vitally important factor influencing the development of water supplies was municipal finance. This is seen in the case of Grahamstown, where the lack of funds frequently affected decisions. Only when there was no other viable alternative did the town council agree to build reservoirs. In Durban, municipal finance impacted on the provision of water until the 1870s; after the appointment of the first borough engineer there was more freedom to take loans to finance ambitious schemes. In Cape Town, after the victory of the “Clean Party”, the municipality was given increased authority; thereafter no water supply scheme was rejected solely for economic reasons. In Johannesburg, municipal finance did not really affect the water supply until 1905, when the municipality took over the distribution system and reservoirs inside municipal area.

If we then look at the development of sanitation infrastructure there are three important issues. The first is the interrelation between the water supply and sanitation. In each of the case studies it became apparent to town managers that to improve sanitation a waterborne sewerage system was needed. However, before that could be constructed the available water supply had to be augmented to a level that would flush the sewers. In Cape Town and Durban, this point was reached in the 1890s; in

Johannesburg it was after the establishment of the Rand Water Board; and in Grahamstown, it was only in the 1930s that the water supply could sustain such improvements.

Grahamstown provides an example of the second consideration involved in upgrading sanitation, namely the lack of funds. As with water supply, the municipality's financial status meant that such improvements were slow in coming. Time after time plans had to be shelved due to financial constraints. In the case of Johannesburg, the sanitary board suffered similar limitations. On paper it had the power to improve the sanitation but because it was economically dependent on the republican government, it could do very little. Only after the Anglo-Boer War, and under a new administration, did this situation improve. In Cape Town and Durban, municipalities initially had limited authority to seek loans. However, in both cities these circumstances improved by the 1880s.

The third issue of relevance in the upgrading of poor sanitation was the attitude of the ruling class and the municipal officials towards the poor and people of colour. Many whites saw those of other population groups as a threat to their health. Regardless of evidence to the contrary, the miasmatic theory linking blackness, dirtiness, and disease was still prevalent among white officialdom at the beginning of the twentieth century. In many cases, African, coloured, or Indian residential areas were regarded as a major sanitary risk. There were certainly those who thought that the living conditions in poverty-stricken areas should be improved and realised that whites are just as susceptible to disease as are blacks, but they were a small minority. Many whites felt that the best way to solve the problem was to relocate people of colour to settlements outside the city limits. In Cape Town and Johannesburg the authorities resorted to the forced removal of these people away from the town centre after bubonic plague epidemics in 1901 and in 1904. In Durban this was also done, but on a smaller scale, when the Indian squatters were removed from the marshy areas in the town. Safeguarding public health was cited as the motivation for these forced removals. Grahamstown is the only case (within the period under discussion) where there were no forced removals, but this was probably because of its relatively small population. The case studies also revealed that although some health officials identified what they saw as the link between poor sanitation and disease, they were unable to persuade others to make the necessary improvements.

Abstract

Environmental health had its modern-day roots in the sanitation and public health movement of the United Kingdom in the nineteenth century. The field addresses all human health-related aspects of both the natural environment and the built environment. In this article the focus is on issues of safe water and sanitation in Cape Town, Grahamstown, Durban and Johannesburg in the period 1840–1920. At the time the introduction and augmentation of water supply and sanitary reform were among the most important municipal issues to be addressed, along with the reduction of fire risks and the establishment of a financially effective administration. The links between health, racial segregation and differences in the provision of municipal services are also discussed in some detail. It will be shown that in conducting their work, local officials, together with the colonial authorities, set up a framework for local administration that was similar to governance structures in the UK. However,

there were certainly unique elements in the evolution of local governments in South Africa.

Opsomming

Vergelyking van ontwikkelinge in watervoorsiening, sanitasie en omgewingsgesondheid in vier Suid-Afrikaanse stede, 1840-1920

Omgewingsgesondheid het sy hedendaagse oorsprong in die openbare gesondheidssbeweging van Brittanje in die negentiende eeu gehad. Hierdie betrokke terrein ondersoek gesondheidsgebaseerde aspekte van die natuurlike en beboude omgewing. In hierdie artikel is die fokus op kwessies van veilige drinkwater en sanitasie in Kaapstad, Grahamstad, Durban en Johannesburg in die tydperk c. 1840–1920. In hierdie era het die aanvulling van die bestaande watervoorrade en saniteitshervorming prominent in munisipale kringe ter sprake gekom. Daar was ook kwessies rondom risikovermindering in gevalle van stedelike brand-insidente. Terselfdertyd het plaaslike owerhede daarna gestreef om hulle finansies goed te bestuur en administrasie te verbeter. Die skakels tussen gesondheid, rassesegregasie en verskille in die voorsiening van munisipale dienste word ook bespreek. Daar word aangedui dat amptenare in samewerking met die koloniale owerhede daarin geslaag het om 'n raamwerk vir plaaslike regering daar te stel wat met soortgelyke stelsels in die Verenigde Koninkryk ooreengestem het. Tog wil dit ook voorkom asof Suid-Afrikaanse omstandighede ook vereis het dat voorsiening vir die ontwikkeling van 'n unieke stelsel gemaak word.

Keywords

Environmental health; South Africa; water supply; sanitation; public health; municipal services; urbanisation; Cape Town; Grahamstown; Durban; Johannesburg.

Sleutelwoorde

Omgewingsgesondheid; Suid-Afrika; watervoorraad; sanitasie; openbare gesondheid; munisipale dienste; verstedeliking; Kaapstad; Grahamstad; Durban; Johannesburg.