

Paradise for Whom? Conservatism and Progress in the Perception of Rio de Janeiro's Drinking-Water Supply, Sixteenth to Nineteenth Centuries

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Abstract. This article examines the ways in which the perception of Rio de Janeiro's drinking water contributed to shaping the city's hydric management in colonial and imperial times. Even though the general assessment of climate and vegetation changed from paradisiacal to noxious in the second half of the eighteenth century in accordance with Enlightenment ideas, this had no effect on the locals' appreciation of the city's drinking water. The criteria for evaluating the quality and quantity of available water were based on works from classical antiquity and remained essentially unchanged from early colonial times to the end of the empire. Not even population growth and increasing susceptibility to epidemics in the nineteenth century induced the authorities to reform the water supply system, as they were confident that the city was provided with good and abundant water by virtue of its natural predisposition.

Keywords: water supply, Rio de Janeiro, urban history, environment, public health

Introduction

One of the characteristic traits of nineteenth-century Brazil was the discrepancy between its highly conservative political system and an often distinctly progressive rhetoric. Sérgio Buarque de Holanda commented on this phenomenon in his seminal *Roots of Brazil*, originally published in 1936, as follows:

The impersonal ideology of democratic liberalism never came naturally to us. [...] Rural and semi-feudal aristocrats imported it and tried to accommodate it, wherever

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* I am grateful to Tamar Herzog, Susan Fitzpatrick-Behrens, Malte Griesse and Martin Biersack as well as to the anonymous peer reviewers and editors for their helpful comments on various versions of this article. Thanks also go to William Templer and to Virginia Catmur for revising my English. The research was supported by funding from the Alexander von Humboldt-Foundation and the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 659520.

possible, to their rights and privileges, those same privileges that were the target of the struggle of the bourgeoisie against the aristocracy in the Old World. Thus, they were able to incorporate into our traditions, at least as an external façade or ornament, those slogans that seemed most appropriate for the time and that were glorified in our books and speeches.¹

Buarque de Holanda characterised Brazil's political and social order as reactionary and aristocratic, albeit those in power seemingly defended progressive and liberal values. Other scholars identified similarly perfunctory adoptions of European attitudes regarding urban life style, cultural activities and science and technology.² Recent historiography, however, has challenged this estimation by drawing on a broader understanding of culture and bringing into focus local practices of science, especially in the fields of medicine, mineralogy and agriculture.³ These studies, which reveal that Brazilians were in fact highly innovative in many fields, are predominantly concerned with particularly Brazilian phenomena, such as the use of endemic medicinal plants, the curing of tropical diseases, or the conservation of soil fertility in torrid environments. The question that interests me, however, is not in which fields Brazilian society did succeed or fail, but why it remained passive regarding a number of technological problems that virtually asked for solutions on a global level. Focussing on one concrete example: how did it come about that a well-informed urban elite like that of Rio de Janeiro was so reluctant to modernise the city's drinking-water supply?

Hence, in this article, I seek to demonstrate that there existed a consistently positive perception of Rio de Janeiro's water provision among the Brazilian elite. Though it did allow for some pragmatic interventions it also served to

¹ Sérgio Buarque de Holanda, *Roots of Brazil* (Notre Dame, IN: University of Notre Dame Press, 2012), p. 129.

² Richard Graham, *Britain and the Onset of Modernization in Brazil, 1850–1914* (Cambridge: Cambridge University Press, 1968), pp. 9–22, 112, 120. See also Roberto Schwarz, *Misplaced Ideas: Essays on Brazilian Culture* (London: Verso, 1992).

³ For a recent overview on healing practices, see Kalle Kanaoja, 'Infected by the Devil, Cured by *Calundu*: African Healers in Eighteenth-century Minas Gerais, Brazil', *Social History of Medicine*, 29: 3 (2016), pp. 490–511. Júnia Furtado has even asserted that the barber-surgeons in the forests and hinterlands of colonial Brazil, although drawing on popular knowledge, 'became the most innovative contributors to the study of tropical medicine': Júnia Ferreira Furtado, 'Tropical Empiricism. Making Medical Knowledge in Colonial Brazil', in James Delbourgo and Nicholas Dew (eds.), *Science and Empire in the Atlantic World* (New York: Routledge, 2008), pp. 127–51, here p. 132. For academic sciences, see Sílvia F. de M. Figueiróa, 'Mundialização da ciência e respostas locais: sobre a institucionalização das ciências naturais no Brasil (de fins do século XVIII à transição ao século XX)', *Asclepio*, 50: 2 (1998), pp. 107–23; Sílvia Figueiróa and Clarete da Silva, 'Enlightened Mineralogists: Mining Knowledge in Colonial Brazil, 1750–1825', *Osiris*, 15: 1 (2001), pp. 174–89; Júnia Ferreira Furtado, 'Enlightenment Science and Iconoclasm: The Brazilian Naturalist José Vieira Couto', *Osiris*, 25 (2010), pp. 189–212; Rogério Ribeiro de Oliveira and Verena Winiwarter, 'Toiling in Paradise: Knowledge Acquisition in the Context of Colonial Agriculture in Brazil's Atlantic Forest', *Environment and History*, 16 (2010), pp. 483–508.

justify the government's prolonged inactivity, especially in the second half of the nineteenth century. This was not an expression of inability, but rather the result of the notion of being in possession of superior natural conditions. Against the backdrop of the imperturbable conservative social order, it prevented a thorough engagement in the improvement of the water infrastructure. The Brazilians' perception was in opposition to a number of broadsides from foreign visitors, who felt inclined to subject the water situation to harsh criticism in their accounts of the city, although others were full of praise. As was the case with the political and social regime, described so well by Buarque de Holanda, the management of Rio de Janeiro's water supply was fundamentally conservative and even aristocratic. Brazilian elites confidently followed their own long-established truth, not acknowledging that the changes in the social setting called for new and more refined approaches.⁴

First Assessments of the Water Quality

Rio de Janeiro is situated in a natural landscape of breath-taking beauty. It is surrounded by mountains covered with rainforests and permeated by rivers, and has a tropical climate with a high level of humidity and frequent heavy rainfalls. At first sight this does not seem to be an environment where water supply would be a major problem. Nonetheless, water was an issue of discussion from the early days of colonisation. The Portuguese first arrived in 1502. The city, however, was founded only in 1565, to defend the territory against other European invaders, most importantly the French, who had been able to establish a small colony there a decade before.⁵ After provisionally founding the city at the entry to the Bay of Guanabara, in 1567 the Portuguese relocated

⁴ On drinking water in general, see Christopher Hamlin, 'Water', in Kenneth Kiple and Kriemhild Coneè Ornelas (eds.), *The Cambridge World History of Food*, vol. 1 (Cambridge: Cambridge University Press, 2000), pp. 720–30; Gunther Hirschfelder and Lars Winterberg, '... weil man das Wasser trinken kann? Aspekte kultureller Wertigkeit und sozialer Distinktion', in Gunther Hirschfelder and Angelika Ploeger (eds.), *Purer Genuss? Wasser als Getränk, Ware und Kulturgut* (Frankfurt am Main: Campus Verlag, 2009), pp. 109–31; Leslie Tomory, 'The Question of Water Quality and London's New River in the Eighteenth Century', *Social History of Medicine*, 27: 3 (2014), pp. 488–507. On the water supply of Rio de Janeiro, see Rosauro Mariano Silva, 'A luta pela água', in Fernando Nascimento Silva (ed.), *Rio de Janeiro em seus quatrocentos anos. Formação e desenvolvimento da cidade* (Rio de Janeiro: Distribuidora Record, 1965), pp. 311–37; Maurício de Almeida Abreu, 'A cidade, a montanha e a floresta', in Maurício de Almeida Abreu (ed.), *Natureza e sociedade no Rio de Janeiro* (Rio de Janeiro: Secretaria Municipal de Cultura, Turismo e Esportes, 1992), pp. 54–103; Diogo de Carvalho Cabral, 'Águas passadas: sociedade e natureza no Rio de Janeiro oitocentista', *Ra'e Ga. O Espaço Geográfico em Análise*, 23 (2011), pp. 159–90; Jaime Larry Benchimol, *Pereira Passos. Um Haussmann tropical. A renovação urbana da cidade do Rio de Janeiro no início do século XX* (Rio de Janeiro: Secretaria Municipal de Cultura, Turismo e Esportes, 1992).

⁵ For a succinct history of the city see Armelle Enders, *Histoire de Rio de Janeiro* ([Paris]: Fayard, 2000).

it to the top of a nearby hill, which later became known as Morro do Castelo. There was a well on this hill, but the inhabitants did not drink from it because its water was brackish.⁶ The plain below was even less suited to sinking wells, being a landscape of saline marshes, swamps and lagoons. Most of the population therefore sent their slaves (or, in the case of the very few city-dwellers who did not own slaves, went themselves) to fetch drinking water from the Carioca river, which originated on the Corcovado mountain in the nearby Tijuca massif and flowed into the Atlantic at today's district of Catete, some 2.5 km south of Morro do Castelo.⁷

Although the inhabitants did not dispose of a proper water supply in the settlement or its immediate environs, most of the travellers who visited Rio de Janeiro in the early colonial period praised the city for its waters. In fact, at the outset of the *Descobrimentos*, good and abundant waters were a feature attributed to Brazil in general. Ship's clerk Pero Vaz de Caminha wrote in his letter to King Manuel after the first landing by Portuguese in the continent: 'The waters are many, infinite. And [the land] is so gracious that in our wanting to make use of it, it will provide everything, because of the goodness of its waters.'⁸ Missionaries who soon started to visit Brazil interpreted the good quality of its waters as one of the four indicators of the presence of the earthly paradise.⁹ Together with the temperate climate, water was thought to make Brazil a place of purity and fertility, able to meet all human needs. Regarding in particular the region of Rio de Janeiro, one of the first Europeans to praise its water was the ship's pilot Nicolas Barré, who took part in the French colonisation project. He wrote to his friends in Paris in the 1550s: 'The territory is irrigated by very lovely streams of fresh water, of the cleanest I have ever drunk.'¹⁰

⁶ Fernão Cardim, 'Narrativa epistolar de uma viagem e missão jesuítica ...', in Fernão Cardim, *Tratados da terra e gente do Brasil*, ed. Ana Maria de Azevedo (Lisbon: Comissão Nacional para as Comemorações dos Descobrimentos Portugueses, 1997), p. 268.

⁷ Gabriel Soares de Sousa, 'Tratado descritivo do Brasil em 1587', *Revista do Instituto Histórico e Geográfico Brasileiro (RIHGB)*, 14 (1851), p. 83.

⁸ Maria Paula Caetano and Neves Aguiar (eds.), *Carta de Pêro Vaz de Caminha a el-rei D. Manuel sobre o achamento do Brasil* (Mem Martins: Publicações Europa-América, 1987), p. 97.

⁹ Simão de Vasconcelos, *Chronica da Companhia de Jesu do estado do Brasil* (Lisboa: A. J. Fernandes Lopes, 1865), p. 142. For a discussion of the earthly paradise topic, see Sérgio Buarque de Holanda, *Visão do Paraíso: Os motivos edênicos no descobrimento e colonização do Brasil* (São Paulo: Companhia das Letras, 2010 [1959]); Laura de Mello e Souza, *The Devil and the Land of the Holy Cross: Witchcraft, Slavery, and Popular Religion in Colonial Brazil* (Austin, TX: University of Texas Press, 2003 [1986]), pp. 3–21; Jean Delumeau, *Une histoire du Paradis*, vol. 1: *Le Jardin des délices* (Paris: Fayard, 1992), pp. 145–52.

¹⁰ Nicolas Barré, 'Copie de quelques lettres sur la navigation du cheuallier de Villegaignon', in Henri Ternaux-Compans (ed.), *Archives des voyages, ou Collection d'anciennes relations*, vol. 1 (Paris: A. Bertrand, 1840), p. 110.

The availability of fresh water was of the utmost importance for the settlers. According to Renaissance scholars, the existence of good and abundant water was a *sine qua non* for the founding of any proper city. The humanist and architect Leon Battista Alberti emphasised the importance of water in his influential treatise *On the Art of Building*; water figured prominently in the *Ordenanzas* decreed by Philip II for town planning in Spanish America; and it was likewise a demand in the official instructions given to Tomé de Sousa, the Portuguese governor-general commissioned to found the first Portuguese city in America, Salvador de Bahia, in 1548.¹¹ As becomes evident from various types of city description, from ancient and medieval *laudes urbium* to nineteenth-century medical topographies, the quality of the drinking water was an important marker for the assessment of the quality of the city itself.¹² To declare that Rio de Janeiro was well supplied with water (even if its ground water was actually brackish) strengthened the legitimacy and standing of the city and colony.

But what did it mean for a city to have good and abundant water? According to which categories would contemporaries judge the quality of water? Leon Battista Alberti explained that the best water was that which contained ‘nothing foreign, nothing bad’, warning that ‘unless it is very pure, uncontaminated by any viscous element, and free of all defect in taste or smell, it will undoubtedly be very detrimental to health’.¹³ Alberti discussed many opinions from Antiquity and the Renaissance about the diverse properties of water – or waters, as the term referred to a class of substances rather than a single substance.¹⁴ According to these views, waters varied from place to place, their characteristics depending on the situation of their origin and the courses they travelled. As had been expressed by, among others, Hippocrates and Pliny the Elder, running waters were thought to be much superior to stagnant waters, and spring waters were better than well waters.¹⁵ Another favourable indicator of water quality, which according to Alberti had been

¹¹ Leon Battista Alberti, *On the Art of Building in Ten Books*, ed. Joseph Rykwert and Robert Tavernor (Cambridge, MA: MIT Press, 1988), pp. 12–15; ‘Nuevas ordenanzas de descubrimiento, población y pacificación de las Indias’, Document 84 in Francisco de Solano (ed.), *Normas y leyes de la ciudad hispanoamericana*, vol. 1: 1492–1600 (Madrid: Consejo Superior de Investigaciones Científicas, 1996), pp. 194–218; ‘Regimento de Tomé de Sousa (17.12.1548)’, in Marcos Carneiro de Mendonça (ed.), *Razes da formação administrativa do Brasil*, vol. 1 (Rio de Janeiro: Instituto Histórico e Geográfico Brasileiro, 1972), p. 38.

¹² Carl Joachim Classen, *Die Stadt im Spiegel der Descriptiones und Laudes urbium in der antiken und mittelalterlichen Literatur bis zum Ende des zwölften Jahrhunderts*, 2nd edn (Hildesheim: Georg Olms Verlag, 1986).

¹³ Alberti, *On the Art*, p. 331.

¹⁴ Hamlin, ‘Water’, p. 721.

¹⁵ Hippocrates, ‘Airs, Waters, Places. An Essay on the Influence of Climate, Water Supply and Situation on Health’, in G. E. R. Lloyd (ed.), *Hippocratic Writings* (Harmondsworth: Penguin, 1978), pp. 148–69; Pliny the Elder, *The Natural History*, ed. John Bostock and Henry T. Riley (London: Taylor and Francis, 1855), book 3, chap. 21.

highlighted by the Roman writer Columella, was that it came down from stony precipices.¹⁶

Although at the beginning of colonisation there existed a strong presupposition that Rio de Janeiro's waters were good and abundant without the need for providing evidence, later the property of falling from cliffs was repeatedly remarked upon regarding the water of the Carioca river. In 1730, for example, Sebastião da Rocha Pita, the major chronicler of colonial Brazil, praised the river's 'pure and crystalline waters, which after penetrating the hearts of many mountains, emerged from high rocks'.¹⁷ In fact, differently from what might have been expected given the general appreciation of Rio's waters, in practice only Carioca water was considered to be good enough for drinking. As we know from chronicler Agostinho de Santa Maria, who drew on information stemming from the beginning of the eighteenth century, the inhabitants ensured that their water was not taken from any other source by asking the slaves to 'cover the pitchers and barrels in which they transported it with branches and leaves from herbs that grow only there [at the Carioca]'.¹⁸

Enlightenment Travellers' Perceptions of the Water

This 'mark of origin' became obsolete after the completion of the great Carioca aqueduct, which delivered the river's water to much nearer to the city. Already at the beginning of the seventeenth century, the space on Morro do Castelo had become too small for the growing population. The settlement had descended to the plain, and the inhabitants had started to drain the swampy substrate and fill the lagoons, reclaiming new areas for the expansion of the city. Until the end of the seventeenth century, urban development was relatively slow, but from then on the city began to prosper following the discovery of gold in the backlands of Minas Gerais. When the aqueduct was completed in 1723, the city had about 20,000 inhabitants, thus equalling the size of Utrecht, Mantua and Montpellier.¹⁹ In 1763, it was declared the capital of the colony and seat of the viceroy, replacing Salvador de Bahia in this function.

It was approximately at this time, the middle of the eighteenth century, that travellers' opinions about the water started to become more diverse. While

¹⁶ Alberti, *On the Art*, p. 333. Hippocrates diverged from this opinion, saying that 'water from rock springs [...] is bad since it is hard, heating in its effect, difficult to pass and causes constipation': 'Airs, Water, Places', p. 153.

¹⁷ Sebastião da Rocha Pita, *História da América Portuguesa*, ed. Mário Guimarães Ferri (Belo Horizonte: Editora da Universidade de São Paulo, 1976), p. 65.

¹⁸ Agostinho de Santa Maria, *Santuário mariano, e historia das imagens milagrosas de nossa senhora*, vol. 10 (Lisbon: Antonio Pedrozo Galram, 1723), p. 20.

¹⁹ Tertius Chandler, *Four Thousand Years of Urban Growth. An Historical Census* (Lewiston, NY: St. David's University Press, 1987), pp. 21, 25.

some travellers continued to praise it, the British in particular, who were by now well into their own expansionist phase, often criticised the supply. Furthermore, water was no longer judged by its essence alone but in association with Portuguese colonisation achievements. The Spanish nobleman Juan Francisco de Aguirre was one of the visitors who was still full of admiration. In his description of the city, which he had visited in 1782, he affirmed: 'One of the things which seemed to us most appreciable in Rio is the abundance of waters and fountains for the service of its public.'²⁰ In a similar stance, Aeneas Anderson, the personal attendant of Lord Macartney on his mission to China, who passed through Rio de Janeiro in 1792, deeply admired the 'stupendous aqueduct'. He considered the structure to be an architectural and technical accomplishment, making the highly enchanting natural landscape even more perfect. And he also acknowledged, like so many had done before him: 'Th[e] water is of the best quality and is withal so very abundant, as not only to afford an adequate supply for all the wants of the inhabitants, but to furnish the ships that come into the harbour with this necessary element.'²¹

The first traveller who had a clearly distinct vision had been James Cook. He made a stopover in Rio de Janeiro on his first expedition to the South Pacific, in 1768. According to the editor of his journal, he made the following comment:

[The city] is supplied with water from the neighbouring hills, by an aqueduct, which is raised upon two stories of arches, and is said in some places to be at a great height from the ground, from which the water is conveyed by pipes into a fountain in the great square that exactly fronts the Viceroy's palace. [...] The water at this fountain however is so bad, that we, who had been two months at sea, confined to that in our casks, which was almost always foul, could not drink it with pleasure. Water of a better quality is laid into some other part of the town, but I could not learn by what means.²²

Although expressing some admiration for the external appearance of the aqueduct, Cook thoroughly despised the water that was transported through it. By alluding to the availability of better water from another source, he put into question the functionality of the aqueduct. Apparently the Portuguese had been so incompetent that they had erected a sumptuous structure but channelled the wrong water, or spoiled originally good water by letting it run

²⁰ Juan Francisco de Aguirre, 'Diario', *Anales de la Biblioteca*, 4 (1905), p. 72.

²¹ Aeneas Anderson, *A Narrative of the British Embassy to China in the years 1792, 1793, and 1794* (London: J. Debrett, 1795), pp. 16, 22–3.

²² John Hawkesworth, *An Account of the Voyages Undertaken by the Order of His Present Majesty for Making Discoveries in the Southern Hemisphere*, vol. 2 (London: W. Strahan and T. Cadell, 1773), pp. 27–8.

through a defective construction. Looking into the report in greater detail, it is possible to discern an overall pattern of interpretation suggesting that the Portuguese colonising project as a whole had failed. For example, the futility of Portuguese efforts shows up clearly in comments referring to plants. On the one hand, the author of the report was full of praise: ‘The country, at a small distance round the town [...] is beautiful in the highest degree; the wildest spots being varied with a greater luxuriance of flowers, both as to number and beauty, than the best gardens in England.’²³ However, when he came to culinary plants, he explained that ‘there are indeed little patches or gardens, in which many kinds of European garden stuff are produced, particularly cabbages, peas, kidney-beans, turnips, and white radishes, but all much inferior to our own’.²⁴ This matches with the perception that the water conducted through the aqueduct, considered as an achievement of colonisation, was bad, while there was another source of water of good quality.

With this interpretation, Cook reversed the strong belief of many Europeans of the early modern era, and especially of the Portuguese, that they were able to influence nature in a way to build a world responding to their needs. Regarding the construction of aqueducts, this had been expressed by, among others, the sixteenth-century humanist João de Barros when praising the Portuguese king for bringing water to the town of Évora, ‘defeating nature with art’ and ‘overcoming the defects of the place by giving health and delight to the people’.²⁵ The resentment felt by Cook’s expedition towards conditions in Rio de Janeiro was probably rooted in a deep prejudice against the Portuguese nation, whom the British thought to be backward and incompetent and thus ineffective as colonisers.²⁶ This feeling was confirmed and enhanced by the rather harsh reception accorded to Cook and his entourage by the governing viceroy Conde de Azambuja, whom they described as an ignorant despot impeding educated people from fulfilling their scientific mission.²⁷

Several later travellers openly refuted Cook’s assessment of the water. Friedrich Ludwig Langstedt, for example, a German clergyman who visited Rio de Janeiro in 1782, remarked ‘We received fresh water which was transported through an artificial conduit from fairly far in the country. It tasted

²³ *Ibid.*, pp. 31–2.

²⁴ *Ibid.*, pp. 32–3.

²⁵ João de Barros, *Panegíricos*, ed. Manuel Rodrigues Lapa (Lisbon: Livraria Sá da Costa, 1937), p. 76.

²⁶ Mary del Priore, ‘Descobrimdo “um no outro”: o olhar do Marquês de Lavradio e os mazombos’, *RIHGB*, 161: 407 (2000), pp. 109–30; Gavin Daly, ‘A Dirty, Indolent, Priest-Ridden City: British Soldiers in Lisbon during the Peninsular War, 1808–1813’, *History*, 94: 316 (2009), pp. 461–82.

²⁷ Ângela Domingues, ‘Oficiais, cavalheiros e concorrentes: o “Brasil” nas viagens de circunavegação do século das Luzes’, *Revista das Índias*, 73: 258 (2013), pp. 365–98.

much better and was not as harmful as it is sometimes described in travel accounts.’²⁸ According to George Staunton, a fellow traveller of Aeneas Anderson in the embassy to the Chinese court, ‘the water was remarkably good, and kept better at sea than any other’. He attributed ‘the contrary opinion of Captain Cook to some accidental impurities remaining in the casks he filled with it’.²⁹

Nevertheless, the account of Cook’s expedition was extremely influential and it matched the perception of the tropics that originated in the Enlightenment and accompanied the increasing involvement of northern Europeans in the exploration of the equatorial regions.³⁰ It relied heavily on the revival of Hippocratic thought, which advocated the superiority of temperate climates, suggesting not only a bad influence emanating from the hot and humid climate of the tropics on health, but, according to thinkers like the Comte de Buffon, even having a deleterious effect on the human race itself.³¹ These ideas transcended a wide spectrum of cultural and social thought, including medicine, science, philosophy, art and politics, and were synthesised most prominently in Montesquieu’s *Spirit of the Laws*, which defended the view that climate determined the customs and laws of countries.³² Climate and topography were now endowed with moral significance. Tropicality no longer just stood for fertility and exuberance, but also for cruelty, disease and oppression. Moreover, the city of Rio de Janeiro was located not only in the tropics but also in a landscape densely interspersed by swamps. From swamps allegedly arose the poisonous exhalations called miasmas, which were thought to be of even more intense morbidity in the tropics than in Europe. Together with the moist and the warm air, these elements were thought to have most detrimental effects on health, body and ultimately civilisation. The once paradisiacal image of the tropics shifted towards a pestilential one. And this change also had had its effects on the perception of the drinking water.

²⁸ Friedrich Ludwig Langstedt, *Reisen nach Südamerika, Asien und Afrika* (Hildesheim: Tüchtfeld, 1789), p. 56.

²⁹ George Staunton, *An Authentic Account of an Embassy from the King of Great Britain to the Emperor of China*, vol. 1 (Philadelphia, PA: Robert Campbell, 1799), p. 79.

³⁰ David Arnold, *The Problem of Nature: Environment, Culture and European Expansion* (Oxford: Blackwell, 1996), especially pp. 141–68; Nancy Leys Stepan, *Picturing Tropical Nature* (Ithaca, NY: Cornell University Press, 2001).

³¹ Mark Carey, ‘Inventing Caribbean Climates. How Science, Medicine, and Tourism Changed Tropical Weather from Deadly to Healthy’, *Osiris*, 26: 1 (2011), pp. 129–41; Chen Tzoref-Ashkenazi, ‘The Experienced Traveller as a Professional Author: Friedrich Ludwig Langstedt, Georg Forster and Colonialism Discourse in Eighteenth-Century Germany’, *History*, 95: 1 (2010), pp. 2–24.

³² Charles Louis de Secondat de Montesquieu, *The Spirit of the Laws*, trans. and ed. Anne M. Cohler, Basia Carolyn Miller and Harold Samuel Stone (Cambridge: Cambridge University Press, 1989).

The Pragmatic Attitude of the Administration

Although people would not have a scientific understanding of the transmission of water-borne diseases until towards the end of the nineteenth century, there had always existed an awareness of the detrimental effects of infected water. At least since the early seventeenth century, Rio de Janeiro's city representatives had continuously scrutinised the quality of the drinking water. They tried to protect it in particular from pollution caused by faeces from cattle grazing along the river banks and by clothes-washing.³³ Ironically, one of the main reasons why the arriving ships, including that of Cook's expedition, were watered at the newly erected fountain at Largo do Carmo – fed by the Carioca aqueduct – and not at the former watering place for ships, the Bica dos Marinheiros – supplied by an independent source – was that by this time its water was supposedly 'filthy and detrimental to health', because the river feeding it was used for washing clothes.³⁴

In one of the few incidents in which a foreigner gave concrete evidence of a disease afflicting Rio de Janeiro's inhabitants, the governing viceroy had himself ascribed its outbreak to infected water, which he tried to remedy. The foreigner was the already cited nobleman Juan Francisco de Aguirre, who had spoken so positively of the water infrastructure; he reported that people suffered much from dysentery and that, according to information he had been given, in 1781 more than 2,000 persons had died from it, wherefore he concluded that 'it is a formal pestilence'.³⁵ As the bacteria causing dysentery are spread through water, the epidemic may well have been caused by the water works going on at that time.³⁶ In order to install the pipes of the subterranean system which would deliver the water to the new fountains, it had been necessary to dig up many streets, and often the conduits were not quickly covered over. Viceroy Luís de Vasconcelos feared that, as a consequence of this failure, the waters which were conducted through the pipes were subject to contamination by 'all sorts of animals'.³⁷ In fact, not only animal contamination, but also filth and sewage, might have penetrated the system in this way.

³³ Arquivo do Distrito Federal (ed.), *O Rio de Janeiro no século XVII. Accordãos e vereanças do Senado da Camara, copiadas do livro original existente no Archivo do Districto Federal, e relativos aos annos de 1635 até 1650* (Rio de Janeiro: Oficinas Gráficas do Jornal do Brasil, 1935), pp. 15, 42; Eduardo Tourinho (ed.), *Autos de correições de ouvidores do Rio de Janeiro*, vol. 1: 1624–1699 (Rio de Janeiro: Oficinas Gráficas do Jornal do Brasil, 1929), p. 58.

³⁴ *Revista de documentos para a história da cidade do Rio de Janeiro do Arquivo do Distrito Federal*, 1 (1950), p. 174. The Bica dos Marinheiros was fed by the Rio Comprido, a river independent of the Carioca system.

³⁵ Aguirre, 'Diario', pp. 121–2.

³⁶ Aguirre himself remarked that the water supply was being considerably expanded when he visited the city: in addition to the three existing public fountains, the government was building another six. *Ibid.*, p. 73.

³⁷ 'Carta de Luís de Vasconcelos (15.7.1781)', *RIHGB*, 51: 2 (1888), pp. 187–8.

The measures taken by the city government generally included the prevention of animals and vegetable matter like leaves from falling into the water, because it was believed that these would putrefy in contact with the liquid and cause illness.³⁸ From the time of the aqueduct's completion special guards had been employed to watch out for such problems. Furthermore, mud entering the water was considered a problem. After heavy rain, the water delivered by the Carioca aqueduct was often not drinkable for one or two days, because the rain had pulled down earth from the hills around the conduit and its waters were mixed with an 'incredible portion of clay', as the Viceroy Count of Resende noted in 1795.³⁹ This problem was usually solved by passing the water with the suspended particles through sedimentation boxes.

But the administration was also concerned with 'socially generated' pollution. Resende reported that when he took over the government in 1790 and large parts of the pipe system were still open, the drinking water was being infected not only by reptiles, insects, leaves and other things, but also by bathers who were carrying diseases thought to be contagious such as leprosy and scurvy, or who were covered by sores or spots and other blemishes. Resende gave himself the credit for having immediately initiated steps to cover the aqueduct to inhibit the outbreak of further diseases.⁴⁰ As has been shown for other regions, this kind of action was motivated not only by a fear of the spread of disease but also by an awareness of infractions committed by members of lower social groups and especially by slaves. There was an elitist desire to prevent those who did not dispose of private bathing facilities from using the public water supply.⁴¹

The Doctors' View

None of the rather pragmatic measures taken by the viceroys and other officials of the administration to guarantee the quality of the water figured in the known expert opinions issued by Brazilian medical scientists from the late eighteenth and nineteenth centuries. Instead of learning from established practices, the physicians argued on the grounds of Enlightenment doctrines which they had brought over from Europe. However, in contrast to their European colleagues' opinions, their appreciation of the city's water was exclusively positive. Already by 1771, the first scientific academy – the Academia Científica do

³⁸ Tomory, 'Question', p. 497.

³⁹ Arquivo Nacional do Rio de Janeiro (hereafter AN), Negócios de Portugal, cód. 68 vol. 12, f. 246.

⁴⁰ *Ibid.*

⁴¹ Tomory, 'Question', p. 490; Mary Douglas, *Purity and Danger: An Analysis of Concepts of Pollution and Taboo* (London: Routledge & Kegan Paul, 1966).

Rio de Janeiro – had been established.⁴² The majority of its members were doctors who were well aware of the scientific and philosophical theories of the Enlightenment. A couple of years later, the Sociedade Literária was founded, succeeding the former scientific organisation. Despite its ‘literary’ designation, it was likewise organised by doctors and devoted to scientific research. In 1786, it commissioned, probably as a reaction to the 1781 dysentery epidemic mentioned by Juan Francisco de Aguirre, the first assessment on water – an analysis of that of the Carioca river – which would advise on the healthful and deleterious effects of its consumption. Two memoirs sprang from this endeavour, one judging the water through the senses, the other relying on chemical analysis, neither of which – unfortunately – has survived.⁴³ But we can infer from a later treatise, written in 1798 by a Coimbra-trained medical doctor, Antônio Joaquim Medeiros, that they very probably ruled out any connection between the water and the epidemic. Medeiros explained that ‘some time ago’, the endemic maladies of Rio de Janeiro had been attributed to the drinking water, but that this had been proven false by experiments carried out by ‘the most able philosophers and medical doctors’ of the city during the time of Viceroy Vasconcelos.⁴⁴ Therefore, Medeiros and two other accredited doctors, who in 1798 had been asked by the municipality for their opinion regarding the causes of the diseases in Rio de Janeiro, also excluded water quality and attributed them instead to the ‘excessively humid and hot climate’.⁴⁵ What James Cook and others had written about the water of the Carioca river did not prevent the first generation of Brazilian doctors to be officially asked for their expert opinion from defending a different and much more favourable opinion. Many more erudite treatises on the health situation of the city would be produced by local doctors in the following decades. They all alluded to the scientific strains of Enlightenment medicine in vogue in Europe, but they followed their own agenda, barring themselves from any sweepingly detrimental evaluation of their city and consistently cherishing its water quality.⁴⁶

⁴² José Carlos de Oliveira, *D. João VI, adorador do Deus das ciências? A constituição da cultura científica no Brasil (1808–1821)* (Rio de Janeiro: E-papers, 2005), pp. 94–6; Maria Beatriz Nizza da Silva, *A cultura luso-brasileira. Da reforma da universidade à independência do Brasil* (Lisbon: Editorial Estampa, 1999), pp. 27–33. See also Lorelai Kury, ‘Homens de ciência no Brasil: impérios coloniais e circulação de informações (1780–1810)’, *História, Ciências, Saúde – Manguinhos*, 11: 1 (2004), pp. 109–29.

⁴³ Joaquim Jozé de Atahide, ‘Discurso em que se mostra o fim para que foi estabelecida a sociedade literaria do Rio de Janeiro’, *RIHGB*, 45: 1 (1882), pp. 69–76.

⁴⁴ Antônio Joaquim Medeiros, ‘Resposta, que ao programma da camara anunciado no N.º 1.º pag. 58., deu o Doutor Antonio Joaquim de Medeiros’, *O Patriota*, 1: 3 (1813), p. 7.

⁴⁵ ‘No anno de 1798 se propoz por acordo da camara desta cidade a varios medicos, hum programma que tinha por objecto os quesitos seguintes’, *O Patriota*, 1: 1 (1813), pp. 58–9.

⁴⁶ For more treatises see Nizza da Silva, *Cultura luso-brasileira*, pp. 77–92.

The Transfer of the Court

In 1808, the Portuguese royal court, fleeing Napoleon's army, moved to Rio de Janeiro, thereby transforming an American town into the capital of a European power. For the first time, foreigners were allowed to come to Brazil and move around freely. Trade, which previously had been restricted to the Portuguese, was now opened up to all friendly nations (which referred in the main to the British). In fact, Rio de Janeiro had not only become the seat of a European crown, but was also situated in one of the economically most promising regions of the world. People were migrating to the city from Portugal and from other European countries as well as from all over Brazil, with the number of slaves also increasing substantially.⁴⁷ In only a dozen years, the population doubled to some 110,000 inhabitants, and by the middle of the century it had reached about 200,000, thus equalling cities like Barcelona, Hamburg and Mexico City.⁴⁸

The sudden growth led to a lack of housing, an overload on the infrastructure, an increase in all kinds of waste and wastewater, and a shortage of drinking water. Foreigners in particular passed a very severe judgement on the hygienic situation in Rio de Janeiro. John Luccock, an English merchant who spent several years in the city between 1808 and 1818, exclaimed: 'It is no wonder that strangers, on the irresistible evidence of different senses, should consider Rio as one of the dirtiest associations of human beings under Heaven. It is no wonder that they dread lest, by the increase of population, it should become one great pest-house.'⁴⁹ In fact, there were no proper sewers in the city until the 1860s, and the ditches collecting the sewage were often congested, tending to overflow and swamp the lower parts of the city after heavy downpours. Water-borne diseases like dysentery and typhoid fever were recurrent, especially during the rainy season.⁵⁰

After the court moved to Rio de Janeiro the whole population – including the newly arrived Portuguese and the local elites – was affected by this kind of inconvenience. In fact, one of the first measures in terms of urbanisation taken by the administration was the instigation of additional water resources.⁵¹ In

⁴⁷ Leila Mezan Algranti, *O feitor ausente. Estudos sobre a escravidão urbana no Rio de Janeiro, 1808–1822* (Petrópolis: Vozes, 1988), pp. 32–3.

⁴⁸ Chandler, *Four Thousand Years*, pp. 24, 44.

⁴⁹ John Luccock, *Notes on Rio de Janeiro and the Southern Parts of Brazil; Taken During a Residence of Ten Years in that Country, from 1808 to 1818* (London: Samuel Leigh, 1820), p. 133.

⁵⁰ Domingos Ribeiro dos Guimarães Peixoto, 'Aos serenissimos Príncipes Reais [...] Prolegomenos, dictados pela obediencia, que servirão ás observações, que for dando das molestias cirurgicas do paiz (Rio de Janeiro 1820)', in Andrea Fraga d'Egmont (ed.), *A saúde pública no Rio de Dom João* (Rio de Janeiro: Editora SENAC Rio, 2008), p. 117; Medeiros, 'Resposta', pp. 6–7.

⁵¹ Abreu, 'A cidade', pp. 60–5, 68.

the first half of the nineteenth century, further rivers were canalised, most importantly the Maracanã, more springs were tapped to feed the Carioca aqueduct, and several new fountains and standpipes were constructed. In addition, some technical innovations were installed to generate a cleaner and more substantial water supply.⁵² Nevertheless, many foreigners remained sceptical about the water quality. For example, John Shillibeer, a British lieutenant returning from the Pacific in 1814, bluntly reported: ‘The water is not good, and on first using it, causes a swelling accompanied with pain in the abdomen.’⁵³

The Anti-colonial Perspective

Although it may seem obvious that the deterioration in health conditions originated in the sudden growth of the population after the arrival of the court, contemporaries provided a different interpretation. The problems were attributed to the bad administration *before* the arrival of the royal family, and the unhealthy situation was seen as a heritage of colonialism. Brazilian-born medical doctor Domingos Ribeiro dos Guimarães Peixoto, surgeon to the king, wrote in 1820, two years before Brazil’s formal independence from Portugal, that, since the arrival of the royal family in 1808, ‘Rio de Janeiro has experienced an inexpressible and unexpected improvement; from being a harmful and uninhabitable place, so to say, it has become a healthier country.’⁵⁴ Of course, he sought to flatter his patron, and he proceeded by saying that there was still much to be desired until the attainment of full satisfaction in all aspects of public hygiene. But salvation from disease, for Guimarães Peixoto and many of his contemporaries, had become a national objective, to be achieved through liberation from the bad habits and prejudices inherited from the colonial past.⁵⁵ It is most striking how the actual deterioration of the situation was overwritten by a perceived improvement, which laid blame for the problems on the former administration.

⁵² The interventions included building tanks and reservoirs, enclosing additional streams, mending leaks and replacing pipes.

⁵³ John Shillibeer, *A Narrative of the Briton’s Voyage, to Pitcairn’s Island* (Taunton: J.W. Marriott and Whittaker, 1817), p. 10. Diplomat Henry Ellis wrote in a somewhat biased fashion: ‘The water at St. Sebastian [of Rio de Janeiro] is not pleasant to the taste, but is said to be wholesome’: Henry Ellis, *Journal of the Proceedings of the Late Embassy to China* (London: John Murray, 1817), p. 14. A fully positive judgement, however, was given by his fellow-traveller surgeon John McLeod, who reported that the ship had ‘recruited her supply of very excellent water’: John McLeod, *Voyage of His Majesty’s Ship Alceste, along the Coast of Corea to the Island of Lewchew* (London: John Murray, 1818), p. 15.

⁵⁴ ‘... o Rio de Janeiro tem adquirido um melhoramento indizível e nunca esperado; de um país malfazejo e inabitável, por assim dizer, se tem tornado um país mais saudável’: Guimarães Peixoto, ‘Prolegomenos’, pp. 107–8.

⁵⁵ *Ibid.*

In spite of this shift in the general perception of the hygienic conditions and health situation, Guimarães Peixoto, with respect to the quality of the water, adhered to the colonial doctors' opinion of the late eighteenth century, declaring the water free from any detrimental qualities. He stated:

The water which the inhabitants take from [the fountains fed by the Carioca river] is splendid and seems to fulfil all the conditions of a good water [supply]; it has its origin in many springs which pour down from the height of a huge mountain called Corcovado, from where it cascades precipitously, whilst being violently beaten by the differences in height of the places through which it passes and the power with which it is flung. Exposed to the open air, it receives heat and light rays from the sun, until it finally flows into the pipes in which it is conducted to the city and distributed to the different fountains.⁵⁶

Although in general terms inclined to break with the colonial heritage, in his opinion about the water quality the doctor relied exclusively on tradition, adopting the argument about the efficacy of the water falling on rocks which went back to Sebastião da Rocha Pita, Leon Battista Alberti and eventually Columella. This belief was not restricted to official statements, but seems also to have been part of popular knowledge, as is shown by a foreigner's comment on the sprinkler of the Largo do Carmo fountain:

This spreading out the fluid and exposing it to the rays of a vertical sun necessarily heats it to a disagreeable degree, but old people say it is not good to drink water that is not agitated. 'Beaten water' is better when warm than cold water not 'beaten'.⁵⁷

Water quality became an administrative issue once again by the middle of the century. Medical doctors of the Academia Imperial de Medicina (Imperial Academy of Medicine) and the recently founded Junta de Higiene Pública (Board of Public Health) were asked by the national government to give their opinion regarding the outbreak of the epidemics descending on the city: in the summer of 1849/50, the first yellow fever epidemic affected more than 90,000 inhabitants, with 4,160 deaths registered, the total number probably being much higher.⁵⁸ It was followed by nearly annual outbreaks of the disease until the beginning of the twentieth century. A few years later, in the summer of 1855/6, a cholera epidemic reached the town and led to

⁵⁶ *Ibid.*, pp. 101–2.

⁵⁷ Thomas Ewbank, *Life in Brazil; or, a Journal of a Visit to the Land of the Cocoa and the Palm* (New York: Harper, 1856), p. 88.

⁵⁸ Benchimol, *Pereira Passos*, p. 113; José Ribeiro da Silva, *Os esgotos da cidade do Rio de Janeiro, 1857–1947* (Rio de Janeiro: CEDAE, 1988), p. 23; Pedro Carlos da Silva Telles, *História da engenharia no Brasil, séculos XVI a XIX*, 2nd edn (Rio de Janeiro: Clube de Engenharia, 1994), p. 357.

another 5,000 deaths in less than a year. Regarding water, which was brought up once again as a possible cause for the epidemics, medical doctor Francisco de Paula Cândido, president of the Board of Public Health, in 1850 once more paid tribute to its good quality, alluding to the theory of the ‘beaten water’. He explained that the water could not be a central catalyst of the epidemics, because during its fall from the heights of the Corcovado it absorbed air, which he thought to be the key requirement for its salubrity. Paula Cândido was a distinguished scientific authority in his field. He had received his doctorate in Paris, where he had also volunteered in the ‘sanitary legion’ organised by the French government in response to the cholera outbreak of 1832.⁵⁹ After his return to Brazil he soon became one of the most important sanitary experts in the empire, being an active member of the Sociedade de Medicina do Rio de Janeiro (Rio de Janeiro Medical Society), as well as occupying a chair in the Medical Faculty. When in 1855 the English physician John Snow put forward his much-disputed assumption linking the outbreak of cholera to water pollution, Paula Cândido probably followed closely the ensuing controversy taking place in Paris. It would later lead Prefect Haussmann and his hydraulic engineer Eugène Belgrand to abandon the river and groundwater supply of Paris, replacing it by a pioneering long-distance spring-water provision in the 1860s and 70s.⁶⁰ It did not, however, induce Paula Cândido to revise his scientific considerations regarding the water supply of Rio de Janeiro.

Although Paula Cândido adhered, in principle, to the established evaluation of the good quality of the water, he also called attention to a possible threat: since the groves which once overhung the Carioca aqueduct were disappearing and no longer capable of protecting it from the intense heat of the sun, the water was not, according to him, being kept cool enough to hold the air it had absorbed. Therefore, he urged the administration to ensure that there were enough trees along the aqueduct to shelter the water and guarantee its freshness until it reached its final destination. Furthermore, he explained that the vegetation would consume the gases produced by the constant processes of putrefaction, thus preventing the nitrification of the water. For these reasons, Paula Cândido advised that trees should be planted in the

⁵⁹ ‘Cândido, Francisco de Paula’, in Casa de Oswaldo Cruz / Fiocruz (ed.), *Dicionário histórico-biográfico das ciências da saúde no Brasil (1832–1930)*, available at <http://www.dichistoria-saude.coc.fiocruz.br> (last access 14 Aug. 2017). For a more general appreciation of national health institutions and their members, see Marcos Cueto and Steven Palmer, *Medicine and Public Health in Latin America: A History* (Cambridge: Cambridge University Press, 2015), pp. 5–105.

⁶⁰ Pierre-Alain Roche, ‘Eugène Belgrand: homme de science et ingénieur’, in Jean-Claude Deutsch and Isabelle Gautheron (eds.), *Eaux pour la ville, eaux des villes. Eugène Belgrand XIXe–XXI siècle* (Paris: Presse des Ponts, 2013), pp. 44–57. Paula Cândido remained president of the Junta de Higiene Pública only until 1864, when he died during a visit to Paris.

entire mountainous area above the course of the aqueducts of the Carioca and the Tijuca, as well as in a broad band of about 100 *braças* (220 m) below them.⁶¹ In fact, reforestation was not a new demand, but up to this time it had not been justified by the wish to improve water quality; rather it was thought to solve the problem of water scarcity.

Water Scarcity

Environmental historians assume that nineteenth-century Rio de Janeiro was affected by an increasing aridity, of which recurrent droughts were the most visible consequence.⁶² It was the result of a centuries-long deforestation of the region, which, as Warren Dean showed, had commenced some 1,500 years earlier, long before the first Portuguese set foot on the American continent.⁶³ It grew much worse, however, after the Europeans arrived and started the intensive exploitation of the country. Apart from clearing immense areas of land to grow sugar and raise cattle, they needed large amounts of firewood for sugar production. But the destruction of the forests did not end with the colonial regime. The most severe impact upon the immediate neighbourhood of Rio de Janeiro occurred only in the first decades of the nineteenth century, with the cultivation of coffee plantations on the hillsides of the Tijuca massif.⁶⁴ Nearly all the forest was cut down for this purpose; not even single trees were spared, which were normally preserved to provide shade for the coffee plants. As a consequence, in periods of rain violent floods coursed down the hills, not only taking much of the fertile upper soil with them, but also hindering the replenishment of the ground-water reservoirs. In 1845, according to the Ministro de Agricultura, Comércio e Obras Públicas (Minister of Agriculture, Trade and Public Works), the water available at

⁶¹ Francisco de Paula Cândido, 'Exposição da Junta de Hygiene Publica sobre o estado sanitario da capital do imperio, e meios de conseguir o seu melhoramento', *Relatório apresentado á Assembléa Geral Legislativa pelo Ministro e Secretário de Estado dos Negócios do Império (RMNI)* (1850), pp. 8–11. In the following year, Paula Cândido repeated his demands, as not much had been done in the meantime: Francisco de Paula Cândido, 'Exposição do estado sanitario da capital do imperio, apresentado ao Ministerio do Imperio pelo Presidente da Junta Central de Hygiene Publica', *RMNI* (1851), p. 13.

⁶² Although the amount of rainfall was measured systematically only from 1851 on, the geographer and historian Diogo de Carvalho Cabral is confident that there was a reduction in precipitation between the end of the eighteenth century and the middle of the nineteenth century; Cabral, 'Águas', p. 172. For official documentation on droughts, see *Relatório apresentado á Assembléa Geral Legislativa pelo Ministro e Secretário de Estado dos Negócios da Agricultura, Comércio e Obras Públicas (RMNACOP)* (1866), p. 158.

⁶³ Warren Dean, *With Broadax and Firebrand. The Destruction of the Brazilian Atlantic Forest* (Berkeley, CA: University of California Press, 1995); see also Elmo da Silva Amador, *Baía de Guanabara e ecossistemas periféricos. Homem e natureza* (Rio de Janeiro: Interciência, 2012).

⁶⁴ José Drummond, 'The Garden in the Machine. An Environmental History of Brazil's Tijuca Forest', *Environmental History*, 1: 1 (1996), p. 89; Cabral, 'Águas'.

the fountains reached only one-third of the volume of what he called the 'old times'. One of his successors claimed that, in 1866, it had diminished to one-quarter of the volume.⁶⁵

Foreigners, once again, were split in their opinion regarding the amount of available water. When it came to general judgements, they were often very critical. The already mentioned merchant John Luccock observed that 'in proportion to the size and the wants of Rio, it has but a scanty supply of water'.⁶⁶ Many other Europeans would agree with him. But most of them derived this impression from the many slaves they noticed waiting at the fountains. This, of course, was more an indication of a lack of access points to the water – if not meant as a critique of slavery *per se* – than of an actual scarcity. However, none of the foreigners whose accounts I have consulted complained that the lack of water had inconvenienced them in their daily routines. On the contrary, the German professor of zoology Hermann Burmeister, who visited Rio de Janeiro between 1850 and 1852, was astonished by the amount of water the Brazilians used. He called it the 'most important of their necessities of life', asserting that it was 'unbelievable how much water they consumed daily'.⁶⁷ To judge from the visitors' assessments, even if they considered the infrastructure to be insufficient, the amount of water available seems to have been more than enough. As Europeans they probably benefited from the high living standard of the better-off population which, with its use of private wells and slaves, could count on a reliable water supply even during the regularly occurring droughts.⁶⁸

The staff at the public works section of the Secretaria de Estado dos Negócios da Agricultura (Ministry of Agricultural Affairs) had a warped and highly unrealistic attitude to water provision in the second half of the nineteenth century. They acknowledged the droughts and regularly published reports urging for the expansion of the infrastructure to increase the supply of drinking water. But the per capita water use numbers on which these reports were based shifted considerably, and the underlying estimates of population size were almost double those of the contemporary census data.⁶⁹ This

⁶⁵ *RMNACOP* (1866), p. 158.

⁶⁶ Luccock, *Notes*, p. 76.

⁶⁷ Hermann Burmeister, *Reise nach Brasilien, durch die Provinzen von Rio de Janeiro und Minas Geraës* (Berlin: Reimer, 1853), p. 84.

⁶⁸ According to Maurício de Abreu, droughts affected the city in the years 1809, 1817, 1824, 1829, 1833, 1843, and worst of all in 1868/9: Abreu, 'A cidade', pp. 62–4, 76, 80.

⁶⁹ Bento José Ribeiro Sobragy, 'Abastecimento d'agua', *RMNACOP* (1864), Anexo R, p. 3: in 1864 the daily per capita supply was put at 31.7 litres in the dry season, rising to 57 litres with the new waterworks, and the population given as 400,000 persons; however, the official population size was only c. 200,000, meaning 63 litres (114 litres with the new waterworks). In *RMNACOP* (1869), p. 166, the water supply in 1869 was put at 22.5 litres per person per day in the dry season, 40 litres in the rainy season, and the population given as 400,000 persons; however, the official population size was only c. 200,000, meaning 45 litres in the dry season, 80 litres

suggests that the experts' main objective was to persuade the government of the necessity for new projects. Furthermore, the inspector of Public Works, Bento José Ribeiro Sobragy, as well as his successor António Maria de Oliveira Bulhões, had an utterly pretentious notion of the city's need for water, putting it at 150 litres per capita per day – an extraordinarily high estimate, at least in comparison with European standards at the time.⁷⁰ They justified it by 'taking into consideration the climate and other circumstances of the capital of the empire'.⁷¹ Far from thinking that they had to change their position – Sobragy even declared that 'there was perhaps no other city in the world supplied by water in such excellent conditions as Rio de Janeiro' – they rather argued that the tropical climate as well as the city's special status at the head of the nation legitimised particularly high expectations in water consumption.

Yet, for quite a long time, no measures whatsoever were taken to expand the water supply system. Only from 1880 onwards were more distant water sources in the Tinguá mountain chain finally exploited to bring additional water to the city, and a comprehensive network with individual household connections installed replacing the slave-operated fountain supply in the central neighbourhoods.⁷² It could be argued that the decision-makers and the elites in general had felt no real need to act, since many households in the better-off neighbourhoods on the mountainsides and on the outskirts of the city had their own private fountains and did not need to drink from the public supply. Like the foreigners, the people working in the administration of the city probably did not have to restrict their consumption, even during droughts. Those affected by the scarcity as well as by the poor quality of the water were the poor, unprotected and marginalised sections of the population. But they lacked a voice representing their needs.

in the rainy season. In *RMNACOP* (1870), p. 157, the water supply in 1870 was put at 73 litres per person per day, and the population given as 300,000 persons; the official population size was however only c. 220,000, meaning 100 litres. For population sizes, see Joaquim Norberto de Souza e Silva, 'Investigações sobre os recenseamentos da população geral do império e cada provincia de per si tentados desde os tempos coloniaes até hoje', *RMNI* (1869), Anexo D, p. 104; Jerónimo Martiniano Figueira de Mello et al., 'Relatório sobre o arrolamento da população do município da corte em 1870', *RMNI* (1870), Anexo C, p. 15; Manoel Francisco Correia, 'Relatório e trabalhos estatísticos (Rio de Janeiro 1874)', *RMNI* (1875), Anexo.

⁷⁰ London's water supply provided 112 litres per person per day, Brussels's 80 and Paris's 60 litres in the 1860s, according to 'Ueber den Wasserverbrauch in großen Städten', *Polytechnisches Journal*, 165 (1862); nowadays the World Health Organisation (WHO) defines 100 litres as the water service level which is fully compliant with consumption and hygiene needs even in tropical countries: WHO, Domestic Water Quantity, Service Level and Health, WHO/SDE/WSH/03.02 (Geneva: WHO, 2003).

⁷¹ *RMNACOP* (1865), pp. 79–80; *RMNACOP* (1869), p. 166.

⁷² Abreu, 'A cidade', pp. 79–83. A major trigger was the drought of 1869/70; *RMNACOP* (1870), p. 158.

Re-establishing Nature

Although the coffee boom as well as the sudden growth of the population after the arrival of the court had exacerbated the scarcity of water in Rio de Janeiro, water shortages were neither a new phenomenon, nor was the call for reforestation an unprecedented response. The travel accounts and chronicles until the middle or end of the eighteenth century in general praised the abundance of water and did not make any allusion to scarcity, but, as we have seen, this was at least partly based on certain expectations in respect of the tropical landscape and the city's situation. The first mention of a drought by a European traveller in fact pre-dated the foundation of Rio de Janeiro. When in 1519 the expedition led by Ferdinand Magellan, undertaking the first circumnavigation of the world, stopped in the Bay of Guanabara, Antonio Pigafetta, who was responsible for keeping the journal, noted: 'It had been about two months since it had rained in that land, and when we reached that port, it happened to rain.' The indigenous people who lived around the bay said that 'we came from the sky and that we had brought the rain with us', from which Pigafetta inferred that '[t]hose people could be converted easily to the faith of Jesus Christ'.⁷³ The explorer used the drought to explain the friendly reception by the natives and point out their simple-mindedness, which resembles the Spaniards' assumption that the Aztecs took Cortés for Quetzalcoatl. Nevertheless, the observation of the drought was probably correct.

After that incident, references to droughts appear from time to time in the administrative documentation of the city, though not very often.⁷⁴ In Europe, it had been assumed since ancient times that deforestation provoked a decline in precipitation, and that the continuous cutting down of forests covering watersheds was responsible for the drying up of springs. As was the case with the criteria for measuring water quality, this belief dated back to the Greeks, especially the writings of Theophrastus, and persisted until the nineteenth century.⁷⁵ Along these lines, colonial judges (*ouvidores gerais*) repeatedly ruled that wood was not to be taken freely from the banks of the Carioca river.⁷⁶ After the arrival of the royal family, in 1817, when the water shortages

⁷³ Antonio Pigafetta, *The First Voyage around the World, 1519–522. An Account of Magellan's Expedition*, ed. Theodore J. Cachey Jr (Toronto: University of Toronto Press, 2007), p. 10.

⁷⁴ Arquivo Histórico Ultramarino (Lisbon), ACL, CU 017 cx. 4 doc. 425; AN, Secretaria de Estado do Brasil, cód. 952 vol. 2 f. 111; AN, Secretaria de Estado do Brasil, cód. 77 vol. 14 f. 305v.

⁷⁵ On Theophrastus, see Clarence J. Glacken, *Traces on the Rhodian Shore: Nature and Culture in Western Thought from Ancient Times to the End of the Eighteenth Century* (Berkeley, CA: University of California Press, 1967), pp. 129–30; on the development of the 'desiccationist discourse', see Richard H. Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600–1860* (Cambridge: Cambridge University Press, 1995), pp. 153–61.

⁷⁶ Tourinho (ed.), *Autos*, vol. 1, p. 29.

worsened, King João VI prohibited the clearing of wood on the tops of the hills around the springs and in a space 3 *braças* (6.6 m) wide along each side of the aqueduct.⁷⁷ As the droughts continued, the imperial government in 1843 finally decided on the expropriation and reforestation of all the properties bordering the rivers.⁷⁸ By this time, the heyday of the coffee plantations had already passed, as the soils were exhausted and production had shifted to other regions. Until the first expropriations were carried out, however, another 12 years were to pass, though eventually an impressive reforestation programme was launched, and between 1862 and 1887 around 95,000 saplings were planted.⁷⁹ Gradually the vegetation recovered and turned back into the thick green forest characteristic of today's scenery.

What was the background to this extraordinary project? By the end of the eighteenth century, nature had become a subject of curiosity and exploration in Brazil. As historian José Augusto Pádua has demonstrated in detail, a small but vigorous group of scientifically and technically educated Brazilian intellectuals, who had absorbed the ideas of the Enlightenment during their studies in Europe, came to appreciate the destructive effects of colonial extractivism on the natural environment.⁸⁰ Concerned with the disappearance of forests, the depletion of soils and climate change, they urged a more responsible use of natural resources, including the conservation of woodlands via the establishment of reserves and the systematic planting of trees. Far from being romantic idealists, they were motivated by the pragmatic and utilitarian objective of promoting economic growth. As José Augusto Pádua put it, they did not consider the destruction of nature as the 'price of progress', but as the 'price of backwardness'.⁸¹ They understood natural resources as instrumental in developing the country and consequently recommended that they should be treated carefully.

This line of thought became part of the emerging national discourse, and, after independence, several of its adherents – although far from constituting a majority among Brazilian intellectuals – came to occupy influential positions in the administration of the newly constituted state. In 1833 preacher, journalist and politician Januário da Cunha Barbosa delivered a 'Discourse on the

⁷⁷ Abreu, 'A cidade', p. 63.

⁷⁸ *Ibid.*, pp. 77–9.

⁷⁹ José Augusto Pádua, *Um sopro de destruição. Pensamento político e crítica ambiental no Brasil escravista, 1786–1888*, 2nd edn (Rio de Janeiro: Jorge Zahar Editor, 2004), pp. 220–5; Cláudia Heynemann, *Floresta da Tijuca. Natureza e civilização no Rio de Janeiro século XIX* (Rio de Janeiro: Secretaria Municipal de Cultura, 1995); José Augusto Drummond, *Devastação e preservação ambiental no Rio de Janeiro. Os parques nacionais do Estado do Rio de Janeiro* (Niterói: EDUFF, 1997); Drummond, 'The Garden in the Machine'.

⁸⁰ Pádua, *Sopro*; José Augusto Pádua, "'Annihilating Natural Productions": Nature's Economy, Colonial Crisis and the Origins of Brazilian Political Environmentalism (1786–1810)', *Environment and History*, 6 (2000), pp. 255–87.

⁸¹ Pádua, 'Annihilating', p. 260.

Abuse of Clearing Trees in Places above Valleys, and about Burnings' to the Sociedade Auxiliadora da Indústria Nacional (Society for the Promotion of National Industry), which was published that same year in the society's journal. In his speech, Cunha Barbosa referred to Rio de Janeiro, where the 'notable diminution [of waters] proceeds to a great extent from the destruction of the forests in the places of their origin and passage'. He used the local case, which was known to his audience, to support his argument that the excessive cutting of trees caused the lack of rain and even led to the sterility of formerly fertile earth in agricultural areas.⁸² Reforestation, in contrast, seemed to be the road to economic and political advancement.

Apart from the target of promoting sustainable development, a sense of national distinctiveness rooted in tropical nature also fuelled the conservationist movement. During most of the colonial period, the Portuguese and their descendants had believed that the same things that were good for Portugal were also appropriate for Brazil. By the end of the eighteenth century, however, there had evolved an awareness of the singularity of the tropical environment. As was mentioned before, many Europeans believed that a high level of civilisation could be attained only in a temperate climate, while a tropical climate, although ensuring a most exuberant and productive vegetation, would destroy human ambition and lead to degeneration.⁸³ British colonists in particular often favoured wholesale clearing of woods and bushes to improve ventilation and disperse harmful miasmas.⁸⁴ Brazilian elites accepted and internalised the notion of difference, but they were ambivalent about its interpretation. While some also tended to think that civilisation was unattainable for their country, others responded by arguing for the superior rather than inferior character of their natural environment. They saw in nature the 'national essence', the substantial basis for identification and legitimation of 'Brazilianity'. Civilisation to them was the means of dealing with the double-edged attributes of nature, containing its savageness and disorder, while taking advantage of its beauty and fertility.⁸⁵

While there were many positions in between these two extremes, the greater part of Rio de Janeiro's nineteenth-century elite agreed on the positive

⁸² Januário da Cunha Barbosa, 'Discurso sobre o abuso das derrubadas de arvores em lugares superiores à vales, e sobre o das queimadas; lido na Sessão annual da Sociedade Auxiliadora da Industria Nacional, no dia 7 de Julho de 1833', *O Auxiliador da Industria Nacional*, 10 (1833), p. 19.

⁸³ For example, Thomas Ewbank recorded from his visit to Rio de Janeiro: 'There is an obvious connection between meteorology and mind; energetic spirits thrive best where heat and cold, calms and storms alternate. I feel an increasing tendency to mental as well as to physical supineness, and can readily understand why those who visit the tropics grow tired of unvarying verdure': Ewbank, *Life*, p. 77.

⁸⁴ Carey, 'Inventing Caribbean Climates'.

⁸⁵ Lorelai Kury, 'Entre nature et civilisation. Les médecins brésiliens et l'identité nationale (1830–1850)', *Les Cahiers du Centre de Recherches Historiques*, 12 (1994).

characteristics attributed to forests – as it was also convinced of the good quality of the water. From the turn of the century, the affluent moved to the parts of the city located near forests: westward to São Cristóvão, where the royal family took up residence, as well as southward to Glória, Catete, Flamengo and Botafogo.⁸⁶ Only a few years later, the wooded hills of Santa Teresa and the Tijuca valley became the most valued areas. Especially during the cholera and yellow fever epidemics, those citizens who could afford it fled to the higher parts of the city. This led to a segregation of the population, leaving the working classes in the cramped quarters in the centre, while most members of the nobility and many ambassadors had a residence or at least a summer house in the hills. The forests underwent a process of aristocratisation, moving from a status of wilderness to one of leisure.⁸⁷

The sometimes acute shortages of water in the city, together with an awareness of the precariousness of the environment and the valorisation of the forests, were strong enough to finally enable the successful reforestation of the Tijuca massif. The objective of the project was not so much to restore the original forest, however, but to set up a landscape with a park-like and planned character.⁸⁸ It symbolised the Brazilians' ability to dominate nature, to control its devastation as well as its exuberance. Nature received its manicured place in the city, demonstrating its valorisation as well as the high degree of civilisation of the Brazilians. But at the same time, it contributed to etching ever more deeply the boundary between the poorer classes and the better-off. Securing the water supply had become part of a process that reinforced social segregation.

Conclusion

Buarque de Holanda's pronouncement quoted at the beginning of this article pointed out the contradiction between the reactionary social order and progressive rhetoric in nineteenth-century Brazil. On closer inspection, however, it turned out that the rhetoric regarding Rio de Janeiro's water supply was not a poor copy of contemporary European discourses, deriving instead from a prolonged process of local individuation. From the beginning of colonisation, the water supply had given the city's representatives occasion for discussion, be it for its brackishness, the pollution caused by washing, animals or bathing, the admixture with mud after heavy downpours, or, most prominently, the desiccation of the springs provoked by deforestation.

⁸⁶ See e.g. Theodor von Leithold, *Meine Ausflucht nach Brasilien oder Reise von Berlin nach Rio de Janeiro und von dort zurück* (Berlin: Maurersche Buchhandlung, 1820), p. 23.

⁸⁷ Abreu, 'A cidade'.

⁸⁸ This was especially the case from 1877, when Gastão de Escagnolle took over the work begun by Manuel Gomes Archer in 1861. Major parts of the Tijuca massif are to this day a National Park: Drummond, 'The Garden in the Machine'.

Nevertheless they never questioned either the quality or the quantity of the water in its essence. Although with the advent of the European Enlightenment a new and deprecatory perspective on tropical nature emerged, the local elite's assessment of the drinking water was only marginally touched by it. In addition, foreign travellers (especially the British) held the Portuguese colonial government responsible for failures in the water supply system. After the arrival of the royal court in Rio de Janeiro, Brazilians likewise blamed the old political system for the deficiencies in the infrastructure, praising the new one all the more for a prospectively better working 'national' management of the water. This happened in spite of increasing aridity in the city and a visible deterioration in the health situation after the end of colonial rule. Yet the positive overall assessment of the water, the ways to evaluate its quality, the understanding of the reasons for the droughts and the proposals for adequate solutions did not change significantly between colonial and post-colonial or early modern and modern times. Although the intellectual elites were well aware of the scientific discussions on drinking water under way in Europe, they did not engage in it, concentrating their scientific energies on the economic enhancement of the nation state rather than on social concerns. Thus, instead of adapting the water infrastructure to the needs of all the people, the affluent simply moved to areas where they could draw on private water resources and continued to enjoy an aristocratic lifestyle which was probably much more comfortable and healthier than that of their European counterparts. By sticking to the argument that the city was provided with good and abundant water thanks to its natural predisposition, there seemed to be no reason to react to the altered social conditions. In other words, the cause for inactivity was not a lack of scientific knowledge or impetus, but social indifference and the unwillingness to consider the general public. Conversely, by implementing the reforestation programme the government brought to perfection the legitimation of the natural setting, re-establishing the paradisiacal appearance which the first travellers had encountered. In summary, while I argue that the lack of scientific and technological commitment was conditioned by the superior social standing of the responsible authorities, I also show that it was the result of a *longue durée* way of thinking. Hence the discourse about water in Rio de Janeiro was not just an 'external façade or ornament', transferred from recent European models, as Buarque de Holanda argued in respect of the slogans on democratic liberalism; it rather represented the local elites' long established, self-reliant and optimistic conviction about the city's superior natural conditions.

Spanish and Portuguese abstracts

Spanish abstract. Este artículo examina las formas en que las percepciones sobre el agua potable en Río de Janeiro influyeron en el manejo hídrico de la ciudad en los periodos colonial e imperial. Aun cuando la evaluación general sobre el clima y la vegetación cambió de paradisiaco a dañino en la segunda mitad del siglo XVIII de acuerdo con las ideas de la Ilustración, esto no tuvo efecto en la apreciación de la población local sobre el agua potable de la ciudad. Los criterios para evaluar la calidad y cantidad del agua disponible se basaron en trabajos de la antigüedad clásica y permanecieron esencialmente sin cambios desde principios del periodo colonial hasta el final del imperio. Ni siquiera el crecimiento de la población ni el incremento de la susceptibilidad a epidemias en el siglo XIX indujeron a las autoridades a reformar el sistema de abastecimiento de agua ya que tenían confianza de que la ciudad era abastecida con agua abundante y de calidad gracias a su carácter natural.

Spanish keywords: abastecimiento de agua, Río de Janeiro, historia urbana, medio ambiente, salud pública

Portuguese abstract. Este artigo examina as maneiras em que a percepção que se tinha sobre a água potável do Rio de Janeiro contribuiu em definir a gestão hídrica da cidade em tempos coloniais e imperiais. Em linha com ideias do Iluminismo, a avaliação geral do clima e da vegetação da cidade passou de edênico a nocivo à partir da segunda metade do século dezoito. Isso porém não surtiu nenhum efeito na avaliação das pessoas locais em relação à água potável da cidade. Os critérios para avaliar a qualidade e quantidade de água disponível eram baseados em trabalhos da antiguidade clássica e permaneceram essencialmente imutáveis desde o começo da era colonial até o final do império. Nem mesmo o crescimento da população e a crescente susceptibilidade à epidemias no século dezenove levaram as autoridades a reformar o sistema de abastecimento de água. Elas estavam seguras que a cidade era suprida de água de qualidade e em abundância em virtude de seu caráter natural.

Portuguese keywords: abastecimento de água, Rio de Janeiro, história urbana, meio-ambiente, saúde pública