

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 injurious 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 to evaluate 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 the population growth and the increasing susceptibility to epidemics in the nineteenth century did induce 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 disposition.

Introduction

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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 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.²

Buarque de Holanda characterized 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 as well as science and technology.³ 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.⁴

² Sérgio Buarque de Holanda, *Roots of Brazil* (Notre Dame, IN: University of Notre Dame Press, 2012), p. 129.

³ 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).

⁴ For a recent overview on healing practices, see Kalle Kananoja, '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 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 Silvia F. de M. Figueirôa, 'Mundialização da ciência e respostas locais: Sobre a

These studies reveal that Brazilians were in fact highly innovative in many fields, but they 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 stayed 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 in its commitment to modernize 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 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 for the improvement of the water infrastructure. The Brazilians' perception stood against a number of broadsides from foreign visitors, who felt inclined to harshly criticize the water situation 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

institucionalização das ciências naturais no Brasil (de fins do século XVIII à transição ao século XX), *Asclepio* 50, 2 (1998), 107-23; Silvia Figueirôa and Clarete da Silva, 'Enlightened Mineralogists: Mining Knowledge in Colonial Brazil, 1750-1825', *Osiris* 15, 1 (2001), 174-189; 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.

confidently followed their own long-established truth, not acknowledging that the changes in the social setting called for new and more refined approaches.⁵

First assessments of the quality of water

Rio de Janeiro is situated in a breath-taking natural landscape. It is surrounded by mountains covered with rainforests and pervaded by rivers, having 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 the water supply would be a major problem. Nonetheless, water was an issue of discussion since 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.⁶ After provisionally founding the city at the entry of the Bay of Guanabara, in 1567 the Portuguese relocated 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.⁷ The plain below was even less suited to drive wells, being a landscape of saline marshes, swamps and lagoons. Thus, the population sent their slaves to fetch the drinking water from the Carioca River,

⁵ 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 *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).

⁶ For a succinct history of the city cf. Armelle Enders, *Histoire de Rio de Janeiro* ([Paris]: Fayard, 2000).

⁷ Fernão Cardim, 'Narrativa epistolar de uma viagem e missão jesuítica, ...', in Fernão Cardim, *Tratados da terra e gente do Brasil*, ed. by Ana Maria de Azevedo (Lisbon: Comissão Nacional para as Comemorações dos Descobrimientos Portugueses, 1997), p. 268.

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 the Morro do Castelo.⁸

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 exploration, good and abundant waters were a feature attributed to Brazil in general. Ship scrivener Pero Vaz de Caminha wrote in his letter to King Manuel after the Portuguese first landing on the country: 'The waters are many, infinite. [The land] is so graceful that wanting to make use of it, it will provide everything, because of the waters it has'.⁹ Missionaries who soon started to visit Brazil interpreted the good quality of its waters as one of the four indicators for the presence of the earthly paradise.¹⁰ 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 shipping 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 freshwater, of the cleanest I have ever drunk'.¹¹

Of course the availability of fresh water also had a concrete utility 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

⁸ Gabriel Soares de Sousa, 'Tratado descritivo do Brazil em 1587', *Revista do Instituto Histórico e Geográfico Brasileiro (RIHGB)*, 14 (1851), p. 83.

⁹ Maria Paula Caetano and Neves Aguas (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.

¹⁰ 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.

¹¹ Nicolas Barré, 'Copie de quelques lettres svr 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.

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 assigned to found the first Portuguese city in America, Salvador de Bahia, in 1548.¹² As becomes evident from diverse types of city descriptions, 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.¹³ 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’.¹⁴ 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.¹⁵ According to these views, waters varied from place to place, their characteristics depending on the localisation of their origin and the courses they travelled. As had been exposed among others by Hippocrates and Pliny the Elder, running waters were thought to be much superior to stagnant waters, and spring waters were better than

¹² Leon Battista Alberti, *On the Art of Building in Ten Books*, ed. by Joseph Rykwert and Robert Tavernor (Cambridge, MA: MIT Press, 1988), pp. 12-5; ‘Nuevas Ordenanzas de Descubrimiento, Población y Pacificación de las Indias’, in Francisco de Solano (ed.), *Normas y leyes de la ciudad hispanoamericana*, vol. 1: 1492-1600 (Madrid: Consejo Superior de Investigaciones Científicas, 1996), n. 84, pp. 194-218; ‘Regimento de Tomé de Sousa (17.12.1548)’, in Marcos Carneiro de Mendonça (ed.), *Raízes da formação administrativa do Brasil*, vol. 1 (Rio de Janeiro: Instituto Histórico e Geográfico Brasileiro, 1972), p. 38.

¹³ Carl Joachim Classen, *Die Stadt im Spiegel der Descriptiones und Laudes urbium in der antiken und mittelalterlichen Literatur bis zum Ende des zwölften Jahrhunderts* (Hildesheim: Georg Olms Verlag, ²1986).

¹⁴ Alberti, *On the Art*, p. 331.

¹⁵ Hamlin, ‘Water’, p. 721.

well waters.¹⁶ Another favourable indicator of water quality, which according to Alberti had been highlighted by the Roman writer Columella, was that it came down from stony precipices.¹⁷

Although at the beginning of colonisation there existed a strong presupposition that Rio de Janeiro's waters were good and abundant without any need of providing evidence, later on, the property of falling from cliffs became 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'.¹⁸ In fact, different from what may have been expected from the general appreciation of Rio's waters, in practice, only the 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 turn to 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]'.¹⁹

The Enlightenment travellers' perceptions of the water

This test became obsolete after the great Carioca aqueduct had been finished, which delivered the river's water to a place 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

¹⁶ '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. by John Bostock and Henry T. Riley (London: Taylor and Francis, 1855), book 3, chap. 21.

¹⁷ 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.

¹⁸ Sebastião da Rocha Pita, *História da América Portuguesa*, ed. by Mário Guimarães Ferri (Belo Horizonte: Editora da Universidade de São Paulo, 1976), p. 65.

¹⁹ Agostinho de Santa Maria, *Santuário mariano, e historia das imagens milagrosas de nossa senhora*, vol. 10 (Lisbon: Antonio Pedrozo Galram, 1723), p. 20.

underground and fill up the lagoons with land, reclaiming new areas for the expansion of the city. Until the end of the seventeenth century, the urban development was relatively slow, but from then on the city began to prosper due to 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.²⁰ 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 by this time, the middle of the eighteenth century, that the travellers' opinions about the water started to become more diverse. While some travellers continued to praise it, the British in particular, who had by now thoroughly entered their own expansionist endeavour, often criticised the supply. Furthermore, water was no longer judged by its essence alone but in association with the 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'.²¹ 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'.²²

²⁰ Tertius Chandler, *Four thousand years of urban growth. An historical census* (Lewiston: St. David's University Press, 1987), pp. 21, 25.

²¹ Juan Francisco de Aguirre, 'Diario', *Anales de la Biblioteca*, 4 (1905), p. 72.

²² 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.

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 gave 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.²³

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 erected a sumptuous building but channelled the wrong water, or spoiled originally good water by letting it run 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 the Portuguese efforts shows up clearly regarding the 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

²³ 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.

with a greater luxuriance of flowers, both as to number and beauty, than the best gardens in England'.²⁴ However, when he came to the useful 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'.²⁵ 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 among others by 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'.²⁶ The resentment of Cook's expedition 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.²⁷ This feeling was confirmed and enhanced by the rather harsh reception of Cook and his entourage by the governing viceroy Conde de Azambuja, whom they described as an ignorant and despotic person impeding educated people from fulfilling their scientific mission.²⁸

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

²⁴ Ibid., pp. 31-2.

²⁵ Ibid., pp. 32-3.

²⁶ João de Barros, *Panegíricos*, ed. by Manuel Rodrigues Lapa (Lisbon: Livraria Sá da Costa, 1937), p. 76.

²⁷ 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.

²⁸ Ângela Domingues, 'Oficiais, cavalheiros e concorrentes: o "Brasil" nas viagens de circum-navegação do século das Luzes', *Revista das Índias*, 73: 258 (2013), pp. 365-98.

received fresh water which was transported through an artificial conduit from fairly far in the country. It tasted much better and was not as harmful as it is sometimes described in travel accounts'.²⁹ 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'.³⁰

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.³¹ 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 deteriorating effect on the human race itself.³² 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 the climate determined the customs and laws of the countries.³³ Climate and topography were now endowed with moral significance. Tropicality did not just stand for fertility and exuberance any more, but also for cruelty, disease and oppression. Moreover, the city of Rio de Janeiro was not only located in the

²⁹ Friedrich Ludwig Langstedt, *Reisen nach Südamerika, Asien und Afrika* (Hildesheim: Tuchtfeld, 1789), p. 56.

³⁰ George Staunton, *An authentic account of an embassy from the king of Great Britain to the emperor of China*, vol. 1 (Philadelphia: Robert Campbell, 1799), p. 79.

³¹ David Arnold, *The Problem of Nature: Environment, Culture and European Expansion* (Oxford: Blackwell Publishers, 1996), especially pp. 141-68; Nancy Leys Stepan, *Picturing Tropical Nature* (Ithaca, NY: Cornell University Press, 2001).

³² 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.

³³ Charles Louis de Secondat de Montesquieu, *The Spirit of the Laws*, transl. and ed. by Anne M. Cohler, Basia Carolyn Miller and Harold Samuel Stone (Cambridge: Cambridge Univ. Press, 1989).

tropics but also in a landscape densely interspersed by swamps. From swamps allegedly arose the poisonous exhalations called miasmas, which in the tropics were thought to be of even more intense morbidity than in Europe. Together with the moist and the warm air, these incident elements were thought to have most detrimental effects on health, body and ultimately civilization. The once paradisiacal image of the tropics inclined towards a pestilential one. And this change also had had its effects on the perception of the drinking water.

The pragmatic attitude of the administration

Although people would scientifically understand how water borne diseases were transmitted only by the end of the nineteenth century, there had always existed an awareness regarding the detrimental effects of infected water. At least since the early seventeenth century, Rio de Janeiro's city representatives were continuously scrutinising the quality of the drinking water. They tried to protect it in particular from pollution caused by faeces from cattle pasture along the river banks and by the washing of clothes.³⁴ 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 old watering place for ships, the Bica dos Marinheiros, supplied by an independent source – was that its water was supposedly 'filthy and detrimental to health', because the river feeding it was constantly used for washing clothes.³⁵

In one of the few incidences where a foreigner gave concrete evidence of a disease afflicting Rio de Janeiro's inhabitants, the governing viceroy had by himself ascribed its outbreak to infected water, which he tried to remedy. The already cited nobleman Juan Francisco de

³⁴ 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), p. 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.

³⁵ The Bica dos Marinheiros was fed by the Rio Comprido, a river independent from the Carioca system. *Revista de Documentos para a História da Cidade do Rio de Janeiro do Arquivo do Distrito Federal*, 1 (1950), p. 174.

Aguirre, who had spoken so positively of the water infrastructure, 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, whereof he concluded that ‘it is a formal pestilence’.³⁶ 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.³⁷ To install the pipes of the subterranean pipe system which would deliver the water to the new fountains, it had been necessary to open many streets, and the conduits were often not readily closed. Viceroy Luís de Vasconcelos was alarmed that as a consequence of the missing covering the waters which were conducted through the pipes were subject to contamination by ‘all sorts of animals’.³⁸ In fact, not only animals, but also filth and sewage might have penetrated into the system in this way.

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 illnesses.³⁹ From the time when the aqueduct was completed special guards had been installed to watch out for these disturbances. Furthermore, mud entering the water was considered a problem. After it had rained heavily, the water delivered by the Carioca aqueduct often was not drinkable for one or two days, because the rain had pulled down earth from the hills neighbouring the conduit and its waters were mixed with an ‘incredible portion of clay’, as the Viceroy Count of Resende noted in 1795.⁴⁰ The usual manner to solve this inconvenience was to provide for the sedimentation of the floating particles to obtain a purer water.

³⁶ Aguirre, ‘Diario’, pp. 121-2.

³⁷ 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.

³⁸ ‘Carta de Luís de Vasconcelos’ (15.7.1781), *RIHGB*, 51: 2 (1888), pp. 187-8.

³⁹ Tomory, ‘Question’, p. 497.

⁴⁰ Arquivo Nacional do Rio de Janeiro (AN), Negócios de Portugal, cód. 68 vol. 12, f. 246.

But the administration was also concerned with ‘socially generated’ pollution. The Viceroy Count of 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 not only being infected by reptiles, insects, leaves and other things, but also by people who bathed in the water with diseases thought to be contagious, such as leprosy and scurvy, or who were covered by sores or spots and blotches. Resende praised himself for having immediately initiated steps to cover the aqueduct to inhibit the outbreak of further diseases.⁴¹ As has been shown for other regions, this kind of action was not only motivated by the fear of the spreading of illnesses but also by a sense of unwanted transgressions 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 facilities to take a bath from using common water.⁴²

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 ground of Enlightenment doctrines which they took over from Europe. However, in contrast to their European colleague’s opinions, their appreciation of the city’s water was exclusively positive. Already in 1771, a first Scientific Academy had been established in Rio de Janeiro.⁴³ The majority of its members were doctors who were well aware of the scientific and philosophical theories of the Enlightenment. A

⁴¹ AN, Negócios de Portugal, cód. 68, vol. 12, f., 246.

⁴² Tomory, ‘Question’, p. 490; Mary Douglas, *Purity and Danger: An Analysis of Concepts of Pollution and Taboo* (London: Routledge & Kegan Paul, 1966).

⁴³ 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. Cf. 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.

couple of years later, a Literary Society was founded, succeeding the former organisation. Despite its different designation, it was likewise organised by doctors and devoted to scientific research. In 1786, it commissioned a first assessment on water, probably as a reaction to the 1781 dysentery epidemic mentioned by Juan Francisco de Aguirre. It commissioned an analysis of the water of the Carioca River to learn from its contents the healthful and deleterious effects that would result from 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.⁴⁴ But as we can infer from a later treatise, written in 1798 by a Coimbra-trained medical doctor, Antônio Joaquim Medeiros, 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.⁴⁵ 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 the water quality and attributed them instead to the ‘excessively humid and hot climate’.⁴⁶ What James Cook and others had written about the water of the Carioca River did not prevent even the first generation of Brazilian doctors officially asked for their expertise, to defend a distinct 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. All of them alluded to the scientific strains of Enlightenment medicine en vogue in

⁴⁴ 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.

⁴⁵ 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.

⁴⁶ ‘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.

Europe, but they followed their own agenda, delimiting themselves from the sweepingly detrimental evaluation of their city, and consistently cherished its water quality.⁴⁷

The transfer of the court

In 1808, the Portuguese royal court, fleeing from Napoleon's army, moved to Rio de Janeiro transforming an American town into the capital of a European power. For the first time, foreigners were allowed to come to Brazil and move there freely. Trade, which before 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. As a consequence, the number of slaves also increased substantially.⁴⁸ In only a dozen years, the population doubled to some 110,000 inhabitants, and by the middle of the century it reached about 200,000, thus equalling cities like Barcelona, Hamburg or Mexico City.⁴⁹

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. Especially the foreigners had a very severe judgement concerning 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.'⁵⁰ Actually, there were no regular sewers in the city until the 1860s, and the ditches collecting the sewage were often

⁴⁷ For more treatises cf. Silva, *Cultura luso-brasileira*, pp. 77-92.

⁴⁸ Leila Mezan Algranti, *O feitor ausente. Estudos sobre a escravidão urbana no Rio de Janeiro, 1808-1822* (Petrópolis: Vozes, 1988), pp. 32-3.

⁴⁹ Chandler, *Four thousand years*, pp. 24, 44.

⁵⁰ Luccock, *Notes*, p. 133.

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.⁵¹

After the court had moved to Rio de Janeiro the whole population – including members of the newly arrived Portuguese as well as of the local elites – was affected by this kind of inconveniences. In fact, one of the first measures in terms of urbanisation taken by the administration was the activation of additional water resources.⁵² In 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.⁵³ Nevertheless, many foreigners remained sceptical about the water quality. John Shillibeer, for example, 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’.⁵⁴

The anti-colonial perspective

Although it may seem evident that the deterioration of the health conditions originated in the sudden growth of the population after the arrival of the court, contemporaries provided a different

⁵¹ Domingos Ribeiro dos Guimarães Peixoto, ‘Aos serenissimos Principes 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.

⁵² Abreu, ‘A cidade’, pp. 60-5, 68.

⁵³ The interventions included the building of tanks and reservoirs, the tubing of additional streams, the sealing of leakages, the exchange of pipes.

⁵⁴ 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: J. 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.

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 the formal Brazilian independence from Portugal, that since the arrival of the royal family in 1808, the country had experienced an inexpressible and unexpected improvement, changing from a harmful and uninhabitable place to a much healthier location. Of course, he sought to flatter his patron, and he proceeded by saying that there was still much to be wished for until full satisfaction in all aspects of public hygiene would be attained. But salvation from disease, for Peixoto and many of his contemporaries, had become a national objective, to be achieved through the liberation from 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 of the problems on the former administration.

In spite of this shift in the general perception of the hygienic conditions and health situation, regarding the quality of the water, Guimarães Peixoto 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; it has its origin in many springs which pour down from the height of a huge mountain called Corcovado, from where it cascades precipitately, being formidably beaten due to the unevenness of the places through which it passes and the power with which it is flung. Exposed to the open air, it receives light and calorific rays from the sun, until it

⁵⁵ Peixoto, 'Prolegomenos', pp. 107-08.

is ultimately received by 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 depended exclusively on tradition, adopting the argument of the 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 to have also 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 Imperial Academy of Medicine and the recently founded Board of Public Hygiene 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 1855/56, a cholera epidemic reached the town and led to 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 Hygiene, in 1850 once more paid credit to its

⁵⁶ Peixoto, 'Prolegomenos', pp. 101-02.

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* (Rio de Janeiro: Clube de Engenharia, 2. ed., 1994), p. 357.

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 Medical Society in Rio de Janeiro, apart from occupying a chair in the Medical Faculty. When in 1855 the English physician John Snow forwarded his much-disputed assumption linking the outbreak of cholera to the pollution of water, Paula Cândido probably closely followed 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, bring 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 covered the aqueduct of the Carioca were disappearing and no longer capable of protecting it from the intensive heat of the sun, according to him the water was not kept cool enough to hold the air it had absorbed. Therefore, he urged the administration to ensure that enough trees existed along the aqueduct to shelter the water and guarantee its freshness until it reached its final

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.dichistoriasaude.coc.fiocruz.br>, accessed 15. Feb. 2016). 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. 58-105.

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 stayed president of the Board of Public Hygiene only until 1864 when he died during a stay in Paris.

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 to plant trees in the entire mountainous area above the course of the aqueducts of the Carioca and the Tijuca, as well as in an area of about 100 *braças* (220 m) below them.⁶¹ In fact, the reforestation was not a new demand, but up to this time it had not been justified by the wish to improve the 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 cleansing 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,

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 Assembléia Geral Legislativa pelo Ministro e Secretário de Estado dos Negócios do Império (RMNI) 1850*, pp. 8-11. In the following year, Francisco de 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, cf. *Relatório apresentado á Assembléia 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: University of California Press, 1995); Elmo da Silva Amador, *Baía de Guanabara e Ecossistemas Periféricos. Homem e Natureza* (Rio de Janeiro: Interciência, 2012).

with the cultivation of coffee plantations on the hillsides of the Tijuca Massif.⁶⁴ Nearly all the forest was cut down for this aim, 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 Minister of Agriculture, Trade and Public Works in charge, the water available at 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 fourth of the volume.⁶⁵

The foreigners, once again, were split in their opinion regarding the amount of the 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 beheld 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 suffering from an actual scarcity themselves. However, none of the foreigners whose accounts I have consulted complained that the lack of water had disturbed 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 very astonished how much 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 to them

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’.

⁶⁵ *RMNACOP 1866*, p. 158.

⁶⁶ 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. 76.

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

seems to have been more than enough. As Europeans they probably benefited from the high living standard of the better off population which due to private wells and the use of slaves could count on a reliable water supply even during the regularly occurring droughts.⁶⁸

The staff at the public works section of the Ministry of Agricultural Affairs had a crooked and partly unrealistic attitude regarding the 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 amount of drinking water. But the numbers on which these reports were based shifted considerably, and the underlying estimate on the population size partly doubled the results of the census data collected at the same time.⁶⁹ This suggests that the experts' main objective was to persuade the government of the necessity of new projects. Furthermore, the Inspector of Public Works, Bento José Ribeiro Sobragy, as well as his successor António Maria de Oliveira Bulhões, were rather presumptuous in their notion of the adequate scope of water, assuming a need of 150 litres per capita and day, which was an extraordinarily high estimate, at least in comparison with European standards.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 renounce something – Sobragy even declared that 'there was

⁶⁸ According to Maurício de Abreu, droughts affected the city in the years 1809, 1817, 1824, 1829, 1833, 1843, and worst of all in 1868/69, Abreu, 'A cidade', pp. 62-4, 76, 80.

⁶⁹ Bento José Ribeiro Sobragy, 'Abastecimento d'água', *RMNACOP 1864*, Anexo R, p. 3: 31.7 litres in the dry period in 1864 with a population of 400,000 persons, with the new canalisation 57 litres; however, the official population size was only ca. 200,000, meaning 63 litres, resp. 114 litres; *RRMNACOP 1869*, p. 166: 22.5 litres in the dry period in 1869, with a population of 400,000 persons, 40 litres in rain period; however, the official population size was only ca. 200,000, meaning 45 litres in dry period, 80 litres in rain period; *RMNACOP 1870*, p. 157: 73 litres in 1870 with a population of 300,000 persons; the official population size was however only ca. 220,000, meaning 100 litres. For population sizes, see 'Relatório de Antônio Thomaz de Godoy', cited in Silva, 'Recenseamentos', p. 104; Jerónimo Martiniano Figueira de Mello et. al., 'Relatório sobre o arrolamento da população do município da corte em 1870', *RMNI 1869*, Anexo C, p. 15; Manoel Francisco Correia, 'Relatório e trabalhos estatísticos (Rio de Janeiro 1874)', *RMNI 1972*, Anexo.

⁷⁰ London had 112, Brussels 80, Paris 60 litres per person and day available, according to 'Ueber den Wasserverbrauch in großen Städten', *Polytechnisches Journal*, 165 (1862); nowadays the World Health Organisation defines 100 litres as fully complying with consumption and hygiene needs even in tropical countries; World Health Organisation, Domestic water quantity, service level and health, WHO/SDE/WSH/03.02, 2003.

⁷¹ *RMNACOP 1865*, pp. 79-80; *Relatório dos Negócios da Agricultura 1869*, p. 166.

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 exposed 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 more distant water sources in the Tinguá mountain chain were finally exploited to bring additional water to the city, and a comprehensive ductwork with individual household connections was installed replacing the slave operated fountain supply in the central neighbourhoods.⁷² It can 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 in the outskirts of the city had their 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 accustomed usages even during droughts. Those affected by the scarcity as well as by infected water were the poor, unprotected and marginalised sections of the population. But they lacked a voice representing their needs.

Re-establishing nature

Although the coffee boom as well as the sudden growth of the population after the arrival of the court had reinforced 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 mid or end of the eighteenth century in general praised the abundance of water and did not make any allusion to scarcity, but as we saw, this was at least partly based on certain anticipations in respect to the tropical landscape and the localisation of a city. The first mention of a drought by a European traveller in fact pre-dated the foundation of Rio de Janeiro.

⁷² Abreu, 'A cidade', pp. 79-83. A major trigger was the drought of 1869/70, *Relatório dos Negócios da Agricultura 1870*, p. 158.

When in 1519 the expedition lead 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 Spaniard’s imputation 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, since ancient times it was assumed 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 the quality of water, 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 margins of the Carioca River.⁷⁶ After the arrival of the royal family, in 1817, when the water shortages worsened, King João VI prohibited the clearing of wood on the top of the hills around the springs and in a space of three *braças* (6,6 m) along each side of the aqueduct.⁷⁷ As the droughts

⁷³ Antonio Pigafetta, *The first voyage around the world, 1519-1522. An account of Magellan's expedition*, ed. by Theodore J. Cachey Jr. (Toronto: University of Toronto Press, 2007), p. 10.

⁷⁴ Arquivo Histórico Ultramarim (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: 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.

⁷⁷ Abreu, ‘A cidade’, p. 63.

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 past, as the soils were exhausted and production had shifted to other regions. Until the first expropriations were realised, 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 again 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 studied 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, realised the destructive effects of colonial extractivism on the natural environment.⁸⁰ Concerned with the disappearance of forests, the depletion of soils and climate changes, they urged for a more responsible use of natural resources, including the conservation of woodlands. They encouraged 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.

⁷⁸ Ibid., pp. 77-9.

⁷⁹ Pádua, *Sopro*, 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.

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 abuse of clearing trees in places above valleys, and about burnings’ to the Society for the Promotion of the 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 immoderate cutting of trees caused the lack of rain and sterilised the formerly fertile earth also 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 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

⁸² Januario 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 E.g. 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.

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 characteristics attributed to forests – as it was also convinced of the good quality of the water. Since the turn of the century, the affluent moved to the parts of the city located near forest: westward to São Cristóvão, where the royal family took 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 appreciated areas. Especially during the cholera and yellow fever epidemics, those denizens who could afford it fled to the upper 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 nobility and many ambassadors had a residence or at least a summer house in the hills. The forests were submitted to 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 the consciousness about 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

⁸⁴ Mark Carey, ‘Inventing Caribbean Climates. How Science, Medicine, and Tourism Changed Tropical Weather from Deadly to Healthy’, *Osiris*, 26: 1 (2011), pp. 129-41.

⁸⁵ Lorelai Kury, ‘Entre nature et civilisation. Les médecins brésiliens et l’identité nationale (1830-1850)’, *Les Cahiers du Cente de Recherches Historiques*, 12 (1994).

⁸⁶ 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’.

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 tailored 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 those 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 the 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 representatives occasion for discussion, be it for its brackishness, the pollution caused by washing, animals or bathing, the admixture with earth after heavy downpours, or, most prominently, the desiccation of the springs provoked by deforestation. 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 depreciative perspective of 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

⁸⁸ This was especially the case since 1877, when Gastão de Escagnolle took over the work begun by Manuel Gomes Archer in 1861. Major parts of the Tijuca Massif are up to this day a National Park; Drummond, 'The garden in the machine'.

the infrastructure, praising the new one all the more for a prospectively better working ‘national’ management of the water. This happened in spite of the increasing aridity in the city and a visible aggravation of 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 common needs, the affluent inhabitants 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 maintaining the persuasion that the city was provided with good and abundant water thanks to its natural disposition, 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 include the general public. Conversely, by implementing the reforestation programme the government brought to perfection the legitimization of the natural setting, re-establishing the paradisiacal appearance which the first travellers had encountered. In summary, apart from arguing that the lack of scientific and technological commitment was conditioned by the superior social standing of the responsible authorities, I showed 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 regarding 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.