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Purifying the River: Pollution and Purity of Water in Colonial Calcutta

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Abstract

This paper explores the river as a site of urban modernity in India. At the heart of this paper is the colonial project of purifying the water of river Hooghly for the domestic supply of Calcutta. The British built the first water purification system for the city around the middle of the nineteenth century at Pulta. Around this history, the paper looks at the various discourses and practices of pollution, purity and purification. The debates were not just about whether the river was polluted or suitable for the supply of water to the city but whether piped water itself was pure. In this story, the science of purity confronted Hindu ritual purity. At another level, the very idea of purity itself was on trial. One of the main sites of examination for this paper is thus the various notions of purity at play in Calcutta at this time within both western science and Hindu scriptural deliberations. These were accentuated by the fact that in Calcutta and several other colonial cities, water was conceptualised through multiple semantic and spatial tropes. The paper situates the project of purification at the heart of this entangled reality and discourse of purity of water.

Key words: Purification, pollution, Hooghly, Calcutta, Water, Pulta, sewage

At the heart of this paper is the colonial project of purifying the water of river Hooghly for the domestic supply of Calcutta. The first water purification system for the city was built by the British around the middle of the nineteenth century at Pulta. Around this history, the paper looks at the various discourses and practices of pollution, purity and purification. The debates were about not just whether the river was polluted or suitable for the supply of drinking water to the city but whether the piped water itself was pure. At one level, these were based on two different notions of purity and pollution. On the one hand, in the Victorian sanitarian regime that imposed itself upon Calcutta and its river, impurity had a clear physical dimension in terms of visible filth on the surface of the water, microscopic germs, or silt. On the other, within Hindu ideas pollution and impurity had a more intangible and ritualistic meaning. The river itself, the object of the colonial project of purification, was venerated by Hindus as sacred and was thus considered inherently pure and incorruptible. In this narrative thus, the modern sanitarian ideas confronted the Hindu notions of ritual purity.

Yet, this was more than a debate between orthodox Hindus and the colonial regime, as for both the parties the question of filth had deep moral connotations. Modern practices and habits of cleanliness have often been seen to resemble non-modern rituals of warding off impurity.¹ For both the Hindus and the colonial sanitarians, the impurity and purity of the river had layers of visible and invisible meanings. While the natural and visible muddiness of the Hooghly was perceived to be an impurity by the colonial officials, it was accepted as an essential part of the presumably pure and sacred *Gangajal*. On the other hand, Hindus believed the floating effluents discharged from the septic tanks to be polluting the sacred river, but the colonial officials regarded these as chemically sterile. Moreover, the Hindus in their arguments about the purity of the Hooghly imbibed Victorian sanitarian values and among the British sanitarians in India, there was considerable diversity of opinion regarding the purity of the waters of the great rivers of India and the merits and modes of their purification. Even within the colonial or modernist ideas of impurity, there was, despite the often-repeated phrase of 'pure water', a remarkable lack of agreement about what that

Acknowledgements: I am grateful to Projit Mukharji for identifying and giving me access to the text *Jantradhrita Jal-Shuddhi*.

¹ Mary Douglas, *Purity and Danger: An Analysis of Concepts of Pollution and Taboo* (London: Routledge & Kegan Paul, 1966), pp. 30-32.

purity constituted or how it could be achieved.² There were different versions of this purity in colonial literature; pure water, natural water, clear water, purified water, wholesome water. It was as if pure water was a vital and obvious category and yet at the same time, an inaccessible ideal. The very idea of purity itself, it seems, was on trial.

One of the main sites of examination for this paper is thus the various notions of purity at play in Calcutta at this time. Nowhere was this more prominent than on the question of water since in India water had been for much longer linked to purity and cleanliness than compared to Europe, where it was linked to hygiene only in the nineteenth century. So, what is 'pure water'; is it water in its natural state? Or, water without dirt and pathogenic microbes? Or, water in its most essential form, i.e. just H₂O? We will come across similar questions in the following narrative repeatedly. These questions have been difficult to resolve even within modern philosophy of science. Hasok Chang has shown that the question whether water is H₂O has complex scientific, philosophical, moral and political undertones. There is no set standard of what pure water is.³ Moreover, if we take Chang's plea for appreciating the pluralism in science a step further, towards the pluralistic understanding of purity of water, then the analysis becomes even more challenging, particularly if we include Hindu notions of purity into this examination.

Historians have shown that purity is a fluid concept. The science of purity of water in this period was at its formative stage. Even a century after scientists showed water to be constituted of hydrogen and oxygen, debates continued among chemists, physicians and bacteriologists about what constituted 'pure water'.⁴ Christopher Hamlin has shown that most often, pure water was defined by 'commonsense standard', appearance, smell, and taste. During the emergence of the science of impurity in Britain during the Victorian era, this standard was overthrown and a new regime of experts, comprising of chemists, hygienists, and bacteriologists commenced. Even then, the various specific analytic procedures continued to be a matter of scientific controversy. In India, and several other colonial sites, the science of purity confronted ideas of ritual purity. Yet, despite such close

² For the repeated references to 'pure water' in colonial literature, see David Arnold, 'Pollution, toxicity and public health in metropolitan India, 1850-1939', *Journal of Historical Geography*, 42 (2013): 124-133, pp. 129-130.

³ Hasok Chang, *Is Water H₂O?: Evidence, Realism and Pluralism* (Dordrecht: Springer, 2012)

⁴ Christopher Hamlin, *A Science of Impurity: Water Analysis in Nineteenth Century Britain* (Bristol: Hilger, 1990).

scrutiny, pure water, in all its semantic and physical sense, remained elusive for the majority of the residents of the city.

If purity is a difficult concept to untangle, the question of purification has been placed at the heart of modern conceptualisation of nature and environment. Bruno Latour argued that the idea of 'purification' is based on the separation between nature and culture.⁵ Latour's work challenges us not to think of nature and society in modernistic terms, in which purification appears to distil nature from the social. This challenge becomes even more acute while writing the history of water in Calcutta, in which the natural and the social were deeply enmeshed, and yet that enmeshing was the problem of modernity. The natural water of Calcutta was seen to be endemically pathogenic and heavily silted and unsuitable for social/human consumption.

Latour thus makes it perilous for us to write a linear history of 'nature', as for him, the very construct of nature, engendering a separation of the human and the non-human is a modernist construct. The only way out of this dilemma seems to revert to the non-modern; to write in terms of networks in which the human and non-human appear intermingled.

Thankfully, Henri Lefebvre provided a clue that rescues us from getting lost in such semantic and conceptual deadlock of the modern constructions of modernity. Lefebvre sees the social production of urban space as a fundamentally political process, which determines and defines access to nature and resource.⁶ His work inspired a new genre of literature on the modern history of water resources. In a pioneering work, Erik Swyngedouw showed that the circulation of water in Guayaquil, Ecuador is governed by the political ecology of power, which shaped the urbanization of the city. Thus, Guayaquil's urbanization is a process of domestication of nature's water as well as exclusion from access to it. In short, the access to water is denied to certain sections of the society through the production of urban spaces.⁷ Within this new, robust and diverse scholarship, the history of water has been seen as a simultaneously political, economic and ecological process and integral to the history of

⁵ Bruno Latour, *We Have Never been Modern* (translated by Catherine Porter) (New York; London: Harvester Wheatsheaf, 1993), p. 30

⁶ Henri Lefebvre, *The Production of Space* (translated by Donald Nicholson-Smith), (1974) (Oxford: Blackwell, 1991).

⁷ E. Swyngedouw, 'Power, Nature, and the City: The Conquest of Water and the Political Ecology of urbanization in Guayaquil, Ecuador: 1880-1990', *Environment and Planning A* 29 (1997): 311-332.

urbanization, governmentality and social inequality.⁸ These processes have also been seen to have led to the emergence of what has been termed as ‘modern water’; a shift from the traditional multitude forms of *waters* to a single, universal substance, whose only identity within the modern capitalist system is that of a commodity and a resource.⁹

These spatial connotations have also been critical in the history of filth or dirt. Several years before Lefebvre, Mary Douglas offered a spatial definition of dirt, arguing that it is the by-product of our universal urge to order and structure our spaces. She thus provided us with the compellingly incisive phrase: ‘dirt as matter out of place’.¹⁰ Subsequently in the literature on public spaces in Calcutta, historians have argued that filth, as it was linked to the lives of the poor or the subaltern, became manifest as the city made space for modernity.¹¹ Garbage, often discarded from homes into the streets, was a product of the modernist project of dividing Calcutta into public and private spaces. In contrast, the pre-modern notions of spaces were in the forms of the ‘enclosed’ and the ‘open’, the enclosed inside and the exposed outside.¹²

There is a problem though with Lefebvre’s scheme of ‘second nature’ and the spatial depictions of ‘modern water’. These tend to assume a pristine form of nature which is uncontaminated by human interference. As historians have shown, it is difficult to conceptualize water in its primary, pure and natural form. Moreover, in Calcutta, it is not possible to trace that relatively straight and clear line from primary to secondary to commodified to capitalist nature that has been identified in the histories of urbanization in the West. Water did become a secular commodity in Calcutta; but was that process ever

⁸ M. Gandy, *Concrete and Clay: Reworking Nature in New York City* (Cambridge, Mass.; London: MIT Press, 2002); Maria Kaika, *City of Flows: Modernity, Nature, and the City* (New York; London: Routledge, 2005); Nikolas C. Heynen, Kaika, Swyngedouw (eds), *In the Nature of Cities: Urban Political Ecology and the Politics of Urban Metabolism* (New York: Oxford, 2006); Swyngedouw, *Social Power and the Urbanization of Water: Flows of Power* (Oxford: Oxford University Press, 2004).

⁹ Hamlin, ‘“Waters” or “Water”?—Master narratives in water history and their implications for contemporary water theory’, *Water Policy*, 2 (2000): 313-325; J. Linton, *What is Water? The History of a Modern Abstraction* (Vancouver: University of British Columbia Press, 2010), Jeffrey M. Banister and Stacie G. Widdifield, ‘The Debut of “Modern Water” in early 20th century Mexico City: The Xochimilco Potable Waterworks’, *Journal of Historical Geography* 46 (2014): 36-52, pp. 40-44.

¹⁰ Douglas, *Purity and Danger*, p. 35. Although Douglas unassumingly referred to it as an ‘old’ definition, I came across the phrase for the first time in her book.

¹¹ Dipesh Chakrabarty, ‘Open Space/Public Space: Garbage, Modernity and India’, *South Asia*, 14, (1991): 15–31; Sudipta Kaviraj, ‘Filth and the Public Sphere: Concepts and Practices about Space in Calcutta’, *Public Culture*, 10 (1997): 83–113.

¹² Chakrabarty, ‘Of Garbage, Modernity and the Citizen's Gaze’, *Economic & Political Weekly*, 27, (1992): 541-547.

complete, or did it begin with modernity? In India, access to water, both for its presumed purifying qualities and because it is a resource was determined in terms of caste and religion. Caste in particular has determined the spatial dimensions around wells, tanks and rivers much before the emergence of the modern urban motif. How do you take the problematic of the public and the private to the question of drinking water? In India, different communities consumed different waters from well-defined sources, which during the colonial regime were translated in terms of public and private forms of waters. In Calcutta today, the rich consume, what I would suggest to be both 'private' and 'enclosed' water, while the poor consume 'public' or 'exposed' forms of water. This transformation is part of the same process by which tradition or the non-modern has remarkably transmuted itself into or co-habited with modernity in India. In that respect, modernity may not have made that critical a difference in our history of space.

Significantly in Calcutta and most other colonial cities, the diversity in the definition of the purity of water co-existed with the diverse semantics of water. Bengali literature is rich with references to various forms, sites and semantics of *waters*, which middle class Bengalis explored in their relentless pursuit of good health. In his humorous play 'Abak Jalpan' [A Strange Drink of Water], written in the early twentieth century, Sukumar Ray mocks this preoccupation, as a desperately thirsty traveller has to endure these various forms and norms of waters, from a wide range of people, including the chemical definition of 'drinking water' from a teacher, before he gets to drink a glass of 'plain, pure, satiating, cool' water.¹³ The fluidity here is both of the various notions of waters and the different ideologies of purity and pollution.

In response to Latour's proposition about the modernist separation between nature and culture, in Calcutta, as we shall see, nature, in our case the river, was not, whether in the nineteenth century or even today, seen to be in alienation from the human, as much as the social spaces of the city was not seen in similar alienation of the non-human. The river was revered as a living and mythological entity, a Goddess, it was at the same time a conduit of imperial commerce, a source of domestic water and a natural sewage for the city. Yet, this is

¹³ Sukumar Ray referred to the various forms of 'jal' [water] that one could drink, such as tap water, river water, spring water, water from the ponds and wells and the multiple semantic expressions of 'jal' in Bengali language such as rainwater, green coconut water, tears, saliva, nasal mucus, sweat, the water of hookahs etc, 'Abak Jalpan' in Satyajit Ray and Patho Basu (eds), *Sukumar Sahitya Samagra*, Centenary edition, volume 2, (Calcutta, Ananda publishers, 1987), pp. 37-42, see p. 38.

a history of the unfolding of modernity. It is in this intrinsic compositure that this modernity was shaped. This is a modernity of multiplicities, which lay in the particular method that these multiplicities were ordered and maintained. The real construct of modernity is that it trains us to think of things as one, uniform and complete in themselves. Historians have explored the street and the bazaar as the two important sites of Indian modernity. They have shown how these two spaces became repositories of modern Indian everyday lives, politics, commerce and heterogeneity.¹⁴ This paper explores the river as another site of modernity in India.

The River and the City

Calcutta owed its growth and prosperity to the river Hooghly from the middle of the sixteenth century when the Portuguese started navigating up and down the river and connecting its banks to Indian Ocean trade. The British called the river 'Hooghly', derived from the town by the same name around 30 kilometres north of Calcutta on the banks of the river, which was their primary base. Until the end of the seventeenth century, the river was exclusively referred to as the 'Ganges' in the various topographic charts and reports of the East India Company.¹⁵ It was only in the early eighteenth century that the part of the river, around the port of Hooghly was referred to as the 'River of Hughley' or 'Hughley River', similar to the epithet 'London River' used for Thames around the city.¹⁶ By the middle of the eighteenth century, as the British gained control of the river and the region, that phrase became 'River Hughley' and came to denote the entire length of the river in lower Bengal.¹⁷ From then the official name of the river became Hooghly denoting its commercial and colonial heritage, while even today in the everyday vernacular of the city it is called 'Ganga' or even 'Bhagirathi', signifying its origin from the great river of the north. This dual identity remained a feature in the question of purity and pollution and the opposing discourses of the secular and the sacred river.

¹⁴ Chakrabarty, 'Of Garbage, Modernity and the Citizen's Gaze'; David Arnold, 'The Problem of Traffic: The street-life of modernity in late-colonial India', *Modern Asian Studies*, 46 (2012): 119-141; Anand A. Yang, *Bazaar India: Markets, Society, and the Colonial State in Gangetic Bihar* (Berkeley, University of California Press, 1998).

¹⁵ 'Early Charts and Topography of the Húglí River', Chapter 4, *Diary of William Hedges, Esq. (Afterwards Sir William Hedges) During his Agency in Bengal, as well as on His Voyage Out and Return Overland (1681–1687)*, Edited by Henry Yule, (1887), pp. 196-202,

¹⁶ *Ibid*, pp. 203, 205

¹⁷ *Ibid*, p. 205

As the city became an increasingly vibrant urban centre, the river itself gradually lost its vitality. Tectonic movements from the sixteenth century led the main channel of the flow of water over the years to divert to eastern Bengal and the Hooghly increasingly silted up. The construction of the Ganges canal in 1854 added to the problem. The dams in northern India diverted much of the water into Ganges Canal to irrigate the surrounding land. This reduced the flow of water to the Ganges all the way down to deltaic Bengal.

The river was not the main source of drinking water for the city. Pumping of Thames water for the city of London and its conveyance through pipes to private homes had started in the sixteenth century.¹⁸ Calcutta, a 'city in the swamp'¹⁹, was crisscrossed by several creeks of the river, including an old channel called *Adi Ganga* (the Old/Original Ganges) which ran through the city, many of which either dried up, or became sewage canals or joined the underground springs. Names of places such as Ooltodinga (later called Ultodanga, meaning capsized skiff) remind us of the earlier boating practices through these creeks.²⁰ These channels and the monsoon rains fed the numerous tanks and ponds in the city, which were the main source of water for the early residents; including the small English population around the Fort William who drew their water from the adjacent and grand Lal Dighi.²¹ In Calcutta, access to drinking water was traditionally determined in terms of the 'enclosed' and 'open' spaces that Chakrabarty has suggested about pre-modern habitations. The English and the propertied class of Indians had access to the protected sources of water from the major or private tanks, while the poor consumed the water of the exposed smaller puddles and creeks. The latter of course was open to various kinds of pollution. European residents of the city stored rainwater in large Pegu jars throughout the year.²² Affluent Bengali households fetched water through their servants from the river, which was then stored in the cellar in large jars. The aqueducts carried unfiltered water from the Hooghly

¹⁸ Anne Hardy, 'Water and the search for public health in London in the Eighteenth and Nineteenth Centuries', *Medical History*, 28 (1984): 250-282, pp. 251-2.

¹⁹ Rhoads Murphy, 'The City in the Swamp: Aspects of the Site and Early Growth of Calcutta', *The Geographical Journal*, 130 (1964): 241-256.

²⁰ *Census of India, 1901, Calcutta, Town and Suburbs* (Calcutta, 1902), p. 89

²¹ *Ibid*, p. 112

²² James Ranald Martin, *Notes on the Medical Topography of Calcutta*, (Calcutta, G.H. Huttman, Bengal Military Orphan press, 1837), p. 28.

into the city during high tide, which was used to fill up the household tanks.²³ Hindus also collected water from the river in small quantities for domestic and ritualistic purposes. By the early nineteenth century, the river carried signs of the growing city. Dead human bodies and skinned animal carcasses could be seen floating on the river. The leather produced in Calcutta was in great demand in Europe and America. At that time, the leather factories were located near Bentinck Street near the river and the skinned animal bodies were disposed into the river. At Nimtala and Kasi Mitter's ghats, at the centre of the so-called Black town, those who could not afford the price of wood and fuel instead of burning them, threw the corpses instead into the river. Others were sent to the Medical College of Calcutta, which after the medical procedures were conducted upon them were similarly disposed off. In the 1860s, Cecil Beadon, the Governor of Bengal, prohibited the practice of skinning of animals at Nimtala ghat and the throwing dead bodies of humans and animals into the river.²⁴ He also built a cinerator on the site of the old burning-ghat, on the banks of the Hooghly.²⁵

The city itself had drawn the attention of the authorities and the residents for its insalubrious conditions and colonial officials alternated between blaming the lay of the city, its climate and the habits of the natives.²⁶ In his Minute in 1803, Wellesley described the drains of the city to be useless and 'offensive'. According to him, the problem was in the early plans to drain the town towards the river Hooghly, while the natural incline was towards the salt water lakes in the east.²⁷ Soon after Wellesley's pronouncement, in 1807, the superintendent of General Police, who was entrusted with the maintaining the public affairs of the city, wrote to Thomas Brown the chief secretary to the Government about the lack of drains and suggested that the lottery funds be used to construct new drains.²⁸ A committee 'for the improvement of Calcutta' was formed, which decided that most of the

²³ Rabindranath Tagore, *Chelebelā* [Childhood], (Calcutta: Biśvabhāratī Granthālaya, 1940), p. 3.

²⁴ C.E. Buckland, *Bengal under the Lieutenant Governors, A Narrative of the Principal Events And Public Measures During Their Periods Of Office From 1854-1898*, (Calcutta, S. K. Lahiri and Co, 1901), pp. 296-7.

²⁵ William Eassie, *Cremation of the Dead: its History and Bearings upon Public Health* (1875), p. 97

²⁶ S.W. Goode, *Municipal Calcutta; Its Institutions in their Origin and Growth*, T.A. Constable, Edinburgh, 1916, pp. 107-8.

²⁷ David B. Smith, *Report on the Drainage and Conservancy of Calcutta* (Calcutta, Bengal Secretariat Press, 1869), p. 2.

²⁸ 'Measures taken to promote public hygiene in Calcutta - improvement of the drainage system', Records of the Board of Commissioners for the Affairs of India: IOR/F/4/319/7253, pp. 15-16, Asia Pacific and Africa Collections, British Library (Hereafter APAC).

drains needed repairing, old canals needed to be opened up and used for sewage, particularly the canal that formerly connected the 'Maratha ditch' at the east end of Dharamtolla road to the salt water lake. Due to the obstruction of that canal, the sewage accumulated in the town itself.²⁹ The main decision was to channelize sewage and waste of to the salt water lake area to the east, rather than towards Hooghly to west. However, the problem was left unattended.³⁰ In 1839, the Calcutta Fever Hospital committee reported on the terrible living conditions in the native quarters and the diseases such as fevers, diarrhoea that afflicted them. Once again, the drains received particular attention. Dr W. Graham reported to the committee that he regarded the drains of Calcutta as 'the hot beds of disease' and surgeon Martin commented that in the neglected native parts of the city 'are to be found all the faults of the cities in India'.³¹

Regimes of Purity

A new regime of purity that first unfolded in Europe in the nineteenth century accentuated these concerns in Calcutta, which critically for our story, linked sewage with drinking water and therefore juxtaposed pollution with purity. This subsequently confronted the indigenous notions of purity and pollution in India. The main protagonist of this narrative was cholera, which supposedly originated from lower Bengal and Calcutta and spread throughout the world. Between 1817 and 1870, several cholera pandemics appeared in Europe, United States and eastern and northern Africa. The main achievement of the nineteenth-century sanitarian movement in Europe, which developed in response to the cholera epidemics, was the linking of disease with urban conditions. In 1842, Edwin Chadwick, an English social reformer and civil servant, published his *Report on the Sanitary Condition of the Labouring Population*, which demonstrated that poor living conditions, overcrowding and foul air predisposed urban populations to epidemic diseases.³² John Snow's subsequent identification of cholera as a water-borne disease in 1854 situated supply and drainage of water at the heart of the regime of purity and urban planning in Europe. This sanitarian governmentality was premised on the modern discovery of 'filth'.

²⁹ Ibid, pp. 17-30.

³⁰ Goode, *Municipal Calcutta*, p. 109.

³¹ Smith, *Report on the Drainage and Conservancy of Calcutta*, p. 3.

³² Edwin Chadwick, *Report to Her Majesty's Principal Secretary of State for the Home Department, From the Poor Law Commissioners, on an Inquiry into the Sanitary Condition of the Labouring Population of Great Britain* (London, 1842).

For most physicians and urban authorities at the end of nineteenth century, 'filth' was the visible representation of cholera. Both had imperial connotations as well. Within imperial sanitarian morality, cholera was characterized as a 'filth disease carried by dirty people to dirty places' which could only be eradicated by the regime of purity: 'pure water, pure air, pure soil, and pure habits.'³³ In Calcutta, at the so-called 'home of cholera', filth therefore became acutely visible. The modernist production of spaces and epidemiology of cholera simultaneously identified filth as the enemy of the city.

To British physicians and municipal authorities this filth was most visible in Hooghly, which to them was not just a river but also an embodiment of urban native habits. The supply of pure water to the modern city needed the purification of nature from these social and cultural practices. On 19 December 1850, J.T. Pearson the Presidency surgeon sent the first memorandum to the city authorities requesting the appointment of a committee to develop plans for the supply of pure water and a better system of drainage for Calcutta. He described the river Hooghly to have been 'corrupted' by the dense population around it. The 'dead bodies of men and animals thrown into it' made it unsuitable for domestic consumption. He also referred to the old problem of drainage, which ran towards the river rather than the salt water Lake.³⁴ The tanks were equally problematic as 'people bathe; vegetables and animals, generated in all the fertility of the tropics, live, die, and decay...; the filth of drains and tatties runs into them...'. The natives used the same water for cooking, washing and drinking: 'T[t]hen comes disease, fever, bowel complaints, and cholera'.³⁵ Even before that, in 1847, F.W. Simms, a British engineer had proposed a plan to supply treated water of the river to the residents of the city. He identified Pultaghat, 18 miles south of Fort William, as an ideal site for collecting water from the river and transporting it to Calcutta via open canals.³⁶ He found the water at Pulta to be less polluted and just above the line of saline water from the sea. Motors would raise the water through suction from

³³ Hart, 'Cholera: Where it comes from and how it is propagated', *British Medical Journal*, 1696 (1 July 1893): 1-4, p. 1.

³⁴ 'Memorandum on the supply of Pure water and a better system of drainage to the town of Calcutta', in F.W. Simms, *Report on the Establishment of Water-Works to Supply the City of Calcutta, With Other Papers on Watering and Draining the City [1847-52]* (Calcutta, 1853), pp. 31-9, in particular, pp. 35-7.

³⁵ *Ibid.*, pp. 35-6.

³⁶ Simms, *Establishment of Water-Works*, pp. 7-8.

the centre of the river and discharge it into the reservoirs.³⁷ The purification of the water was to be done at Ballygatchea. After filtration, it would be passed into one or more reservoirs, from there the water would be forced through steam power into mains leading to the city with a pressure that would deliver it into elevated cisterns in each house.³⁸ Work started under Lord Dalhousie and in 1868, the waterworks at Pulta were completed. By 1870, the major streets of the city had been piped, providing water to some Indian homes as well, as Rabindranath Tagore described, 'in the first exuberance of its [Pulta water] triumphant entry it [the city authority] did not stint even the Indian quarters of their supply'.³⁹

The Pulta waterworks did not immediately usher an era of 'modern water' in Calcutta. Instead, it generated a completely new range of debates about the purity of water. Soon after Simms submitted his proposal for using the Hooghly water for drinking purposes, William Clark, the civil engineer of the city proposed a 'water-carriage system' for the town to the Municipal Commissioners. Clark suggested a 'combined' sewage and drainage system; to carry both rainfall and sewage from the city to the salt water lakes through underground covered drains. This would also get rid of the system of collecting and disposing night-soils through carts.⁴⁰ In 1857, when the Calcutta Drainage Committee sat to discuss Simms' and Clark's reports together it made sense to them that sewage should be discarded in the salt water site in the east while pure water was collected from the river in the west. They accepted Clarke's suggestion that the drainage of the city through the existing canals (the Nimtollah, Colootollah and Dhurumtollah), extending and opening new ones to the salt water lake. The tides from the Bay of Bengal, which entered the lake through creeks and channels, they believed, would carry the sewage into the sea.⁴¹

This seemingly perfect plan was not implemented. The old practice of collecting domestic effluents into public depots, carrying these in open carts at night through the crowded parts of the town and then dumping into the river continued.⁴² The British residents of the city

³⁷Ibid, p. 5.

³⁸ Ibid, p. 8.

³⁹ Tagore, 'Within and Without', in *My Reminiscences* (1917), Macmillan Company, pp. 15-16.

⁴⁰ William Clark, 'Report on the drainage of Calcutta', in Letter from the Municipal Commissioners to the Government of Bengal, forwarding a report on the drainage of Calcutta', dated the 29th December 1855. British Library.

⁴¹ *Report of the Committee of Drainage of Calcutta, 1857*, Calcutta, John Gray, 1857, pp. 1-7, APAC.

⁴² Smith, *Report on the Drainage and Conservancy of Calcutta*, p. 6.

were less affected by the practice, as these were carried through the crowded native quarters. Only those living away from open and fine streets near Chowringhee suffered as the large public depots were often located near their residences, where the effluents remained all day and the from the open carts as they were transported was unbearable.⁴³ In 1864, John Strachey (Sanitary Commissioner of Bengal) passed a damning verdict on Calcutta, 'the state of the Capital of British India, one of the greatest and wealthiest cities in the world, is a scandal and a disgrace to civilized government'.⁴⁴ The same year, Mr Schalch (Chairman of the Justices of the Peace) described Calcutta as 'one mass of cesspools', the 'poison' of which led to three out of every four deaths caused by diseases.⁴⁵ In 1865, when more than two hundred people died in the city from cholera, the city's health officer ascribed this to the accumulation of putrefying night-soil.⁴⁶

Moreover, this deposit was now polluting the river Hooghly, which was simultaneously being purified for the supply of drinking water. The very regime of purity that the colonial authorities had sought to erect was now under threat. In 1869, David B. Smith (Sanitary Commissioner of Bengal) submitted a report to the city authorities. Smith found the disposal of night-soil into the Hooghly as the greatest problem for the residents of the city who now used the water for drinking purposes. He suggested once again the salt water lake area as the ideal repository for the night-soil of Calcutta. He also recommended fertilizing the area and starting agriculture so that 'what is now a wilderness and a morass would bear profitable crops and furnish splendid pasturage'.⁴⁷ F.N. Macnamara, Professor of Chemistry at the Medical College in Calcutta, raised the old fear in his report on water in Bengal: if the Hooghly was being used for both sewage and drinking purposes, cholera would always find its way into the alimentary canals of the residents of the city.⁴⁸ The Pulta waterworks put a new focus on the question of purity of Hooghly, while the river continued to serve its hybrid roles, that of a sacred river, a source of domestic water and a natural sewage for the city. The colonial authorities, in their urge to purify the river, often commented on its multiple uses by Indians with misplaced sarcasm: 'Still the Natives drink it [the water from Hooghly]

⁴³ Ibid, p. 6.

⁴⁴ Ibid, p. 4.

⁴⁵ Ibid, p. 5.

⁴⁶ Ibid, p. 9.

⁴⁷ Ibid, p. 114.

⁴⁸ F.N. Macnamara, *Report on the Analysis of Potable Waters of Cantonments in the Bengal Presidency*, (Calcutta, 1868), pp. 33-4.

with the greatest appetite, bathe in it everyday, to clean their bodies and souls...'.⁴⁹ This now throws into relief the question of pollution and purity of the river.

Purity of the River

Was the natural, flowing water of Hooghly polluted? The main form of impurity of the river that the colonial officials encountered were visual; the natural muddiness of its water.

Question arose; was this muddiness caused by silt or rotting organic matter? The silt content of Hooghly had concerned the English for some time, particularly from the point of view of navigation. In 1842, Henry Piddington, as a member of the Hooghly River Committee, had collected samples of water of the river to determine the average silt content. He found that the main content of the silt was carbonate of lime, not organic matter, which was deposited in crystalline form as the carbonic acid evaporated.⁵⁰ Piddington's report, submitted in the days before the Pulta works were conceived of, remained buried in the conventional navigation literature on the river. As the Pulta works were built, the silt posed a problem in the filtration process; the filters got choked too often. Even several rounds of filtration did not eliminate the cloudiness of the water. Filters supplied from England (such as the Spencer's Regulating Cup) were found to be ineffective, particularly in the monsoon when these could not cope with the increased volume and salt content of the water.⁵¹

A maverick Scottish entrepreneur, David Waldie, provided the solution. Waldie came to India as a chemist in 1853 to take up a post as Chemist for a chemical works, Malcolm & Co, of Calcutta. Around 1860 he established his own chemical works at Baranagore, Calcutta. As he lived on the banks of the Hooghly, Waldie decided to participate in the discussions on the muddiness of the water of the river, which was at that time being considered for the supply of Calcutta. He travelled along the course of the river on a boat collecting water from various points and experimenting with these and came up with a unique solution. He found that the problem of silt in Hooghly was critical only during the months of the monsoon when the river carried excess silt. He noted that there was a deficiency of saline matter in the water in the monsoon, when the water was most muddy. The saline matters acted as precipitants of the mud. Therefore, the solution would be to add salts of lime and magnesia

⁴⁹ Smith, *Report on the Drainage and Conservancy of Calcutta*, p. 16

⁵⁰ Piddington, 'On the Quantity of Silt held in suspension by the waters of the Hooghly at Calcutta, in each month of the year', *Journal of Asiatic Society of Bengal*, 23, (1854): 283-7.

⁵¹ Macnamara, *Eighth Report on the Analysis of Potable Waters of the Cantonments in the Bengal Presidency* (Calcutta, Office of Supt of Govt printing, 1871), pp. 11-15. IOR/V/27/841/2, APAC

to the water in the filtration process to bring the saline content to the levels of December and January. The very fine particles of clay would then coalesce and aggregate into larger and denser ones and settle down and the water could be then filtered easily through settling beds.⁵²

Waldie's simple solution settled the problem of silt but stirred up the question of impurity of the river. To some of the British health officers of the city, it was not conceivable that the main issue of purification of the Hooghly, which appeared so visibly polluted, was just silt. In 1866, at a meeting of the Asiatic Society of Bengal in Calcutta, where Waldie presented his initial findings based on his examinations of the water, that the main pollutant of Hooghly was silt and not organic matter (a conclusion earlier reached by Piddington), Smith (Sanitary Commissioner of Bengal) reacted strongly. Smith rejected the laboratory experiments that in his view tended to obscure the obvious and visible filth of Hooghly. He retorted that Hooghly was an 'indescribably unclean and revoltingly contaminated river...a vehicle of every variety of excrementitious abomination...'.⁵³ This obvious, visible and abhorrent filth made Waldie's suggestion 'vanished entirely from his mind'. To counter Waldie's experimental results, Smith painted a vividly colourful, and one might say even emotional, picture of the pollution of Hooghly. An extract of his extraordinary depiction will be sufficient:

We must remember...the incalculable vast sources of vegetable and animal adulteration occurring in the whole previous course of so large an Indian river. We must think of all its tributaries, and of the thousands of *nullahs* that carried into it pollution of every conceivable kind—dead and putrid animals, decaying vegetation and waste matter from populations covering vast areas. ... We must recall the fact of there being, at the present moment, such things as floating Latrines for thousands of our famine-stricken paupers who find shelter close to the river bank...Besides this, we must remember that very vast quantities of night-soil are deposited daily in the Hooghly...If we think of all these impurities and couple them with the tropical conditions of heat and moisture in which they are found [then it is]...highly probable

⁵² D. Waldie, 'On the Muddy Water of the Hugli during the rainy season with reference to its purification and to the Calcutta Water-supply', *Proceedings of the Asiatic Society of Bengal*, (1873), pp. 175-179

⁵³ *Proceedings of the Asiatic Society of Bengal, 1866*, (Baptist Mission Press, Calcutta, 1867), p. 224

that there should be as much as 5 grains of organic impurity in each gallon of the water.⁵⁴

Rajendralal Mitra, the Indian Orientalist, who was present at the meeting, disapproved of Smith's 'high coloured picture' and cautioned, as we will soon find almost prophetically, against such '*a priori* arguments which proved nothing'. Stressing the need for further rigorous analysis of the water, he suggested that the river 'was not a closed vessel' and discharged enormous volume of water every minute into the sea, which needed to be taken into account along with the polluting matter that is being added. He also suggested that the exposure to the atmosphere and the oxygen present in the water constantly transformed large quantities of filth. He concluded: 'rivers were the natural drains of a country, and designed expressly to carry away its surplus waters and its sewage where they became the least offensive...The Hooghly in this respect was not worse off than the Thames, the Seine, the Rhine, or the Meuse in other countries. They were the best of sewers...'.⁵⁵ Before we move on to examine the question of the pollution of Hooghly caused by organic matters, we must pause for moment to consider the fact that on the question of sewage, Mitra had described Hooghly as a natural, physical entity, even as a sewer and thus not distinct from any other rivers of the world. He then reinforced that physicality with his everyday Hindu experiences of the river to suggest that Hindus knew from their ritualistic 'experience of ages' that at most times of the year the water was safe to drink.⁵⁶ Here we encounter for the first time, the multiplicity of the river in Hindu consciousness; to Mitra, the modern and the ancient river, the sewer and the *Ganga*, coexisted without violating each other. We shall return to this coexistence and to the project of its filtration in greater detail later.

Meanwhile, domestic effluents were still being carried in open carts through the city, but by the early twentieth century, mostly to the dumping grounds in the east, rather than the river. This practice brought about a volte-face in the debate about the purity of the river, as the growing concern was now with the accumulating sewage in the marshy lands. In 1903, AE Silk, the sanitary engineer of Bengal conducted experiments to see if it would be possible to abolish the practice (causing 'the horrible nuisance and expense') of carrying night-soil in carts and the 'the horrors' of trenching grounds in the salt water area where these were

⁵⁴Ibid, p. 222

⁵⁵ Ibid, pp. 227-8

⁵⁶ Ibid

dumped.⁵⁷ Silk suggested a reversal of policy; sewage could be better disposed into the river as was the practice in England.⁵⁸ He believed that in India, the problem of disposing sewage into the Hooghly was much less, compared to that in England, where the rivers were much smaller. Many of the inland towns of England discharged the effluents from their putrefaction works into small brooks, streams or comparatively large rivers. These streams and rivers also formed the sources of drinking supply for the towns lower down. He suggested that circumstances in India were different. First of all, 'the enormous rivers of India containing at all times of the year vast bodies of water in motion and always ready to quickly purify, by oxidation, any organic matter that falls into it'. The seasonal rivers even had sand beds, which acted as natural sewage filtrates. Along with it was the force of the tropical sun; 'we have the sun and wind which seem to have much greater purifying effects in this country than they do in colder climates, more especially when the matter to be purified is kept in motion.' He called these the 'tremendous natural advantages' of sewage disposal in India and that 'Practically all that we need to do in this country is to dispose of our night-soil in an inoffensive and cheap manner...' As he passed this verdict Silk also asked for a degree of tolerance for the organic pollution in the river as '...no standard of chemical purity can help us when our senses of sight and smell are offended.'⁵⁹

Silk's suggestion had an important precedence. In 1895 EH Hankin, the imperial chemical examiner based in Agra, discovered the 'remarkable' power of self-purification of the water of Ganges, which was due to the presence of volatile acid substances and strong sunlight.⁶⁰ A few years later he made an even stronger assertion that due to the presence of a 'mysterious' antiseptic, the water of the Ganges and Jumna 'is hostile to the growth of cholera microbe'.⁶¹ E.H. Hart, the editor of *British Medical Journal*, who visited India around that time, wrote to the Lieutenant-Governor of the Northwest Provinces that Hankin's discovery had given 'fresh confidence to those concerned with municipal water supplies.'⁶²

⁵⁷ A.E. Silk, *A Sewage Disposal Experiment in Calcutta*, 2nd edition, (Calcutta Bengal Secretariat Press, 1903), p. 26, IOR/V/27/842/5, APAC.

⁵⁸ Here he was drawing from his own earlier book: *Recent Methods of Sewage Disposal in England*, (Calcutta, Bengal Secretariat Press, 1898).

⁵⁹ Silk, *A Sewage Disposal Experiment in Calcutta*, p. 24-25

⁶⁰ 'Microbes of Indian Rivers', *BMJ*, 1780 (9 February 1895): 312.

⁶¹ Hankin, *The Cause and Prevention of Cholera*, 6th edition, (1897), Preface, pp. 3-4.

⁶² From Dr E Hart, Editor *BMJ* to Sir A MacDonnell, Bombay, 9 March 1895, *BMJ*, November 1895, 789-92, pp. 790-1

Thus according to this new science of water, the visibly polluted Ganges was also purifying itself. Its water could thus be easily used for drinking purposes. The river could be used as sewage as well.

In W. Clemesha's subsequent analysis of 'tropical waters', we find similar evidence of the comparison between the natural purity of water in India and England. In his view, in a small and thickly crowded country like England the rivers were 'mere streams' compared to the great rivers of the East and were heavily polluted. In fact in England, many rivers were 'little more than sewers', and very few other natural sources of water existed which could be used without purification. Moreover, in the 'cold, dull grey climate' of England with 'frequent rain and little sunlight' the natural purification of water could hardly take place. Thus, the question of purification had appeared more critical there. He declared that from the perspective of drinking water, 'England is a land of scientifically purified waters'.⁶³ In the East, on the other hand, the great rivers, the 'leviathans' such as the Ganges, the Indus, the Irrawaddy, the Brahmaputra, carried massive quantities of water. The towns along the side rarely had underground drains, which drained into these and often the pollution could not be traced, even near a large town such as Benares.⁶⁴ In contrast to his verdict on England, India to him was 'the land of unpurified water-supplies, or to be more correct, a land where purification...is brought about by natural agencies'.⁶⁵ He undertook a detailed analysis of Hankin's suggestions about the self-purification of rivers in India, particularly the faecal matters that seemed to be the critical pollutant. Clemesha concluded that in India, the self-purification of the river waters were effective for 8 months. In other months, the 'reverse is the case' as the torrential rains washed an enormous amount of surface pollution to the rivers, along with a lot of silt.⁶⁶ His main argument was that any attempt of purification of water sources in India had to take into consideration the 'extent and power of these natural forces'.⁶⁷ Thus, even at the beginning of the twentieth century, we are faced with some of the questions that we started this discussion with; what was the nature of impurity of Hooghly and was there a need for its purification? Or, what should be the modes of such

⁶³ Clemesha, *The Bacteriology of Surface Waters in the Tropics* (Calcutta, Thacker, Spink & Co., 1912), p. 1.

⁶⁴ *Ibid*, p. 2.

⁶⁵ *Ibid*, p. 3.

⁶⁶ Clemesha, *Research into the effect of Storage of Highly polluted waters in the Monsoon season*, Report no. 2, (Calcutta, Bengal Secretariat Book depot, 1913), p. 1.

⁶⁷ Clemesha, *Surface Waters*, p. 3.

purification? It is now necessary to incorporate into our analysis the wider debate, which was taking place about the physical and spiritual nature of purity and pollution of Hooghly. The debate about purifying the sacred river had been posed at the heart of the modernist project of purification.

Purifying the River

Saurabh Mishra has shown that the discourse of adulteration of milk in India was shaped by the nostalgia among the Indian middle class about a pristine past when everything was seemingly pure, which appeared to have been lost with the onset of modernity, industrialization and urbanization.⁶⁸ The purification of Hooghly as a modernist secular intervention on the river led to a similar sense of nostalgia about the loss of a sacred river and a pure and pristine past. However, on the question of water, this sense of nostalgia was tempered by the juxtaposition of the pristine and the polluted, in which the sacred river of the scriptures coexisted with the polluted one of the Indian metropolis. The project of purification of Hooghly in Calcutta encountered this particular entanglement of the sacred and the polluted. In this enmesh, same terms acquired distinct meanings. Within traditional Hindu worldview, terms such as pollution and purity had sacred and ritualistic connotations, while to the sanitarian regime; these terms had secular, physical and moral meanings. Purification of Hooghly was premised on the physical and moral notions of pollution of water. The opposition to it, on the other hand, was based on a ritualistic idea of purity of Hooghly, which they feared would in fact be polluted by the colonial project of purification. To give an example, as the plans for the purification of water at Pulta were being drawn up, sections of the Indian population opposed them. J.O. Beckett, Secretary to the Commissioner for the Improvement of the Town of Calcutta wrote to Cecil Beadon that a few Hindus have questioned the plans. He was pessimistic about their acceptance of piped water and felt that they would continue to send their women and servants to fetch unfiltered water from the river, 'notwithstanding it is impure and corrupt'. Here Beckett used the terms 'impure' and 'corrupt' in sanitarian, secular and moral sense. The British had referred to the filth and pollution of Calcutta and Hooghly from this moralistic viewpoint. Those who opposed the project of purification used similar terms but in a ritual and sacred sense. Yet, these categories were also fused as Hindus adopted the moral sanitarian

⁶⁸ Saurabh Mishra, *Beastly Encounters of the Raj: Livelihoods, Livestock and Veterinary Health in North India, 1790-1920* (Manchester, Manchester University Press, 2015), pp. 102-122

categories to reinforce their ritual sense of pollution. In the ensuing debates on the purification of Hooghly, we will explore the contiguity between the pure, the impure, the sacred and the corporal.

Beckett went on to add that the Indian members of the Board of Improvement of Calcutta remained 'strongly opposed' to Simms' plans. Although not opposed to purification as such, they believed that most Hindus of the city would regard the mechanically purified water to be actually 'polluted'. They had suggested that 'a very long time must elapse, and education must spread far and wide, before Hindoos could be expected to use Water supplied by means of aqueducts or iron pipes...'.⁶⁹ Although Beckett did not specify the nature of the opposition, it seems that two issues were at stake; the fact that the water would be passed through iron pipes and that it would be handled by people of lower castes. While proposing the works at Pulta, Simms did refer to both concerns. However, he was optimistic that Hindus considered the water of Hooghly to be 'so holy as to purify everything in contact with it, therefore there can be but little doubt that it would (after the first shock to the prejudices of the orthodox Hindus is got over) be acknowledged to produce that sanitary effect upon the pipes...'. He also argued that since the Hindus already used the unfiltered water that was piped from the river and pumped at Chandpal ghat, they might not reject the water that was piped from Pulta.⁷⁰ On the problem of caste, he suggested that Brahmins could be entrusted with the maintenance of the waterworks, which would make it acceptable for others to use it.⁷¹

It is not clear how entrenched this opposition was, but in the early 1870s, when piped water was first introduced in Calcutta, a debate took place on whether filtered water was suitable for domestic use. The Sanatan Dharma Rakshini Sabha (Society for the Defence of Traditional [Hindu] Religion), which had been established recently, in 1873, and several Brahmin pundits of Calcutta participated in the deliberations. The main debate was whether that particular form of water, which modern machines extracted rather than collected directly from the river was suitable for use in Hindu households. The Sabha, after

⁶⁹ From J.O. Beckett, Secretary to the Commissioner for the Improvement of the Town of Calcutta, to Cecil Beadon, Sec to the Gov of Bengal, 4 September 1852, in Simms, *Establishment of Water-Works*, pp. 46-51.

⁷⁰ Simms, *Establishment of Water-Works*, p. 25. The first major urban project on the river was the steam engine installed in 1822 at Chandpal ghat, which pumped unfiltered water directly from the river to wash the streets of the White town.

⁷¹ *Ibid*, pp. 26-27.

considerable scriptural consultations and deliberations, passed the verdict that Hindus could use the modern machine-produced water for drinking and bathing purposes. The merits of 'Gangajal' (unfiltered water of the *Ganga*), however, remained greater. The Sabha thus opted for an expedient separation of secular and the religious waters, a distinction that exists even today in Hindu households in Calcutta; unfiltered *Gangajal* was to be used for religious and ritualistic purposes, while the modern 'machine produced' and 'healthy' water could be used for bathing and drinking purposes. This verdict was premised on the distinction between the clean and the sacred; the machine-produced water was clean and healthy but not sacred.⁷²

Although most residents of Calcutta accepted this distinction between modern and the sacred waters, a small section of orthodox Hindus continued to oppose piped water. The president of the Sabha, Kamal Krishna Deb Bahadur, had to pass a yet another verdict on the matter. He published a text, *Jantradhrita Jal-Shuddhi* (The Mechanical Purification of Water) in 1875, written in heavily Sanskritized Bengali, in which he provided evidences from several *Shastras* and other Sanskrit texts in support of the legitimacy of the machine-produced filtered water. In the text, Deb Bahadur reiterated the bodily benefits of the modern water when he sarcastically commented that some of the prominent Brahmins of the city who had become extremely vocal in this matter had expended in their protest, 'whatever strength they had acquired by drinking the machine-produced water...'⁷³

At the outset, the text reflects the semantic and scriptural debate within Hinduism on water and purity that the arrival of modern water had posed. However, rather than being an internalist text, a reflection of a debate taking place *within* the Hindu community, it is situated within the wider debates around purity and pollution of water. Although the text was written by the president of an orthodox Hindu organization to pass a verdict on the debate of religious sanctity of piped water, Deb Bahadur, in his search for references to pollution and purification, embarked on a secular reading of religious texts. To that extent, the text is part of the British orientalist tradition of reading of classical Indian texts for

⁷² Raja Shri Kamal Krishna Deb Bahadur, *Jantradhrita Jal-Shuddhi* [The Mechanical Purification of Water], (Calcutta, Baburam Sarkar, 1282 [1875]), 'Introduction', p. ii. All translations from Bengali to English are by me

⁷³ *Ibid*, p. iv

references to Indian law, medicine and geography.⁷⁴ Most of the questions that the text raised around the purity of Hooghly concerned not just certain sections of the Hindu orthodoxy, but the entire sanitarian regime. Questions such as, is water naturally pure; if water is naturally pure, then what is the need for its purification; if water becomes impure for any reason, is there any way to purify it; do the same causes of impurity of water hold true for all forms of water, etc had reverberated within the contemporary scientific community.⁷⁵ By addressing these questions, Deb Bahadur was not only participating in the wider debate on purity and pollution of water, but was also incorporating the modern piped water within the semantic and spatial multiplicity of waters in India. The text refers to the various forms of waters in traditional Hindu understanding, which were defined in geographical, hygienic, semantic and ritual terms. Throughout the text, Deb Bahadur used the term '*ei jal*' (this water) while referring to the filtered water from Pulta as a metonym for what is referred to in historiography as 'modern water' and '*Gangajal*', to refer to the unfiltered water of the Ganges, which was sacred and 'traditional'. In suggesting that traditional waters could be both polluted and purified, he placed the traditional and the sacred adjacent to the modern and the secular.

First, we are presented with the scriptural definitions of pollution of water. According to the *shastras* and other Sanskrit texts, water was naturally pure, which could become polluted (*dushito*) if it became stagnant.⁷⁶ Thus, large bodies of water such as rivers were naturally pure unlike shallow tanks and wells.⁷⁷ If such flowing water acquired filth such as human excrement, the mud and the natural flow of the river cleaned it.⁷⁸ After establishing the possibility of pollution and purification of natural water from the scriptures, Deb Bahadur addressed the crucial matter of water purified through machines and supplied through pipes. According to him, the *shastras* clearly stated that purification through mud and flow

⁷⁴ For references to Indian geography from ancient texts, see Alexander Cunningham, *The Ancient Geography of India*, (London: Trübner & Co., 1871), for William Jones' search for Hindu penal code and rule of property, see Javed Majeed, 'James Mill's "The History of British India" and Utilitarianism as a Rhetoric of Reform', *Modern Asian Studies*, 24 (1990): 209-224. For perils of such projects, in the case of smallpox vaccination, see Dominik Wujastyk, 'A Pious Fraud: The Indian Claim for Pre-Jennerian Smallpox Vaccination' in G J Meulenbeld and D Wujastyk (eds), *Studies on Indian Medical History* (Groningen, Egbert Forsten, 1987), pp. 131-67

⁷⁵ Deb Bahadur, *Jantradhrita Jal-Shuddhi*, p. 1

⁷⁶ *Ibid*, p. 17

⁷⁷ *Ibid*, p. 4

⁷⁸ *Ibid*, p. 2

restored the goodness of water. Thus the water the purification procedure at Pulta, which used filter beds to purify the flowing water of Hooghly, had sanction from the *shastras*. For the use of machines to extract and supply the water, Deb Bahadur identified clear sanctions in the *shastras* about machine-produced water. With a degree of creative interpretation, he referred to any form of mechanical extraction of water traditionally used that was referred to in the texts. To support his claim, he even found the Sanskrit phrase '*Jantradhrita Jalam*' (machine-extracted water), which forms the title of the text.

Deb Bahadur next considered the question of sovereignty and patronage. He negated the suggestion that the water produced by a foreign ruler (*mlechharajashyamik*) was impure. He argued that *shastras* did not consider caste of the ruler (the sovereign) within the normal caste systems so the ordinary regulations of ritual purity were not applicable to the ruler. He interpreted water as a form of patronage. He provided examples where pious Hindus had often accepted patronage from rulers of foreign origin. Even those opposed to the Pulta water, had in recent times, Deb Bahadur noted, accepted financial assistance from the British government. Piped water, according to Deb Bahadur was a similar form of endowment.⁷⁹ He reiterated his verdict about the validity of using piped water by demonstrating that even in Gujarat, Rajasthan and northern India, Hindu authorities, following similar consultation of scriptures had approved the use of piped water.⁸⁰

Throughout this discussion, Deb Bahadur referred to purity and pollution in a physical sense. Although at the outset he accepted that the religious merit of the unfiltered *Gangajal* was greater than that of the purified water of Pulta, it did not preclude the possibility of the former being physically polluted (despite its innate spiritual purity) and the need to purify it through physical and mechanical processes. Only towards the end of the text, Deb Bahadur introduced the layer of the spiritual purity of water, in order to negate suggestions of the pollution of the water touched by people of lower castes. He argued with, yet another, creative reference to the notion of sacrament (*Prasad*: a devotional offering of food made to a god that is later shared among devotees) offered to *Jagannath*, which cannot be polluted by human contact. The water of the Ganges, which to him was a form of sacrament, was similarly immune to such social impurities.⁸¹ Thus, the spiritual and the

⁷⁹ Ibid, pp. 24-27

⁸⁰ Ibid., pp. 31-2

⁸¹ Ibid, pp. 27-28

physical were fluid categories, enacted as and when required to serve specific purposes. Herein lay a hint about Hindu attitudes towards Hooghly or the Ganges. The river could remain sacred and pristine while it was being polluted and purified.

To an extent, in the everyday lives of the city, these conclusions drawn from these religious debates, were foregone. For most residents of the city, who were fortunate enough to receive it (including the orthodox Hindus), piped water came as a blessing and they accepted it without much hesitation. Tagore was a young boy when the Pulta water-works was being built and he wrote in his reminiscences, 'in that golden age of pipe water', it used to flow up to his father's rooms in the third storey of his grand ancestral home. A lonely child, confined to home while his father was away most of the time, Tagore spent his afternoons secretly in his father's room upstairs, staring at the open terrace and daydreaming. Apart from the pleasures of the 'stolen entry' into his father's room there was another attraction; the joy of experiencing the modern piped water: '...turning on the shower tap I would indulge to my heart's content in an untimely bath. Not so much for the comfort of it, as to give rein to my desire to do just as I fancied. The alternation of the joy of liberty, and the fear of being caught, made that shower of municipal water send arrows of delight thrilling into me.'⁸²

However, this bliss and the sense of novelty around piped water were short-lived in the city. Within a few decades, a new source of physical contamination threatened the spiritual purity of the river. This was from the septic tanks, which had been established in an around the city from the late nineteenth century. In 1896, Donald Cameron of Exeter, in England devised septic tanks for the first time, as part of a sewage purification system. The purpose was the purification of sewage in the so-called tank, by anaerobic bacteriological action.⁸³ Soon afterwards, in 1899, Silk surveyed various parts of Calcutta, for the suitability of introducing the septic tank system there. He concluded that septic tanks would be a satisfactory method of disposing of sewage although, unlike in England, where such purification took place in 24 hours, in Calcutta it would take 7 to 10 days due to its tropical climate.⁸⁴

⁸² Tagore, 'Within and Without', pp. 15-16

⁸³ H.W. Clark, 'The Bacterial Purification of Sewage', *Public Health Papers and Reports*, 25 (1899): 187-197, p. 192

⁸⁴ Silk, *A Sewage Disposal Experiment in Calcutta*, pp. 26, 22

Alongside this new apparatus of purification, another major development had taken place along the banks of the Hooghly. From the 1890s, several jute and paper mills were established along the river, mostly north of Calcutta. These mills had enthusiastically adopted the septic tanks for the disposal of the waste matters of their labourers. As the discharged faecal materials from these tanks flowed down the river, residents of the city complained about the septic tanks, which they believed were polluting the river. In response, Andrew Fraser, the Lieutenant-Governor of Bengal instituted an enquiry in 1904.⁸⁵ The committee visited several mills, north of Calcutta and investigated the septic tanks on the banks of the Hooghly in particular.⁸⁶ It also interviewed several prominent Bengalis who had opposed the septic tanks, such as the educationist Raja Peary Mohun Mookerjee, and the Commissioner for the Port of Calcutta Babu Nalin Bihar Sircar and the professor of Sanskrit of Doveton College, Pandit Yogisa Chandra Sastree. They objected to the regular and large-scale 'organised' discharge of faecal matter, the visibly floating 'oily black scum', into the river through the septic tanks by these imperial industries.⁸⁷ What violated their senses about the septic tank? Partly physical and aesthetic; the visible human effluents, the fact that they were kept in a confined space without sun and air, which to them indicated the increased putrefaction, partly the feeling that such effluents were then wilfully and in large-scale thrown into the river as a general practice. Mookerjee insisted that this was a new form of pollution, different from the existing effluents in the river. Those faecal matters normally present in the river were less harmful because fishes and other animals ate them up as soon as they dropped into the river. However, in the septic tanks these underwent putrefaction and were therefore much more injurious than fresh effluents.⁸⁸ This also appeared as a deliberate act of defilement by an alien mechanism, the septic tank, much like the mechanical purification of water had appeared to some, a quarter of a century before.

⁸⁵ *The Administration of Bengal under Sir Andrew Fraser, 1903-1908* (Calcutta, Bengal Secretariat Book Depot, 1908), p. 113

⁸⁶ *Report of the Special Committee Appointed to Examine the Working of the Septic-tank Installations in Bengal*, Calcutta, Bengal Secretariat Press, 1905, IOR/V/26/842/2, APAC

⁸⁷ *Ibid*, p. xviii. Pandit Kaliprosanna Bhattacharya objected to the 'organised system' of throwing of waste matters by the septic tanks into the sacred river, pp. xl-xli.

⁸⁸ *Ibid*, p. xv

One element of the debate was unmistakably new. Now the Hindus⁸⁹ raised the issue of the physical pollution of the river. In doing so, they fused their ritual sense of pollution with the sanitarian one. They used terms such as 'pollution' and 'purity' in both ritual/sacred as well as secular/moral sense. The colonial officials on the other hand, now resorted to the new science to argue that such physical nature of pollution, caused by an industry that was vital to the imperial economy, was deceptive. To the latter, the physical and visible filth now had the subliminal bacteriological and chemical notion of purity. As an example of this tension between the new source of pollution and the new science of purification; while referring to this new source of pollution of the Ganges, Mookerjee referred to Edmund A. Parkes' *A Manual of Practical Hygiene* to assert that 'Water may be chemically pure and yet as deadly as prussic [hydrogen cyanide] acid'.⁹⁰ The colonial officials pointed out that Parkes' manual was written before septic tanks came into existence.

The new science of anaerobic purification in fact helped the British scientists to reinstate what they believed were the actual source of pollution; native habits. The report included a long note by Leonard Rogers, on his recent experiments on the bacteriological action within the septic tanks built near the mills.⁹¹ In his report, he made a distinction between two forms of effluents. He called the effluents from the septic tanks, which had undergone anaerobic purification, the 'purified effluents'. The other was the real pollutant, the product of the visually abhorrent 'habits of the natives', committed indiscriminately on the banks of the river, which he called the 'crude surface faecal contamination'.⁹² Therefore in the debate, the pure and the impure, the moral and ritual became conjoined; the river, which was ritualistically pure, could be physically polluted. The scum that appeared to be physically and morally offensive could in fact be purified matter.

The task in front of the committee was two-fold. First, to convince the complainants that what looked like oily black scum was not pollution but was in fact a form of purity. To do so,

⁸⁹ There is a need to clarify the use of the term 'Hindu' here, as there is a constant overlap between their Indian and Hindu identities in the following discussion. Although almost all the Indians consulted by the committee were Hindus, not all of them articulated a Hindu religious/scriptural opposition to the pollution caused by the septic tanks. Often their opposition was about the physical notion of pollution and was posited against a foreign mechanism. At the same time, some of them connected physical purity with the scriptural one.

⁹⁰ *Report of the Special Committee Appointed to Examine the Working of the Septic-tank Installations*, p. xv

⁹¹ *Ibid*, pp. xxvi-xxvii

⁹² *Ibid*, p. xxvii

it was critical for them to separate the physical from the moral and ritual sense of filth, since Hindus now objected to the physical pollution of Hooghly by using both ritualistic and moral/sanitarian logic. The committee suggested that Hindus had often polluted the river, which they considered sacred.⁹³ The question that they asked repeatedly and in various forms to those who objected the presence of the tanks was, why did Hindus dispose of their domestic waste into the river that they considered sacred?⁹⁴ In *On the Banks of the Ganga*, Kelly D Alley enquired at Benares: 'How is it that a sacred river can be polluted?'⁹⁵ Her query was based on her observation that Hindus at that holy city dumped garbage and waste matters on the same river Ganges that they otherwise considered sacred and worshipped. Although Alley is careful not to mix her contemporary query with historical debates, the parallels between her question and that raised by the committee, although the two were driven by very different intents, is hard to ignore. Both arose from a perplexity about the conflation of the sacred and the defiled, or of physical impurity with ritual purity. It is also difficult not to notice here the parallel with another historical perplexity; the Indian habit of throwing domestic refuse on to the streets. The latter according to Dipesh Chakrabarty, is presented by the modernizing gaze. Chakrabarty suggests that the Indian street presented a confounding spectre to the modernist gaze of the public and private. In the streets, people practised apparently 'private' affairs such as sleeping, cleaning, washing and even defecating in 'public'. Those indulging in such practices did not regard the street as public and their homes as private.⁹⁶ The confusion around a similar act of indiscriminate disposal of waste into the Ganges or the Hooghly by Indians cannot be ascribed to the modernist production of space. The fact that the Hindus treated the river as sacred adds a new dimension to the issue. Alley hints at the answer, which exposes another problem of modernity, when she suggests that in the non-modern understanding, the secular and the

⁹³ Peary Mohun Mookerjee was first asked, 'Is it not the fact that the Ganges at Benares receives discharge from all the drains of the city?' When he replied that people did not drink the water there, the next question was; 'Then you admit that the Ganges is impure?' (Ibid, pp. xv-xvi). ; Or, to Abinash Chandra Banerjee, 'What do you say about the droppings [of human excretion] from the boats, etc.?' (p. xx). When Raj Krishno Tarkapanchanan admitted that effluents were indeed discharged onto the river at Benares, the next query posed was 'Then you mean to say that Ganges there [at Benares] is impure?' (p. xlvii)

⁹⁴ Ibid, p. xv-vi, p. xlvii ('What do you think of the effluents that are discharged into the Ganges near Benares?'; 'Do you know that at Benares the effluent is discharged into the Ganges?')

⁹⁵ Kelly D Alley, *On the Banks of the Ganga; When Waste Water Meets a Sacred River* (Ann Arbor: University of Michigan Press, 2002), p. 4

⁹⁶ Chakrabarty, 'Of Garbage, Modernity and the Citizen's Gaze'

sacred can coexist without being 'dissolved' into one another. In such a worldview, purity and pollution are two incommensurable concepts.⁹⁷

It is necessary to introduce another layer to complexity to Alley's analysis. In Hindu practices, there was in fact a fundamental interspersion of the spiritual and the material and of the sacred and the secular, which allows such incommensurability to coexist. Caste, which is based on scriptural and spiritual notion of purity and contamination and yet can be easily translated into physical and even racial notions of segregation, represents one example of this conflation. This coexistence of the spiritual and material is reinforced by the fact that within Hindu caste system, purity is as ethereal a concept as it is personal, bodily and ritualistic, as opposed to the collective or the environmental. The fact that Deb Bahadur in his scriptural verdict (*Jantradhritra Jal-Shuddhi*) felt the need to insert the logic of the divide and the coexistence of the secular and the spiritual shows that these were often in reality inseparable. The *Ganga* and the Hooghly was at the same time a sacred river to bathe in and feel purified by and a body of water to wash one's clothes. Since one is constantly faced with this entwining of the polluted and the pure, used in both ritual and moral sense, the writing of a conventional environmental history of pollution remains problematic in India.

This commensurability of incommensurables in India helps us to understand the debate around the septic tanks and the issue of multiplicity that we face on the question of water in Calcutta. Seeking to challenge the entanglement of the ritual and physical pollution of the Hooghly and to introduce the singular notion of modern water, members of the committee repeatedly asked the Hindu respondents to distinguish between their religious and sanitary opposition to the septic tanks.⁹⁸ The respondents insisted that their opposition to the tanks was *both* sanitarian and religious.⁹⁹ They maintained that the river was at the same time a physical and a mythological entity and this new filth was thus both spiritually and physically offensive. The colonial officials then posed a slightly different, and a more provocative, question drawing from the earlier scriptural assertions about the purity of Ganges. This was

⁹⁷ This is more clearly articulated in her article 'Ganga and Gandagi: Interpretations of Pollution and Waste in Benaras', *Ethnology*, 33 (1994): 127-145, particularly pp. 140-3

⁹⁸ *Report of the Special Committee Appointed to Examine the Working of the Septic-tank Installations*, see for example, pp. xvi, xviii.

⁹⁹ *Ibid*, see for example, pp. xvi, xix-xx

a subtle inversion of Alleys' and their own earlier query: if the Ganges was indeed holy and incorruptible how could it possibly be polluted by the effluents?¹⁰⁰

Among all the respondents, the Sanskrit scholar Sastree was the only one who accepted the distinction between spiritual and physical sense of pollution. In doing so, he inverted the question to suggest that the Hooghly was indeed being polluted by the mills. He started by reasserting the scriptural holiness of Hooghly. He clarified that Hindus called the same river that flows through western Bengal as 'Ganga', while the British called it 'Hooghly', implying that the former treated it with the same veneration as they did the Ganges.¹⁰¹ He then reinstated the essential purity and holiness of the Ganges by referring to the Vedas, the *Brahmanas*, the *Kalpas* and the *Puranas*, to suggest that the river was not only pure but was also 'an all-powerful and all-purifying deity'.¹⁰² Sastree then deftly moved from the ritual to the physical sense of purity. He provided scientific testimonies of this ability of the river to purify itself by referring to a 'private chemist' (most probably Hankin), who had proved through experiments that the water of the Ganges possessed 'such natural purifying elements'.¹⁰³

He followed the argument of this dual character of the purity of Hooghly by drawing a semantic distinction between the spiritual and physical pollution of the river. He used 'dirty water' as a translation of 'anirmala jala', or 'apariskrita jala' to refer to the physical pollution of water, and the terms 'defiled', 'polluted' or unholy' for 'apabitra jala' to refer to ritual or moral impurity.¹⁰⁴ He stressed that according to the *shastras*; the Ganges can be dirtied in a physical sense, but not polluted in the religious sense.¹⁰⁵ Thus, on the one hand, the term 'pollution', which had been used by the colonial officials in their questionnaire and in their evaluation of the quality of the water of Hooghly, remained ensconced within Hindu religious and moral frame. On the other, the notion of physical impurity of the Hooghly and thereby the rationale for its purification, when needed, was now acknowledged within traditional thinking and was in fact being asserted to the colonial regime.

¹⁰⁰ Ibid, p. xvi, particularly p. xx: 'Don't you think the Ganges can never be polluted?'

¹⁰¹ Ibid, p. xxv

¹⁰² Ibid, pp. xxxii-xxxiii

¹⁰³ Ibid, pp. xxxvi-xxxvii

¹⁰⁴ Ibid, p. xxxii

¹⁰⁵ Ibid, pp. xxxiv-xxxv

The Sanskrit pundit reiterated this distinction between the physical and moral forms of pollution by submitting a plan for the mechanical purification of the effluents of the septic tanks, before they entered the river Hooghly. This was premised on the principle of sun and heat being the natural purifiers of water. According to his plan, the hot water, which came out from the mills could be mixed with the effluent coming out of the filters and the combined effluent could enter a tank and remain there during the day time; 'A[a]nd thus purified by air and light this water, before they are discharged into the Ganges between 7 P.M. and 4 A.M. when the Hindus generally do not perform their religious rites. The necessity of mixing up with hot water is to destroy any injurious or unhealthy bacilli.'¹⁰⁶

[Insert image here]

[Sastree's Plan for the Purification of Septic tanks, Source: *Report of the Special Committee Appointed to Examine the Working of the Septic-tank Installations in Bengal*, Calcutta, Bengal Secretariat Press, 1905, p. xxxvii]

The note written by Sastree and the accompanying diagram he provided on the purification of effluents of the septic tanks would not have been out of place in a conventional late nineteenth-century English manual on hygiene and purification. Perhaps that is where he found his inspiration and information from. He had not only accepted the theory of germs and the rationale of purification, but had also incorporated the scriptural doctrines of purification by air and light and adjusted the mechanisms and schedule of the purification of the septic tanks with the religious rituals performed along the banks of the river. Thus, it is essential not to see the debates around the purity of Hooghly just as a conflict between the colonial science of hygiene and Hindu ritualistic ideas of purity. Both were elite ideologies of purity, premised on social and cultural privilege and remarkably fluid and adaptable to each other. To both, pollution and purity had simultaneously moral and physical connotations. While Sastree and other Hindus adopted modern theories of hygiene to reinforce their sense of the pollution of the sacred river, the colonial officials, despite their modernist rhetoric, often disagreed about the nature of impurity in the river. The history of the emergence of Indian modernity, which is shaped by accommodation and multiplicity, can be

¹⁰⁶ Ibid, p. xxxvii

traced in these debates. In time, both the mechanical purification of Hooghly and the septic tanks were accepted and accommodated within everyday life around Calcutta.

The committee did not adopt Sastree's rather virtuous method of purification of the septic tanks. It took pains to explain that the contents of the septic tanks although apparently vile were actually harmless. The committee concluded that most of the objections were 'sentimental' in nature. In the actual scientific measurement of pollution, the water appeared without injurious bacterial infestation. In this remarkable unanimity about the lack of pollution through septic tanks and the pollution introduced by native practices, the colonial authorities seemed to have finally moved towards the new science of purity, from the physical and the aesthetic to the bacteriological and the chemical. In doing so, the ambiguity about the essential nature of pollution in Indian rivers, which we have referred to earlier, seemed to have been overlooked. They were unable, however, to submit a final opinion on whether the effluents purified in such a manner could indeed be discharged freely into the river. They recommended that more observations and trials should be made before a decision was arrived at.¹⁰⁷ The Municipality of Bengal conducted further experiments in the mills and decided that the best mode of treating the contents of the septic tanks was with chlorinated lime. Thus treated, the anaerobically purified fluid of the septic tank was virtually sterile and 'much purer than Hooghly water itself'. In fact, they found that the fluid of the septic tanks contained less living organisms than the drinking water of Calcutta.¹⁰⁸

It is in this assertion that we revisit the Latourian proposition of purification, albeit in a slightly oblique way. The anaerobic process, taking place inside the septic tanks appears to be a form of purification of nature that Latour described. Interestingly, this bacteriological transformation in the tanks was not too dissimilar to the so-called self-purification of the river that Silk, Hankin and Clemesha referred to. In both, nature was seemingly purifying itself. However, there were two differences; the septic tank was a modernist act, devised, erected and sustained by the modern capitalist regime. Secondly, this mechanism violated

¹⁰⁷ Ibid, p. 5

¹⁰⁸ 'Resolution Reviewing the report of the Special Committee Appointed to Examine the Working of the Septic Tank Installations in Bengal, Municipal Department, Sanitation, Calcutta, 6 January 1906, *Supplement to the Calcutta Gazette*, (10 January 1906), pp. 28-9.

both social and aesthetic sensibilities. Thus, a new water, a new river and a new aesthetics of purity were required to be formed to sustain this new institution of purification. Yet in Calcutta, this modernist purification, both in terms of separation of culture from nature (the removal of aesthetic and mythological values from the water that was also used as a resource) and the pure from the polluted was never fully achieved. In 1922 the 'Hooghly River Pollution Enquiry' committee reported that the mills and factories were still 'polluting' the water with their effluents from the septic tanks, there were several hundreds of municipal and other drains depositing vast contents of liquid sewage into the river daily. It also found that at more than 80 places various municipalities around Calcutta were dumping other forms of refuse into the river. In addition, along the banks of the river, people continued to attend to their 'calls of nature'.¹⁰⁹ We may add that they also bathed frequently in the holy water to cleanse their bodies and souls.

Conclusion

In Europe, ideas of water underwent a fundamental change in the course of the nineteenth century as water ceased to be many and became one; it lost its multiple connotations as waters and became the singular H₂O.¹¹⁰ In India, the multiplicity of waters survived the modernist interventions. The paper has explored two forms of that multiplicity in Calcutta. First in the debates on purity and pollution; what constituted pure water, whether Hooghly was indeed impure in both sanitarian and religious sense. The second was in the semantics of waters; the same river and water had diverse meanings and served different purposes, from washing of streets to Hindu rituals. There was yet another form of multiplicity, which we have not touched upon here. In Calcutta and most other colonial cities, the diversity in the definition of the purity of water co-existed with the different sources from which the city's residents collected water, even in the era of purification. These included the river (filtered and unfiltered), stored rainwater, the tanks, creeks, wells, and later, the deep tube wells.

In Calcutta and other urban centres of India, there is an absence of a central or clear notion of purity of water as much as there is a lack of supply of water, by municipalities or other public authorities, which could be considered safe for drinking. Consequently, households

¹⁰⁹ *Fifty-third Annual Report on the Director of Public Health for Bengal, 1920* (Calcutta, Bengal Secretariat Book Depot, 1922), p. 22

¹¹⁰ Hamlin, "'Waters' or 'Water'?"

often use private mechanisms to purify public water. Various domestic modes of purification have developed and proliferated, from simple boiling, to water purification tablets, to various domestic water purifying gadgets ranging from pressure sand filters to UV and RO purifiers. Then there is of course the multibillion rupees bottled water industry. Those who can afford it, drink the water that is safe to drink. Others depend on murky tanks and unfiltered river water.

I set out to write the paper in search for answers to the questions; why has safe drinking water remained elusive in ordinary households in Calcutta? Why does one have to fetch it from various public sources, such as tube wells or tanks, unless one is affluent enough to install a mini private purification mechanism inside ones homes? I realised, very soon, that this was partly a false question as the answer is evident in the political economy of water in Calcutta. The more serendipitous conclusion I arrived at was that historically there has been a multiplicity in the discourses of purity of water, which continued even in the age of purification. In fact, the project of purification, rather than untangling this compositure, was entwined within it, which in turn allowed for the various forms of modern waters to coexist in the city. This hybridity, this diversity and this juxtaposition remains as much a part of the urban modernity of Calcutta as it manifests and translates itself into its social and economic disparities.