

# WATER AND HEALTH: THE FORMATION AND EXPLOITATION OF THE RELATIONSHIP IN LIVERPOOL, 1847-1900

*Sally Sheard*

## I

As cities expanded in the nineteenth century most of them encountered problems with their supplies of water. The initial sources which had often sufficed for hundreds of years were becoming inadequate for the needs of the new population as well as the industries. Water could be supplied by a variety of organizations to the urban dweller. In 1844, twenty-six of the fifty largest towns were supplied from an undertaking which had parliamentary authorization.<sup>1</sup> The period from 1831 to 1851 saw a partial privatization of the water industry. Between 1846 and 1865, eighty joint stock companies joined the sixty-five private waterworks already operating.<sup>2</sup> However, for many towns the privatization experiment only lasted a short time. From the mid-nineteenth century a trend towards the municipalization of water supplies in urban areas can be identified. This accompanied the unification of other urban services which followed the *Municipal Corporations Act of 1835*. In 1841 the proportion of municipally supplied towns was 40.8%; by 1881 this figure had risen to 80.2%.<sup>3</sup> By 1900 only

- 1 J. Hassan, 'The growth and impact of the British water industry in the nineteenth century', *Economic History Review*, XXXVIII (1985), p. 534.
- 2 W. M. Stern, 'Water Supply in Britain: the Development of a Public Service', *Royal Sanitary Institute Journal*, LXXIV (1954), p. 999.
- 3 Hassan, 'Growth and impact', p. 535.

six out of twenty-nine towns in Great Britain with a population over 100,000 received their water supplies from private companies.<sup>4</sup>

The supposed 'failure' of private water by the 1840s can be seen indirectly through parliamentary action, firstly by identifying monopolistic tendencies in the companies which led to their characterization as the villains in numerous reports, and secondly by a succession of towns promoting bills for municipal water supply. There have been several explanations for this failure, most of them employing economic analysis to suggest that private companies were constrained by their acts of incorporation from raising the substantial amounts of capital needed to build the new reservoirs which the expansion of urban areas required.<sup>5</sup> However, the contemporary reports present a different picture, in which the connection between water and health is made explicit for the first time, and is used as a primary argument for transferring the responsibility for the supply of water from commercial organizations to municipal authorities. Liverpool had its water supply municipalized in 1847. The two companies which had supplied the city prior to this had a poor reputation. This paper will investigate how the health implications of water supply were used by Liverpool Corporation to achieve the necessary Act of Parliament for municipalization, and subsequent Acts during the nineteenth century.

## II

The water system is one of the most effective mediums through which the sanitation of an urban area can be improved. Sanitation may be articulated in a number of ways, for example as a series of mortality rates by which progress can be quantified and measured; or as a visual impression of the urban environment—do people look clean, are the streets free of refuse? Water affects both of these assessments. Flinn stated that the main axiom of Chadwick's 1842 Report on the Sanitary Condition of the Labouring Population of Great Britain was:

4 P.P. 1900, VII, q. 12 (*Joint Select Committee Report on Municipal Trading*).

5 Hassan, 'Growth and impact', p. 536.

the correlation between insanitation, defective drainage, inadequate water supply and overcrowded housing on the one hand with disease, high mortality rates and low expectation of life on the other.<sup>6</sup>

The Royal Commission into the State of Large Towns and Populous Districts also recommended that services such as water supply, paving, street cleansing and drainage should be provided locally under one administrative body.<sup>7</sup> The failure of private companies to fulfil their commitments to consumers and to the sanitation of the urban environment was already becoming apparent.

All the reports and inquiries of the first half of the nineteenth century recognized the problems manifest in the supply of water. Some of them found fault with the mode of supply, others with the lack of storage facilities, quantity supplied, or the bias towards the wealthier customers. However, they all agreed that the provision of water could, and must be, improved. The public health concerns revolved around the mortality rates for the larger towns and cities, and the public health theorists such as Chadwick, Simon, and Southwood Smith recognized the connection between the major urban killers (typhoid, typhus, diarrhoea, and cholera) and the supply of water. The implication had existed in urban culture for a considerable time that dirty people were unhealthy, and this concept has been well documented by Wohl.<sup>8</sup> The prevailing theory on the transmission of disease until the 1840s was that decaying matter gave off harmful gases, or miasmas. This miasmatic theory produced the right solution to the problem of high urban mortality rates in the form of cleaning up the urban environment, even if the mechanics were not entirely accurate. The correction was made by John Snow in 1849 with his book *On the Mode of Communication of Cholera*, which identified water as a mode of transmission.<sup>9</sup> Although cholera was not statistically

6 M. W. Flinn (ed.), *Report on the Sanitary Condition of the Labouring Population of Great Britain 1842 by Edwin Chadwick* (Edinburgh, 1965).

7 P.P. 1844, XVII (*Royal Commission on the State of Large Towns and Populous Districts of the United Kingdom*).

8 A. S. Wohl, *Endangered Lives—Public Health in Victorian Britain* (London, 1983).

9 Snow traced the London cholera epidemic to particular infected water supplies within the city.

important except in epidemic years, this new theory on the transmission of disease at least opened the minds of the campaigners to the concern with providing a pure and sufficient supply of water. Flinn suggested that:

Cholera constituted a more direct threat to the wealthier classes because it was a water borne disease, and these classes enjoyed a more liberal access to a supply of water than did the inferior classes.<sup>10</sup>

However, a direct correlation cannot be made between the amount of water available per person and improvements in sanitation. It is important to consider the way in which water enters the domestic environment, the frequency of supply, the hygiene habits of the population and the relative value they placed on a supply of water. Reeve has stressed that documenting the change from privies to water closets is not enough, and that it is more important to look at the way in which they were used—frequently emptied privies could still be more hygienic than infrequently flushed water closets,<sup>11</sup> while within the house, Wohl has shown how the poorer classes preserved water and recycled it. An enormous effort went into the struggle to attain cleanliness, with large amounts of the household budget being spent on soap and washing materials.<sup>12</sup> Many of the accounts collected for Chadwick's report in 1842 claimed that the main deterrent to the use of larger quantities of water was the distance it had to be carried from the standpipes into the home. This arrangement was predisposed to cause more discomfort to the working classes who had limited time to collect water.<sup>13</sup>

### III

A distinction must be made therefore between those areas which claimed a water supply problem, and those which had

10 Flinn, *Report on sanitary condition*, p. 10.

11 P. Reeve, 'Sanitation and Mortality in Liverpool 1847-1900' (unpub. B.Phil. thesis, Open Univ., 1986), p. 101.

12 Wohl, *Endangered Lives*, p. 62.

13 Flinn, *Report on sanitary condition*, p. 142, evidence of the Revd Elwin of Bath.

water available but lacked this infrastructure necessary to deliver water into the home. In Liverpool the problem as identified by the parliamentary inquiries of 1846 and 1880 was one of a lack of water in the locality to meet the needs of the expanding population, and, more importantly, a new range of services which required an adequate water supply. Another way of illustrating the importance of water in the nineteenth century is to investigate the campaign for the constant supply system. The Waterworks Clauses Act of 1847 provided for constant supply of water, but private companies were only obliged to do this if the local authority or a majority of residents requested it, and Hardy has suggested that such petitions were rarely successful in increasing the supply from the companies.<sup>14</sup> The transformation from intermittent to constant supply happened in most urban areas in the 1850s but supply reverted back to intermittent at times when the quantity of water available was limited. Liverpool achieved a constant supply in 1857 when Rivington Pike was switched on, but the supply was barely sufficient and hot, dry summers interrupted the constant supply until the 1890s.

Improvements in the quantity of water supplied under the intermittent system would only benefit two groups. First, those who had facilities for storing water in their homes in cisterns or water butts, and second, those who were situated close to standpipes where the time of supply was long enough for all the inhabitants to take as much water as they wished. It can be suggested therefore that it was only after the introduction of the constant water supply system that the whole population benefited from the increased amounts of water, and that the effectiveness of water from a sanitary point of view was limited until a constant supply was achieved.

In Liverpool most improvements to the water supply were made through Local and Private Acts of Parliament. The area is not endowed with springs of riverine fresh water in sufficient quantity to support a large population, and wells had been sunk into the sandstone on which Liverpool sits, with the water distributed by handcarts and buckets until the late eighteenth

14 A. Hardy, 'Parish pump to private pipes: London's water supply in the nineteenth century', *Medical History*, Supplement No. 11 (1991), p. 85.

century.<sup>15</sup> As demand increased, new wells were sunk on private property and the owners of course exacted a generous price from their captive market. In 1822 an Act was passed to form the Company of Proprietors of the Liverpool Corporation Waterworks.<sup>16</sup> The links with the Corporation were strong but as yet they were in name only. As the list of shareholders has not survived it is not possible to tell if the Corporation had a financial interest in the company. This company was known as the Liverpool and Harrington company, which distinguishes it neatly from its rival the Liverpool Waterworks Company, which was formed by Act in 1799 and became popularly known as the Bootle company, as it was from that township that the supply of water came.<sup>17</sup> The description of the two companies being rivals is not strictly true. After persisting for several years in laying pipes in the same streets and competing for the same customers, they came to an agreement to divide up Liverpool and each to supply water as if they both had monopolies in the water market. The price each could charge was fixed by the Acts of Parliament which had incorporated them.<sup>18</sup>

The Acts of Parliament by which these two companies were formed, and later modified, stipulated several conditions aimed at ensuring the basic rights of the consumer, and extending the benefit of the water supply to the urban area in general. The Bootle company's Act of 1799 stated in section 15 the general terms of the engagement between the customer and the consumer:

the inhabitants of Liverpool may lay down service pipes to communicate with the company's mains, paying rent to the company for water as agreed.

This was a typical arrangement for water companies, and resulted in a first stage elimination of possible consumers, as landlords were reluctant to invest in the necessary pipes and fittings for fear that they would be stolen or vandalized by the

15 G. H. Pumphrey, *The Story of Liverpool's Public Services* (Liverpool, 1940), p. 120.

16 3 Geo. IV, c. lxxxvii, Liverpool Water Supply Act.

17 39 Geo. IV, c. xxxvi, Liverpool Water Supply Act.

18 Bootle company section 15; Liverpool and Harrington company section 36.

transient tenants. The properties occupied by the lower sections of society therefore usually had no water supply directly into the home. Section 20 provided for the use of the company's water to put out fires 'without entitlement to compensation'. Clearly there was some attempt to ensure that the supply of water was not totally governed by profit. The Bootle company grew rapidly from its inception in 1799. Local Acts of Parliament in 1810 and 1813 extended the district to which it could supply water to include Bootle, Linacre, Kirkdale, Everton and West Derby.<sup>19</sup> In 1847 the company was reviewed prior to the Corporation buy-out.<sup>20</sup> The achievements looked impressive on paper for such a young company (only forty-eight years old). The source of water was three main lodges at Bootle supplemented by an additional eleven boreholes to meet occasional peaks in demand. From here the water was pumped using four steam engines to the company's reservoirs at Crosby Street, Everton Valley, Eaton Street, Church Street, Devonshire Place and Atherton Street. The water mains stretched for approximately 126 miles and delivered a daily quantity of 994,520 gallons.

For the domestic supply, more detailed evidence is provided by the report on the 1847 Bill, when it was stated that an average of forty-seven gallons was supplied to each house.<sup>21</sup> The company gave the average household size as 6.65 persons and therefore the company claim to have supplied 7.2 gallons per person per day. The accuracy of this figure is questionable when one considers the context in which it is presented. The figures form part of the Parliamentary evidence submitted by the Corporation of Liverpool to substantiate their claim that a new water supply was desperately needed for the city to relieve problems of water shortage and the ensuing public health crises. It would be in the Corporation's best interests, therefore, to underestimate the daily personal water supply, as this would give more weight to their claim for a new large-scale waterworks. However, the figures can be interpreted in another way. It must be remembered that this 1847 Bill was for the

19 50 Geo. III, c. 165; 53 Geo. III, c. cxxii.

20 P.P. 1847, XXI (*Report of the Commissioners of Her Majesty's Woods, Forests, Land Revenue, Works and Buildings on the Liverpool Waterworks Bill*).

21 P.P. 1847, XXI, p. vii.

Corporation to gain permission to purchase the two water companies. It would thus be in the interests of the companies to show in the statistics on their performance an overestimation of the amount of water they supplied to the people of Liverpool. By doing this they could undermine the Bill in two ways. Firstly, if they could prove that they already supplied more water than Liverpool demanded, using their own wells, they could show that the Rivington works (which the Corporation proposed) were an unnecessary expense. Secondly, by producing such 'rosy' information on their own performance they had a chance in persuading Parliament and Liverpool that the supply was managed efficiently in private ownership, with any profit being channelled back into the waterworks rather than siphoned off to subsidize less economical municipal schemes.

The supply of water to the notorious courts of Liverpool was a particularly contentious matter, given the contemporary pressure from the Medical Officer of Health (Dr Duncan) to reduce the levels of disease through measures to improve the water supply, housing and other associated services.<sup>22</sup> The Bootle company had in their report for the Parliamentary Committee stated that in the previous year they had supplied 757 courts which contained a total of 4,498 dwellings.<sup>23</sup> The water would be turned on by the turncocks a maximum of three times a week, usually late at night or early in the morning. Residents who did not have the luxury of cisterns connected to the mains had to use a variety of containers to get enough water to supply them for the next two days. The water was often only turned on for fifteen minutes. Cisterns were seen by the householders as the best method for water storage, but frequently the higher placed ones in respect to the height of the supplying reservoir would not get water if the turncock shut off the supply too quickly. Dr Duncan objected strongly to the use of cisterns, especially lead-lined ones, which he supposed contaminated the water and caused lead poisoning.<sup>24</sup> He also gave examples of water smelling foul

22 P.P. 1847, XXI, p. 103.

23 Of this total number of dwellings, 3,691 had individual pipes into the houses, 125 had cisterns to store the water, and the remaining 682 houses were served by communal standpipes.

24 P.P. 1847, XXI, p. 103.



when it had been kept in cisterns for a long period of time during hot weather.<sup>25</sup>

By 1847 the idea of a constant supply had not yet gained much support. People saw nothing wrong with the intermittent supply method, as long as the periods between supply were not too long and plenty of water was distributed. In the evidence to the 1847 Parliamentary Committee the main complaint against the water companies was the supply to the poorer districts. Complaints especially came from landlords with property in the Scotland Road area of the city, where a high percentage of houses were located in courts.

The Liverpool and Harrington company operated a very similar system to that of the Bootle company. The Acts of Parliament relating to its formation contain similar clauses—specifying the terms of engagement between the landlord and the water company and the rates charged for the supply, which were related to the rentable value of the property. There were separate provisions for the rating of shops and the cost of water supplies to shipping. The 1827 Act extended the area of supply to include the villages of Harrington and Toxteth Park, provided that the company purchase land within the district within three years. A further Act was passed in 1846 because of the strain put on the financial resources of the company.<sup>26</sup> Their existing borrowing powers were set at £30,000, but due to the rapid rate of population growth in the city, and the need for a new water infrastructure, this limit was raised initially to £60,000 and a further subscription authorized to raise additional capital of £200,000. Section 23 of the Act made it compulsory for consumers to take water for a minimum of three years, with the amount of their annual rate calculated as a tenth of the cost of laying pipes to their property. The works of the Liverpool and Harrington company were larger than those of the Bootle company, supplying 3,003,600 gallons per day to 30,303 houses. There were five main pumping stations at Copperas Hill, Bevington Bush, Toxteth, Soho, and Windsor Well. The company also supplied 1,940 courts.

25 P.P. 1847, XXI, p. 103.

26 26 Geo. III, c. xii; 7 & 8 Geo. IV, c. xxxvi; 9 Vict. c. xxxv. Rentals specified in section 36 of 3 Geo. IV, c. lxxvii.

## IV

Both the water companies had compulsory purchase clauses in their Acts of Incorporation, giving the Corporation the facility of buying them out within a certain time limit. The Acts do not make it clear if this was a 'safety valve' arrangement so that the Corporation could keep some degree of control over the companies, or whether the Corporation had foreseen that one day it would want to have full control over the water supply. After the companies came to their arrangement to divide up the city and to create two mini-monopolies, there were no sustained efforts to improve the quality of the supply for the customers. The evidence given for the 1847 Bill to municipalize the water supply to Liverpool provides a detailed insight into the operations of the two companies, especially through the investigations of the two surveying officers—John Herbert, a barrister of Lincoln's Inn, and Thomas Page, a civil engineer from London. They made visits to a number of courts, accompanied by Dr Duncan and Mr MacDonald of the Liverpool and Harrington Water Company. Residents complained of the infrequency of the supply and the reluctance of the companies to provide cisterns to hold the water. In fact under the Liverpool and Harrington Waterworks Act of 1846, the company could now refuse to supply water to any dwelling which did not have a cistern to receive it, which effectively relieved it of any duty to supply water to the poorer residents.<sup>27</sup> Dr Duncan made a strong claim that the rate of mortality in Liverpool was exceptionally high because of the lack of plentiful and pure supplies of water.<sup>28</sup> The Corporation of Liverpool had come to an agreement with the water companies to buy water to wash the courts, but the turncocks rarely allowed the water to be used in this way. An additional, commercial problem was that the water from the wells tended to be hard, making it unsuitable for manufacturing and causing an 'unnecessary expenditure on soap'.

The surveying officers also heard evidence on Liverpool's record of fires and the associated loss of property. Liverpool had acquired a national reputation for the frequency with which it

27 9 Vict. c. xxxv, clause 50.

28 P.P. 1847, XXI (*Report on the Liverpool Waterworks Bill*), Minutes of Evidence, p. 37; Evidence of Robert Santhouse, p. 103.

experienced fires, and more particularly the inability of the fire police to bring them under control. Between 1838 and 1846 there had been 990 fires in Liverpool, resulting in a loss of property valued at £2,567,291.<sup>29</sup> Mr Dowling, the head constable of Liverpool and superintendent of the fire police, suggested that the water companies were not keeping the mains under sufficient pressure as required by their Acts of Incorporation.<sup>30</sup>

The provision of water by the private companies was generally chaotic, profit-motivated and irresponsible in respect of the duties required of them towards the provision of a public health system for Liverpool. Public hostility towards the two companies was considerable. Complaints made directly to them concerning such problems as lack of pipes or the disruption to pavements rarely brought about any action. The companies, however, profited substantially despite their poor operational performance. Samuel Holme showed how the value of the companies' shares had risen. The Bootle company's shares with a face value of £100 were worth £380 in 1845, and the Liverpool and Harrington company's shares with a face value of £100 were worth £610 in 1845.<sup>31</sup> The Corporation Water Committee minutes for 27 March 1848 contain some of the accounts for the private companies, showing that they made a combined profit in the year to 31 December 1847 of £33,685 on a capital of approximately £660,000, thus showing a return of nearly 20%. This perhaps justifies the contemporary accusation that the water companies were increasing their profits by refusing to carry out essential maintenance work or to provide sufficient water.<sup>32</sup>

## V

The evidence of the failure of the private water companies in Liverpool is well documented in the 1847 inquiry, and

29 P.P. 1847, XXI, p. xiii.

30 Evidence from the fire police book as used by S. Banner and S. Holme, *Water—A Pamphlet* (Liverpool, 1845).

31 Banner and Holme, *Water*, p. 5.

32 P.P. 1847, XXI (*Report on the Liverpool Corporation Waterworks Bill*) p. 30, q. 380.

Parliament duly passed the Act for the Corporation to buy the two companies.<sup>33</sup> The new Act, which had been promoted by the Corporation as 'the fitting appendix to the 1846 Liverpool Sanitary Act', was seen as an important milestone in the journey to an efficient and adequate water supply system for Liverpool. The Corporation had, through an Act of Parliament in 1843, obtained powers (formerly held under the Highway Commission) to obtain an independent supply of water for fire and public usage by sinking a well at Green Lane. The 1847 Act thus united all the water interests in Liverpool under the jurisdiction of one committee. With such bountiful resources at their disposal, the success of the system should have been assured, but this was not so. The municipalization of Liverpool's water supply was not initially an improvement on the private companies. There are several explanations for this situation. It has been attributed to human incompetence on the Water Committee, the overriding problems of population growth, and the constraints of a municipal organization. A further suggestion is that the Water Committee faced an insurmountable problem in the opposition of the people of Liverpool and their reluctance to part with large sums of money on a 'luxury' like a constant water supply system.

There were many more demands for water than there had been at the start of the nineteenth century. The evolution of the domestic sewerage system from 'dry conservancy' methods such as pail closets and cesspits to the water closet, which was widely seen as a sanitary improvement, required large amounts of water to be supplied under pressure to dwellings to flush the W.C.s and the new infrastructure of sewers to which they were connected. Liverpool Corporation gained the power to compel the conversion of privies to water closets through the 1854 Sanitary Amendment Act. The procedure required inspection and certification by the Medical Officer of Health that the privies were 'in a situation and condition as to be injurious or prejudicial to health'.<sup>34</sup> The conversion programme in Liverpool, which began in 1863, was comparatively early and

33 10 & 11 Vict. c. cclxi, Liverpool Corporation Waterworks Act.

34 9 & 10 Vict. c. 127, An Act for the Improvement of the Sewerage and Drainage and for the Sanitary Regulation of the Borough of Liverpool, sections 82 and 83.

came at a time when other major towns such as Manchester were deciding in favour of investment in the pail closet system. Clearly there were conflicting views on sewerage systems, emanating not only from central government but also from municipal employees. The Corporation commissioned a report on the sanitary condition of the town in 1871 partly to clear up the controversy over the benefits of the water closet.<sup>35</sup> London also introduced water closets early in the nineteenth century, and Hardy states that by the 1870s they were found in most London homes.<sup>36</sup> Both Liverpool and London initially prohibited the connection of house drains or water closets to the sewer systems, as the underground network was intended for rainwater only. The transition to water closets as the primary form of sewerage system required the installation of a new design of sewer which was small and elliptical to cope with solid as well as liquid sewage. Thus the sewerage of the urban environment was now dependent upon the water supply, and any problems with the latter could lead to insanitary situations hitherto unknown.<sup>37</sup>

Public awareness of the connection between water and health, or rather between cleanliness and the prevention of disease, was articulated in a very clear way in Liverpool in 1847, when the threat of another cholera epidemic led to the formation of queues to use the corporation baths and wash-houses.<sup>38</sup> Entrance to the establishments had to be restricted, and free baths for children were stopped due to the opposition from paying customers who could not get in.<sup>39</sup> This sudden demand for clean bodies and clothes shows that the connection between disease and dirt was well known among even the

35 *Liverpool Corporation. Reports of Dr. Parkes and Dr. Sanderson on the Sanitary Condition of Liverpool* (Liverpool, 1871).

36 Hardy, 'Parish pump to private pipes', p. 83.

37 In 1864 there was insufficient water available to flush the sewers, and the Corporation had to employ workmen to clear the sewers of accumulations of sewage: J. Newlands, *Liverpool Corporation. Report of the Sub-Committee on Mortality* (Liverpool, 1866), p. 42.

38 The Corporation opened the Frederick Street Baths on 28 May 1842, but the first public wash-house in Liverpool was operated in 1832, when Catherine Wilkinson allowed the poor to use her kitchen for washing clothes and bedding during the cholera epidemic.

39 Liv. R.O., H.352.CO.U Health Committee minutes, 30 Nov. 1847.

lowest socio-economic groups. Of course the success of the Corporation's new policy of building public baths and wash-houses rested on the ability of the private water companies to supply sufficient water to operate them, and the problems with the intermittent system operated by the companies gave strength to the municipalization campaign.

The period of municipal water supply in Liverpool began in 1848. In March the Corporation Water Committee was upgraded from an advisory body into the operational centre for the whole water supply system. The immediate decisions taken were based upon information supplied by Thomas Hawksley, consultant engineer to the Water Committee. He came to the attention of the Highways Board in 1844, when a deputation of three members accompanied by the Green Lane engineer, James Simpson, made a visit to Nottingham to see the system Hawksley had designed, which had given a constant supply since 1831. He presented his estimates on the average daily production of water, showing that at 2,800,000 gallons per day the average supply per person was only seven gallons, inclusive of that portion which went to manufacturing and shipping.<sup>40</sup> The Health of the Towns Association had stated in 1845 that the minimum supply should be 13.5 gallons per person per day, exclusive of other demands.<sup>41</sup> Hawksley saw that even allowing for a supply from the Green Lane well of 1,200,000 gallons per day there would still be a shortfall of some 4,000,000 gallons. He recommended that the powers gained in the 1847 Act for the Rivington Project be put into operation immediately.<sup>42</sup> On a more practical level, Hawksley initiated the amalgamation of the three separate water supply networks. Linkage pipes were put in and a new management structure set up. Some staff were kept on from the old water companies by the Corporation and several new posts were created to aid the collection of rents. Authorization was given at the committee meeting of 27 March to put out a tender for

40 Liv. R.O., Water Committee Minute Book, p. 19.

41 *Liverpool Health of Towns Advocate*, 1845.

42 Rivington is situated approximately 35 miles to the north of Liverpool in the Lancashire hills. Plans had been drawn up for the construction of a series of reservoirs and pipelines to bring water from this unpolluted district into Liverpool.

the supply of 2,000 tons of iron pipes so that the water system could be extended.

In the report on the Metropolis Water Bill in 1851 Michael Scott was called in to give evidence on the supply of water in Liverpool.<sup>43</sup> He had been the engineer for the Bootle company and transferred to the Corporation staff after the buy-out as the managing engineer, but he resigned after only two years, dissatisfied with the Corporation's performance. Scott gives some interesting details about the ineffectiveness of the new Water Committee and its determination to persist with the Rivington Pike scheme despite the considerable public opposition. By 1848 there were two Water Committees in Liverpool—the official Council one and another appointed by the ratepayers to try to negotiate on the Rivington scheme. Liverpoolians were split into two camps, the 'pikeists' and the 'non-pikeists'. The tension created by this matter pervaded all aspects of life, and municipal candidates based their election campaigns upon the issue. The municipal elections of 1850 returned an 'anti-pikeist' Council, but as the contracts had already been signed, Rivington was past the point of no return. Scott claimed that none of the Water Committee members had any knowledge consistent with their position on such a technically specialized committee. He had to prepare the most basic of reports for them on the principles of water supply and elementary hydraulics. There were also problems with the collection of water rents, as the Corporation had attempted to consolidate the collection of several types of rates. This put an extra strain on the poorer classes who, when faced with a single amalgamated bill, frequently defaulted on the payment. In 1850 the Corporation abolished the additional charges that had previously been made for houses with water closets and baths, in an attempt to encourage the installation of these 'sanitary measures', but with little consideration of the extra demands such a move would place on the limited supplies.<sup>44</sup>

The Rivington scheme had its opponents from the start. Objections were raised by the manufacturers of north Lancashire and the mill owners on the rivers Douglas and

43 P.P. 1851, XV (*Report on the Metropolis Water Bill*) p. 567, qq. 9911 to 10162.

44 Liv. R.O., H352.COU *Council Proceedings* 1873-74, p. 504.

Roddlesworth. These cases were put during the Bill's debate but did not lead to an outright rejection—merely the introduction of compensatory supply clauses. Liverpool's requirement for water for sanitary purposes outweighed the purely profit-motivated claims of the industrialists. The scheme was referred to an adjudicator, Robert Stephenson, in November 1849 in view of the indecision of the Water Committee over the best course of action. Some of the committee members had favoured trying to increase the supply of water obtainable from the wells by making deeper boreholes into the sandstone rock. However, Stephenson supported the Rivington scheme.<sup>45</sup> The initial estimate was £450,000, but this was raised to £839,000 in 1849 when work on the scheme began, and the final cost was £1,345,969.<sup>46</sup> Rivington water was finally available in Liverpool in 1857 but already water shortages were being mentioned in the council chambers and proposals were being received for new water schemes.

The Rivington scheme was a major disaster. However, this only came to light when the actual quantities of water received in Liverpool failed to meet Hawksley's calculations. In 1864 Rawlinson, who had been involved in the water debate in the 1840s, published the 'truth' on the scheme.<sup>47</sup> By this date Stephenson (the adjudicator) had left Liverpool and Shuttleworth (the Town Clerk) was dead, thus removing any element of scandal that the details could have caused had the participants still been active in Liverpool. Rawlinson showed that Hawksley had taken two particularly wet years to calculate his average when estimating Rivington's potential supply.<sup>48</sup> Therefore when the reservoir was constructed the amount of water collected from the designated watershed was well below his expectations. In 1865 a sixth reservoir was constructed at

45 Liv. R.O., *Council Report of the Special Water Committee* 1849; also see R. Stephenson, *Report on the Supply of Water to Liverpool* (London, 1850). There is a discussion on the scheme in G. M. Binnie, *Early Victorian Water Engineers* (London, 1981).

46 B. D. White, *A History of the Corporation of Liverpool 1835-1914* (Liverpool, 1951), p. 57.

47 Rawlinson had proposed his own scheme to bring water to Liverpool from Bala Lake in a pamphlet in 1846, reprinted in 1866.

48 Binnie, *Early Victorian Water Engineers*, gives a technical review of Hawksley's errors.



Rivington in a futile attempt to increase the capacity. It was nicknamed 'Beloe's dry dock' after the chairman of the beleaguered Water Committee. The undercapacity of Rivington became uncomfortably apparent during the great drought of 1865. Wells had to be re-opened to supplement the reduced supply from Rivington. By September 1865 the situation was so severe that water was only turned on for two hours a day, and Rivington only had a further ten days' supply left in it. Fortunately the rains came just in time.<sup>49</sup> Hawksley was also criticized by the Water Committee in May 1853, when he was accused of neglecting his duties on the Rivington scheme (no doubt in favour of more profitable work elsewhere).<sup>50</sup> Rawlinson claimed that in 1847 Shuttleworth had admitted that he had serious doubts about the Rivington scheme, but as he was new to the post of Town Clerk and having heard that the private water companies had plans of their own to increase water supply (which would have made the Corporation buy-out more expensive) Shuttleworth went to Parliament in support of the Rivington scheme without having made a thorough investigation of the plans.<sup>51</sup>

*Porcupine* was a weekly Liverpool political newspaper with a Liberal bias. It constantly brought the actions of the Water Committee into the public eye—recounting the ineffectiveness of the committee members, their inability to make decisions, and their lack of accountability to the ratepayer, and telling of serious problems with the water supply which were reminiscent of the old private water companies. An article on 17 November 1860 entitled 'Revelations of Rivington' recited what the scheme's proposers had promised, namely a constant supply, an end to costly pumping from the wells, savings to ratepayers and grand fountains in every ward.<sup>52</sup> *Porcupine* revealed that the committee's excess of expenditure over income was £20,000 p.a. on top of a crippling debt of £1,700,000. There were constant claims for compensation (some of £20,000) for damage to property and lack of water. From 1 January water

49 *Liverpool Corporation. Report of the Engineer on the Waterworks* (Liverpool, 1900), p. 14.

50 Liv. R.O., Water Committee Minute Book, 5 May 1853.

51 Reeve, thesis, p. 61.

52 *Porcupine*, I, p. 75, 17 Nov. 1860, 'Revelations of Rivington'.

assessments were 'to be raised and on hundreds of rentals the rate will be doubled!'

Under the 1847 Act conditions were laid down concerning the profits from the water undertaking after the Corporation buy-out. Rents were to be kept as low as possible and any unforeseen profit was to be put back into the system to improve the waterworks or to pay off the debts.<sup>53</sup> Why then was the new water system unable to support itself? *Porcupine* hinted in its usual satirical way that the committee was frittering away money on unusually high salaries for the water officials, the retention of unnecessary staff, and general extravagances claimed on 'expenses'. On 20 September 1862 *Porcupine* refers to the recent fire at the workhouse in which several children died. The fire police had been unable to get any water from the mains and Mr Duncan of the Water Committee told the Council that this was because the cistern for the workhouse was higher than the supplying reservoir and that the Poor Law officers had not seen fit to make alterations to it.<sup>54</sup> *Porcupine*, however, made the allegation that at night the water pressure was turned off in the town and directed to the docks and warehouse district to protect the valuable goods. On 29 June 1865 *Porcupine* launched a particularly bitter attack on the Water Committee, due to rumours that the 'pike' was not producing all the water it should:

Liverpool in all its innocence did not know how scarce water was until told: but like the poor man who was made really ill by being perpetually told he looked so, the town has at last become thirsty.<sup>55</sup>

In 1866 G. F. Deacon (the Borough and Water Engineer) presented a report to the Water Committee on the subject of additional water supplies:

The committee are aware that the water now at command is insufficient to admit of its being constantly kept on; 30 gallons per person per day are not considered more than enough for each person of the entire population; at the present time we are short of that quantity by about 33 per cent.; and I may add that on a very recent occasion evidence was given by an authority to the effect that to the

53 9 & 10 Vict. c. 127, Sections 4 and 125.

54 *Porcupine*, IV, p. 193, 20 Sept. 1862, 'Fire and Water'.

55 *Porcupine*, VII, p. 139, 29 July 1865, 'The Water Difficulty Solved'.

scarcity of water have been traced demoralization, disease and death.<sup>56</sup>

In 1866 an Act of Parliament gave Liverpool permission in view of its water shortage to purchase part of the 7,500,000 gallons daily discharged as compensation water into the rivers Douglas and Roddlesworth.<sup>57</sup> This purchase cost the Water Committee £43,000 but it was only a temporary solution to the ever-present water problem. In 1873 the Council agreed to find a new large-scale source of water. Schemes were proposed, including Bala Lake, Windermere, Thirlmere and extensions to the sandstone well supply.<sup>58</sup> The water question in Liverpool in the 1870s was highly politicized. The Tories, who were in control of the Council, were in favour of a substantial expense on a new scheme. The Liberals, who launched their attacks through *The Liberal Review* and *Porcupine*, claimed that the people themselves did not want any more big schemes and associated rate rises. *The Liberal Review* on 2 February 1878 carried an article entitled 'Water Committee Vagaries' concerning the debate over the water schemes:

indeed it would appear from their (the committee's) conduct that any scheme, which is a large one, and will cost a great deal of money, will meet their approval.<sup>59</sup>

The *Review* then proceeded to claim that the Water Committee had deliberately been drawing less water during the past seventeen weeks from their sandstone wells, which had led to a dangerously high level of water and the threat of the boreholes closing up. This, the *Review* suggested, would increase the committee's evidence that a new scheme was necessary and that the wells were finally exhausted. On 10 August the *Review* made a more pointed comment on the current debates between the Water Committee and the council over the further supplies of water for the town: 'Naturally a great number of persons will be enriched if gigantic works are entered upon by the Corporation.'<sup>60</sup>

56 *Liverpool Corporation. Report of the waterworks engineer on the extension of water supply and new works* (Liverpool, 1866), p. 9.

57 23 Vict. c. xii, Liverpool Corporation Waterworks Act.

58 These are reviewed in P.P. 1880, I (*Enquiry on the Liverpool Waterworks Bill*).

59 *Liberal Review*, 2 Feb. 1878, 'Water Committee Vagaries'.

60 *Liberal Review*, 10 Aug. 1878 and 17 Aug. 1878, 'The Water Juggle'.

On 14 August there was a five hour long Council debate on the water issue, resulting in a grant of £10,500 to mix the 'suddenly hard' well water with the water from Rivington Pike.<sup>61</sup>

## VI

It was not until 1879 that the Council finally gave permission to draw up plans to construct a reservoir at Vyrnwy in north Wales. A Parliamentary subcommittee was formed by the Corporation to put the case for extending Liverpool's water system again. Anthony Bower was elected as chairman. He was a prominent member of the Town Council (elected in 1873) and had been chairman of the Executive Water Committee since 1876. Bower was a Justice of the Peace for the borough and he derived his income from the engineering firm of George Forrester, where he was a senior partner.<sup>62</sup> The Parliamentary subcommittee seemed to have unlimited funds and no accountability to the main committee. There are no accounts of its expenditure although James Smith (the engineer) put through weekly claims for himself and the contractors, clerks and draughtsmen.<sup>63</sup>

Bower went to Paris in September 1879 to engage Thomas Hawksley again, despite his failure on the Rivington scheme. Hawksley was allowed to rent a house in London for the duration of the Parliamentary inquiry.<sup>64</sup> This took place in July 1880 under a Select Committee of nine members.<sup>65</sup> The Severn Water Commissioners formed the main opposition to the Bill, claiming that if Liverpool was allowed to take a large amount of

61 *Liberal Review*, 17 Aug. 1878, 'The Water Muddle'; Council Proceedings, 14 Sept. 1878.

62 Perhaps the allegations made by the *Liberal Review* referred to Bower, as his firm would probably tender for the Vyrnwy contract.

63 Liv. R.O., Water Committee—Parliamentary sub-committee minute book. The committee was formed on 1 Aug. 1878 and by the end of the first month Smith had claimed £134 9s. 4d.

64 *Ibid.*, 15 Sept. 1879.

65 The debate started on 3 June 1880 and finished on 1 July 1880. The proposal for a second reading of the Bill had taken place in February and was reported in Hansard (24 Feb. 1880). The Liverpool M.P. Rathbone did not feel he had to attend to ensure that the Bill passed this stage and this attracted some criticism from the opposition that Liverpool was not really concerned about the fate of its Bill.

water from north Wales then their interests would be severely damaged. Their case rested on two points. Firstly, that the Severn fishing interests would be harmed if the river level dropped, and secondly that the impoundment of water in the Vyrnwy reservoir would remove the 'freshets' which scoured the river and helped to keep it navigable. However, the investigation found that the scheme would actually be advantageous for the Commissioners as it would reduce the severity of flooding, and that the scouring of the river was done by the tidal action of the estuary below Gloucester, not the freshets.<sup>66</sup>

Having convinced the Select Committee that there were no valid objections to the scheme, the Liverpool representatives still had to prove that Liverpool needed to break the traditional restrictions placed on local authorities seeking to go outside their natural boundaries for resources. Manchester had had to do this for its Thirlmere scheme as it had no local supply of water.<sup>67</sup> Bower, Hayes Wilson and Hawksley presented evidence of the falling off in supply from the wells in the city.<sup>68</sup> Statistics were also produced on the expected population growth in Liverpool to 1,600,000 by 1916, which would require a water supply of 48,000,000 gallons daily.<sup>69</sup> References were made to the public health of the city and the Medical Officer of Health's reports were used to show a correlation between mortality and the drought of 1866. Hayes Wilson gave details of the increasing pollution of the sandstone wells, which in some areas had been used as cesspools due to the deficient sewerage system.<sup>70</sup>

Comparisons were drawn with the water supply in other

66 P.P. 1880, I, p. 27.

67 The Thirlmere Act was passed in 1879. It had been suggested that Liverpool share the water with Manchester, but the completion was apparently not planned soon enough to relieve Liverpool's water shortage.

68 P.P. 1880, I, p. 27. The wells were deepened from time to time. Between 1850 and 1876 the Windsor well borehole was widened to 6 in. and made 212 feet deeper (1854) and at Dudlow Lane an additional well was sunk in 1867. This should have increased supply to 8,785,261 gallons per day, but the readings in 1876 showed a supply of 6,480,512, hence Hawksley's estimate of a 'falling off' of 2,301,699 gallons per day.

69 P.P. 1880, I, p. 6.

70 P.P. 1880, I, p. 23.

large towns and cities and their respective mortality rates. Liverpool, which had a supply of twenty-five gallons per person per day (often much less than this during the frequent periods of intermittent supply) had a mortality level of 30 per 1,000, whilst London, which had thirty-two gallons per person per day, had a mortality rate of 24 per 1,000.<sup>71</sup> The witnesses also showed that Liverpool needed large amounts of water in connection with her economy—to supply the ships with domestic water and to provide water for the steam boilers. The use of baths was also increasing in Liverpool.<sup>72</sup>

Parliament approved the Vyrnwy scheme and the proposed finance for it. Work began in 1881 under the guidance of Hawksley and Deacon (Liverpool's Water Engineer). Hawksley resigned in September 1886, and Deacon was left to finish the scheme. The period between the construction of Rivington and the completion of Vyrnwy was one of the worst in Liverpool's water history. A series of dry years from 1864 to 1867 resulted in the water from Rivington being cut to eight hours a day, and mains were constructed to pump salt water from the Mersey to use for sewer flushing, street cleaning and the public baths. The first Vyrnwy pipeline was completed in 1892 and by 1905 it supplied 40,000,000 gallons per day.<sup>73</sup> The final cost, at £2,203,855, was substantially more than the ratepayers or the Council had ever imagined. The construction of the Vyrnwy reservoir concluded Liverpool's first fifty years of municipal management of the water supply. For most of those years there had been an ongoing imbalance between the supply and demand for water, which the Corporation seemed unable to rectify. Undoubtedly, the Corporation of Liverpool had a difficult task in municipalizing the city's water supply. It inherited an antiquated system from the old water companies, yet paid out a large sum for 'goodwill' in the purchase price. The need for a new water system was urgent and the political mood of the Corporation was against large investment. Waller suggests that the general level of competence of the staff of municipal corporations in the nineteenth century was low.<sup>74</sup>

71 P.P. 1880, I, p. 28.

72 P.P. 1880, I, p. 28.

73 White, *History of Liverpool Corporation*, p. 117.

74 P.J. Waller, *Democracy and Sectarianism* (Liverpool, 1981), p. 288.

The evidence provided by Liverpool's Water Committee would seem to substantiate this view. There were several charges of incompetence and the financial control of the committee was weak. The municipalization of water in Liverpool does not substantiate the idea that removing the profit motivation necessarily improves the service. The Corporation Water Committee was ineffective in the management of the supply and had it not had the 'authority' of an elected organization it would not have survived.

## VII

The relationship between water and health was used successfully in the 1847 campaign to remove the supply from the private water companies, and in 1880, when Parliamentary permission was required for a second large-scale waterworks to supplement the supply from Rivington Pike. The correlation was not lost in the intervening years, but was subservient to the ratepayers' demands for economy and the tedium of the municipal decision-making process. The water shortages of the 1860s effectively halted the programme to convert privies to water closets, which had been identified as a major sanitary requirement. The shortages also stifled the promising public baths and wash-houses venture in the city, despite the common awareness of the link between cleanliness and the reduction in certain diseases. The conclusion must be that the mortality and morbidity rates would probably have shown a greater and earlier improvement if there had been an unlimited and continuous water supply. The health of the inhabitants of Liverpool did suffer as a result of the water supply problems which dogged the city for most of the nineteenth century.