Pace Environmental Law Review

Volume 5
Issue 1 *Fall 1987*

Article 6

September 1987

The New York City Water Supply System - An Assessment

Maurice Hinchey

The New York City Water Supply System — An Assessment

Maurice Hinchey*

I. Introduction

The water supply system of New York City, which has been called one of the engineering marvels of the modern world, is noted for the high quality of its water.[1] This was not always so, and considerable vigilance and planning will be required to maintain its quality in the future. Supplying a great city with water has always taxed the engineering genius of nations; yet it has been done, and quite successfully, even before the advent of modern engineering technology as witnessed by some of the old Roman aqueducts still standing.[2]

We have to look beyond technological barriers to explain the recurrent water famines which have afflicted New York City over the past two centuries. An antiquated body of New York State water law, some of which has not changed in three centuries, has been suggested as playing a substantial role in complicating the water supply problems not only in New York City, but in the state as a whole.[3] The various legislative mea-

---

* Assemblyman Maurice Hinchey is chairman of the New York State Assembly Environmental Conservation Committee and the New York State Joint Legislative Commission on Solid Waste Management.

1. Scenic Hudson, Inc., Water for Millions: At What Cost?, A Resource Book on Water Demand and Use in the Greater New York Metropolitan Region 7 (C. Lee ed. 1987) [hereinafter *Water for Millions*].

2. *See generally* 1 M.N. Baker, The Quest for Pure Water 1-8 (2d ed. 1981).

3. Robinson, *Water Law in New York: Its Scope and Opportunities for Reform*, in *Water for Millions*, *supra* note 1, at 15.

sures passed in recent years in an attempt to bring existing law into greater conformity with the more demanding standards of today's society have given a patchwork pattern to water law. It is now sometimes difficult to determine in which agency of government the responsibility and the authority resides.

The account that follows presents an overview of the history of the development of New York City's water resources to the present time, and the consequences not only for the city itself, but for the state as a whole. The commentary goes on to discuss the present problems of water supply and demand, the effects of water metering, conservation methods and water supply management, and concludes with suggestions for the future development of a new state water management policy.

A. *New York City's Water: The Early Period*

From the very earliest days of Dutch and English settlers, many of the businesses and private homes on Manhattan Island had their own wells; those that did not depended on the public wells located in the streets.[4] As early as 1750, water drawn from many of the public wells had become foul.[5]

In 1774, the city made its first attempt to construct a municipally-owned water supply system. A reservoir was built which drew water from a freshwater pond of about forty-eight acres known as the Collect. This was supplemented by digging additional wells. Bored log mains were laid in the principal streets and the system which was not yet completed was put into operation in 1776. The quality of the water from the system was poor and generally considered unfit for domestic use. The Revolutionary War intervened and the project was abandoned.[6]

The city grew rapidly and so did its need for water. In 1790 its population was 33,000 persons. In ten years the popu-

4. C. Weidner, Water for a City: A History of New York City's Problem from the Beginning to the Delaware River System 15 (1974).

5. *Id.*

6. *Id.* at 16.

lation doubled. In another ten years the population tripled and there were nearly 100,000 people living on the southern tip of the island.[7] In 1798, a Dr. Joseph Browne submitted to the Common Council the first proposal that the city move beyond Manhattan Island and use the Bronx River to secure an adequate supply of water.[8] In 1799, the New York State Legislature passed an act which had been pushed strongly by Assemblyman Aaron Burr to incorporate the Manhattan Company (consisting of Aaron Burr and several others) to supply the city with water.[9]

The Legislature and the Common Council had intended that the company would act on Dr. Browne's proposal, but instead it simply sank another well near the Collect and built a reservoir with a capacity of about 550,000 gallons. It laid six miles of wooden mains to furnish water to four hundred families, but the service was unsatisfactory from the beginning, and by 1804 complaints had become so numerous that the Common Council was again looking outside the city for an additional source of water. By 1809, the flow of water in some of the Manhattan Company's original mains was completely shut off. The company continued to lay additional pipe but by as late as 1830, water was available to only about one third of the populated area of Manhattan. Moreover, customers were complaining that the company's water was unfit for domestic use and that service was periodically interrupted.

By 1830, the city's population had increased to 202,000 and two thirds of the inhabitants were still relying on wells or other sources for their water supply.[10] There was no citywide sewer system. Scientists estimated that one hundred tons of human excrement were being put into the porous soil of lower

---

7. *Id.* at 17.

8. *Id.* at 18-19.

9. The creators of the Manhattan Company were more interested in establishing a bank than in supplying the residents with water, and Burr had "engrafted, in an apparently innocent measure incorporating a company to supply the city with water, a clause providing that its surplus capital might be employed in any transactions not inconsistent with the laws of the State." C. Weidner, *supra* note 4, at 21. It was in this roundabout way that the Manhattan Company Bank, now Chase Manhattan, came into being. *Id.*

10. *Id.* at 22.

Manhattan daily. One historian says of that period:

> In addition to the seepage of human excrement contaminating the wells, there was the seepage from graveyards and the drainage from stables and the filthy streets. Dead animals and offal were carelessly disposed of with no notion that such refuse might become the host of disease-breeding organisms. The stench arising from the streets was appalling. Travelers frequently declared they could smell the city two to three miles away.[11]

Between 1809 and 1835, there was much debate but very little effective action despite the fact that in Europe, and in other cities in the United States, efforts at improving the quality of water supplies were already being undertaken.[12]

A yellow fever epidemic in the city in 1798, in which 2000 people died (one out of every thirty inhabitants), helped to convince the Common Council to seek state aid in obtaining uncontaminated water.[13] There was also concern for sufficient water to fight fires. The cholera epidemic of 1832, which took the lives of 3500 citizens (one out of every sixty inhabitants), further aroused public sentiment.[14]

B. *New York City's Water: the Middle Period*

In 1834 the state legislature, on an appeal from the Common Council, passed legislation empowering New York City to construct its first municipally owned waterworks.[15] In the following year, a proposal was submitted first to the people and then voted on by the Common Council to construct what would eventually be known as the Old Croton Aqueduct.[16]

The project included the construction of a dam on the Croton River about six miles from where it joined the Hud-

---

11. *Id.* at 22-23.
12. *See generally* M.N. Baker, *supra* note 2.
13. C. Weidner, *supra* note 4, at 18.
14. *Id.* at 28.
15. *Id.* at 35.
16. *Id.* at 36.

son, a closed aqueduct forty and one half miles long,[17] and a distributing reservoir at 42nd Street where the New York Public Library now stands. On the Fourth of July, 1842, with great ceremony, the aqueduct began to supply water to the city although work was not finished on all phases of the project until 1848.[18]

At the time the project was approved, the population of the city had been 300,000. By the time it was completed the population had already increased to 500,000. Twenty years later the population doubled, reaching one million.[19] As a result of this rapid growth in population, appeals were made to the public almost as soon as the project was completed, to be conservative in use of water.[20] The situation was exacerbated by the fact that per capita consumption increased dramatically due to the patenting of the water closet in 1830, and the extensive installation of private bathrooms about 1850.[21] These innovations were practicable only because of the increased availability of piped water. Laws passed in 1870 and 1873 authorized the Department of Public Works to place water meters in all business establishments and factories, but private dwellings were specifically exempted. This would prove to be a very costly mistake. Over a hundred years were to pass before the city was ready to consider universal water metering.[22]

In the entire period between 1850 and 1890, the city was never completely without threat of water famine. There was no dearth of planning or debate about proposed projects, but the emphasis was always on ways of increasing the supply, with scant attention to the possibilities of reducing consumption which was climbing steadily upward on a per capita

17. *Id.* at 40-41.

18. Citizens Union Foundation, Inc., Water Supply Project. Water Watchers: A Citizens Guide to New York City Water Supply 13 (1987). Available from Citizens Union Foundation of the City of New York, Inc., 198 Broadway, New York, NY 10038 [hereinafter *Citizens Guide*].

19. *See* C. Weidner, *supra* note 4, at 53.

20. *Id.* at 56.

21. *Id.* at 55-57.

22. *Id.* at 56-57.

basis.[23]

The Croton watershed system was enlarged by the construction of additional dams, aqueducts and reservoirs between 1857 and 1911. In 1906, the New Croton Dam was completed, creating a reservoir nineteen miles long with a capacity of 33,815,000,000 gallons, equal to about a third of the whole Croton system.[24] Additional dams and reservoirs were added to the system and completed by 1910.[25]

Despite more than seventy years of work on the Croton system, the city's water supply still remained inadequate. The city turned to the Catskills as a source of water supply; however, even while the Catskill system was being built between 1907 and 1927,[26] the city's population continued to grow, making periodic shortages inevitable.[27]

During the construction of both the Croton and Catskill systems, the city disregarded the rights and sensibilities of individuals and communities in its removal of homes and villages in the creation of a series of reservoirs. This has left a legacy of suspicion and ill feeling in some upstate communities that lingers to this day. There were no effective state agencies at that time to develop or implement a coordinated water resource development program.

C. *New York City's Water: Delaware System to the Present*

The city next turned to the Delaware watershed for additional water[28] and again moved ahead without regard for local territorial rights. The Delaware system was approved in 1929, but its development created an issue that finally had to be decided by the Supreme Court because of objections by both

---

23. Some of the nation's foremost engineers were involved in the city's massive water supply projects. Portland Cement came into use in the 1850's, and steel began to replace cast iron pipes in the 1880's. It was an era of technological advance. *Id.* at 51.

24. *Id.* at 117.

25. *Id.* at 116, 124.

26. *Id.* at chs. 21, 22, 25. *See also Citizens Guide*, *supra* note 18, at 17-18.

27. *See* C. Weidner, *supra* note 4, at 284-85.

28. *Id.* at 289.

New Jersey and Pennsylvania.[29] Both states were relying on the same watershed for their own water. When the suit was finally settled in 1931, work still could not be started because of the advent of the Great Depression. It was not until 1937 that the work actually began, and not until 1944 that the project was formally opened, although the Rondout Reservoir segment would not be completed until 1955. Even before the suit was settled, New York City went ahead with its own plans, as it was to do again in 1950 when Pennsylvania refused to accept a proposal for coordinated development of the Delaware Basin by New York, New Jersey, Delaware and Pennsylvania. A Supreme Court decree in 1954 allotted New York 800 million gallons daily from the Delaware system.[30] In 1961, under the threat of preemptive federal action, the four states agreed to a compact to form the Delaware Basin Commission.[31]

In 1977, after resisting for years an accommodation to legitimate upstate environmental concerns, New York City was required, under a law passed in 1976,[32] to follow a timetable of water releases to streams below the upstate reservoirs. This was designed to protect the natural resources of those areas without jeopardizing the city's water supplies.

The Croton, Catskill, and Delaware systems are constructed so that water can be transferred from one system to the other as the need arises to maximize storage capacity and minimize the effects of local droughts. Water is brought to the city from these systems by gravity, through large aqueducts and balancing reservoirs and three controlled lakes having a total capacity of 550 billion gallons. Within the city, the water is distributed through two major tunnels and four distribution facilities. A third tunnel, under construction, will supplement the two tunnels now in use. With a pump station at Chelsea,

---

29. New Jersey v. New York, 283 U.S. 805 (1931).

30. New York v. New Jersey, 347 U.S. 995 (1954).

31. Citizens Union Foundation, Inc., Water Supply Project. Thirsty City: A Plan of Action for New York City Water Supply 26 (Jan. 1986). Available from Citizens Union Foundation of the City of New York, Inc., 198 Broadway, New York, NY 10038 [hereinafter *Thirsty City*].

32. 1976 N.Y. Laws chs. 888-889.

New York has the ability to take up to 100 million gallons per day (mgd) from the Hudson River. First used in 1965 for a ten month period, the pump station was again resorted to in another drought period in 1981. This water, while of acceptable quality, is inferior to the Catskill and Delaware water, and is diluted with other system water to a ratio of about 1:9 before being delivered to the New York City consumer. Its use has caused some controversy, as it affects the salt front of the Hudson River, endangers those upstate communities that rely on the Hudson for their water supply, and poses problems for the ecosystem of the river basin.[33]

East of the city additional problems are brewing. Long Island relies principally on its underground aquifers for water. In the nineteenth century, prior to the incorporation of the five boroughs in 1898, Brooklyn and Queens were serviced by several public and private water supply systems. Jamaica Water Supply, a private utility which still has customers in Queens and Nassau counties, has been forced to close fifteen of its seventy-six wells in Queens because of toxic contamination. The city now supplies the company with upstate water and is mandated to take the system over. The city's third tunnel, now under construction, will be able to accomplish this efficiently as well as provide flexibility and repair capability to the entire city system. If contamination of the Long Island aquifers continues to spread, even greater demands will be made on the city's system.

II. Supply and Demand

The New York City system currently serves an estimated 8.5 million people, including 750,000 upstate.[34] The total non-

33. As an estuary with strong tidal influence as far north as the dam at Troy, the Hudson ranks high as a productive ecosystem, rich in nutrients supporting fish and other aquatic life. Disruption of the salt front not only could destroy the balance supporting valuable natural resources, but would also create problems for municipalities like Poughkeepsie whose 75,000 residents rely on the river for their water supply. The problem will be compounded as other communities in the lower Hudson valley continue to expand in population and seek access to additional sources of water. *Water for Millions*, *supra* note 1, at 31-32.

34. Division of Water, N.Y. State Dep't of Envtl. Conserv., New York State

drought demand on the system is roughly 1,500 mgd. The anticipated yield in time of drought (safe or dependable yield) is 1,290 mgd, leaving a deficit of over 200 mgd.[35]

Water managers compare the average demand on a water supply system under normal conditions with the available supply of safe yield under extreme conditions to determine the potential water supply deficit. Normal demand on the city system now exceeds safe or dependable yield by about 300 mgd, based on the 1960's drought. Deficit estimates to the year 2030 range from 400 to 1200 mgd.[36]

There have been numerous studies and proposals designed to meet the future water need of the city. They usually involve an increase in the supply, the control of water use through conservation measures, an improvement in management techniques, and the maintenance of water quality.[37] The proposals differ in the emphasis they place on each of these factors. It should also be added that all of them are flawed to the extent to which they are based on demand statistics and projections which are highly problematical.[38] The failure to go to universal water metering over one hundred years ago when the recommendation was first made doomed city planners to

---

Water Resources Management Strategy at IV-2 (May 1987). Available from New York State Dep't of Environmental Conservation, 50 Wolf Road, Albany, New York 12233-3504 [hereinafter *Management Strategy*].

35. *Id.* at 9.

36. *Management Strategy*, *supra* note 34, at SR-3.

37. The first thorough investigation of the city's water supply needs was the Burr-Hering-Freeman report of 1903, which included a physical survey of eleven districts in Manhattan and the Bronx, checking for plumbing leaks, per capita consumption, wastage, and system integrity. C. Weidner, *supra* note 4, at 103-04. The information it developed was recycled many times in the extrapolations contained in the subsequent studies. In 1973, the Temporary State Commission on the Water Supply Needs of Southeastern New York issued its report entitled *Water for Tomorrow*, and in 1977, the U.S. Army Corps of Engineers issued its report entitled *United States Water Supply Study*. In 1979, the Hudson River Basin Study Group of the N.Y. State Dep't of Environmental Conservation, with funding from the federal government, issued its study on *The Water and Related Land Resources of the Hudson River Basin.*

38. *See* N.Y. State Senate Research Serv. Task Force on Critical Problems, Diagnosing Water System Problems in New York . . . Pipe Dreams or Planning? 45-46 (Jun. 1985) [hereinafter *Pipe Dreams or Planning*].

working with a statistical base of undetermined accuracy.[39]

The most frequently advanced recommendations for increasing supply include the use of the Hudson River, the Upper Hudson Basin, the Great Lakes and the Long Island Aquifers.[40] Of these, using the Hudson would probably be the easiest to implement but its use could have severe ecological consequences. Apart from environmental considerations, these options would require larger financial outlays and a longer time frame to accomplish.

Throughout the 1970's consumption constantly surpassed 1550 mgd, but this caused no problem until the 1980-81 drought. However, the city's campaign at that time to reduce consumption was successful in reducing demand to close to the 1290 mgd safe yield goal.[41]

The possibility of another drought of the severity of that occurring in the 1960's has been estimated to occur once in two hundred fifty to four hundred years. The city experienced sharp but shorter droughts in 1982 and 1985. The risk involved in huge capital outlays for new reservoirs that may be needed only once in four hundred years is highly problematic, especially when conservation measures and better management techniques offer the possibility of meeting future demand at a fraction of the cost. Furthermore, demand estimates extending as far into the future as the year 2030 are necessarily subject to large possible errors. In this connection, it is worth noting that official census figures show a drop in the city's population between 1970 and 1980.[42]

III. Water Metering

Water metering is an essential precondition to a sound water supply program.[43] Not only is it important in leakage

39. C. Weidner, *supra* note 4, at 56-58.

40. *See* Mayor's Intergovernmental Task Force on New York City Water Supply Needs, Increasing Supply, Controlling Demand, Interim Report 12-16 (Feb. 11, 1986).

41. *See Water for Millions*, *supra* note 1, at 10.

42. *Thirsty City*, *supra* note 31, at 78.

43. *See* C. Weidner, *supra* note 4, at 56-58; *Thirsty City*, *supra* note 31, at 43-44; Water Use Analysis Task Force Report for the New York City Universal Metering Project (presented by Elizabeth Scanlin, Sept. 22 1986) [hereinafter *Task Force Re-*

control and water pricing, but it is a basic management tool in controlling for unaccounted water use and establishing an equitable rate schedule. Without metering, it is impossible to know how much water is being lost through leakage in the city's supply system, how much is being wasted by the consumer, and how much is being lost through faulty plumbing fixtures. Intelligent estimates of present real demand cannot be made and it also is difficult to make realistic proposals for providing future demand. The water supply people are like a headquarters command fighting a war without the benefit of intelligence reports — from either its own side or the enemy's. Hard data on the city's water usage is scarce.

The various estimates of potential water savings have been largely recycled from studies quoted in previous reports, and to a certain extent, from the experience of other cities. It is estimated that metering could result ultimately in savings of as much as 200 mgd. But these estimates are quite speculative. It is known that Boulder, Colorado, achieved a thirty-six percent decrease in demand after installing a metering program, that Kingston, New York achieved a twenty percent decrease, Troy, New York, a twenty-five percent decrease, and Philadelphia, a twenty-eight percent decrease.[44] California, which is in the forefront in water awareness and preparedness, has reported differences in water use of as much as forty-two percent between metered and unmetered municipalities in the same geographical area.[45] Water metering, used as a tool in

---

port on Metering]. *See also* Dep't of Envtl. Protection, City of New York, Universal Metering Program Implementation Plan Executive Summary (1987) [hereinafter *Executive Summary on Metering*].

44. *Pipe Dreams or Planning*, *supra* note 38, at 135; N.Y. State Senate Research Serv. Task Force on Critical Problems, Water Conservation: The Hidden Supply 52-53 (Sept. 1986) [hereinafter *Hidden Supply*].

45. *Task Force on Metering*, *supra* note 43, at 4. The Task Force remarks that:

> [It] continues to accumulate information from other municipalities and data sources to assess New York City's own water uses. This information should give us a clearer picture of what our City's actual water requirements are, what demands may be reasonably determined above those requirements, and what may be residual leakage and other uses of water that are significant in connection with management of use through metering.

Id. at 9. This is not only a revelation concerning the city's lack of data on its own system, but also on the reliability of its estimates of future needs.

arriving at a realistic pricing policy,[46] has been successful in many municipalities throughout the country.

IV. Controlling Water Use Through Conservation Measures

Per capita daily water consumption within the New York City water supply system has climbed to over 200 gallons a day, from 154 gallons a day in 1960, and 142 gallons a day in 1930. In the 1965 drought period, per capita consumption was reduced to 134 gallons a day or to a level thirty-three percent under the current level. It would appear that the 200 gallon a day current per capita consumption[47] could be cut substantially without any discernible diminution of the quality of life. Per capita consumption differs widely from city to city across the country, but New York City's apparent consumption is considerably higher than in some cities located in areas where one would expect demand to be considerably heavier.

Cooperation in water conservation efforts is more easily achieved in drought periods, but there are many conservation efforts that can be undertaken on a regular basis which would go far in reducing the deficit in times of drought. Ancillary benefits of such conservation efforts would include: savings in the costs of water treatment and water pumping energy expenses; extension of the useful life of existing treatment, pumping, storing and conduit systems; reduced water heating expenses; reduced water and sewer bills; reduced occurrence of groundwater overdraft which can result in land subsidence or saltwater intrusion; increased stream flow and improved appearance and quality of streams and reservoirs.[48]

Water metering and judicious use of the water rate structure are important prerequisites of a good conservation program, but some of the other more frequently recommended conservation actions are: plumbing code changes which would reduce the flow of toilets, showerheads, aerators, washing machines, dishwashers, hot water pipes; leak repair within homes and buildings; leak repair of the water distribution system;

---

46. *See Hidden Supply*, *supra* note 44, at 49-50.
47. *Water for Millions*, *supra* note 1, at 9.
48. *Hidden Supply*, *supra* note 44, at 16.

and a public education program.[49] Such conservation efforts are long overdue and would benefit from a statewide policy.

V. Improving Management and Maintenance Techniques

Water system management is not yet making sufficient use of recent developments in technology that make more informed decisions in maintaining the system possible without incurring unnecessary costs. Deterioration of water system hardware is inevitable, but there are routine maintenance procedures that can forestall the need for emergency maintenance when mains or other distribution lines break. Some of these procedures are: exercising valves and monitoring hydrant conditions; flushing lines with bursts of water and chemical treatment to remove encrustation; lining pipes and filling cracks; finding leaks with sophisticated monitoring equipment before they begin to have a deteriorating effect on other parts of the system; developing computerized monitoring capability with accurate records of all parts of the distribution system and developing from this data base the kind of information that will signal future danger points.[50] The state should play a stronger role to assist communities to take advantage of technological advances.

VI. Facing Up to the Problem

The federal response to the record drought that occurred in the sixties was the Water Supply Act of 1965,[51] calling for a study by the U.S. Army Corps of Engineers which was eventually published in 1977.[52] At the state level, the Temporary State Commission on the Water Supply Needs of Southeast-

---

49. *Id.* at 34.

50. *See generally Pipe Dreams or Planning*, *supra* note 38, at ch. 4.

51. An Act Authorizing the Construction, Repair, and Preservation of Certain Public Rivers and Harbors, for Navigation, Flood Control, and for Other Purposes, 79 Stat. 1073 (Oct. 27, 1965). *See* section 101(a), Title I - Northeastern United States Water Supply, which directs the Corps to cooperate with appropriate agencies in preparing comprehensive plans which could meet the long-range water demands of the people in the Northeast.

52. U.S. Army Corps of Eng'rs, N. Atl. Div., Northeastern United States Water Supply Study: Summary Report (Jul. 1977).

ern New York was created in 1969.[53] The Commission issued its recommendations in 1973.[54] Both the federal and state studies clearly put forth the problems the city would face in meeting its future water supply needs and the available options. Despite the effort and analysis that went into these reports, they did not establish policy but simply explored options. They were not action programs.

In July 1984, the New York State Water Resources Management Strategy Act was signed into law.[55] It was designed as an action program to develop long-term water programs for the state as a whole as well as for individual localities. In compliance with the mandate of the legislation, the New York State Department of Environmental Conservation submitted in May 1987, the draft report, *New York State Water Resources Management Strategy*.[56] There is reason to believe that it represents a promising beginning effort at a coordinated state water management policy.

Prodded by the 1985 drought and no doubt sensitive to the possibility that the state's own water management plan would impose new mandates with which the city would have to comply, New York City's mayor formed an intergovernmental task force, comprised of federal, state and local government officials involved in water supply planning and development, to reassess the city's long-term water needs. An interim report was issued in February 1986,[57] and in the fall of 1986 an analysis was issued on the costs and benefits of universal water metering.[58] This was followed by the New York City Department of Environmental Protection's executive summary on the water metering plan[59] which tacitly acknowledged the inadequacy of its own data base. Referring to the

---

53. 1969 N.Y. Laws ch. 593.

54. Temporary State Comm'n on the Water Supply Needs of Southeastern New York, Water for Tomorrow, Recommendations of the Commission (Dec. 15, 1973).

55. N.Y. Envtl. Conserv. Law § 15-2901 to -2913 (McKinney Supp. 1988).

56. *Management Strategy, supra* note 34.

57. Mayor's Intergovernmental Task Force on New York City Water Supply Needs, Increasing Supply, Controlling Demand, Interim Report (Feb. 11, 1986).

58. *Task Force Report on Metering, supra* note 43.

59. *Executive Summary on Metering, supra* note 43.

experience of other sections of the country, it reported that potential water savings of twenty-two to forty-five percent are possible by adopting universal water metering.[60]

Year after year bills have been introduced in the state legislature to require universal water metering in New York City, but they have not been approved. Reasons include cost and practical politics. However, in 1987, the city at last embarked on its own program to phase in universal water metering over a ten year period.

The city will also undertake an ambitious project to obtain a detailed picture of New York's water usage by various categories, estimating consumption by unmetered users on the basis of metered data for similar users. To facilitate the study a plan has been developed for installing meters in selected buildings and homes.[61] In a sense, then, both for the City and the State, 1987 appears to have been a landmark year. There are, however, important policy problems still to be resolved.

VII. What Remains to be Done

The entire southeastern region of the state has an interest in the water resources that New York City has tapped for its own use. As those communities grow in population, so do their own water needs. There is an important need for a regional approach to the planning and development of facilities for all of the communities in the region, including New York City. This should result in economies of scale and greater efficiency. The Water Supply Act of 1905 already gives Ulster, Greene, Delaware, Schoharie, Sullivan, Orange, Westchester and Putnam counties the right to water from the system for a fee.[62] As a matter of practicality, however, it is difficult for municipalities in these areas to take advantage of that right because of the cost of the hookup and the required backup interconnec-

60. *Id.* at 1-4.

61. *See* Scope of Services for Study of Water Demand on New York City System for New York State Water Resources Management Strategy, Delaware/Lower Hudson Sub-State Region (Aug. 14, 1986) on file at Pace Envt'l L. Rev. office.

62. New York Water Supply Act of 1905.

tions with other water systems.[63] These interconnections are necessary in order to provide for emergency supply if the city should exercise its right under its service agreement with customers to shut down an aqueduct for maintenance or emergency conditions.

A recent draft report prepared for DEC[64] suggests that the New York City system can be considered to be acting as a regional supply system. However, the mayor's invitation in 1986 to those upstate communities to participate in the Task Force which is investigating the city's future needs will naturally be regarded with some suspicion by them. The development of a clearly defined policy, regarded as fair and equitable by both the city and the upstate counties, is essential. That policy should be carried out by a regional authority rather than by extending the city's authority to the region.[65] Currently, municipalities with city facilities within their borders derive revenue from the city for these taxable properties. It would be important to honor these obligations in the event that a regional commission is established.

There is a question as to whether or not the city's water is properly priced. With the advent of universal metering it will become possible to set more realistic rates. Rather than setting rates on a flat rate basis or a rate declining with greater usage, conservation should be encouraged by increasing the rate as usage increases, with a block rate structure. Other cities throughout the country have reported reduced consumption following changes in water rates. There is a need for consistency between the Department of Health and the Department of Environmental Conservation on New York City's use of water. Current policies are criticized as inconsistent.

The city has interpreted the 1905 Water Supply Act as applying to specific municipalities rather than to counties.

---

63. Division of Water, N.Y. State Dep't of Envtl. Conserv., Delaware-Lower Hudson Region Water Resources Management Strategy, Draft prepared by Hazen and Sawyer, at 1-2 (Jun. 1987) [hereinafter Delaware-Lower Hudson Report]. *See also Pipe Dreams or Planning*, *supra* note 38, at 200-01.

64. *Delaware-Lower Hudson Report*, *supra* note 63, at 1-4.

65. *Pipe Dreams or Planning*, *supra* note 38, at 201.

Separate arrangements are thus negotiated with each town, city or village.[66] This issue should be resolved in the interest of potentially greater economies and efficiency. Another source of dissatisfaction is that the city restricts wholesale sales of water to each community to a total per capita amount not exceeding per capita consumption in New York City.[67] For small, industrial communities this could present an overwhelming obstacle to viability. Data bases and data methodologies should be standardized, not only for communities tied into the New York City water system but statewide as well.

New York State does not rank well in water conservation efforts. Only twelve states have accomplished less. This is an area in which substantial water savings can be made at relatively little cost.[68] Various new technologies have been recommended for experimental work: a pilot desalinization plant, recharging of aquifers in Nassau County with treated water, and controlled field experiments on feasibility of weather modification. All are relatively radical approaches and currently not promising.[69]

In the past, the city has met its crises by expanding its water supply sources. Each time it moved forward, it underestimated the rate at which the population would grow. That does not mean, however, it is underestimating growth at the present time. It is quite possible that this time it is overestimating growth; it is the suburbs that are growing. When there is a need to expand our sources of good water it should be for the use of the entire region, rather than of just the city. Because of the kinds of political problems such new adventures create, it would be advisable that the development of any new reservoirs or other water sources become part of a regional or statewide system rather than a particular locality's system.

Continued education of the general public through effective state and local agency programs can also play a crucial role in winning acceptance of proposals which, because of the

66. *Id.* at 200.
67. *Id.*
68. *Water for Millions*, *supra* note 1, at 22.
69. *Id.* at 20.

conflicting claims of the various communities, will always be attended with considerable controversy.

VIII. Conclusion

Even if New York City's population does not increase in the next fifty years, the evidence indicates that the population of the southeastern region will continue to grow at a substantial rate so that there is a pressing need for providing for the future water supply needs of the region. Per capita consumption can and should be reduced through water metering and other conservation efforts. The city's system should become an integral part of a southeast regional system. As the outlying counties continue to grow in population, they will exert more and more political pressure for an equitable share of the system's supply; much of the friction can be avoided by setting up the framework for a fair distribution now. Important hearings were held in the fall of 1987, under the 1984 Water Resources Management Strategy Act, which are critical to the establishment of a new state water management policy.