



Factor Analysis of Water Rate Revisions (External Factors and Internal Factors)



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1. Period of Expansion & Stable Water Supply to the Next Stage

Tokyo Metropolitan Government (hereinafter referred to as, "Tokyo Waterworks") has increased water rates until 1994 because of "increasing project costs". The causes of increasing water charges are both external and internal factors including cost increase by inflation, increasing costs of construction improvement projects (capital investment), maintenance management costs (repairing fee), and others as well. The paper discusses about external and internal factors when water rates have been revised to date, and controlling water charges on eras of renewing and re-building large-scale facilities.

During the period of post-war economic growth, the concentration of both population and industries in Tokyo was significant, and this situation greatly contributed to the development of the area. However, the rapid population influx to Tokyo urged the area to expand the water supply system in order to deal with the demand for water. Afterwards, the situations changed: Advanced purification plants have been constructed on the grounds of deterioration of the quality of water from rivers; preparations for disasters have been required and others. In this era, stable water supply is the main focus. Having gone through such times, Tokyo Waterworks is about to face "Next Stage," the era when redevelopments of major facilities will begin all together from FY2018. The paper discusses about the future water rate revisions by looking into the past implementations.

2. A comparison of the Water Rate Revisions in 1975, 1994, and 2005

Table 1 describes the water rate revisions since 1965.

Table 1. Changes of water rate in Tokyo

Revision Time	Water Rate Revision Rate	Increase Rate	Revision Details and Social Conditions at That Time
February, 1966--		3.00 times	Revision of the rate structure (from stage to a pipe diameter)
December, 1968--		6.00 times	
September, 1975--		6.00 times	Prices shot up in the wake of the first oil crisis. The draft revision caused confusion.
December 1st, 1978--		6.10 times	Established a new water resources development fund. The largest water distribution volume per day hit a record of 6.45 million cubic meters (largest recorded volume)
November 1st, 1981--		5.74 times	
May 1st, 1984--		4.69 times	
June, 1989--	Reduced the rate by 4%, and introduced the 3% consumption tax	4.69 times	The 3% consumption tax was introduced on April 1st, 1989
June 1st, 1994--		4.51 times	
June, 1997--	Consumption tax 3%→5%	4.71 times	On April 1st, 1997, tax rate was revised (consumption tax and local consumption tax were increased to 5% in total)
January, 2005--		4.16 times	Reduced the rate by 1.3%, discount for payment via bank transfer by 0.9%. Lowered the base water volume: 10 m ³ →5 m ³ . Introduced the discount system for payment via bank transfer
June, 2014--	Consumption tax 5%→4%	4.16 times	On April 1st, 2014, consumption tax rate was revised (consumption tax and local consumption tax were increased to 4% in total)

In Tokyo, Tokyo Waterworks had not adopted the rate revisions for 7 years since 1968 until 1975, based on the political judgment, which took the social, economic situations and others into consideration. That was the time when the financial situation in waterworks was difficult and Tokyo Waterworks had a large cumulative deficit. The priority was put on the reconstruction of finances as the cumulative deficit exceeded 45.2 billion yen in March, 1975.

In 1975, Tokyo Waterworks had to tackle the reconstruction of finances amid the recession following the oil crisis and the price spurt triggered by the crisis. At the same time, Tokyo Waterworks had to deal with the increasing water demand. This period is referred to as "Expansion Period" in this paper.

Throughout 1994, with price still moderately increasing in the aftermath of the bubble economy, Tokyo Waterworks intensively tackled issues, such as increasing costs of developments of water resources, promoting constructions of advanced water purification facilities, and enhancement of monitoring system for water quality. This period is referred to as "Transition Period" in this paper as this period is in the stage of transition from Expansion Period towards the period of stable water supply (focusing on stable supply of safe water by ensuring earthquake resistance and others).

Throughout 2005, Tokyo Waterworks addressed the issues of stable water supply, by reinforcement and maintenance of facilities, such as enhancement of facility reliability (earthquake resistance) and supply of safe, better-tasting water (by advanced water purification system). This period is referred to as "Stable Water Supply & Maintenance Period" in this paper.

With regard to the customer price index and the revenue from water supply service, as well as the annual volume of water distribution can be referred to Table 2. In addition, Table 3 shows the classification of the external and the internal factors for the rate revisions.

Moreover, the revenues and expenditures upon the rate revisions over the last three years were examined (Table 4), along with the factors listed in Table 3.

Table 2. Consumer Price Index, revenue from water supply service, and annual volume of water distribution

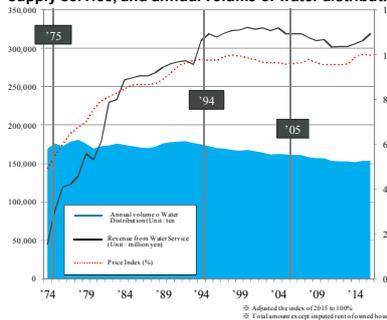


Table 3. External and Internal factors for Rate Revisions

	Rate Revision in 1975 Expansion Period	Rate Revision in 1994 Transition Period (Gradually Transitioned from Expansion to Stable Water Supply)	Rate Revision in 2005 Stable Water Supply & Maintenance Period
External Factors	Rapid population increase Rapid price increase Taking measures to stabilize increasing water demand Increase in laborers' wage	Structural change in water demand Deterioration of water quality Lack of enough water resources (developments of new water resources) Price increase	Moderate increase in population Price increase remained almost at the same level. Structural change in water demand Change in awareness of citizens of Tokyo (water-saving efforts are widely spread)
Internal Factors	Delay in rate revision (political judgement) Construction improvement projects (facility investment) Expansion of facilities	Construction of advanced water purification facilities Expansion of facilities	Promoted construction of advanced water purification facilities Ensuring earthquake resistance of facilities
Others (Internal Efforts)	Sold off a park, roads etc. at the former site of Todoroki Water Purification Plant Put emphasis on operational efforts	Abolished the shared water use system Meter reading once in every 2 months, changed from once in 4 months	Made every effort to improve the operational efficiency by revising construction improvement costs, etc.

(After the adoption of the rate structure according to a pipe diameter)

The external and the internal factors with regard to the following 3 rate revisions were examined.

- The rate revision in 1975, when the increase rate was significant
- The rate revision in 1994, when the expenses for water resources developments increased, and constructions projects of advanced purification facilities were encouraged.
- The revision in 2005, when the rate was reduced by the revision of the base water volume and others.

3. The Implementation of Rate Revisions in terms of the Fiscal Revenues and Expenditures, and Its Factors.

Firstly, in Expansion Period (1975), the revenue from water rate was half of the operating cost, and was unable to follow the inflation which was external factor. This could partly be attributed to the political situation, as listed as an internal factor at that time, which did not allow rate revision. Meanwhile, issue of bond was almost in an amount equal to the cost of construction improvement. However, as for revenue and expenditure, expenditure exceeded the revenue. This was attributed to the following situations at that time: The priority was put on the resources developments and the expansion of water system and others in order to meet the increased demand for water on the grounds of the rapid increase of population. Thus, in Expansion Period, external factors work more than internal factors, and therefore, a rate revision is required at a right time.

In Transition Period (1994), the revenue from water rate was almost equivalent to the operating cost. This was attributed to the constant efforts made by Tokyo Waterworks. However, with an advent of following challenges, it was indispensable for Tokyo Waterworks to outlay capital expenditures. One is development of new water resources with a view to securing sufficient water supplies. Another is construction of advanced water purification facilities, launched in 1989 for the purpose of enhancing its water quality. On account of these factors, Tokyo Waterworks estimated in its medium-term plan that it would post a cumulative payments deficit; accordingly, it revised its water rate structure with eye to compensating this shortfall.

In Stable Water Supply & Maintenance Period (2005), Tokyo Waterworks shifted its focus from expanding facilities and water resources developments to crisis management in case of disasters, earthquake resistance for stable water supply, as well as developments of the facilities to deal with water quality. The construction improvement cost was three-times as much as the amount of issue of bond (double in 1994), however, the revenue and the expenditure were almost same, and it seemed that the levelling of necessary costs was going well. With such situations, Tokyo Waterworks decided to reduce the rate by revising the base water volume and others as the social conditions and the awareness of citizens of Tokyo were changing greatly.

Table 4. Samples of fiscal revenues and expenditures

Year	Revenues				Expenditures				Balance Based on (1) (Deficit)	Cumulative Balance Based on (1) (Deficit)
	Rate	Issue of Bond	General Account Money Transferred from Others	Total	Operational Cost	Investment Cost	Principal Repayment	Total		
1975	200	400	0	600	300	300	0	600	0	(-1,000)
1976	200	400	0	600	300	300	0	600	0	(-1,000)
1977	200	400	0	600	300	300	0	600	0	(-1,000)
Total	1,342	2,242	0	3,584	2,000	2,000	0	4,000	0	(-2,320)
1994	2,800	500	0	3,300	2,300	1,000	0	3,300	0	(-200)
1995	2,800	500	0	3,300	2,300	1,000	0	3,300	0	(-200)
1996	2,800	500	0	3,300	2,300	1,000	0	3,300	0	(-200)
1997	2,800	500	0	3,300	2,300	1,000	0	3,300	0	(-200)
Total	11,400	2,200	0	13,600	10,000	3,600	0	13,600	0	(-1,200)
2004	3,300	300	0	3,600	2,300	1,300	0	3,600	0	(-100)
2005	3,300	300	0	3,600	2,300	1,300	0	3,600	0	(-100)
2006	3,300	300	0	3,600	2,300	1,300	0	3,600	0	(-100)
Total	9,900	900	0	10,800	6,900	3,900	0	10,800	0	(-100)

4. Renewal & Reconstruction Period

Based on these situations, the renewal and reconstruction of major facilities are discussed. As assumptions, large-scale facilities such as purification plants, and others are to be renewed and rebuilt while population drops slightly, and demand for water decreases owing to improvement of water-saving efforts and equipment. The external factors such as inflation and increase of unit labour costs, is difficult to control as utilities. However, the internal factors such as maintenance, management, and reconstruction of facilities can be controlled.

- 1) Inflation → Efforts of cost reduction (Although this measure has a limitation as this is based on the external factor, this measure along with the internal factor, such as internal efforts is implemented.)
- 2) Increase of Construction Improvement Projects (Including Redevelopments) → Asset management, downsizing, levelling of operation and burden
- 3) Increase of maintenance and management cost → Well-planned repairs, levelling with regard to projects, such as sizes of repair works and others.

If inflation continues in the future, Tokyo Waterworks needs to consider making efforts systematically (levelling of projects and finance) which is controllable part such as projects' scales by utilities as internal factor.

Meanwhile, in case those efforts do not bear fruit, without showing much improvement in financial conditions, implementation of a rate revision must be undertaken in order not to increase the future burden, and deteriorate finances (rate revision is an important option).