

## **4-1-1 Asset Management Technique and Accelerated Restructuring of Sewerage System**

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**Abstract:** Almost a half of sewer pipelines in the Tokyo 23-ward area will exceed its service life of 50 years in 20 years. Under the above situation of limited budget and framework, the Bureau of Sewerage, Tokyo Metropolitan Government adopted an asset management technique in rebuilding sewer pipelines in Tokyo. In this project, the economic service life for the sewer pipelines in the 23-ward area is set to about 80 years, and the cost and work of restructuring project are leveled. Furthermore, the pace of current restructuring project should be accelerated.

**Keywords:** asset management; rehabilitation; aging

### **Current sewerage system in the Tokyo 23-wards areas**

Total length of sewer pipelines in the Tokyo 23-ward areas extends up to 16,000 km. However, one tenth of the assets, today exceeds their service life of 50 years. In addition, unless the restructuring is made, another 6,500 km of pipelines will join the ranks in 20 years, creating the situation that almost a half of sewer pipelines in the Tokyo 23-ward area exceeds its service life of 50 years.

With such looming renewal requirements for aging pipelines, it is apparent that the current pace of restructuring will not catch up with the times. Delaying renewal means further progressing of aging sewer pipelines and increasing cracks and breakages.

Broken sewer pipe will not only disrupt the function of wastewater flowing, but also sink roads and lands, deteriorating the safety and security of Tokyo residents.

### **Restructuring project using asset management technique**

Under the above situation of limited budget and framework, the Bureau of Sewerage adopted an asset management technique in rebuilding Tokyo's sewer pipelines. The asset management referred here is a technique to evaluate facility conditions, control appropriate maintenance, and manage the assets (sewerage system), taking account of life-cycle cost and leveling the cost and work in view of mid- and long-term restructuring project.

### **Leveling cost and work in restructuring project**

#### **(1) Life-cycle cost for sewer pipeline**

The total project volume to restructure in the whole 23-ward areas will be quite huge. Therefore, the overall project cost should be curbed anyhow. Under the situation, the scheme is planned to minimize the life-cycle cost. Generally speaking, the total expenses for construction and for operation and maintenance are often economically compared only by its initial cost for construction. However, there are non-negligible expenses of facility operation and maintenance, which increase year by year. The total expenses for construction and for operation and maintenance are minimized at some point in the figure; then, rebuilding the facility becomes economically feasible. Thus, the economical service life and the project period for restructuring are able to be set. The life-cycle cost is the sum of cost for construction and expenses for operation and maintenance. According to the calculation of the cost for construction and expenses for operation and maintenance based on actual results of the investigation, the

economic service life for the sewer pipelines in the 23-ward area is recalculated to about 80 years.

Legal service life for sewer pipelines in Japan is about 50 years. To compensate the gap of 30 years with the above economic service life of 80 years, the efforts to extend the life of existing sewer pipeline are needed in the restructuring project. The Bureau of Sewerage developed new type multi-vision camera to increase efficiency in inspection, especially in shooting and data processing, contributing to well-planned and efficient repairing works. With these efforts, the Bureau of Sewerage will try to extend the service life for additional 30 years.

### **(2) Accelerating the pace of current restructuring project**

In order to undertake the restructuring project effectively based on the economic service life of 80 years, the Bureau of Sewerage has made a plan to group sewer pipelines by year of construction and start rebuilding according to the level of aging deterioration.

The Bureau of Sewerage tries to level the cost and work of restructuring project by prioritizing the rebuilding area, according to the average of economic service life in each area. However, it is apparent that, at the current work pace, the whole sewer pipelines in the 23-ward areas could not be renewed within 80 years. The current pace of restructuring project should be accelerated.

As described at the beginning of this document, due to limited budget and framework, the ongoing restructuring project will focus more on the pipe rehabilitation method, which can reduce the working cost by a half, rather than the conventional open-cut method. So far the restructuring work included the simultaneous improvement of rainwater discharging capacity. However, for the areas with little risk of flooding, remedial measures for aging pipeline should be first implemented and then the reinforced rainwater excluding plan should be gradually added later. By these measures, the Bureau believes it is possible to accelerate the development pace without increasing the restructuring budget.

### **(3) Visualization of asset management**

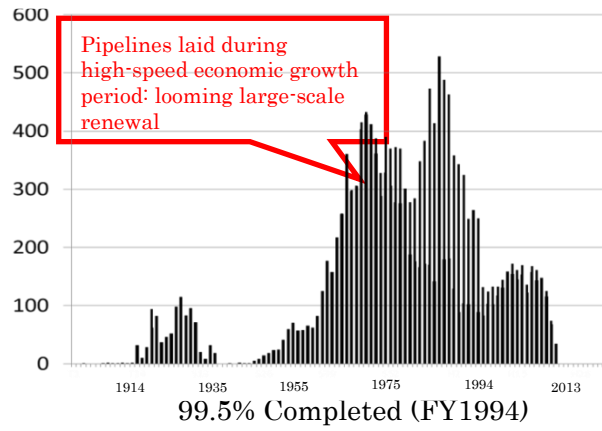
Because the term "asset management" is relatively new in Japan, the Bureau of Sewerage believes it is important to disclose the details of restructuring policy and progress to the public. Therefore, the Bureau encourages every staff member to speak to customers and partner companies to explain the direction and volume of restructuring project in an easy-to-understand manner. To manage the project, it is essential to visualize the future picture and its required work volume, and find the way to manage manpower, equipment and facilities, and budget.

To our customers, by presenting the visualized asset management, the Bureau of Sewerage promises to provide safe and stable sewerage system forever and ever, maintain the pipelines properly to eliminate any cave-in accidents by aging pipes, and continue the long-term restructuring projects. To our staffs, the Bureau explains the necessity to accelerate the pace of project and provides the motivation to increase their technical skills. To our partner organizations, by presenting the mid- and long-term restructuring business volume, the Bureau encourages their preparations.

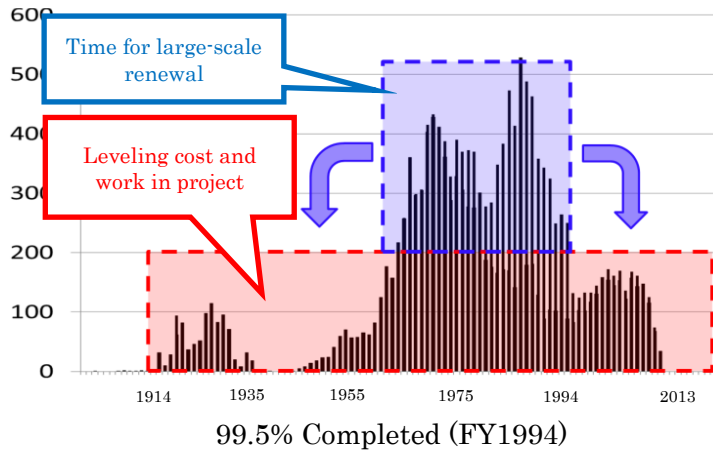
### **Asset management in the future**

To address the looming large-scale renewal of aging sewer pipelines all together in the near future, the Bureau of Sewerage formulated the restructuring policy by adopting asset management technique. Hereafter, the Bureau needs to implement the plan, review the results, and revise the plan if necessary, the process so called Plan-Do-Check-and-Action, to refine the effective project ever.

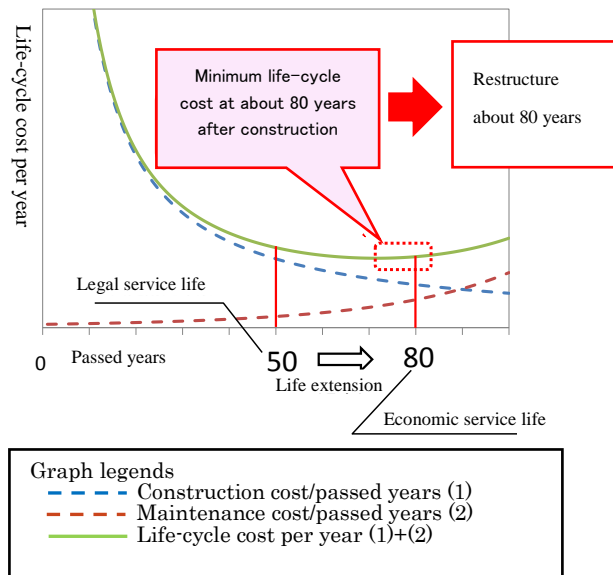
**Figure1:** Length of sewer pipeline built by year



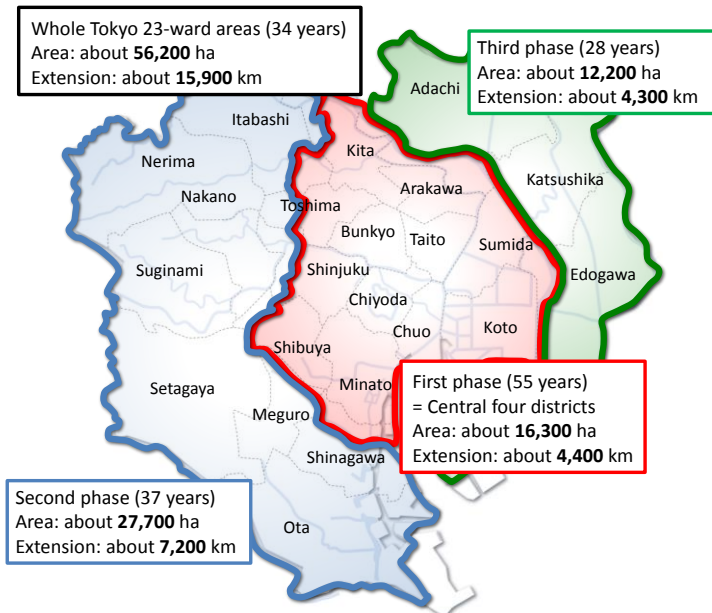
**Figure2:** Image of leveling



**Figure3:** Life-cycle cost for sewer pipeline



**Figure4:** Areas need to restructure and average years after construction



Number in ( ) indicates average passed year of sewer pipeline at the end of FY2012

**Figure5:** Image of asset management

**Length of sewer pipeline built by year (Km)**

