Demonstration to Establish the Comprehensive Gradual Sewer Diagnosis System Using ICT (B-DASH)

(Research of FY 2018-2019)

1. Purpose

In this study, researchers carry out the efficiency screenings and a close investigation by utilizing technologies including deterioration prediction system with big data analysis, ICT data input support and accumulation tool, and a direct-view inspection camera, in the actual field. The purpose of the study is to demonstrate the low cost, effective "Comprehensive Gradual Sewer Diagnosis System by Using ICT."

The demonstration is selected as B-DASH Project[1] 2018 of MLIT[2]. The joint research group of Clearwater OSAKA Corporation, JS, and Osaka City conduct the demonstration as an entrusted research project of NILIM[3]

*1. B-DASH Project: Breakthrough by Dynamic Approach in Sewage High Technology Project
*2. MLIT: Ministry of Land, Infrastructure, Transportation, and Tourism
*3. NILIM: National Institute for Land and Infrastructure Management
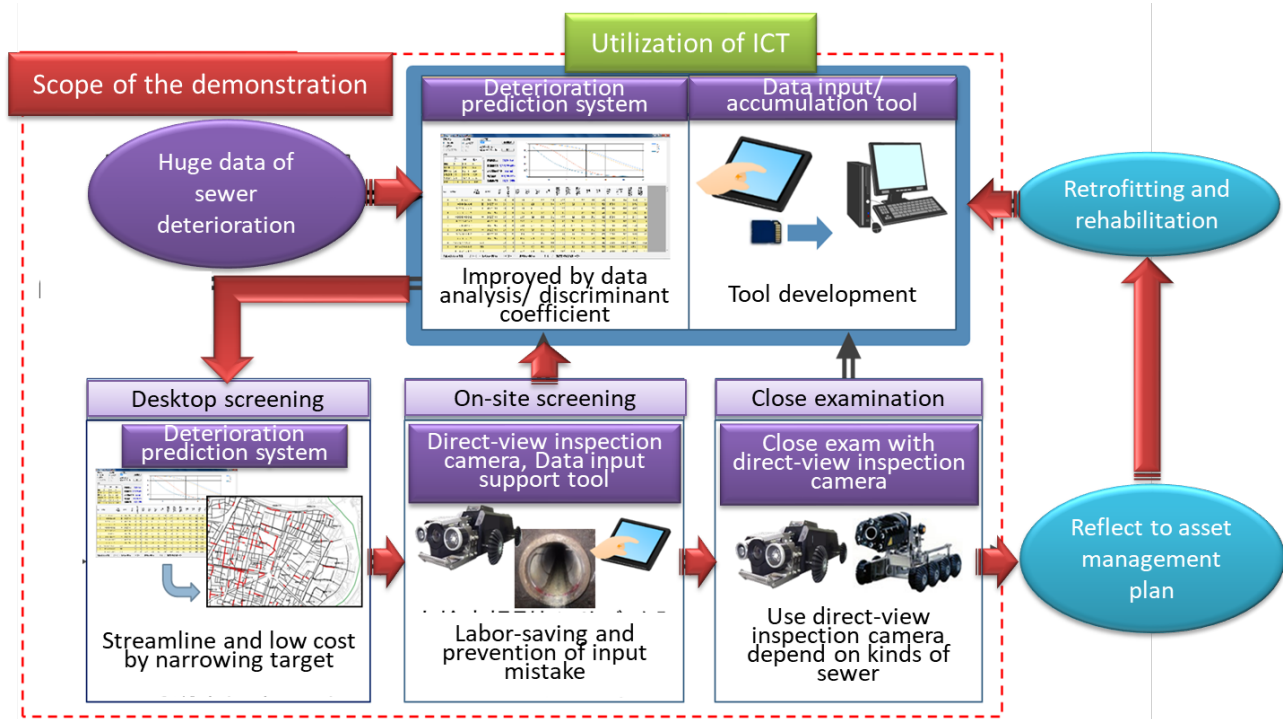
2. Summary of demonstration

Figure 1. The scope of demonstration

In the demonstration, the research group narrows areas for close investigation by using the deterioration prediction technology that analyzes big data including huge information about sewer deterioration. Besides, a direct view inspection camera for the on-site screening and ICT data input support tool for inspection of manholes are used to improve the efficiency and reduce the costs.

3. Outcomes of this year

(1) The research group verified the deterioration prediction system by desktop screening. As a result, while the combination of sewer deterioration data should be considered for the calculation of determination values by multivariable analysis, for concrete pipes, the the precision of urgency rating was 76.4%, which showed constant validity.

(2) For sewer pipe inspection, the urgency rates were compared between onsite screening technology and the conventional TV camera investigation.

As a result, the precisions were 100% for concrete pipes, 97% for clay pipes. Therefore, the utilization of onsite screening technology may narrow the areas for close investigation.

(3) In the manhole inspection, it was verified that ICT data input/accumulation tool reduced work period including field and indoor operations by 40% and costs by 41%.

(4) In the unknown water investigation, the research group evaluated onsite screening technology by the comparison of rainwater invasions amount and basic wastewater amount. When comparing the evaluation results of a simple water level gauge, an infrared camera and an inflow meter, the precision rate was 80% and over, which verified the validity of the screening technology.

(5) For hydrogen sulfate concentration continuous measurement technology, the research group attempted to detect the correlation between hydrogen sulfate concentration and level difference/fall. The place having a manhole depth of more than 5m and an incomplete incline was selected for investigation, but the group did not gain enough data to verify the detection of correlation.

(6) The research group implemented a hearing survey to 21 municipalities. The survey found that many municipalities have problems on the shortages of O&M budget and personnel, and they need low-cost, efficiency and accurate onsite screening technology for unknown water investigation.

(7) The rationality including economy, effectivity, and applicability of the whole system was verified each for desktop screening and onsite screening by the comparison with the conventional technology.
The desktop screening achieved the reductions of costs and work periods of concrete pipes and rigid PCV pipes more than their targets. Onsite screening could reduce the costs and work periods of a simple water level gauge and an infrared camera.

4. Conclusion and future issues

The research will continue to verify the following subjects:

- Accuracy improvement of desktop screening as deterioration prediction,
- 2, The improvement of driving performance of a direct-view inspection camera in onsite screening technology as sewer pipe investigation, and
- Area narrowing has achieved "small blocks" now. In future, the research group attempts the further narrowing area of unknown water using simple water level gauges.

Keywords: **ICT, Deterioration prediction, Onsite screening technology, Investigation of unknown water**