

# Research Trends and Results

## Preparation of Sound Ratio Curve for PVC Pipes (Proposal)

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### 1. Introduction

The function ("sound ratio curve") available for determination of the deterioration of sewer pipes and forecast for reconstruction demand was often used in the past and developed mainly for rigid pipes such as reinforced concrete pipes that need to be reconstructed.

However, since PVC pipes, which are flexible pipes, now account for about 50 percent of all the pipes laid across the country with a total length of 460,000 km, it is necessary to grasp the deterioration of PVC pipes correctly and forecast reconstruction demand to prepare for reconstruction expected to expand in the future.

National Institute for Land and Infrastructure Management (NILIM) has prepared visual inspection standards (proposal) and urgency diagnosis standards (proposal) for examination of deterioration in PVC pipes. Further, as a study in the current fiscal year, we examined the sound ratio curve in order to prepare an appropriate reconstruction scenario for PVC pipes and to level maintenance cost.

### 2. Outline of sound ratio curve

"Sound ratio" represents the ratio of sound pipelines to all the pipelines, and the curve drawn based on the sound ratio and the function expression of elapsed years is called "sound ratio curve." Sound ratio curve represents the progress in the (macroscopic) deterioration of the whole pipeline with statistical approach using the probability prediction model. In the sewer pipeline, all the pipes laid between two manholes are counted as one unit ("span"), and pipes are diagnosed to grasp the urgency for reconstruction for each span by classifying the levels of deterioration into four categories: I, II, III, and "No deterioration." The sound ratio curve in Figure 1 shows the time series trend of generation ratio according to elapsed years for each level of urgency.

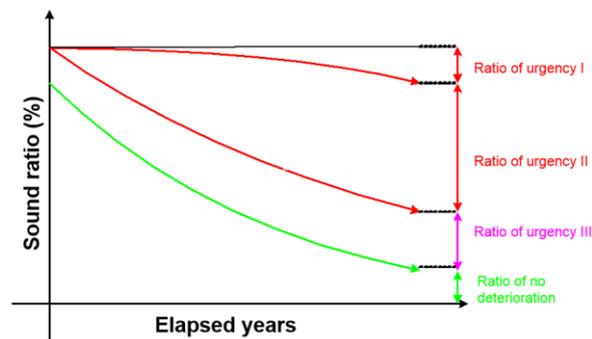


Figure 1. Concept of Sound Ratio Curve

### 3. Preparation of sound ratio curve for PVC pipes

In preparation of the sound ratio curve for PVC pipes, there are three main issues. The first is that there is little survey data on deterioration since PVC pipes have recently begun to be used. The second is that there are few samples of PVC pipes showing deterioration. The third is that the time series trend of the sound ratio is not a monotonic increase trend. In consideration of all of these issues, we made examination by dividing into four steps as shown in Figure 2. As the result, the validity of the sound ratio curve for PVC pipes was evaluated from the clarification of the functions and variables of sound ratio curve and comparison with the percentage of correct answers of sound ratio curve for rigid pipes. When more accurate sound ratio curve is required, it is necessary to consider the regional difference of age-dependent changes in the trend of deterioration occurrence. We plan to publish the sound ratio curve for PVC pipes.

1) "Manual for formulation of sewer life extension plan based on stock management method (proposal)", Sep. 2013, Sewerage and Sewage Purification Department, Water and Disaster Management Bureau, MLIT [http://www.mlit.go.jp/mizukokudo/sewerage/crd\\_sewera ge\\_tk\\_000135.html](http://www.mlit.go.jp/mizukokudo/sewerage/crd_sewera ge_tk_000135.html)

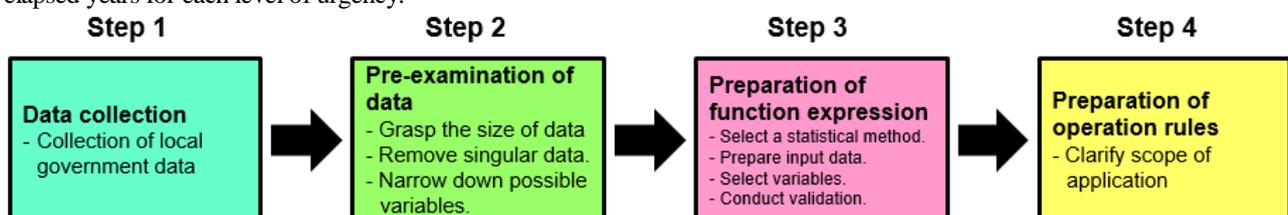


Figure 2. Examination Steps for Sound Ratio Curve