

# Mass Load-Based Pollution Management of the Han River and Its Tributaries, Korea

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**Abstract** Spatio-temporal variations of biochemical oxygen demand (BOD) and total coliform (TC) in the Han River, Korea, were investigated in terms of concentration-based and mass loading-based approaches. Considering the river water quality criteria regulated by the Ministry of Environment in Korea, the tributaries linked to the mainstream of the Han River were found to be highly contaminated with respect to both BOD and TC and, in fact, most of the tributaries exceeded the maximum water quality criteria. To evaluate the pollution impact of tributaries on the mainstream, the monthly water quality monitoring data for six years (from 1995 to 2000) were collected from the Han River basin, and statistically analyzed using Pearson's correlation coefficient. The results revealed that mass loading-based approach was superior to the concentration-based approach for effective Han River watershed management. Overall results supported that the mass loading-based approach associated with total maximum daily loads (TMDL) management would be a useful and suitable protocol in watershed management for

improving the water quality of the Han River and protecting public health. Therefore, this study supporting TMDL management can be applicable to a wide array of contaminants and watershed settings in Korea.

**Keywords** The Han River · Water quality · Total mass load · TMDL · Watershed management

## Introduction

The Han River basin is one of four major river basins in Korea, and consists of five subbasins, as shown in Fig. 1 and Table 1A. Among these five subbasins, the smallest is the Jamsil subbasin, which includes the Seoul metropolitan area, where the Han River is the primary water resource and recreational area for the twenty million residents living along the river. The flow rate of the Han River is controlled by the Paldang dam upstream, which has an average flow rate of around 700 to 1000 m<sup>3</sup>/sec. Since the majority of the rainfall in Korea is concentrated in the summer season (i.e., the monsoon season in June, July, and August), the maximum and minimum flow rates are vastly different (Table 1B). In addition, the Jamsil subbasin consists of several tributaries that are joined to the Han River mainstream. And though the flow rates of these tributaries are quite small (about 1%) as compared to that of the Han River mainstream, because of the numerous environmental infrastructures (e.g., wastewater treatment systems) installed (Table 1C), the role of the Jamsil subbasin tributaries cannot be neglected when considering aspects of water quality.

Due to the rapid development in the economy and industries around the central part of Korea in the 1970s, the water quality of the Han River dramatically worsened. Although there has been some relative improvement as a

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