An Approach for Management of Chemical Releases and Flows Using PRTR Data

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[Abstract]

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We evaluated how much of the PRTR-reported data is reliable as information reflecting the actual release and transfer from the viewpoint of the estimation technique. The results showed that the employed estimation technique is not necessarily appropriate for about 5%-25% of the reported data, suggesting that the data may deviate from the actual situation. The accuracy of the estimated "releases from listed industries below the threshold" was evaluated based on the consistency with the PRTR-reported data. The estimated values based only on the questionnaire to facilities were considered underestimated by several orders of magnitude. We evaluated the coverage of actual release by the PRTR data based on the consistency between the detection frequency of the substances in the environment and the number of sources or release amount of the PRTR data, as well as the comparison of the monitoring data and the predicted environmental concentrations models (AIST-ADMER, G-CIEMS). The results suggested that the release to air and public water bodies of the PRTR data may insufficiently capture the actual release amount for several and about 20 substances, respectively.

We proposed a method for estimating the flows of PRTR target substances through waste treatment by connecting the PRTR-reported transfer data to the administrative reporting data on waste treatment. We estimated the amount of transfer for each treatment pattern by connecting these data and multiplied it by the assumed distribution rate of chemicals in each waste treatment pattern to estimate the flows of the substances to each destination through the waste treatment. It was estimated that organic compounds are mainly decomposed by thermal treatments or recycled after treatment, while inorganic compounds are mainly transferred to final disposal and wastewater treatment.

The inflows and distribution rates of PRTR target substances in sewage treatment facilities were verified by the comparative investigation between PRTR published data and the surveyed data of the monitoring of 108 PRTR compounds at actual facilities. Based on the results, the estimated releases were refined for 19 substances and the estimated releases were newly acquired for three substances. In addition, the behavior of perfluorooctane sulfonic acid (PFOS), which is one of the PRTR compounds, during sewage treatment was investigated by lab-scale experiments. It was shown that PFOS increases during biological treatment due to the formation from the precursors. The findings were utilized for suggesting a new estimation of PFOS from sewage treatment.