A Study on the Estimation of Contribution Rate of Odour Substances Using CALPUFF model

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The environmental odours produced by anthropogenic origin according to urbanization and industrialization continue to increase. These odours cause mental and physiological stress and have a variety of adverse health effects, including nausea, headaches, loss of appetite, gastrointestinal disorders, difficulty in breathing, and allergy. Therefore, the odours are degrading the quality of life for residents in nearby residential areas, causing health hazards and eventually causing economic loss in the community. Miscellaneous approaches are used internationally within odour regulatory systems, with methods and tools for management and control supported by ambient air odour concentration and individual chemicals(maximum impact standard); fixed and variable separation distances(separation distance standard); maximum emission rate for odours and individual chemicals(maximum emission standard); number of complaints or annoyance level(maximum annoyance standard); best available technologies e BAT (technology standard). However, the occurrence of odors is a very local issue that reflects the characteristics of individual sources and the subjective impact of nearby residents. Therefore, prior to these regulations, it is very important to assess the impact of individual emissions quantitatively. The CALPUFF model is a typically used model for assessing the dispersion of air pollutants or odours in various research institutes, including the U.S. EPA. This model is an optimal method for calculating the contribution rate of individual emission sources in area where odour sources are concentrated. In this study, the CALPUFF model was used to identify the contribution rate of the four adjacent emission facilities to the surrounding areas in Saenggok Industrial Complex located in Saenggok-dong, Gangseo-gu, Busan in Korea. In order to estimate the contribution rate of individual emission sources, the predicted odour concentration of each emission source was calculated respectively(S1-S4). Next, the predicted odour concentration was calculated considering four emission sources together(Base). Finally, the contribution rates of individual emission sources within the modeling domain were calculated as the ratio of S1-S4 to Base. The amount of area sources in each emission facility was indirectly calculated using the concentration measured near the emission facility. Meterological input data produced by applying the results of the WRF model to the CALMET model. As a result of the CALPUFF model, the contribution rate of sludge treatment facility was the highest at 76%, and the rest of the facilities were shown to contribute about 10% to the surrounding area.

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