

거주자 행태를 고려한 생활밀착형 미세먼지 대응방안 연구

Reducing Daily Exposures to Particulate Matter through Urban Environmental Design

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SUMMARY

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Every winter and spring, fine dust levels gets extremely high causing high levels of public anxiety and limiting daily life in Korea. The purpose of this study is to suggest how to improve urban building spaces and to present guidelines that reduce the exposures to fine dust in daily life. For this purpose, behavioral patterns of citizens should be examined first so that urban design factors can be defined which is related to fine dust matter. The site for research is ‘Multifunctional Administration City(hereinafter MAC)’, which is a newly developed city within Sejong City.

Since exposure and receptor-oriented approach is a new trend in policies to cope with fine dust in the Atmospheric environment and health sectors, one of researchers’ main tasks in architecture and urban design is to find solutions to reduce the risks of fine dust based on user characteristics and behavior patters. In the built environmental research area, several studies have been conducted focusing on improving ventilation facilities in residential areas and multi-use facilities, and attention has been paid to green infrastructures and urban facilities as an effective method to reduce fine dust in outdoor space. Recent apartment buildings have shown leading examples of high technology in protecting residents from fine dust by applying various technologies in an integrated solution to indoor and outdoor spaces. Our research team investigated the impact of fine dust on the lifestyle of MAC residents using big data analysis, surveys, content analysis of posts on fine dust and focus group interviews.

The findings and implications of the analysis are as follows. First, the government should reduce the exposure of fine dust when using public transportation or staying in schools and workplaces where residents stay for long performing their daily duties. This is because in mandatory schedules, there is a limit to reducing fine dust exposure levels with personal protections, and most of commuters in MAC use their own cars usually, especially when the fine dust level is high.

Second, optional activities are likely to be reduced by high level of fine dust, so protective spaces should be provided to attract more citizens to embrace a healthy lifestyle. As fine dust reduces outdoor activities, the overall satisfaction with leisure time tends to fall significantly amid an overall decline in physical activity through leisure. In terms of leisure facility, MAC lacks large-scale indoor space, while existing public facilities within residential area are limited in size and program. Therefore it is necessary to improve the quantity and quality of public facilities for indoor sports and other leisure time activity.

Third, reliable information about the level of fine dust which is measured in actual place should be produced and provided to citizens. Information about fine dust level, currently available to the public through smartphone applications, are measured far away from where individuals are located and most of facilities in MAC are not equipped to measure indoor air quality. Thus, A fundamental improvement is needed in the way that reliable information is produced and provided for indoor air quality of facility regarding activity unit.

The main idea of managing fine dust in a daily life is to keep outdoor environment safe to reduce the exposure of fine dust, to manages indoor air quality focusing on fine dust inflow and ventilation facilities and to provide information on the exact level of fine dust and how to cope with it.

Since MAC has been built with a major planning concept of neighborhood units which has community area in its center and connected to other units by public transportation and walking street, it is important to link residential and walking environments safely from fine dust in outdoor space, while intensive management of indoor space is needed concerning health impact on vulnerable people. To implement these ideas, this study suggest environmental improvement through designating intensive management areas for fine dust by overlapping facilities used mainly by children and the elderly, places where fine dust is likely to converge, and lively sidewalks.

Since the MAC's district unit planning guidelines do not have the concept of protection from fine dust, it is necessary to encourage supplementation of sectoral implementation guidelines through master plans for each neighborhood units and to specify implementation guidelines for public facilities located at the center of neighborhood. Accordingly, this study proposed a revision of guideline to adapt environmental elements related to protection from fine dust to the implementation guidelines by land-based and public sector guidelines.

This study brings together the behavior patterns and vulnerability factors of the fine dust layer among the MAC's living environments to categorize the intensive management area, and suggests environmental improvement and the guidelines for district unit planning. There is a fundamental limit to the study in that it considered only simplest combination of site type and planning elements, omitting verification of the costs and effectiveness of each policy tool. Another limitation of the study is that it has not fully considered the possibility of improvement of a particular component being in conflict with other factors.

For further study, it is necessary to develop process of production and sharing of data on fine dust of living environment creating social consensus and finding feasible ideas to deal with fine dust through urban design improvement.

Keywords :

Fine Dust, Particular Matter, Exposure Protection, Behavioral Pattern, Urban Design Improvement, Multifunctional Administration City, District Unit Planning Guideline