

Design and evaluation of effective methods of green infrastructure for municipalities

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The purpose of this study is to evaluate the effective method of green infrastructure in the level of municipalities. The research area is river basins and surrounding areas in Tsukuba, Ibaraki, Japan. According to analysis the data of local green areas, farmland, etc., and using PPGIS (Public participation geographic information system) and Hydrological modeling to select the locations of potent/effective functions of green infrastructure. Through the above analysis to clarify the ideal combination of river green infrastructure and regional landscape regeneration.

In 2013, the European Commission formulated a solution called "green infrastructure", and the concept of "Eco-Disaster Risk Reduction (Eco-DRR)" was submitted. In Japan, the introduction of "green infrastructure" was clearly stated in the national land formation plan decided by the Cabinet in August 2015 and the social capital development priority plan in December 2015, as an important direction in future infrastructure development.

Due to the heavy rains in the Kanto Tohoku region in September 2015 and the heavy rainfall from typhoon No. 19 in October 2019, flooding in areas such as Tsuchiura City and Tsukuba City in Ibaraki Prefecture, causing serious losses in residential areas and fields. Based on this situation, it is necessary to promote the rebuilding of a water disaster prevention awareness society. that works on disaster prevention and mitigation measures that integrate hardware and software throughout society. During these five years from 2014 to 2018, The number of rivers that exceed the target discharge of the river improvement plan and the flood risk water level is increasing year by year. As a result, the countermeasures against urban floods such as external and inland water floods are required in each region.

Green infrastructure is not only a green and "green" infrastructure but also an infrastructure that intelligently uses the resources and mechanisms provided by the natural environment and various living things. It is a means to solve various environmental problems by making good use of the various functions of nature. Depending on the cases in Europe and the United States, green infrastructure is mainly of three types: basin size (river), site size (street), and neighborhood size (park). The scale of site size (street) and neighborhood size green infrastructure are mainly prevented for storing rainwater and mitigating flood risk by rain seepage. However, those types of green infrastructure are not limited, in some cases, there are also adopt a combination of parks and rivers to simultaneously prevent external and internal water inundation. The remaining four and five are acting on rainwater storage and flood mitigation.

By the above, not only the river scale but also the street and park scale green infrastructure is equally important. Therefore, the three elements of basin size (river), site size (street), and neighborhood size (park) are important in the formulation of a green infrastructure plan. Besides, as the population and land use rate is decreasing in Japan, there is a possibility that such green infrastructure means can be introduced by utilizing the open spaces, waste green spaces, and low unused land in urban areas.

Keywords: green infrastructure, municipality, region, landscape management