

琉球大学学術リポジトリ

低炭素社会実現のための入力と排出の環境負荷低減に関する研究

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博士論文の要約

Dissertation Title: A Study on Environmental Loads of Input and Discharge for Low Carbon Society

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Environmental loads are serious problems in China as well as Japan and all over the world. Energy consumption in buildings is one of the biggest resources of carbon dioxide as the input to the environment, while solid waste is one of the biggest impacts as the discharge connected with carbon dioxide emission. These two environmental loads against low carbon society are the targets of this study. Cool roof that means solar protection on a roof is thought as an effective passive way to reduce cooling load of buildings and energy consumption for air conditioning. Four types of cool roofs, photovoltaic panels as shading devices, heat insulation paint as a solar reflector, rooftop garden as an outside heat insulator and rooftop water pond as an evaporative cooler, were tested to estimate their thermal performance. The test results indicate obvious surface temperature difference between the cool roofs and the ordinary rooftop surface. The temperature difference by the rooftop water pond is smaller than other three systems. The heat flux reduction by heat insulation paint was calculated from the results to estimate the cooling load saving and the cost performance. The construction cost can be paid back by the energy cost reduction for cooling system in 5 years. Municipal solid waste is a considerable resource of Green House Gas as social discharge, because incineration of combustible waste emits carbon dioxide and dumped and abandoned organic waste makes methane that has 25 times stronger Global Warming Potential than carbon dioxide. This is the reason why waste management has a great impact on the realization of low carbon society. The total amounts of domestic waste discharge in Beijing, Shanghai, Nanjing and Guangzhou in the near future were predicted by using the data from 2009 to 2017. Some multiple regression equations with independent variables of local population, local economic product, number of tourists, etc. were tested to find a most suitable equation. The concluded equation indicates that the total amount of domestic waste in Beijing, Shanghai, Nanjing and Guangzhou will reach 13, 13, 6 and 7.5 million tons per year in 2027, respectively. A field investigation and a questionnaire survey of domestic waste were also conducted to examine the reasons and the solutions of increasing domestic waste. It is a serious reason of increasing domestic waste that the residents discharge various waste materials free of charge without sorting. It is expected that the people would reduce the waste, if separate collection and collection of discharging fee like Japanese system would be introduced. Various data of domestic waste and the result of the questionnaire indicate that about 600,000 tons of waste per year will be reduced in Beijing.