B-53 Technological study on urban energy and resource management and urban structure to arrest the global warming (Final Report)

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In an urban area a lot of energy and resource which come from outside are circulated, metabolized and wasted to support various social and economic activities. These great flows of energy and resource affect many kinds of aspect including global warming. In addition characteristics of buildings and urban structure change the weather in an urban area, which conduct high temperature and energy efficiency down. The main purpose of this study is establishment of technology and systems for transforming the urban activities and structure in order to arrest the global warming.

We estimated that the national CO_2 emission reduction realized by using untapped energy was about 10% of the CO_2 reduction target for 1996. Limitation of distance from heat source to the area was existing to gain energy saving and CO2 reduction.

For the reduction of carbon dioxide release, distributed energy supply system was analysed. Making the most of the energy resources obtained in urban area, such as fuel cell, the possibilities for the carbon dioxide release reduction were obtained.

In order to provide supporting information for establishment of the sustainable and environmentally sound recycling system, we estimated effects of recycling technologies and system to GHG reduction.

Three models expressing thermal conditions of a building, the canopy layer in a section of city, and the mesoscale region surrounding the city, respectively, have been developed. By the combination of these models, the relationship between energy consumption and urban thermal environment have been well simulated.

Some characteristics of surface energy fluxes were obtained. The local meteorological model was improved for verifying the surface heat budget in the urban area. And it became possible to represent the detailed structure of the urban atmosphere by improved model.

We developed a numerical tool for the evaluation of heat released from buildings and air conditioning systems considering the interactive relation between urban structures and atmospheres, and to quantify the exhausted heat of buildings as a thermal load in the urban atmosphere.