

An Important Perspective on Urban Management: The Application of Material Flow Balance Model to the Past Recycling Society in Japan¹

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ABSTRACT. Since the industrial revolution, growing and active economic activities in urban area have disrupted sustainable material flow balance in the environment, and the imbalance has induced some serious environmental problems. In order to realize proper urban management, taking measures to keep well-balanced material flow between urban and rural area is necessary. It is considered by historians that Edo, the old name for Tokyo, was environmentally friendly with its material recycling system developed. This paper develops a material flow balance model to quantitatively investigate the impacts of economic activities on the quality of the environment and the effects of the recycling system of Edo. A simulation result by the model shows that the water quality of Edo-bay (present day Tokyo-bay) was 0.095mg/L in the water quality index of total nitrogen (T-N). This value is within the optimal range for the cultivation of Nori, a kind of seaweed essential for Japanese traditional food Sushi. This result means that the recycling system contributed not only to the environment of the Edo urban area but also to seafood production in Edo-bay, and implies the importance of material flow balance for optimal and sustainable urban management.

KEYWORDS. *Evaluation model, economic activity, environmental problem, global eutrophication, material flow balance*

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1. INTRODUCTION

From a historical perspective of environmental problem, the consumption of fossil fuels since the Industrial Revolution continues to increase and cause many kinds of environmental problems. Our socio-economic system has been constructed under the influence of the Industrial Revolution for a few centuries. Previously, our society has experienced some kinds of environmental problems, for example, local industrial pollution, cross-border air pollution, etc., which grow into a more serious problem. After all, these environmental problems have been generated by pollution emission from combustion of fossil fuels in our economic activities. In recent years, global environmental problems such as global warming and air pollution have become international issues. In particularly, we can recognize two types of global environmental problem in atmosphere and in aquasphere. Figure 1 modified from Takahashi (2007) shows the structure of two types of global environmental problem, and the relationship between economic activities in urban area and the global environmental problems. Global warming, which is the famous environmental problem in the world, is mainly caused by GHG emission into atmosphere from combustion of fossil fuels and resources for energy use of industrial activities in urban area. Also, in the aquasphere, the global eutrophication is caused by nutrient salts increasing in the rivers, lakes, and oceans, and occurs by the same mechanism as the global warming. It should be noted that the eutrophication problem is also the global and immediate environmental problem. Clarifying the impact of economic activity in urban area on the water environment is important, and it is useful for urban management system balanced environmental concerns with socio-economic activity.

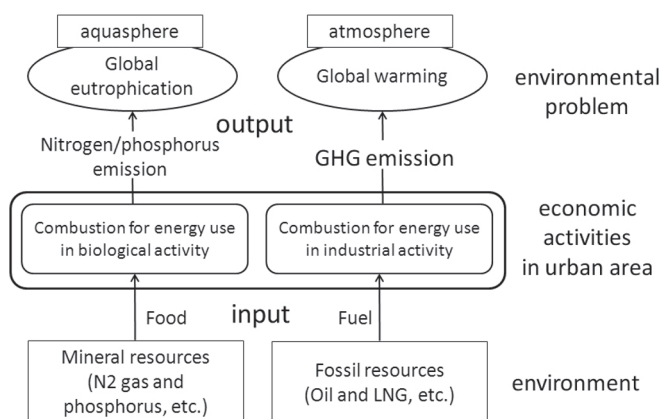


Figure 1. Structure of global environmental problem in aquasphere and atmosphere

NOTE. Modified from Takahashi (2007)

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