

Weight of Cities - Material Stock and Flow Analysis based on spatial database over time

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To establish a “true” sustainable society, we need to measure not only GHG emission but natural material resource input. The physical weight of industrial life is reflected in buildings, roads, cars, furniture and other durable materials which provide services we need. Reducing accumulated weight and improving efficiency by weight are vital in achieving a more sustainable society. Multi-scale Material Stock Analysis with regard to heavy anthropogenic disturbance, on national, regional and city scales, is an essential to de-carbonization and dematerialization of our society. Material Stock Analysis of urban infrastructures and buildings is not only focus on its stocked weight but on its in-flow and out-flow which includes hidden material flows. As to in-flow of construction materials, anthropogenic disturbance by extracting sand, gravel and limestone should be considered due to huge flow of materials. As to out-flow, recyclability and cascade use of demolition material should be taken into considerations. Furthermore, for stocked material as a fundamental service provider, we need to consider stock/flow productivity and material saturation –how much material we need-with change of population, development of society.

This study shows the scheme of material stock analysis and its possibilities with case study of Japan by using statistic and 4d-GIS database. This database provides the material stock of building and infrastructure classified by region, materials and construction types. Furthermore using this database, the relationship of material stock and economic growth and its disparity was analyzed. One of the results of this study showed about 21.8 billion tons, and that material stock growth contributes to improved productivity.

Biographical notes

Hiroki Tanikawa is a Professor, Dr. Eng., of Graduate School of Environmental Studies, Nagoya University, Japan. Material Stock / Flow Analysis and its related topics are main research interests for 20yrs.

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