Material Flow Analysis for Kayangel State, Republic of Palau: Solid Waste Management on a Small Pacific Island

Owens, Emily
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Michigan Technological University – Civil & Environmental Engineering

Solid waste generation is a universal human activity. Industrialization and globalization have served to alter the composition of goods and to increase access to these products such that management of the resulting solid waste has become a global problem recognized by the United Nations. Nowhere is this more apparent than in the context of a Small Island Developing State (SIDS) like the Republic of Palau.

Using the island setting as a controlled microcosm for assessing the generation, composition, and management of solid waste, it is possible to make a more comprehensive investigation of both local practices and global waste problems. This report documents the implementation of two strategies for achieving these aims, using Kayangel Island in the Republic of Palau as a case study. First, a household solid waste study based on fieldwork conducted by the author from March-June 2008 serves to characterize solid waste by type and mass for 25 of the 30 households within the community of Kayangel. Next, a material flows analysis (MFA) is employed to spatially trace the fate of materials that have been introduced to the island (nonorganic fraction of solid waste generation). MFAs have been implemented as an assessment tool for tracing the movement of specific target elements and streamlining processes in a variety of applications worldwide. To the author's knowledge, this is the first application of MFA in the context of solid waste management for a SIDS.

The results of these two analyses are collectively used in characterizing household solid waste in Kayangel by type and annual generation, as well as assessing current management practices. Twelve waste categories used in classifying the household solid waste generation study are objectified within the MFA to reflect material fate categories: accumulation, removal from the island, or burning. The accumulation category accounts for 93% of total annual household solid waste, and as such is the focus for further analysis of local management practices. Combining the household solid waste characterization and generation data with all material flows for the island serves to broaden the scope of the analysis to include all material flows. Based on this MFA, the Kayangel community collectively produces an average 0.93 lbs. of solid waste per capita per day. This can be subdivided into daily per capita solid waste generation rates for the three material fate categories: 0.87 lbs. of accumulation, 0.04 lbs. removed from island, and 0.02 lbs. burned. Recommendations include segregation of household solid waste, consolidation and possible exportation of goods within the accumulation material fate category, as well as implementation of waste reduction strategies on Kayangel Island, as well as the world at large.