SUSTAINABILITY AND SOLID WASTE MANAGEMENT

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Sustainability has emerged as a result of concerns about the unintended social, environmental, and economic consequences of rapid population growth, economic growth, and consumption of natural resources. The concept of sustainability is based on a simple principle for survival and well-being of present and future generations to coexist in a manner with our natural environment to ensure that we have and will continue to have, the water, materials, and resources to protect human health and the environment. So what does sustainability have to do with municipal solid waste management? Are there tools that can be used to encourage more holistic thinking in regards to solid waste management that can lead to more sustainable solutions?

We live in a resource-constrained world and policy decisions result in social, economic, and environmental trade-offs. In a recent World Bank report, solid waste is identified as the most important municipal service and serves as a prerequisite for other municipal action. Just about every city government in the world provides solid waste management for its residents. Conventional decision-making often does not adequately characterize these complex interactions. Life-cycle based decision support tools have been developed in the U.S. and other countries as an aid to policy decisions regarding materials and discards management. Although no one tool can answer every question that decision makers may have, available life-cycle based tools help evaluate the environmental tradeoffs through use of a systems analysis approach. Sustainable materials management encourages more productive and sustainable use or reuse of resources throughout their life cycles, from the point of resource extraction through material disposal. The objective of sustainable materials management is to minimize the environmental impacts of materials while also taking into consideration their economic efficiency and any applicable social considerations. A systems analysis approach in solid waste management tracks waste (and materials) from the curbside or drop-off bin to disposal or recovery to be recycled, composted, or used in making energy or fuel. Using this information, decision makers can make more informed decisions on the benefits of source reduction (through avoiding transport and disposal emissions) and materials recovery helping to identify which materials and sectors (i.e., urban, rural, suburban, commercial) to target to maximize environmental benefits (conserving energy and natural resources) while also factoring in costs and some social factors (such as land usage and employment opportunities).

Most of the available life-cycle tools provide life-cycle assessment (LCA) impacts associated with materials and discards management providing a holistic and systematic analysis of the multi-media and multi-pollutants from the collection, transport, processing, recycling, composting, combustion, and landfilling of municipal solid waste. One of the available tools for sustainable materials management [referred to as the municipal solid waste decision support tool (MSW-DST)] provides LCA impacts in addition to economic information (based on full cost

accounting) that allows a user to compare the cost of different strategies. Although no less important, the available tools do not provide information on social aspects that will also be important in identifying more sustainable materials management strategies. However, the MSW-DST can be used to evaluate some social aspects such as land usage and employment opportunities.

The MSW DST was initially developed in the 1990s and has evolved over the years to better account for changes in waste management practices, waste composition, and improvements in decision support tool design and functionality. The most recent version of the tool is publicly available (https://mswdst.rti.org/) and has an improved interface with embedded tutorials to guide the user. The tool incorporates an optimization routine to identify least cost or least life-cycle emissions strategies. The MSW DST has up to eight sectors that can be used to represent urban, rural, suburban, and commercial sectors accounting for differences in waste composition and quantity, facility design and operation, transportation fuels and distances, population densities and other factors can be specified to account for variations among sectors.

As part of the U.S. EPA's Sustainable and Healthy Communities Research Program, the MSW-DST is being applied to evaluate sustainable materials management as part of a case study for Durham, North Carolina. The MSW-DST is being tailored to the community taking into account community priorities, waste quantity and composition, local infrastructure, population density, energy grid mix and consumption, variations in the design and operation of recycling, treatment, and disposal facilities, economic constraints, and other factors. Although more than 100 studies have been conducted using the MSW-DST since its initial release, the study for Durham, North Carolina will illustrate how the tool can be used to aid decision makers as they consider more sustainable materials management plans for municipal solid waste. The tool is being used to estimate the environmental and cost implications of current programs and identify more sustainable options working closely with the solid waste managers for the city and county. First on the list of priorities for Durham is to evaluate better options for management of organics for residential and commercial waste. Other materials will also be evaluated to identify options to achieve more environmental benefit from recycling while considering the potential financial risk due to fluctuations in energy and commodity materials market prices. The ultimate goal of the pilot study is to help illustrate how the tool can be used to identify more sustainable materials management solutions and how it can be used to help decision-makers access information that leads to more sustainable materials management.

References

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