ACCELERATING SUSTAINABLE MATERIALS MANAGEMENT IN THE U.S.

EXECUTIVE SUMMARY

Mark Lichtenstein, SUNY College of Environmental Science and Forestry

The Challenge

The U.S. represents just four percent of the world's population, but it produces 12 percent of global municipal solid waste (MSW) according to a report by Verisk Maplecroft. During the last few decades, despite investments and initiatives to reduce MSW – the total volume of discarded materials has continued to increase with devastating impacts on the climate. One estimate suggests that more than 40 percent of the climate impact in the U.S. comes from the materials and food consumed ("consumption emissions").[1] This includes the entire supply chain, from manufacturing, transportation, and usage, to final disposition of the materials which continues to be reliant on inefficient, polluting, and greenhouse gas (GHG) generating disposal facilities, such as landfills. While national recycling rates increased six percent between 2000 and 2017[2], it is expected that 2019 data will likely show a drop from its 2017 peak at 35 percent. With China and other countries refusing to continue to accept U.S. waste[3], recycling rates are expected to continue their decline. As national and regional policies realign in order to respond to the threat of COVID-19, it is essential that opportunities are identified to shed old, costly, and carbon-inefficient waste management facilities, processes, and systems.

The Solution

Sustainable Materials Management (SMM) is an integrated approach toward managing material life cycles to achieve economic efficiency, environmental viability, and social equity. Material life cycles include all human activities related to material selection, exploration, extraction, transportation, processing, consumption, recycling, and disposal.[4] SMM is a framework that strives to preserve natural capital by increasing resource productivity, reducing material throughputs, and reusing and recycling materials to such a degree that depletion of natural capital is minimized and ecosystem services maintained. The objective is to maximize positive, and minimize negative environmental, economic, and social outcomes across entire product life cycles, as well as at every stage of the cycle. SMM with associated and embedded zero waste, circular economy, and zero carbon goals, provides a progressive response of deep decarbonization that is intrinsically linked to sustainable development.

Zero waste: divert materials from disposal facilities

Achieving zero waste includes the combination of various conservation strategies, such as reducing the amount of materials needed to provide the function required (source reduction), extending the service life of products, developing more sustainable materials and materials management processes, and eliminating the concept of waste in part by ensuring that there are

robust markets to reutilize post-industrial and post-consumer materials. To achieve zero waste, SMM prioritizes: source reduction, reuse, recycling, composting and reducing discarded food.

Circular economy: design waste out of the system

The U.S. has an extractive industrial model based on a linear production system of "take-make-waste."[5] By contrast, a circular economy is one that redefines growth and materials use, and focuses on positive, society-wide benefits. This includes emphasizing social equity, such as fostering a just economic transition, recognizing environmental justice concerns, and incorporating intergenerational interests. It is an economy based on decarbonization. In a circular economy, economic activity builds – and rebuilds – overall system health. The concept recognizes the importance of the economy needing to work effectively at all scales – for large and small businesses, and for organizations and individuals, locally and nationally. Fiscal tools are needed that help transition from subsidizing extractive industries to supporting circular economy activities. Focus should be on the entire life cycle of materials from extraction to end of life, and include externalities such as GHG production.

Zero carbon: decrease the use of carbon and the generation of GHGs

The U.S. Environmental Protection Agency estimated potential GHG reductions through the implementation of a few aggressive SMM strategies. This data below offers a glimpse at the potential reductions in GHGs that could be assumed through SMM practices:[6]

Source Reduction	Reduce packaging use by:	50% 25%	40-105 $MMtCO_2e$/yr.[7] 20-50 $MMtCO_2e$/yr.
	Reduce use of non-packaging paper products by:	50% 25%	20-70 $MMtCO_2e$/yr. 10-35 $MMtCO_2e$/yr.
Reuse/Recycling	Increase recycling of construction and demolition debris to:	100% 50% 25%	150 $MMtCO_2e$/yr. 75 $MMtCO_2e$/yr. 40 $MMtCO_2e$/yr.
	Increase national MSW recycling and composting rate from 2006 rate (32.5%) to:	100% 50%	300 $MMtCO_2e$/yr. 70-80 $MMtCO_2e$/yr.
	Increase composting of food scraps from 2006 rate (2%) to:	100% 50% 25%	20 $MMtCO_2e$/yr. 10 $MMtCO_2e$/yr. 5 $MMtCO_2e$/yr.

In addition to the direct impacts on GHG emissions and harm done to ecological systems, integrating SMM principles and practices into everyday life will result in many positive extraneous benefits. For example, sustainability, greenhouse gases, and decarbonization are intangible concepts to many people. The average person likely does not recognize the GHGs they emit on a daily, monthly, or yearly basis. They are difficult to track and hard to quantify. However, with

some effort, a person can clearly see and measure the amount of material they produce over any given time span. SMM is tangible and can act as a gateway in creating a strong environmental ethic, leading people to take interest in additional decarbonization actions.

Policy Recommendations

SMM, with associated and embedded zero waste, circular economy, and zero carbon goals, should be embraced as U.S. national policy. The U.S. needs to play a foundational role accelerating the global transition to a just, resource-efficient, circular, and climate-neutral economy, with zero carbon as a primary objective. It cannot do this without addressing the current economic and consumption model and associated materials management schemes. To more rapidly reach zero carbon objectives, the U.S. must also address a multitude of issues and challenges related to materials management, including, but not limited to:

- *Product stewardship and extended producer responsibility initiatives*
- *Fragmentation and distributed policy authority*
- *Outdated federal policy*
- *Disassociation and distraction*
- *An unlevel playing field*
- *Difficult materials (such as plastics)*
- *"Chemical recycling"*
- *Waste-to-Energy impacts*

To accelerate toward SMM, zero waste, and circular economy solutions, policy emphasis and change needs to emanate primarily from the Federal Government. While there are many successful state, local, private, and public-private accomplishments in the field of materials management, progress has been unacceptably slow, with discarded materials increasing in quantity and continuing to pose other environmental and public health impacts.

Federal action includes the need for the U.S. Congress to develop a comprehensive suite of policy changes and fiscal tools to move from subsidizing extractive industries to supporting circular economy activities and SMM; including, but not limited to:

- a national beverage container deposit act,
- material bans (such as single-use plastics),
- promotion of product stewardship,
- requiring comprehensive SMM plans for large organizations, and
- banning organic material from disposal facilities.

Model SMM legislative initiatives and other progressive actions should be promoted that states and local governments could adopt from their peers. New technology opportunities and other strategies should be incentivized by the Federal Government to achieve zero carbon through SMM at facilities and institutions, and new, related academic research and development activities should be supported. In addition, the U.S. needs to play a global leadership role, with zero

carbon as a core goal, attained in part through SMM and circular economic objectives included in free-trade agreements; bilateral, regional, and multilateral processes and agreements; and in U.S. external policy funding instruments.

Outcomes

Targeted international, federal, state, and local policies will form a foundation that will optimize material use and management with commensurate reduction in carbon use and GHG production. When coupled with "green" manufacturing initiatives, SMM can not only help to safeguard human and ecosystem health through significant GHG reductions, but also provide economic stimulus for "clean" industries and job creation. These combined concepts represent a valuable perspective for decoupling resource consumption from industrial growth and economic value creation.

References

1. "Smokestacks, Tailpipes, and Trashcans," Eco-cycle Solutions, Accessed July 30, 2020, https://www.ecocyclesolutionshub.org/about-zero-waste/climate-change/.

2. "National Overview: Facts And Figures On Materials, Wastes And Recycling". 2020. US EPA. https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials.

3. Seldman, Neil. 2018. "Monopoly and the U.S. Waste Knot," Institute for Local Self Reliance. Accessed July 26, 2020, https://ilsr.org/monopoly-and-the-us-waste-knot/.

4. Fiksel, Joseph. 2006. "A Framework for Sustainable Materials Management," The Journal of the Minerals, Metals & Materials Society, (January 2006): 15, p. 16.

5. "Concept: What is A Circular Economy? A Framework for An Economy that Is Restorative and Regenerative By Design," Ellen MacArthur Foundation, Accessed August 1, 2020, https://www.ellenmacarthurfoundation.org/circular-economy/concept.

6. *Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices,*

US Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, DC: September 2009, https://www.epa.gov/sites/production/files/documents/ghg-land-materials-management.pdf.

7. MMtCO2e/yr.: Million metric tons of carbon dioxide equivalent per year.