



**A GUIDE TO  
SUSTAINABLE MATERIALS MANAGEMENT  
AND SUMMARY OF WHITE PAPER IDEAS**

**May 4, 2015**

**Prepared by Gary Liss, John Davis, Julie Rhodes, Leanne Spalding,  
MaryEllen Etienne, Marie Kruzan and Laura Flagg in support of the  
NRC Sustainable Materials Management Summit**

## Table of Contents

<b><u>INTRODUCTION</u></b>	<b>3</b>
White Paper Categories	3
Business Roles/Market-based Solutions	3
Tools for Job Creation, Economic and Market Development	3
Training and Certification of People and Products	4
Locally Driven/Local Scale SMM Policies, Programs and Facilities	4
National Roles/Policy-Based Solutions and Miscellaneous	4
National Sustainable Materials Management Action Plan	4
<b><u>BACKGROUND ON SUSTAINABLE MATERIALS MANAGEMENT</u></b>	<b>5</b>
Introduction to Materials Management	7
<b><u>HOW SMM CAN HELP THE NRC NETWORK</u></b>	<b>10</b>
<b><u>HOW THE NRC NETWORK CAN HELP SMM</u></b>	<b>11</b>
<b><u>ATTACHMENT A - SUMMARY OF WHITE PAPER IDEAS</u></b>	<b>13</b>
Business Roles/Market-based Solutions	13
Tools for Job Creation, Economic & Market Development	14
Training and Certification of People and Products	16
Locally Driven/Local Scale SMM Policies, Programs, and Facilities	18
National Roles / Policy-Based Solutions & Miscellaneous	21
<b><u>ATTACHMENT B - PRE-SUMMIT ATTENDEE LIST</u></b>	<b>24</b>

## INTRODUCTION

The [National Recycling Coalition](#) (NRC) is bringing together many of the greatest minds in sustainable materials management, determined to elevate the issues around discards management back to the forefront of national policy. The [National Sustainable Materials Management Summit](#) is being held May 12 and 13, 2015, at the University of Maryland, College Park. Delegates and attendees from a broad spectrum of interests and expertise around waste reduction, reuse, recycling, composting, product stewardship and more, will contribute to the creation of a new, forward-thinking, strategic National Sustainable Materials Management (SMM) Action Plan.

To prepare for the Summit, NRC organized a series of webinars to provide a Guide to SMM for the full range of professionals broadly involved with reuse, recycling, composting, anaerobic digestion, product stewardship and other SMM activities for business, government or academe. PowerPoints and videos of the webinar presentations are available on the [NRC website](#).

### White Paper Categories

Summit participants were asked to write a one-page White Paper to summarize their contributions to SMM, and from their unique perspective or expertise, recommend policies and programs to be adopted nationally to help local SMM initiatives.

NRC has developed this background document and the “Summary of the Ideas” compiled from all the White Papers received by April 27, 2015, to help stimulate discussion and develop consensus at the Summit for the types of policies and programs proposed by participants. This Summary categorizes the ideas received into the categories of the five Panels of the Summit, which include the following topics:

**A. Business Roles/Market-based Solutions:** Design for durability, disassembly, reuse, recycling and composting; collaboration between product designers and end-of-life collectors and processors; and product policies such as bans, Extended Producer Responsibility (EPR) and Product Stewardship.

**B. Tools for Job Creation, Economic & Market Development:** Ensuring quality of materials; marketability of materials; contamination issues; research and development; and other tools to support retention, expansion and attraction of reuse, recycling and organics processing industries.

**C. Training and Certification of People and Products:** Certifications of professional reuse, recycling and composting practitioners; labeling and certification of products; and standardization of measurement or best practices.

**D. Locally Driven/Local Scale SMM Policies, Programs, and Facilities:** Addressing local community issues: collection systems, infrastructure, local goals and ordinances, franchises, and garbage rate structures.

**E. National Roles / Policy-Based Solutions & Miscellaneous:** For those that focused on big picture, national solutions or actions, such as national definitions, laws, funding, and national stakeholder dialogs and those that didn't fit into other categories. These may be appropriate for one or more federal agencies to act upon, and/or could be the role that NRC plays in supporting national policy and programs on behalf of the NRC membership.

## **National Sustainable Materials Management Action Plan**

The discussion at the Summit will be focused on getting participants engaged and contributing input on these ideas, as well as those highlighted by the Resources presentations at the beginning of each Panel discussion. Please be prepared to comment on which of the proposed ideas should be highlighted in the National SMM Action Plan as key priorities for **action by**:

- ◆ National Recycling Coalition
- ◆ One or more Federal Agencies (please specify)
- ◆ Business leaders and trade associations
- ◆ State and Local Government leaders and organizations
- ◆ Colleges and Universities
- ◆ Others (please specify)

Following the Summit, additional White Papers may be submitted. NRC will post all White Papers on its website for public review. NRC will build upon this Summary to draft the National SMM Action Plan, prioritizing consensus items from the discussion at the Summit.

The Draft National SMM Action Plan will be circulated to all participants of the SMM Summit, the NRC Policy Committee, NRC's Recycling Organizations Council, the SMM Summit Advisory Committee and other networks and contacts for review and comment. Staff will review and revise it, then present it for adoption by the NRC Board of Directors, no later than September 2015. The approved Plan is intended to become the strategic roadmap for future NRC activities and advocacy for SMM.

## BACKGROUND ON SUSTAINABLE MATERIALS MANAGEMENT

*Materials* include everything from raw materials to products consumed by individuals, businesses and governments. Materials could include, for example, sand used for roadways, concrete, cell phones, food, office supplies and packaging.

Here is a working definition of materials management from EPA:

*“Materials management is an approach to using and reusing resources most efficiently and sustainably throughout their lifecycles. It seeks to minimize materials used and all associated environmental impacts.”*

An updated, modified definition was developed by the West Coast Climate and Materials Management Forum:

*“Sustainable materials management is an approach to serving human needs by using and reusing resources most productively and sustainably throughout their life cycles, generally minimizing the amount of materials involved and all the associated environmental impacts, as defined in [The Road Ahead, EPA, 2009](#)”.*

Another definition that has been used by EPA is:

*“Materials management refers to the life cycle of materials as they trace their course through the economy, from raw material extraction to product manufacture, transport, use, source reduction, reuse, recycling, and disposal.”*

Which of these definitions resonates most for NRC? Are there attributes of SMM that NRC would like to emphasize? Should SMM definition and principles help focus our network on: Redesign? Reduce? Reuse? New policies, programs and facilities needed to use quality discarded materials in the U.S.? Keeping materials from being buried or burned?”

Regardless of which definition is used, **SMM requires looking beyond “downstream<sup>1</sup>” end of life management to also address all stages including upstream production and use phases.**

---

<sup>1</sup> “Downstream” includes reuse, recycling, composting, anaerobic digestion, landfills and thermal destruction processes.

<b>Comparison of Discards Management vs. Materials Management</b>		
	<b>Discards Management</b>	<b>Materials Management</b>
<b>Goal</b>	Managing discards	Sustainability
<b>Lifecycle</b>	Primarily downstream, with upstream impacts as recycled wastes displace virgin materials	All stages
<b>Environmental Scope</b>	Emissions from waste facilities; resource conservation from recovery	All pollutants, resources
<b>Partners</b>	Waste generators, waste industry, users of recovered material	Everyone involved in the life cycle of materials

Life cycle analysis (LCA) is the preferred method used to analyze materials management impacts. LCAs measure resource and energy inputs and calculate environmental outputs such as greenhouse gas emissions, air and water pollution, acidification, eutrophication, fossil fuel depletion, eco-toxicity and human toxicity. The proper boundaries for SMM LCA analysis measure material flows from acquisition, manufacturing, distribution, and use to end of life management. The results of LCAs inform decisions involving product design, processes (production and end of life management), and policy.

When used to support SMM, LCAs can help to answer complex questions about choices and impacts; are multi-attribute; and offer inter-related solutions. Rather than focus on a single attribute, impact, or stage, LCAs help materials managers holistically assess products across their full environmental range. Better informed and more comprehensive decisions are more likely to yield environmentally sustainable solutions.

EPA's WASTE Reduction Model (WARM) uses a modified lifecycle approach to evaluate the energy and greenhouse gas impacts of discards management. WARM excludes use phase impacts, since end of life management decisions typically do not affect use-phase impacts. While WARM includes impacts "upstream" in resource extraction and production, it is only designed to evaluate changes in these upstream impacts resulting from waste prevention and "downstream" discards management actions. WARM is not designed to evaluate the impacts of other materials management strategies, such as material substitution or improvements in how materials are manufactured.

These other actions can have very significant impacts. For example, a study by the Oregon Department of Environmental Quality (ODEQ) and others found that plastic shipping bags – even if made from virgin resources and not recycled – have lower environmental burdens in most categories than cardboard boxes – even if the boxes contain high levels of recycled content. So, despite the fact that recyclability is a desirable attribute of a product, like packaging, something that is recyclable doesn't necessarily mean that its environmental burden is less than non-recyclable alternatives. Again, materials management allows us to look at the full picture and not just discards management to inform decisions.

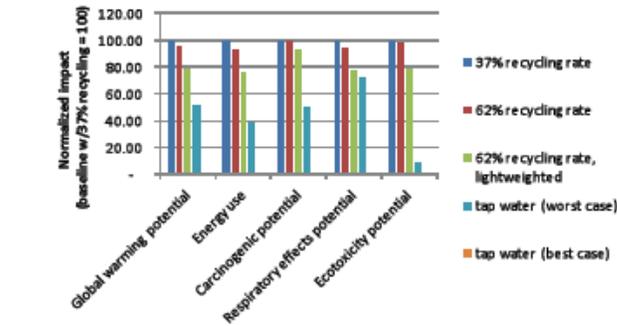
Looking at a full view of impacts and actions across a product's full lifecycle yields useful insight. Another ODEQ study investigated the most environmentally responsible

way to consume drinking water. They found that if you drink bottled water, and recycle the PET bottle, you will reduce GHG by 16% compared to disposing of the bottle. Drinking water from the tap, however, reduced GHG by 79-98%



**Sustainable Materials Management for Recyclers**

**Example of Actions Across the Life Cycle: PET Water Bottles**

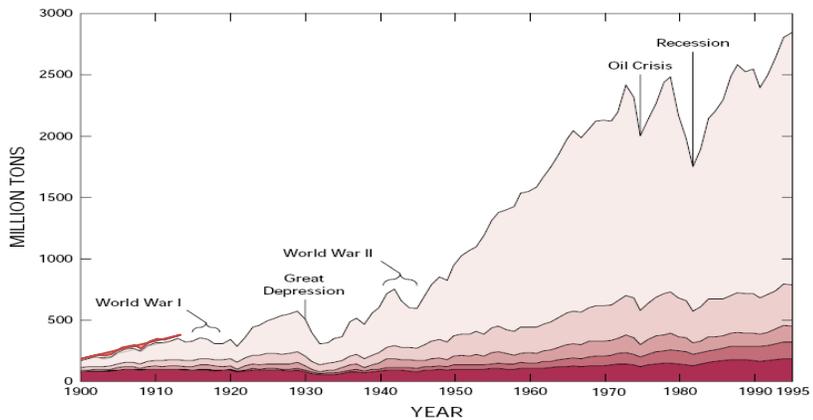


"Baseline" = PET, half-liter, 13.3 grams, 0% post-consumer recycled content (PCR), on-site molding, purified municipal water (reverse osmosis, ozone and uv), 50 miles to retail, 5 miles home-to-retail, co-purchase w/24 other products, no chilling.

compared to disposal. The study also considered other types of environmental impacts, such as ecotoxicity, energy use, carcinogenic and respiratory effects. Increasing PET recycling rates, for example, had no impact on ecotoxicity or carcinogenic impacts; and very little impact on respiratory effects, while prevention and reuse (tap water in a reusable bottle) had significant reductions in all of these areas. The impacts of tap water use were reduced even further by using energy-efficient dishwashers.

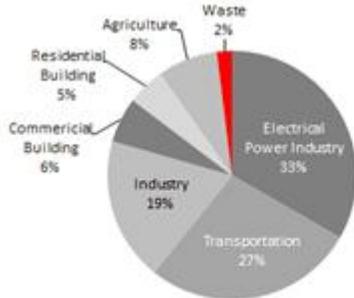
**Introduction to Materials Management**

Over time, the consumption of materials has dramatically increased in the US. Mining and producing materials takes energy and that energy primarily comes from fossil fuels. As burning fossil



Use of materials in the United States, 1900-1995. Modified from Matos and Wagner, 1998, p. 110.

Fuels produce greenhouse gases and contribute to climate change, producing materials also contribute significantly to climate change.

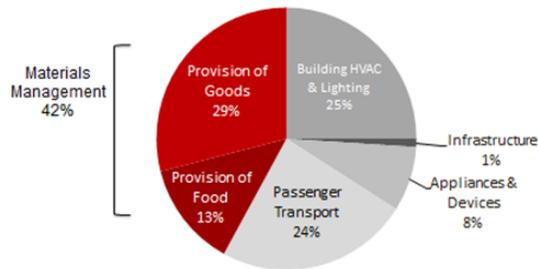


Source: U.S. Inventory of GHG Emissions and Sinks: 1990-2006 (US EPA, 2008)

**US Greenhouse Gas Emissions (2006)**

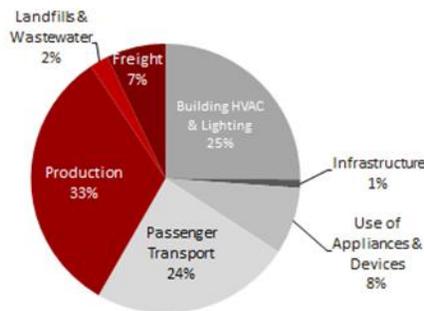
In the EPA 2006 inventory of U.S. greenhouse gases (GHG), the electrical power, transportation, and industry sectors were shown to contribute the vast majority of the nation's GHG emissions. Materials (or products) that become "waste" comprised about 2% of the nation's greenhouse gas emissions, primarily from landfill methane. But this 2% doesn't account for the impact of producing products.

The full greenhouse gas impacts of materials are spread throughout every category of the GHG inventory when presented in this way. When EPA looked at the same data through a systems analysis, EPA found that the impact of the provision of goods and food contributes to 42% of the nation's GHG emissions. These are the same national GHG emissions as the previous chart, just viewed through a different lens.



Source: Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices. U.S. EPA.

**US Greenhouse Gas Emissions (2006)**



Source: Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices. U.S. EPA

**Materials: Production Dominates Emissions**

Here is the same data but the provision of goods and food (the materials) are broken down into the stages of a material's lifecycle when the emissions occur. About 32% of the nation's emissions are a direct result of producing the materials we consume, 7.1% is from shipping them to the consumer, and only 2.2% is a result of disposing materials in landfills. So, it's

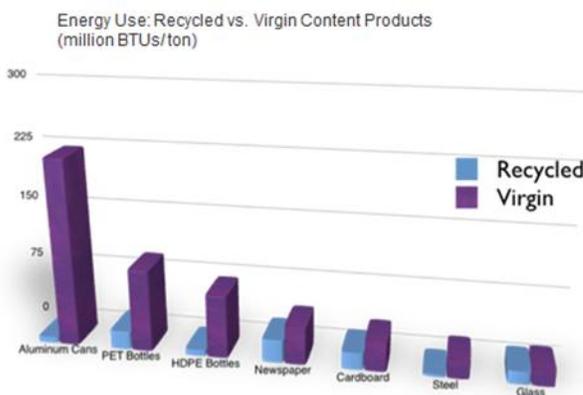
pretty clear that **the production of materials is where the vast majority of impacts occur over the lifecycle of materials.**

This simple chart shows the lifecycle of a product: resource extraction, processing, manufacturing, distribution, use, and finally recovery or disposal. All materials follow this lifecycle. Waste management programs focused on the end of a material's lifecycle, which is represented by the small circle in this graphic. Waste management could include recycling, burning for energy recovery, composting, and landfill disposal.

WASTE management vs. MATERIALS management



**Reducing consumption has the biggest benefits because that completely avoids the production of new materials,** which has the biggest impact over the lifecycle of materials. **If you reuse materials, you also avoid the production of new materials,** which has significant benefits. Finally, if you recycle a material you certainly avoid the landfill, which is good, but **the bigger benefit, from a greenhouse gas perspective, is reducing the demand for virgin materials in the production of new products.**



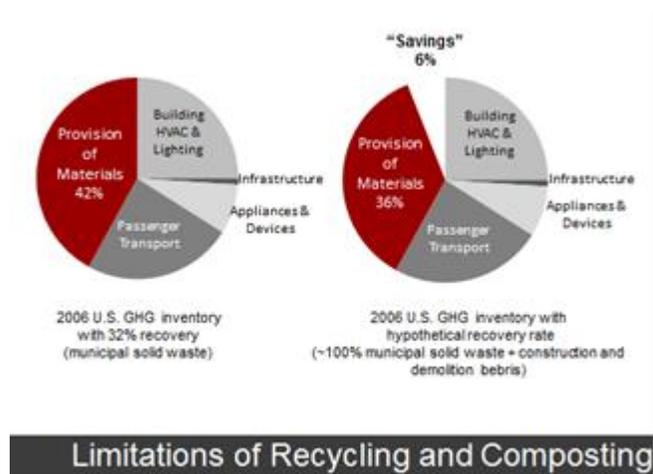
Recycling Conserves Energy

Recycling reduces the energy demand for making new materials by conserving virgin resources, which is one reason why it's so beneficial. This chart shows that making a product from recycled material uses significantly less energy than using new "virgin" resources. Despite the benefits of recycling, let's remember that there's an order to *reduce, reuse, recycle* for a reason- **reduction and reuse have larger environmental benefits than**

**recycling. Nevertheless, recycling is a significant materials management strategy. In governments' role, they can dramatically impact the success of**

**recycling and composting programs**, while they have less ability to impact reduction and reuse.

If we recycled and composted everything, using entirely domestic end markets, this chart shows that we would reduce the nation’s GHG emissions by about 6%. But 36% of the nation’s GHG emissions associated with our material consumption would remain (not to mention all of the foreign emissions associated producing the goods that we import for use here). That 36% is the difference between “Waste Management” and “Materials Management”.



## How SMM Can Help the NRC Network

Given all the climate change benefits of production process redesign and product use compared to improved downstream materials handling, does this mean that downstream processes are not important? The answer is unequivocally NO! There are still many benefits of downstream processes. Recycling programs **do** address issues such as limited natural resources and the need to make sure that when products/materials are consumed, that those resources get back into the recycling stream. Many materials, such as plastic and metals, save significant energy by using recycled feedstocks and ensuring that those new raw materials do not have to be extracted and undergo initial processing. A robust recycling infrastructure must still be supported to efficiently and effectively manage the recycling stream.

Recycling could also benefit from being more a part of overall sustainability, triple bottom line and climate change initiatives. Recycling, reuse, composting and other diversion tactics are critical to any climate action plan. As an example, California gained tremendous support for recycling and composting programs by showing the GHG benefits, which led to a new 75% Recycling, Composting and Source Reduction target by 2020 statewide, and a statewide mandate that all major businesses must recycle. GHG reduction also drove the state to adopt a requirement that all businesses recycle their organic waste after April 2016. Fifty million dollars in cap and trade funds provide grants and loans to expand existing capacity or establish new facilities in California for processing organic materials.<sup>2</sup>

<sup>2</sup> CalRecycle’s first grant solicitation yielded 69 projects requesting over \$153 million

These funds will also help to build a manufacturing infrastructure to capture recycled materials now exported, lowering greenhouse gas emissions and creating jobs.

This is a clear demonstration of the importance of working to help solve other critical problems for communities and businesses at the same time as working to reduce waste, reuse, recycle and compost more. That brings more allies to help on gaining approval for new policies, programs, facilities and funding.

Economic benefits have also been integral in driving statewide recycling policy. As example, the Indiana Recycling Coalition released a study that demonstrated that 10,000 additional reuse/recycling jobs could be created through more aggressive efforts, which resulted in a new statewide 50% recycling goal.

More attention to SMM could result in other help for NRC members, partners, and supporters. Attachment A includes many ideas submitted by Summit participants.

There will be hard tradeoffs for products that perform well overall but are not recyclable now. Solar panels are difficult to recycle now but have major environmental benefits. Legislation is proposed in California to declare them Universal Waste as a first step. This serves as a model for a national policy, which could be advocated, instead of a patchwork of state laws. And this demonstrates how manufacturers could be encouraged to find recycling solutions for waste stream challenges.

In the water bottle versus tap water example above, once a full LCA is done and the most sustainable paths are articulated, those paths could still be improved further. In the case of the tap water example, they highlighted that tap water would be even more beneficial if they used energy efficient dishwashers. For the coffee product example, although the film product is not recyclable currently, it's possible that new research into strength of materials and packaging design could result in either a recyclable or compostable film product in the future.

## How the NRC Network Can Help SMM

Although GHG emissions are a critical aspect of making product choices, and we want to use LCAs as a key tool when evaluating product choices, consumption *is* still happening on a large scale and we need the most efficient and effective downstream end of life policies and programs to handle those materials. Thus, focusing on design and production should be coupled with educating consumers to buy the right product, and reusing, recycling and composting those. We also need to provide the reuse, recycling and composting infrastructure to support those material and product choices being made by consumers in today's economy.

Many of the ideas proposed in Attachment A below may require new players, organizations, tools, services, applications, and resources to accomplish. Existing reuse, recycling and composting professionals may not be the ones with the skills, knowledge, expertise, and role to implement these ideas alone. Therefore, one of the challenges is identifying *who* is best situated to implement these solutions. In the National SMM Action Plan, more attention will be paid to suggestions about who should be asked to help implement different ideas.

Other examples of the role that NRC's network, partners and supporters could play in advancing SMM are included in ideas from the White Papers that are summarized in Attachment A "[Summary of White Paper Ideas](#)":

All pre-registered Summit participants are listed in Attachment B.

## Attachment A - Summary of White Paper Ideas

This is a summary of the specific ideas received, organized into the categories of the five Panels of the Summit. The ideas are listed in no particular order of priority, nor considered a complete list representing all Summit participants' ideas. It is a compilation of the ideas in the 34 White Papers submitted by participants in advance of the event. These are NOT adopted policy of NRC, its partners, supporters, or other participants of the Summit.

### A. Business Roles/Market-based Solutions

1. Need programs to address difficult to recycle materials.
2. Encourage reuse of steel recovered from disassembly of existing structures.
3. Continue to develop high strength steel alloys (e.g., for automobiles).
4. Recognize Sustainable Materials Management as a Carbon Reduction and Climate Change Strategy and an essential component of building a more sustainable economy
5. Use carbon credit auction proceeds to incentivize GHG waste reduction initiatives.
6. Take away subsidies from timber, oil, gas & mining interests.
7. Create steps to changing out items to eliminate waste.
8. Document waste diversion better and include Reduce in formula.
9. Fund university research and development programs for problem materials, to improve product design and innovate for reuse, recycling and composting. Support research into new technologies in the use of recyclable materials in manufacturing (like the technologies that reduced fiber loss in pulping/papermaking, eddy current technology to separate non-ferrous metals, and optical color sort technology that were all transformational to recycle more materials more efficiently). For example, mattress manufacturers could work with recyclers to make mattresses without metal springs individually encased in fabric for easier disassembly.
10. Rally recycling industry, commodity groups, packaging organizations, and brand owners around an ambitious set of actions and goals, policies and financing mechanisms to take recycling to the next level. Public policy, third party investment, and some forms of producer responsibility are needed to help re-stimulate the value of recovered materials, and buffer local governments from negative economic impacts from global and macro-economic events that are beyond their control. Mechanisms must also be developed for recyclers and reusers to provide feedback to manufacturers and designers to produce goods that will enable reuse, repair, or recycling to occur. A good example of successful implementation of this approach is the Steel Recycling Institute's program. A good example of recent progress is that of the Carton Council working with

- MRFs and municipalities. The relatively low recovery rates and down-cycling of glass is an example that needs to be better addressed.
11. Strengthen partnerships and collaboration among recycling value chain members. There has been considerable progress on this front during the past few years, and many brands and product manufacturers have committed funding to help improve recycling infrastructure. However, changes in packaging are occurring at a much more rapid pace than changes in processing technology, infrastructure, and market development. There needs to be more synchronization between upstream product and packaging and product design and downstream recovery (which increasingly must be accomplished using processing infrastructure that was designed for a markedly different materials stream).
  12. Convene national stakeholder dialogues and negotiations that are more effective than past efforts such as the National Electronic Product Stewardship Initiative (NEPSI) and the Carpet America Recovery Effort (CARE).
  13. Including a product labeling standard for recycled content, recyclability, and carbon footprint (e.g., How2Recycle Label).
  14. Require suppliers produce sustainability reports on their products.
  15. Develop a national public service announcement (PSA) campaign similar to Keep America Beautiful's 1970s campaign.
  16. Incentivize extended producer responsibility (EPR). Governmental policy and encouragement of product stewardship may decrease the need to continue to make new items with new / raw materials. Promote the adoption of federal extended producer responsibility laws.
  17. Integrate SMM measures into established industry/government sustainability and economic activity reports.
  18. Work with systems such as LEED to sit down with architects, engineers, owners and operators in design and construction before the project begins to identify opportunities for waste reduction.
  19. Qualify Sustainable Materials Management for Energy Efficiency Incentives.

## B. Tools for Job Creation, Economic & Market Development

1. Markets matter: emphasize material quality and value. Develop economic and market development incentives for expanded reuse, recycling and composting, particularly for end-uses of materials. Fully integrate source reduction and reuse into existing recycling-focused programs at all levels.
2. Need to expand infrastructure for reuse to meet the capacity needed in most communities. The key to harvesting quality reusable materials is creating a network of reuse portals to provide convenient and affordable alternatives to disposal with minimal seed money and appropriate incentives and resources. Need to return repair shops and reuse jobs to the norm of yesteryear. Need to emphasize and support the powerful and positive impacts that reuse offers, including its reduction of CO<sub>2</sub>

- emissions, ability to generate revenue and new jobs, and the rich training it offers for effective workforce development.
3. More fully integrate recovered materials-reliant and SMM industries into local economic development strategies, beyond collection and processing to maximize recovery and build a more circular economy. Focus on local and regional market development and reduce reliance on export markets to have long-term, secure end markets, to create local green job opportunities, and to reduce the GHG and other pollution around transporting materials long distances
  4. Establish coordinated business and jobs initiative to push for local, state and regional job creation opportunities that are inclusive and target low income and people of color communities.
  5. Expand purchasing policies and programs that focus on recycled content goods by Federal, state and local governments (e.g., 30% post consumer waste paper standard), and by private businesses (e.g., NRC's Buy Recycled Business Alliance). Develop tools and launch national educational efforts for consumers to purchase products that reduce the use of natural resources, reuse, recycle, lower toxicity of the waste stream and are more easily repaired or are more durable.
  6. Research how many jobs and economic opportunities have been created from SMM initiatives to convince lawmakers, investors, and citizens of the economic significance of this work. Educate local, state, and national decision makers about the value that proper resource management can provide for communities and businesses.
  7. Renew the Jobs Through Recycling grant program and support development of [Resource Recovery Parks](#) (particularly at landfills and transfer stations). Help establish market development programs in every state by providing a template of a state Market Development program. Include an emphasis on recovery of human resources and establishing quality standards for these to be good green jobs as part of the Jobs Through Recycling Program.
  8. Amend the Bill Emerson Good Samaritan Act to extend liability protection to all donated materials, rather than just food.
  9. Local governments adopt and use clauses in contracts with collection service providers to redirect materials to processors and manufacturers to make those operations profitable. Local governments should only add new materials to recycling collection programs if there are viable and economical markets for the materials.
  10. Establish a nationwide hub and spoke network to help prevent unnecessary overlap and ensure proper coverage for processors. Invest in new infrastructure where needed to optimize coverage in all U.S. regions and industry sectors.
  11. Provide nation-wide location-aware searches to connect local businesses for direct byproduct cycling (waste = food) and for waste pooling (gathering byproduct streams together for critical volumes) to address rare byproducts.

12. Adopt a national Zero Waste, Clean Cities and Green Jobs Fee of \$10-20 per ton to support Zero Waste and Green jobs as done by most European nations in response to 1999 EU Landfill Directive.
13. Establish national protocol to sort discarded materials into 12 market categories to show value of materials being discarded and identify current market and facility voids where there are no local markets.
14. Research and develop modifications to Single Stream recycling to provide quality material that is needed for the end market. Need to design a national model to modify MRFs to be sized for various waste sheds. This could include new collection methods and post MRF intermediary processing to reduce contamination to end markets. Collect materials in split trucks to collect containers and fiber separately in the same truck to reduce cross contamination of material and produce cleaner material. Prioritize quality of material feedstocks in recycling manufacturing over just quantity. Develop standards and practices for collection systems to focus on the highest and best use for materials.
15. Cleaner commodities on the front-end make faster, cleaner commodities on the back-end. Blending of materials (e.g. paper and metal, plastic and metal, paper and plastic) needs to stop, in order to better recover the materials by recyclers. Need to stay away from all-in-one collection of discards to dispel the “throw-away” mindset.
16. Recognize that more than half of all discarded materials will go into domestic markets (i.e., reusables, compostables and materials derived from construction and demolition debris). Need to develop a Soil Strategy to replenish agricultural lands as part of SMM planning.
17. View waste as a resource
18. Develop a sustainable, local, low-carbon materials processing system
19. Eliminate, over time, the export of recyclable materials to other nations
20. Achieve continuous, measurable increases in the amount of materials recycled, reused, and remanufactured
21. Provide technical and economic support to ensure multiple materials handling, processing, treatment, and remanufacturing pathways
22. Identify and support development of markets for recycled, reused, and remanufactured materials
23. Stimulate markets and demonstrate government leadership by establishing national, state and local purchasing and product end-of-life requirements
24. Stimulate new technologies that reduce GHGs and co-pollutants
25. Upgrade existing recycling and composting facilities as technology evolves to improve energy efficiency and reduce direct emissions

### C. Training and Certification of People and Products

1. Develop education, training and certification programs for SMM professionals to assist with professionalizing the industry. For example, the USCC is evaluating the development of a Professional Composter Certification. One goal of this program is to provide state regulators with

- some level of assurance concerning the skill sets of industry “certified” practitioners. Professional certification could increase the use of best management practices, provide timely training on technology advancements, and increase overall facility success. These outcomes could, in turn, increase the overall success of SMM programs nationally and catalyze their broader adoption in regions where, at present, little-to-no efforts toward SMM programming are being made. Finding well trained professionals or the academic and professional training opportunities once they are hired are real challenges confronting recycling programs in rural areas, particularly since many municipal recycling managers wear other hats in rural areas.
2. Facilitate campus workshops and training at state and regional conferences and expand intra-collegiate and external college and university SMM networks. Offer ratings, standards and resources that campuses and similar institutional facilities can use to plan, implement, measure, report, compare, and progress with.
  3. Accredite SMM coursework and advance training/certification programs.
  4. Develop common terms for claims, achievements, and metrics, particularly around measuring reduce and reuse.
  5. Local governments and those that do work for them should require certifications in SMM as they do for other environmental protection staff (e.g., sewage systems, water treatment and distribution, land use planning, environmental engineering).
  6. Fund and promote student scholarships for training in SMM.
  7. EPA support professional certification programs. Require SMM professionals to have adequate training in reuse. Fund the creation and dissemination of SMM engagement and education toolkits.
  8. Create a fund for reuse research that supports initiatives, which establish the “Reuse Sector Data Standard”, ideally done in conjunction with the EPA so it could be used to expand the reuse data sets in the WARM model.
  9. EPA should Support development of training Programs for Sustainable Resource Management and require EPA solid waste and recycling staff to be [Certified Sustainable Resource Management \(SRM\) Professionals](#) and [Zero Waste Business Associates](#). EPA and State governments should support NRC Recycling Certification program so that all professionals have consistent training. States should either require or prefer Certified SRM Professionals at recycling and composting facilities.
  10. Professional certification should be required as part of job descriptions in all sectors (public and private).
  11. Develop and conduct training program for state and local staff on Zero Waste.
  12. NRC create SMM model based on EPA’s report “[Reducing Greenhouse Gases through Recycling and Composting](#)” and [ICLEI’s Recycling and Composting Protocol](#) to provide a template to determine benefits of SMM.

13. Establish metrics to better estimate the amount of food scraps generated from different types of sources and establishments.
14. Create more complete and accessible data sources by exploiting new information technologies and by establishing a standard SMM Profile for use in tracking and publicizing progress across industries over time.
15. Benchmark successful programs and initiatives used in Europe and other locations. Standardize information, education, and measurement that works for and makes sense to all of the stakeholders involved. Measurement and data collection provide validation for successful recycling programs and identify areas that need improvement.
16. Training is important to bring the precepts of SMM to a new generation of industry professionals. As the leader of one of the first counties in Pennsylvania with a Zero Waste goal, I understand the importance of expanding the recycling mission to Sustainable Materials Management. This needs to happen not only with industry professionals, but with all sectors, including everyone from preschoolers to elected officials.
17. Need to plan for consistency among the states for measurement of SMM goals.
18. Federal funding support provided by EPA, US Departments of Agriculture, Energy, Commerce or Labor should be used to develop new state training programs (for example Illinois' program was developed under a Department of Labor grant). Initial funding is required to develop state-level curriculum and administrative support systems to launch programs that then can become self-sustaining based on earned income in the future.

#### D. Locally Driven/Local Scale SMM Policies, Programs, and Facilities

1. Policies that will support the growth of local composting infrastructure are needed. On the facility side, these could include grants, low-interest loans, tax incentives, enterprise zones, and others. On the product demand side, policies such as purchasing preferences, minimum organic matter standards for post-construction soils, and general "green infrastructure" support, will provide profitable outlets for the sale of compost-based products. Tools and resources such as the US Composting Council (USCC) "Model Compost Regulation Template", which has recently been adopted by a number of states, and the CCREF's Toolkits on Compostable Plastics and Curb-to-Compost could be leveraged.
2. Composters must view themselves and be treated as compost manufacturers. Regular compost-specific testing, accompanied by a statement of ingredients and use directions, should be expected by consumers and required by regulators and specifying agencies. All compost should be tested for quality control and safety
3. A related challenge is a strong need for regulatory consistency for identical feedstocks. Organic residuals are generally treated as solid waste, rather than product feedstocks by most state regulatory agencies. Compost manufacturing facility permitting, infrastructure and operating

- requirements can be very costly and onerous. The lack of consistency in state regulatory policy adds another layer of challenges to this process, which is already more complex than dealing with conventional recyclables. However, when vegetative food scrap feedstocks are delivered to an animal feeding operation they fall under a far less restrictive set of state regulatory controls. Even though it is the same feedstock representing the same environmental risks, they are subject to far less scrutiny and generally regulated by state department of agriculture officials, and not by solid waste officials. This "unlevel playing field" is a deterrent to the proliferation of compost manufacturing operations and the resulting benefits derived from introducing compost products back into the soil.
4. State governments should adopt "compost-friendly" policies that encourage recovery of organic materials and allow for the creation and expansion of facilities to process these materials into valuable products. Tools and resources such as the USCC's "Model Policy Template", which was recently adopted by the state of Kentucky, and the "State Regulator Map" could be leveraged.
  5. Support source-separated recycling opportunities for all. Discourage communities from pursuing a 'dirty MRF' (also called 'mixed waste processing') model because of:
    - a. The positive economic impact of the current recycling industry and the potential to significantly grow that impact with increased collection of quality recycled feedstock.
    - b. The negative impacts from contaminated material (especially fiber products);
    - c. The elimination of glass from all collection under a dirty MRF program;
    - d. The penalty of fines for creative and increased recycling alternatives (a monopoly system); and
    - e. Long-term contracts that locks communities into a system eliminating the possibility for more innovation in the future.
  6. Maximize steel can diversion with the addition of empty aerosol and paint cans to the steel can mix collected in all recycling programs, with appropriate outreach to the public.
  7. Engage behavior science to help design, implement and evaluate SMM programs. The ways people get their information varies: some TV, some radio, some print. How to effect behavior change is quite well understood in the advertising industry; zero wasters would do well to learn from them.
  8. Stop requirements that composting programs take compostable containers, paper towels and napkins until composting facilities in the vicinity of the program certify that they can handle such materials. Many Compost/Organics facilities serving business are only taking food scraps due to negative impacts on quality of finished product.
  9. Develop information about the amount and types of reusable, repairable, and refurbishable products in the waste stream, and what it would take to get these products back into their original use.

10. Develop a network of reuse outlets, supported by resources, including best-practice recommendations and operational templates.
11. Develop collection resources, processing infrastructure and public educational programs in rural regions, small cities and suburbs. Tens of millions live in the hinterlands of North America and they are too often underserved.
12. Avoid the creation of disaster debris by proper planning, zoning, buyouts and education. Plan for triage in disasters to allow for reuse, recycling or organics management (e.g., get people and movable assets out of harm's way, have plans for immediate installation of intake, triage, processing capacity in the event of disaster). NRC develop a best practices manual in consultation with those already involved in disaster debris management (e.g., utilities).
13. Include campus SMM infrastructure, operations, and outreach in funding priorities.
14. An ethic of SMM needs to be built among the public and elected officials across the country at all levels – locally, statewide and at the national level.
15. Create funding for universal access to recycling collection.
16. States should make recycling mandatory and ban commodities with high value from landfill.
17. There should be at least equal amounts of recycling service as provided for landfilling or incineration.
18. Turn local and state solid waste plans into Zero Waste, prevention and recovery plans.
19. Ban special discards designed for landfill and incineration.
20. “Decouple” to making the economic system local and sustainable.
21. Document the role that Zero Waste can play in reducing the impacts of climate change through recycling, composting and application of [compost on rangelands](#).
22. All trash should be processed before it goes to a waste-to-energy facility or landfill.
23. Support upstream food waste reduction efforts such as EPA’s *Food: Too Good to Waste* and the Food Recovery Challenge through increased public awareness and action.
24. Support funding opportunities for downstream solutions such as Iowa’s 2015 House File 355 bill, the Food Waste Pilot Project, which appropriates \$200,000 to the IDNR for providing grants for food waste landfill diversion demonstration projects.
25. Public entities shall ensure that residents, including residents of single and multifamily dwellings and businesses, have an opportunity to recycle. Opportunity to recycle means availability of recycling and curbside pickup or collection centers for recyclable materials at sites that are convenient for customers to use. All haulers providing trash pickup would be required to provide recycling pickup as well as part of the contract.

26. Managing materials sustainably will require bottom-up solutions involving local governments, businesses and nonprofits uniquely situated to understand how and why local systems function the way they do. What works in California may not work in Michigan or Mississippi for reasons that can involve weather and geology as much as political leadership or community will.
27. Municipalities need assistance in landfill diversion and material recovery.
28. Reduce the amount of organics and recyclable materials disposed of in landfills
29. Evaluate if regulatory action is needed to phase out landfilling of organic materials
30. Incentivize the most beneficial use of material based on local and national economic, energy, waste, and environmental goals
31. Educate residents and businesses on their ability to help achieve national, state and local recycling goals and reduce their carbon footprint

#### E. National Roles / Policy-Based Solutions & Miscellaneous

1. The National Clean Power Plan should not incentivize combustion of waste for energy (in conventional incinerators, boilers, cement kilns or along with coal). SMM should not include the combustion of discarded materials, biomass, or any other fuels for energy generation, including incineration in conventional incinerators and incineration of discarded materials along with coal in coal plants, boilers, cement kilns or other facilities.
2. EPA should repeal incineration loopholes in Non Hazardous Secondary Materials regulation.
3. EPA and NRC Campus Council should develop research and development programs to work collaboratively with: industry; federal, state and local governments; and academe to redesign products, packaging and hard to manage materials for repair, reuse, recycling or composting
4. End corporate subsidies for wasting (in mining, extraction and construction).
5. EPA has an immediate opportunity to convene stakeholders, foster meaningful dialogue, and build commitment to action. EPA's Sustainable Financing Dialogue is an example of the beneficial role EPA can play. That led to the birth of a groundbreaking example of private support for public recycling programs: The Recycling Partnership. EPA should take the next step to provide leadership around an ambitious set of actions and goals to improve recycling to create Recycling Phase II.
6. EPA should count climate pollution from all sources, including municipal solid waste and biomass, and carbon accounting should consider life cycle climate benefits of SMM.
7. EPA should Include waste diversion amounts in WasteWise Program reporting so the public can query which members have achieved different waste diversion levels.

8. EPA should develop [R&D program](#) to work collaboratively with: industry; federal, state and local governments; and academe to redesign products, packaging and difficult to recycle materials
9. Embrace (not replace) existing frameworks like Cradle-to-Cradle, the Natural Step and Zero Waste (among others).
10. Institute tax incentives for sustainable products and services.
11. EPA should adopt definition of Zero Waste (ZW) of the [Zero Waste International Alliance](#) (ZWIA). EPA should follow ZWIA [ZW Definition, Principles, and Zero Waste Hierarchy of Highest and Best Use](#) in life-cycle analyses evaluating options.
12. Define “Sustainable Materials Management” as “Zero Waste” and adopt the internationally peer-reviewed [definition of Zero Waste](#).
13. Set national goals for making progress toward Zero Waste.
14. EPA should support adding a Clean Lands goal to RCRA.
15. EPA should research best practices for product stewardship policies (including Extended Producer Responsibility) for hazardous materials and difficult to recycle materials.
16. EPA should adopt more rigorous landfill regulations comparable to those adopted by the European Union in response to their [1999 Landfill Directive](#), and enforce regulations vigorously.
17. EPA develop a [Zero Waste Challenge](#) encouraging businesses and communities to adopt Zero Waste as a goal and to develop plans to implement that goal (like Food Recovery Challenge).
18. EPA should develop a Reduce and Reuse Challenge.
19. EPA should ask states to include evaluation of a Zero Waste goal in RCRA State Solid Waste Management Plans.
20. Expand federal environmentally preferable purchasing guidelines for reuse-related goods and services (used/refurbished goods, materials exchange software, etc.)
21. Establish a \$1 billion national green bond for curbside carts, containers, facilities to collect process and make end products. Since this would be a national fund.
22. USEPA should publish Zero Waste resources on their website. EPA should Develop best practices and [case studies](#) of [new rules](#) and [incentives](#) that support Zero Waste. EPA should provide other tools and resources for Zero Waste, including model contracts, resource guides and toolkits.
23. Establish an Inter/National Reuse Awareness Day every year in October.
24. Develop a strategic nationwide public service announcement to increase recycling participation and elevate environmental awareness. However, it cannot be a one-and-done campaign. It needs to seep into our culture like the color pink in October.
25. World and local goal should be Zero Waste by 2040.
26. Incentivize building new local infrastructure for non-landfill alternatives
27. Streamline national and state air, water and solid waste permitting for non-landfill alternatives

28. Develop national and local post-processing and re-manufacturing capabilities
29. Foster national, state, local, and private sector leadership to help build the infrastructure
30. Ensure that environmental justice concerns are part of the decision-making process
31. Reduce direct GHG and co-pollutant emissions from existing waste treatment options
32. Enhance packaging and product optimization (longer lasting and easier to recycle)
33. Enhance producer responsibilities for hard-to-manage waste materials
34. Identify opportunities to reduce food waste
35. The National SMM Action Plan should be the vehicle to develop a comprehensive definition of Sustainable Materials Management (SMM). The Plan itself should contain goals, objectives and strategies. Within the goals and objectives should be a review of areas in the United States that have already make SMM a priority in their communities. Within the context of strategies, should be the development of best practices that represent SMM and a comprehensive path forward. The path forward should contain the following elements:
  - a. Infrastructure required to achieve the objectives of SMM
  - b. Funding requirements and sources
  - c. Programs required to achieve the goals
  - d. Policies required to implement the goals
  - e. Potential Barriers in achieving goals

## Attachment B - Pre-Summit Attendee List

Ruth Abbe, Abbe & Associates / Zero Waste USA (R/A)  
Richard Anthony, Richard Anthony Associates / Zero Waste International Alliance (A)  
Sonny Beale, University of Virginia  
Sue Beets-Atkinson, SBM Management / US Zero Waste Business Council (A)  
Gary Bilbro, SMART Recycling of South Carolina (B/R)  
English Bird, New Mexico Recycling Coalition (RO/R)  
Edward Boisson, Boisson Consulting  
Henry Boyer, Neighbor Distribution  
Mark Braswell, Tennessee Recycling Coalition  
Phil Bresee, City of Philadelphia  
Stephanie Busch, Georgia Recycling Coalition (RO)  
Bob Bylone, Pennsylvania Recycling Markets Center (RO)  
Maggie Clarke, Beyond Waste Solutions (B)  
Diane Cohen, Finger Lakes ReUse  
Cheryl Coleman, US Environmental Protection Agency  
Susan Collins, Container Recycling Institute (B)  
Wynne Coplea, Illinois Recycling Association (RO)  
Bridget Croke, Closed Loop Fund (A)  
Megan Daum, Can Manufacturers Institute  
John Davis, Mojave Desert and Mountain Recycling Authority / Recyclers Global Warming Council of California Resource Recovery Association (A)  
Diane Davis, Carolina Recycling Association (RO)  
Jack DeBell, University of Colorado Recycling (B)  
Stacey Demers, SCS Engineers (S)  
Resa Dimino, National Association for PET Container Resources  
Betsy Dorn, Reclay StewardEdge  
Kelli Driessen, Casella Organics (RO)  
Judith Enck, US Environmental Protection Agency (K)  
Abdi Erazouki, Planet Aid  
MaryEllen Etienne, Reuse Institute / Association of Ohio Recyclers (RO/R/A)  
Laura Flagg, National Recycling Coalition (S)  
Matt Flechter, Michigan Department of Environmental Quality  
John Frederick, Intermunicipal Relations Committee COG (B)  
Kathryn Garcia, New York City Department of Sanitation (R)  
Bob Gedert, Austin Resource Recovery (R)  
Diana Gentilcore, EPS Industry Alliance  
Harvey Gershman, Gershman, Brickner & Bratton  
Wayne Gjerde, Mid-America Council of Recycling Officials (A)  
Michelle Glenny, Professional Recyclers of Pennsylvania (RO)  
Nina Goodrich, GreenBlue (R)  
Marjorie Griek, Colorado Association for Recycling (B/RO)  
William Guididas, University of Maryland (S)  
Alan Gurganus, Alabama Recycling Coalition (RO)

Bonnie Haas, Kettle Creek Corporation  
Michael Halady, SBM Site Services  
Carey Hamilton, Indiana Recycling Coalition (RO)  
Lauren Henry, Missouri Recycling Association (RO)  
Jen Iannucci, Housatonic Resources Recovery Authority  
Jennifer Jordan, City of Iowa City / Iowa Recycling Association (RO)  
Jennifer Killinger, American Chemistry Council  
Peter Klaich, Rubicon Global (R)  
Marie Kruzan, Association of NJ Recyclers (RO/A)  
Tim Lee, Virginia Recycling Association (RO/A)  
David Levine, American Sustainable Business Council (R/A)  
Mark Lichtenstein, President and CEO, National Recycling Coalition, Inc. (B)  
Gary Liss, Gary Liss & Associates / Co-Chair of NRC SMM Summit (B/A)  
Leslie Lukacs, California Resource Recovery Association (RO)  
Andrew Mangan, US Business Council for Sustainable Development  
Brenton McCloskey, Environmental Finance Center at the University of Maryland  
Molly McGlinchy, Capital Area Food Bank (R)  
Ryan McMullan, Toyota Motor Sales (R)  
Chaz Miller, National Waste & Recycling Association (A)  
Michelle Minstrell (B/A)  
Jessica Moore, University of Maryland (S)  
Scott Mouw, North Carolina Department of Environment and Natural Resources (R)  
Julie Muir, Peninsula Sanitary Services Inc. / Stanford Recycling  
Michele Nestor, Nestor Resources, Inc.  
Sara Nichols, State of Texas Alliance for Recycling (RO)  
Anne Nicklin, Building Materials Reuse Association (A)  
Kerrin O'Brien, Michigan Recycling Coalition (RO)  
Susan Palmer, St. Vincent de Paul of Lane County  
Laura Palmese, Instituto de Derecho Ambiental de Honduras  
Rick Penner, Re-TRAC Connect (S)  
Joseph Pickard, Institute of Scrap Recycling Industries (S/R)  
Brenda Platt, Institute for Local Self-Reliance  
Blair Pollock, Orange County NC Solid Waste Management Department  
Jerry Powell, Resource Recycling (S/A)  
Brenda Pulley, Keep America Beautiful  
Eve Pytel, Delta Institute  
Al Rattie, US Composting Council (R)  
Charlie Reighart, Maryland Recycling Network (RO)  
Julie L. Rhodes, Julie L Rhodes Consulting / Co-Chair of NRC SMM Summit (B/A)  
Antonio Rios, Coalición de Reciclaje de Puerto Rico (B/RO)  
Susan Robinson, Waste Management  
Elizabeth Roe, Eco Partners, Inc.  
Lynn Rubinstein, Northeast Recycling Council  
Lisa Ruggero, National Recycling Coalition (S)

Gray Russell, Association of New Jersey Recyclers (RO)  
Will Sagar, Southeast Recycling Development Council (B/A)  
Brenda Schmidt, Professional Recyclers of Pennsylvania (RO)  
Marty Seaman, Resource Recycling Systems  
Neil Seldman, Institute for Local Self-Reliance  
Joanne Shafer, Centre County Recycling and Refuse Authority  
Prentiss Shaw, Cornerstone Environmental Group  
Lisa Skumatz, Skumatz Economic Research Associates (B)  
Mike Smaha, Owens-Illinois  
Leanne Spaulding, US Composting Council (R/A)  
Mathy Stanislaus, US Environmental Protection Agency (K)  
Justin Stockdale, Pennsylvania Resources Council  
Mark Thimons, Steel Recycling Institute (S)  
Suzette Thomason, Steel Recycling Institute (S/A)  
Joanne Throwe, Environmental Finance Center at the University of Maryland (S)  
Michael Van Brunt, Covanta (B)  
Ron Vance, US Environmental Protection Agency  
Thomas Vinson, University of Texas, Arlington  
Monica Wilson, Global Alliance for Incinerator Alternatives  
Meri Beth Wojtaszek, Solid Waste Association of North America (A)  
Melissa Young, Syracuse University Center for Sustainable Community Solutions  
(S)  
Mia Zavalij, Food Recovery Network (R)

*(B) – NRC Board Member; (RO) NRC Affiliated Recycling Organization Member; (S) – Summit Supporter;  
(K) – Keynote Presenter; (R) – Summit Resources; (A) – Summit Advisory or Steering Committee Member*