

# CE Promotion Activities, Research, and Standardization Examples in the USA

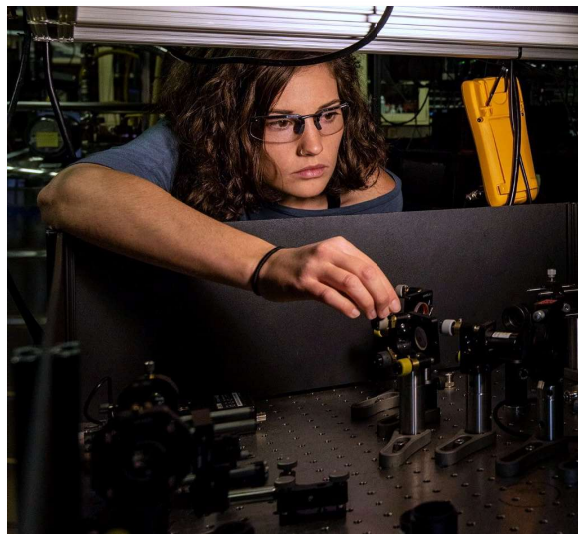
*Kelsea Schumacher*  
*Circular Economy Program*



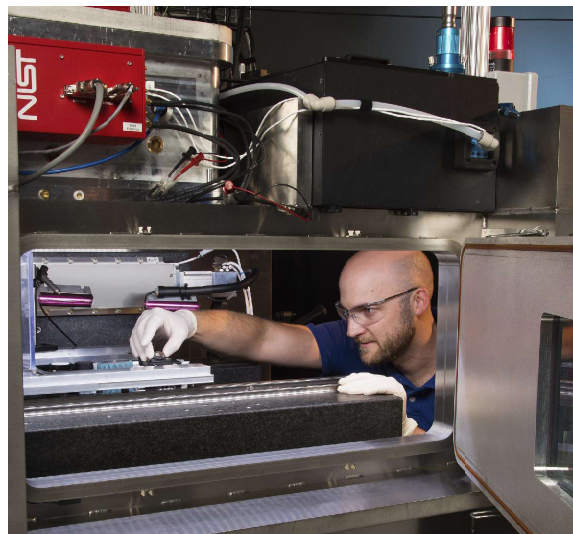
# Mission Statement



To promote U.S. innovation and industrial competitiveness by advancing **measurement science, standards, and technology** in ways that enhance economic security and improve our quality of life



World-Leading Scientific and Engineering Research



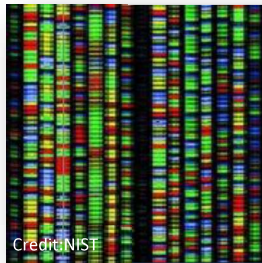
Advanced Manufacturing National Programs



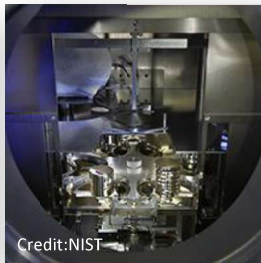
Technology Dissemination and Standards for U.S. Innovation

# NIST Laboratory Programs

NIST



Material  
Measurement  
Laboratory



Physical  
Measurement  
Laboratory



Engineering  
Laboratory



Information  
Technology  
Laboratory



Communication  
Technology  
Laboratory



NIST Center  
for Neutron  
Research

## Circular Economy Program

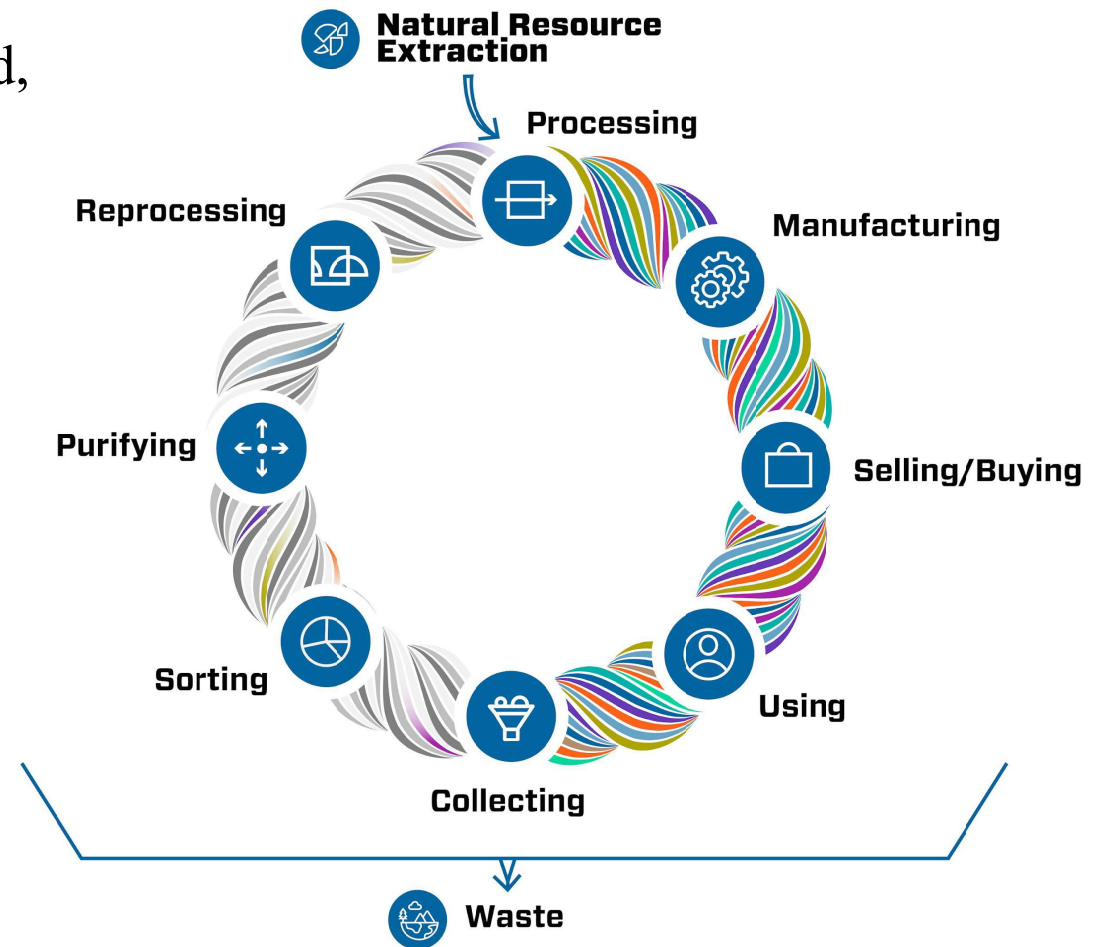
<https://www.nist.gov/labs-major-programs>

# NIST Circular Economy Program

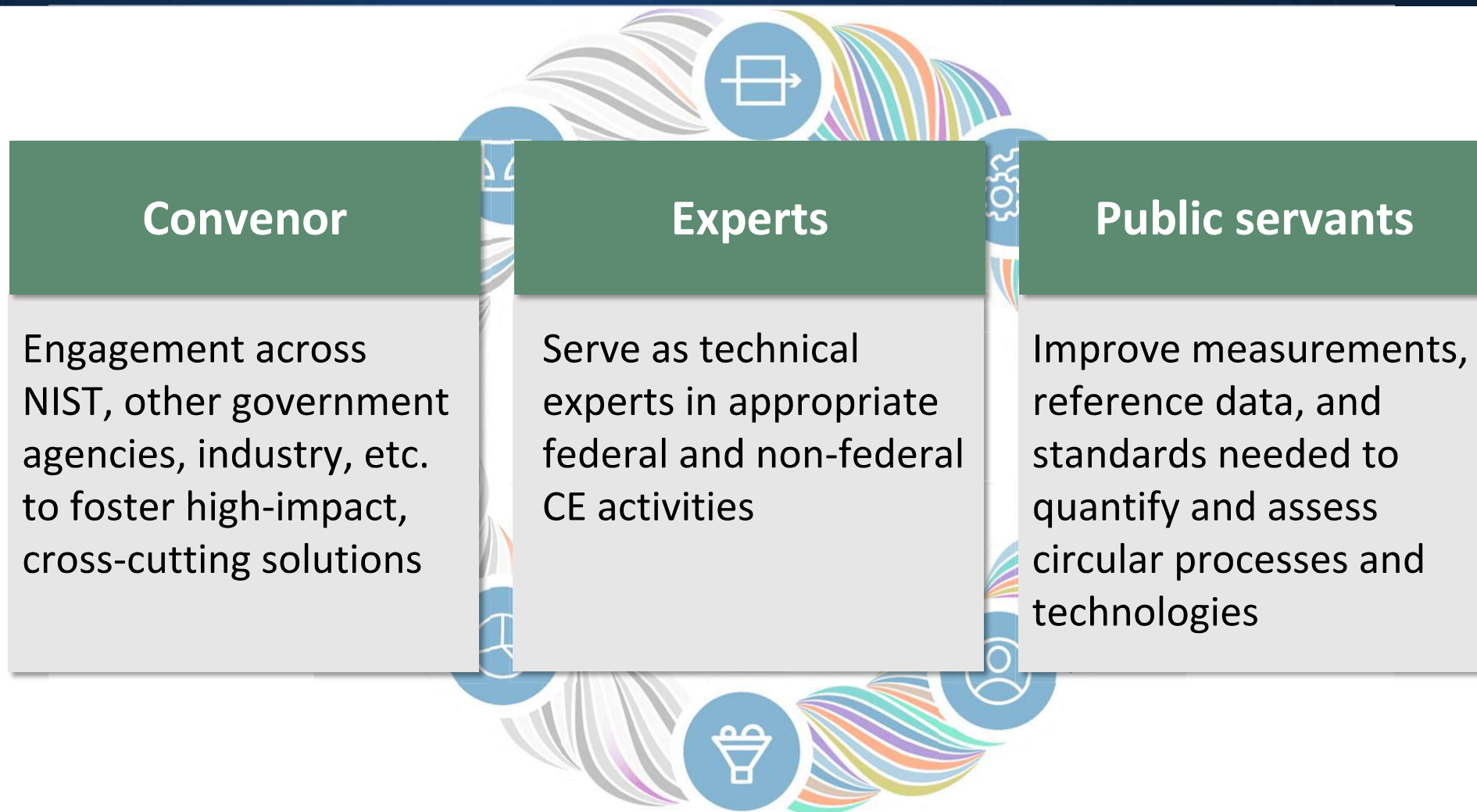


Aiming to keep atoms and molecules in the economy and out of unwanted sinks (e.g., land, air, and water systems)

- Plastics
- Electronics
- Batteries
- Textiles
- Concrete
- Metals
- Food waste
- Manufacturing





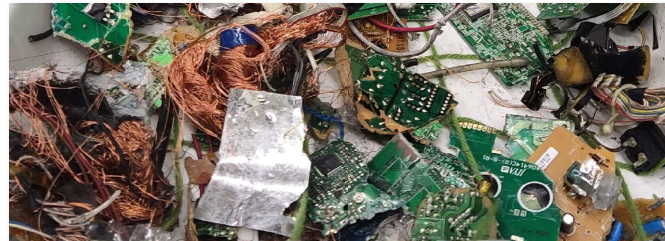


# NIST CE Thematic Areas



## Data and Decision Tools

- CE Resource Registry
- LCA Modeling Tools and Databases
- Database development/expansion
- System integration
- Circularity metrics



## Material Science

- Polymers
- Textiles
- E-waste
- Batteries
- Food Waste
- Concrete
- Alloys



## Environmental Impact Assessment

- Nano and microplastic measurement
- Plastic additives
- Organics in marine sediment

# NIST CE Workshops



2021

2022

2023

Jan

May

Sept.

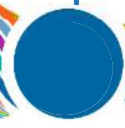
April

June

Jan

Oct

Dec



Circular Economy in the **High-Tech World**

[workshop](#) | [report](#) | [article](#)

Facilitating a Circular Economy for **Textiles**

[workshop](#) | [report](#) | [article](#)

Fostering a Circular Economy and Carbon Sequestration for **Construction Materials**

[workshop](#) | [report](#)

NIST/ASTM/AATCC **Standards Needs for Textile Circularity**

Assessment of **Mass Balance** Accounting for **Polymers**

[workshop](#) | [report](#)

ASTM/NIST Fostering a Circular Economy of **Manufacturing Materials**

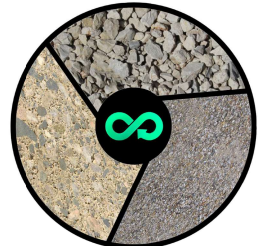
[workshop](#) | [report](#)

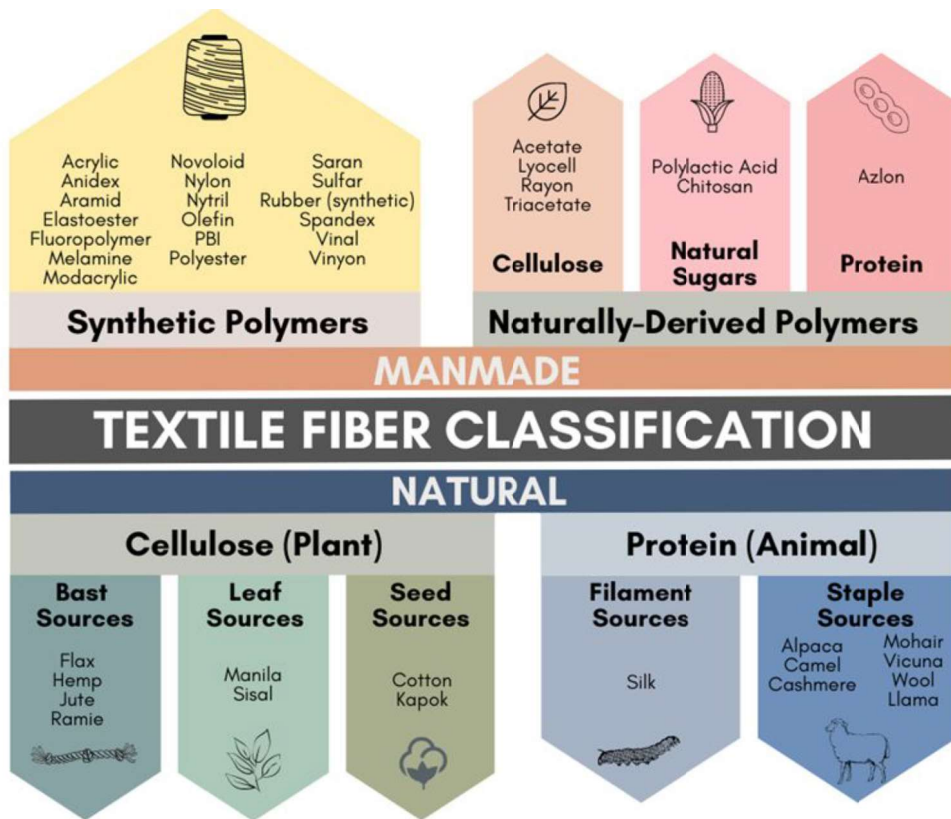
Data and Harmonization for **Plastics**

[workshop](#)

**Food Waste** in a Circular Economy

[workshop](#)





## Textiles Waste

Used textiles were the fastest-growing category of waste between 2000 and 2018, according to EPA data.

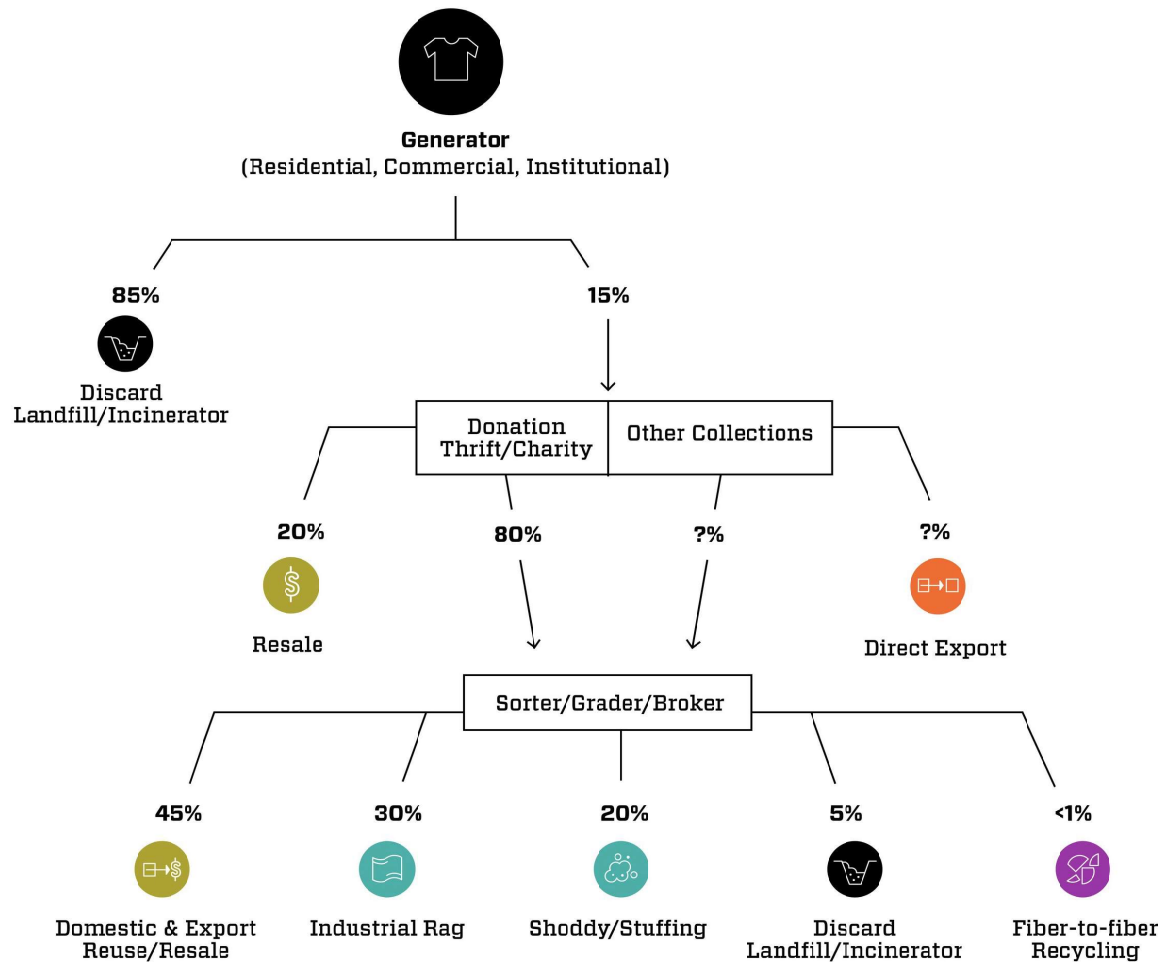
Many of the same polymers that make up single-use plastics are also used in textiles.

- *Polyester*
- *Nylon*
- *Polyolefins*

**Textiles are another source of plastics waste in our environment, including microfibers and microplastics!**

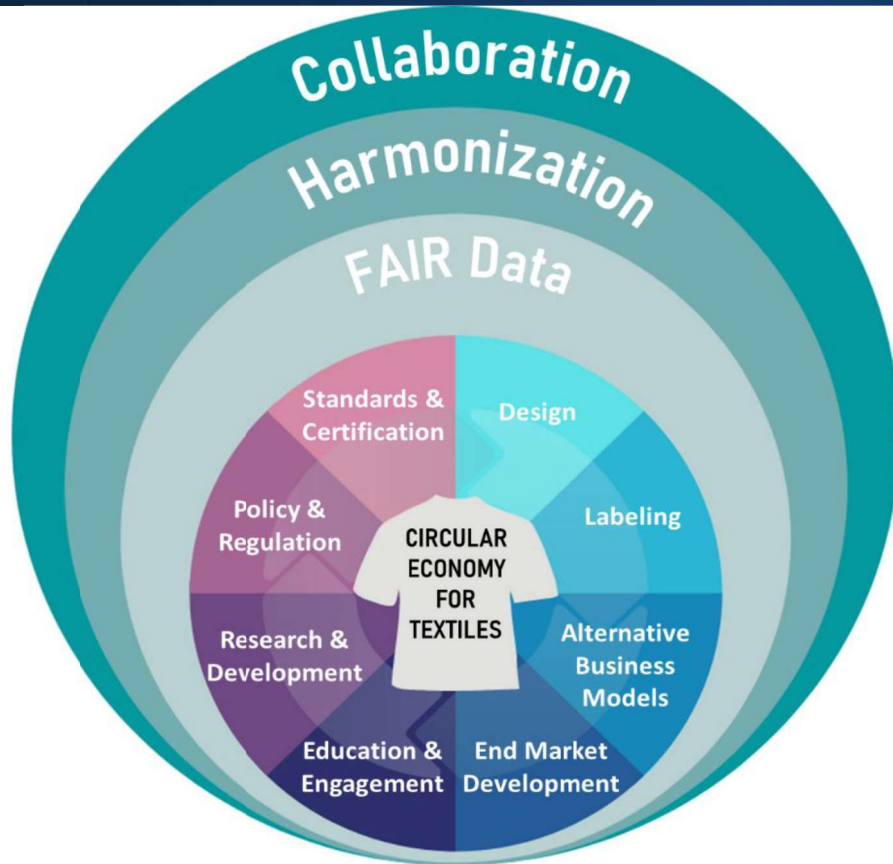


# Textiles at end of life



- On average, each person in the U.S. discarded approximately 47 kg (103 lb) of used textiles in 2018.
- **Currently, only about 15 % of textiles are reused or recycled.**
- **Less than 1% is recycled back into fibers**
- Possible reasons:
  - Growth of fast-fashion: quickly changing trends, inexpensive clothes
  - Lack of knowledge/ interest in reuse, repair, etc.
  - Confusion about what to do with clothing at end of life

# Textiles CE Needs



Collaboration can support system harmonization for exchange of data

Textile circularity requires collaboration from diverse communities such as academics, sorters, charities/thrift, brands, researchers, and recyclers

CE needs:

- Design for end of life
- Enhanced labels or digital product passports
- Alternative business models & end market development
- Research and development (new materials and processes)
- Policy and regulation
- Standards and certification
- Education and engagement

\***FAIR**: findable, accessible, interoperable, and reusable

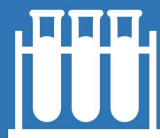
Schumacher, K.A. & Forster, A.L. *Textiles in a circular economy: An assessment of the current landscape, challenges, and opportunities in the United States* Front. Sustain., 30 November 2022

Volume 3 - 2022 | <https://doi.org/10.3389/frsus.2022.1038323>

# NIST CE Textiles Research Focus Areas



Advance  
Standards and  
Facilitate Data  
Sharing



Foster Design  
for End of  
Life



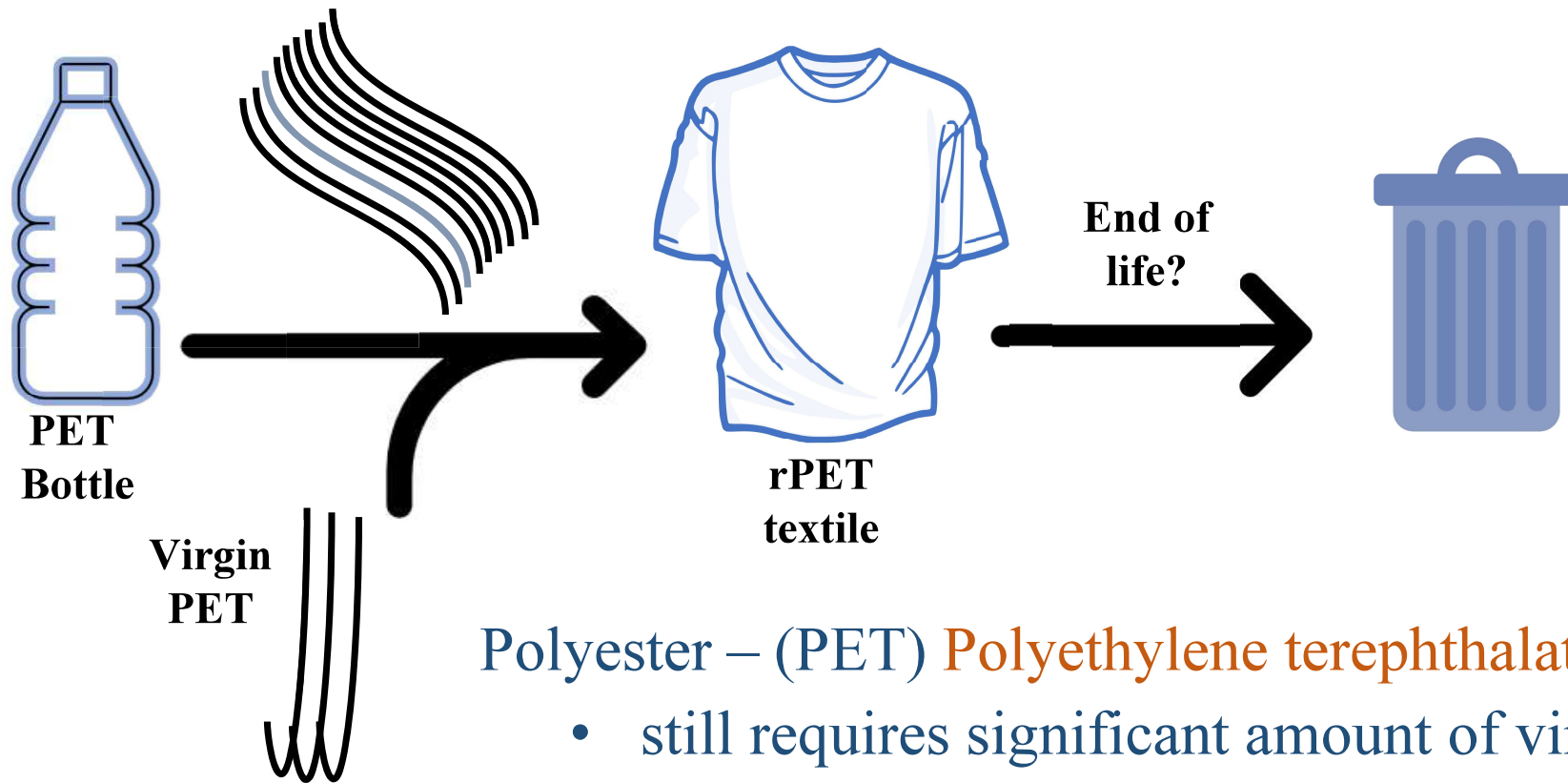
Improve  
Chemical &  
Mechanical  
Recycling of  
Textiles



Enable Rapid  
Efficient  
Textile  
Sorting

NIST Contact: Amanda Forster ([amanda.forster@nist.gov](mailto:amanda.forster@nist.gov))

# Improve Chemical & Mechanical Recycling



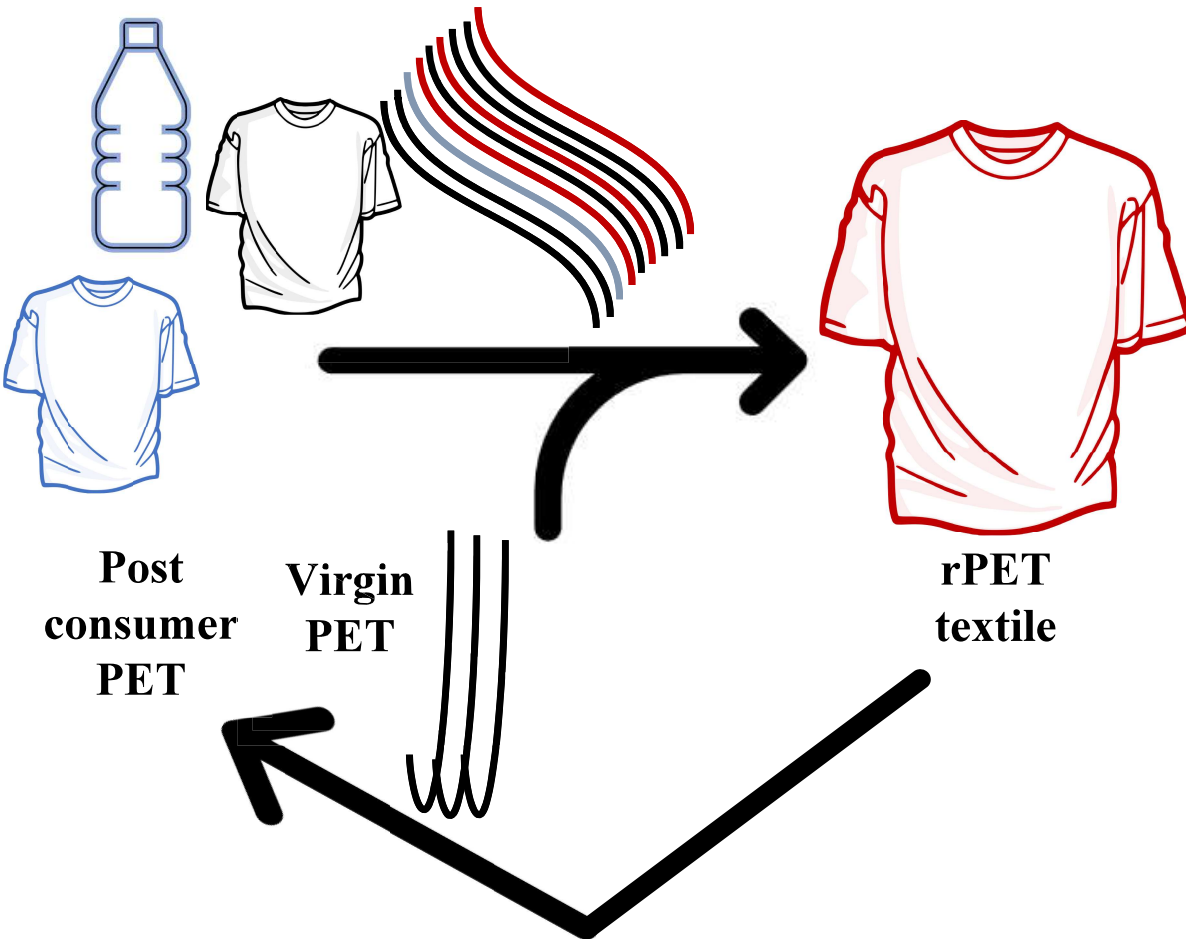
Polyester – (PET) Polyethylene terephthalate

- still requires significant amount of virgin content to produce good-quality fibers





# Improve Chemical & Mechanical Recycling



Goal: increase the amount of fiber-to-fiber recycled content

- Innovate and improve sorting of textiles to increase pure textile feedstock availability
- Develop novel materials that are more easily recycled

# Advance Standards to Enable Textile CE

NIST



## Workshop on Identifying Standards Needs to Facilitate a Circular Economy for Textiles

October 17, 2023 - October 19, 2023

Virtual

October 17 & 18: 10:00 AM - 3:00 PM ET

October 19: 10:00 AM - 12:15 PM ET

REGISTRATION COMING SOON



ASTM INTERNATIONAL



- Held standards workshop in October with ASTM and AATCC
- Emerging themes:
  - Terminology
  - Recycling input specifications
  - Guides to grading and sorting of textiles for reuse, repair, recycling
  - Labeling and digital product passports
  - Design guides
- Report currently in draft and should be released late this year





## ISO/TC 323 on Circular economy

- Foundations for a shift to CE
- Macro-level management
- One vote per country

*Credit: ISO*

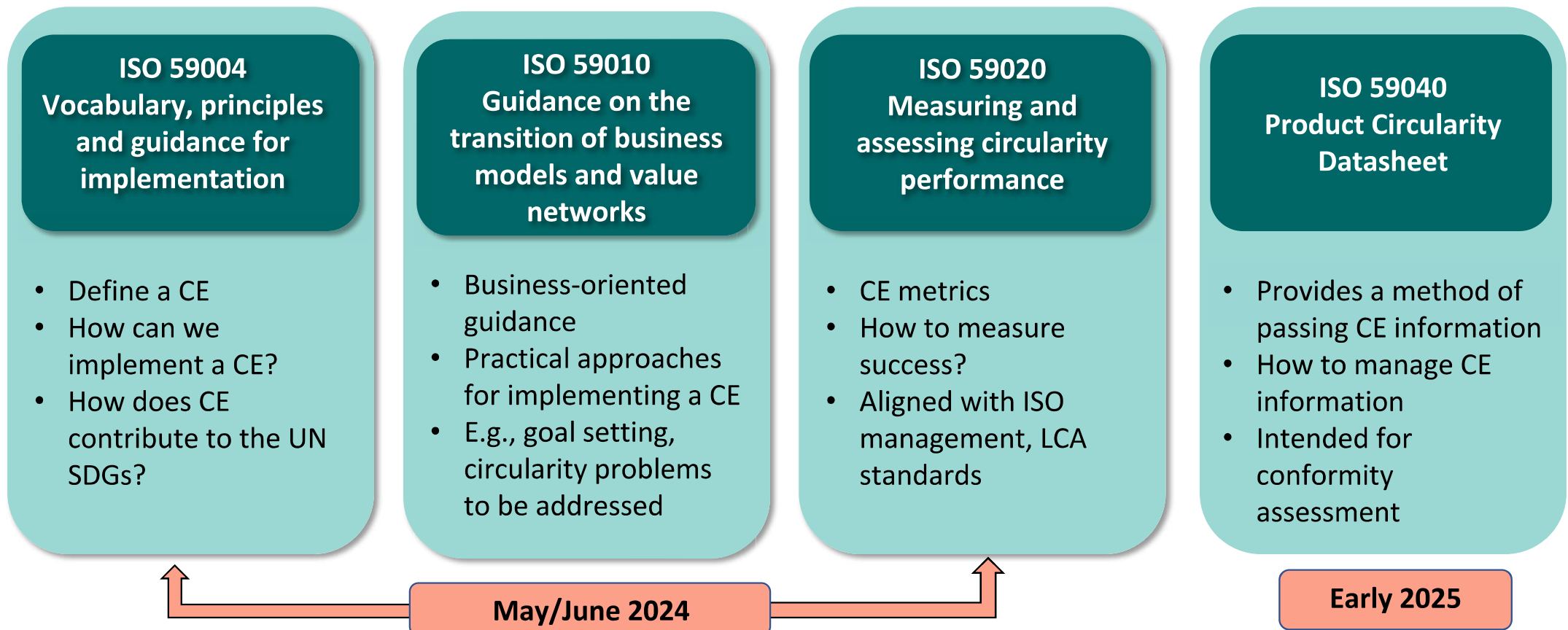


## ASTM Committee E60 on Sustainability

- Support sector-specific standards
- Operations – principle and performance standards
- One vote per organization
- Holds US vote to ISO 323

*Credit: ASTM International*

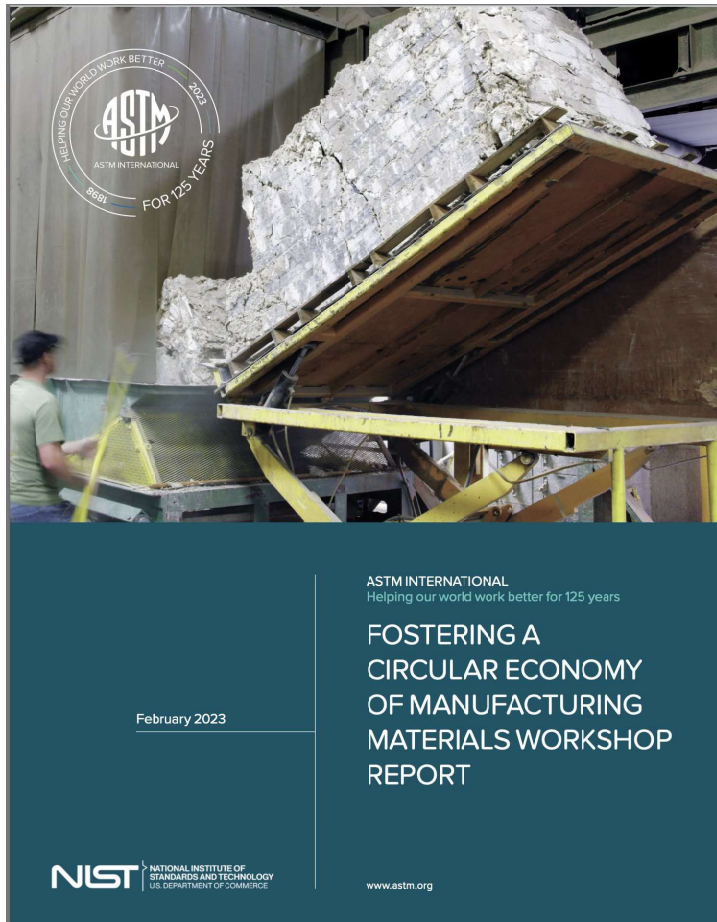
# ISO/TC 323 upcoming standards





# Standards Needs for Manufacturing Materials in CE

from ASTM Workshop April 2022



<https://go.astm.org/mmwr>

## Foundational Standards for a CE

- Definitions/Terminology
- Reporting
- LCA/LCIs

## Systems Support Standards

- Systems thinking
- Traceability & Digital records
- Labelling

Front-End  
Design

Manufacturing  
Production

Back-End  
Recovery

Recycling  
Related

NIST Contact: KC Morris (katherine.morris@nist.gov)

# Thank you!

## Circular Economy Program

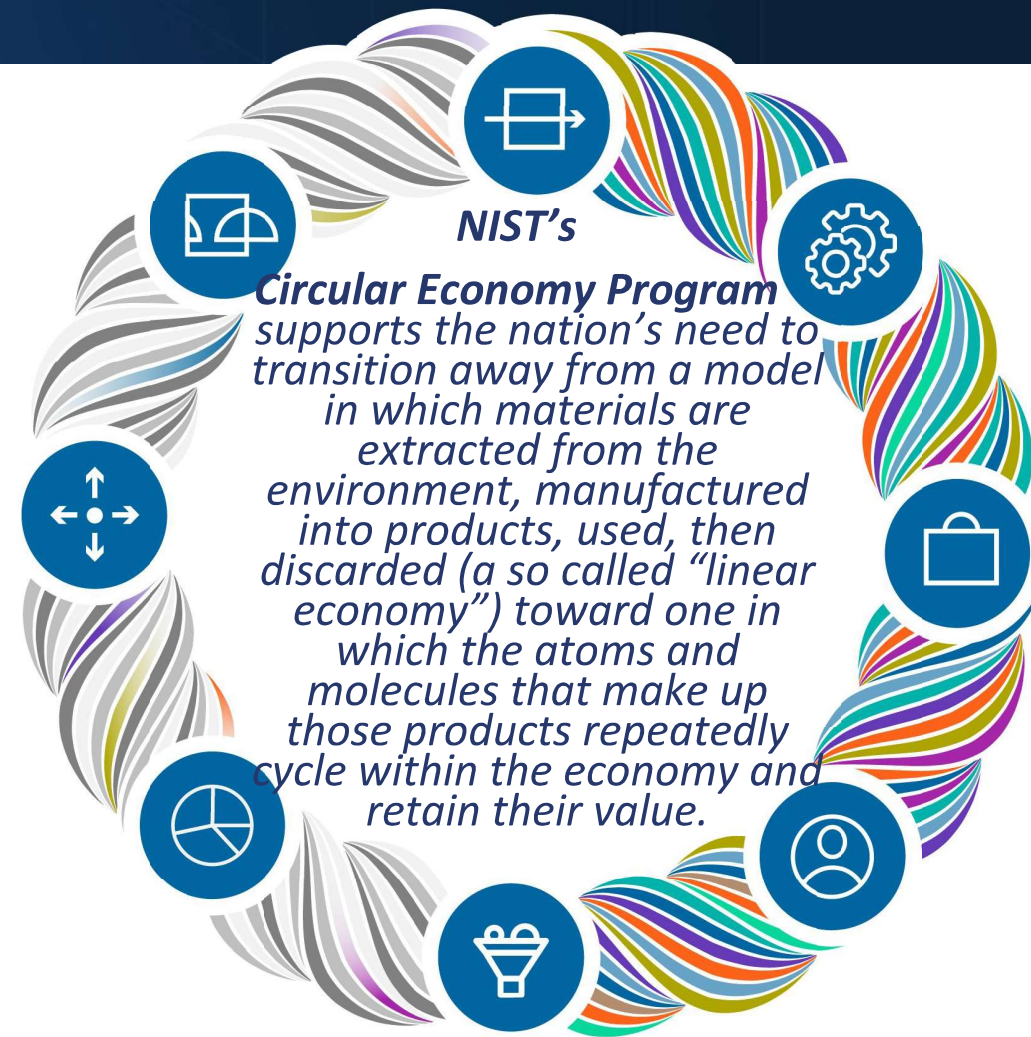
Data and  
Decision Tools

Material  
Science

Environmental  
Impact Assessment

Workshops

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**THANK YOU!**  
**Arigatō**

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