ACED:
Accelerated Circular Economy Development

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Reduce
Reuse
Repair
Remanufacture
Recycle
Recover
Replace

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Plastic example made from FF

Today in US we produce over 36 million tons of plastic waste each year compared to 0.39 million tons in 1960.
Leakage and adaptation: Fossil fuels to FUELS
Now and future: fossil fuels to plastic to FUELS

PRODUCTION OF PLASTIC
Global annual plastic production in million tonnes.

More than half of all the plastics ever produced have been made since 2000.

56%
OUR BIG IDEA

Accelerate the transition to “zero” fossil fuels by:
● Valuing/pricing waste
● And using to stimulate reducing, recirculating, recycling, and recovering materials for 2nd-life applications
● Fast-tracking replacements for carbon-based products

... In novel, pragmatic, economic, and equitable ways
Circular Economy diagram adapted from PBL Netherlands Environmental Assessment Agency. themasites.pbl.nl/circular-economy/

https://www.uschamberfoundation.org/blog/post/circular-economy-toolkit-small-businesses

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Designing and pricing system level models for ACED

**System Level Goals:** Transition to zero, equity/justice, efficiency, cross-disciplinary objectives.

**Innovations:** Strategies, markets, operations, computation, behavior, policies, materials, manufacturing, localization, property rights

**Spatial and time scopes:** Household, city, state, county, continent, global; Now, 1 year, decade

**We need:** integration between lifecycle models (accounting, simulation), independently operated system optimizations, planning and investment processes be linked by prices of shared inputs and outputs

**The mathematical problem:** How can we effectively determine such prices, what properties do they have, and what policies should govern their evolution, and how optimized objectives between several aspects within the system can be achieved?
What Goal Area(s) does this address?

1) Waste reduction motivated by costing/valuing waste
2) Public health problems
3) Sustainable replacements for fossil-/carbon-derived products
4) Urgency to make rapid movement towards climate goals
5) Address sustainability in an equitable manner
6) Inspire greater collaboration among all potential stakeholders
What is required to pursue a circular, sustainable world?

1) An interdisciplinary and inclusive approach to problem conceptualization and solutions:
   a) Engagement of multiple stakeholders: consumers, product developers, entrepreneurs/innovators, behavioral/social scientists, computing/data/math modelers, engineers across multiple disciplines (systems, industrial, control, etc.), physical scientists, economists.
   b) Data scientists, mathematical modelers, computational specialists.

2) Accelerated innovation:
   a) Technologies that pursue and incorporate new, long-lasting materials that can be used to replace existing carbon-derived products.
   b) Advanced technologies for conversion of waste for 2nd-life applications (e.g., real chemical recycling).

3) Leveraging and extending existing market designs to price mechanisms for waste.

4) Innovative resource collection systems.