LCAs for Solid Waste Management: Key considerations

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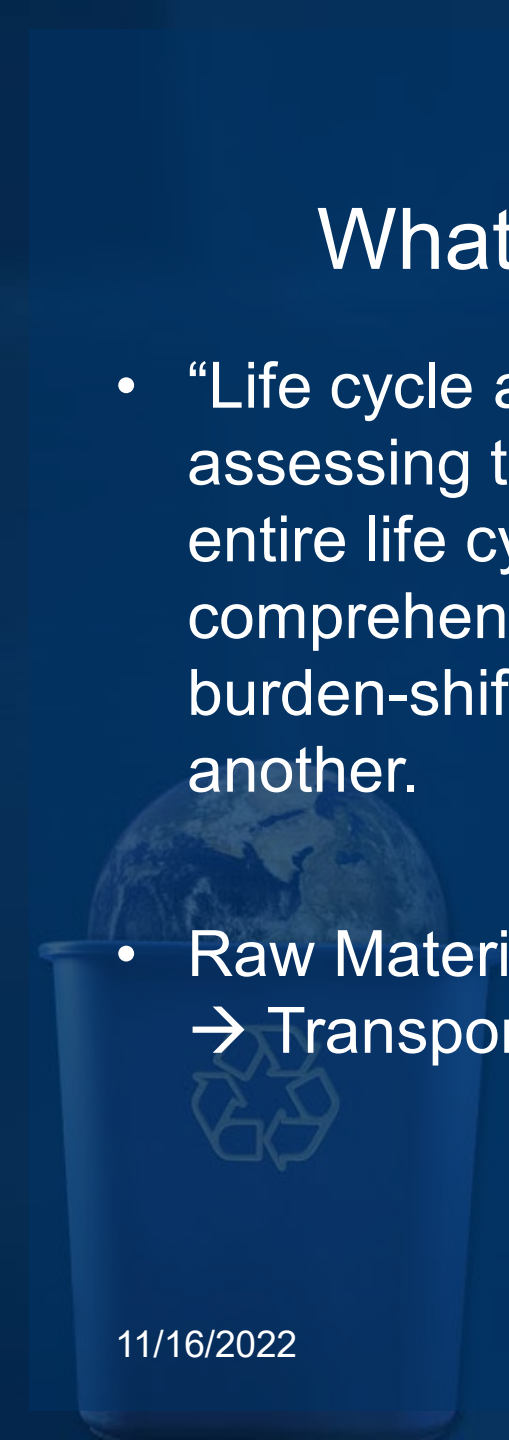
What is a Life Cycle Assessment?

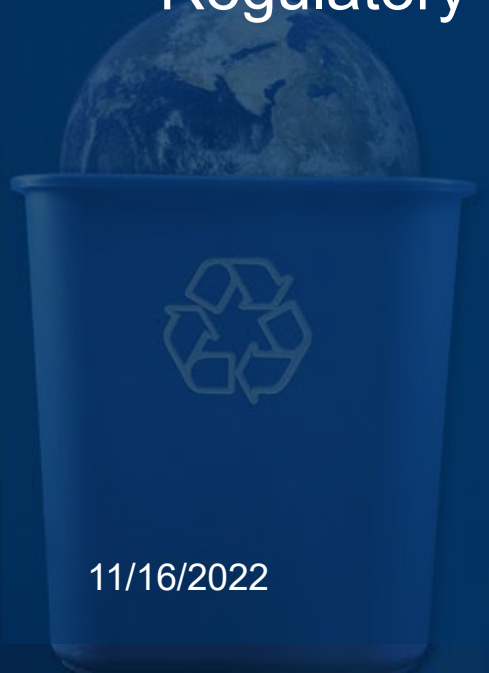
- “Life cycle assessment, or LCA, is a methodology for assessing the environmental impacts associated with the entire life cycle of a particular product or process. LCA's comprehensive scope helps analysts identify and avoid burden-shifting from one environmental impact to another.

- Raw Material Extraction → Manufacturing & Processing → Transportation →Usage & Retail → Waste Disposal



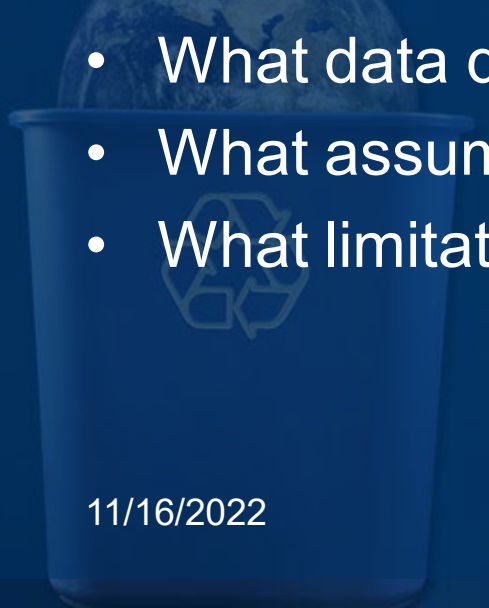
What are LCAs used for?

- Product Development and Research Development
- Supply Chain Management and Procurement
- Marketing and Sales
- Strategic management and CSR/ESG Planning
- Regulatory compliance (increasingly common)



What is included in an LCA?

- Define your goal and scope: What is the purpose of the LCA and who is the intended audience? Directional vs. Detailed LCA
- Determine system boundaries: What are the boundaries of my system, and am I going to include
- What is the functional unit that I will be using?
- What data do I need?
- What assumptions am I making?
- What limitations (if any) exist in my approach?



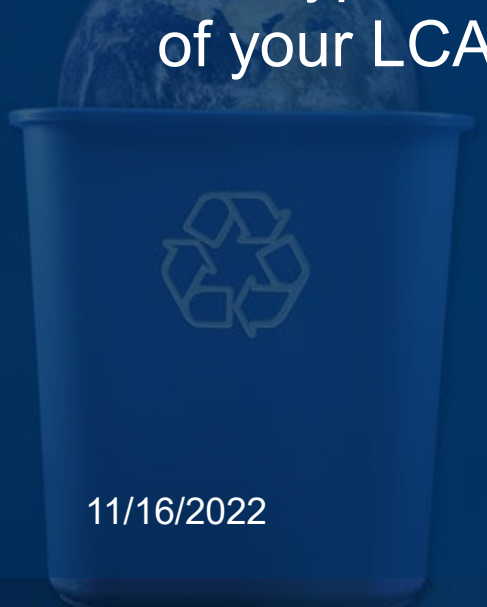
Environmental Impact Categories

- Global Warming Potential: Gases in the atmosphere that absorb and emit radiation
- Abiotic Depletion : Consumption of non- living resources
- Human Toxicity Potential
- Land Use
- How much land is needed

- Most conventional LCAs focus on GWP and primarily Carbon emissions

Data Collection and Analysis

- Access to credible/accurate data the biggest obstacle to most LCAs
- What data do I need, where do I get it, what considerations do I need to keep in mind, can I use data proxies? Etc.
- The type of data you need depends on what the purpose of your LCA is

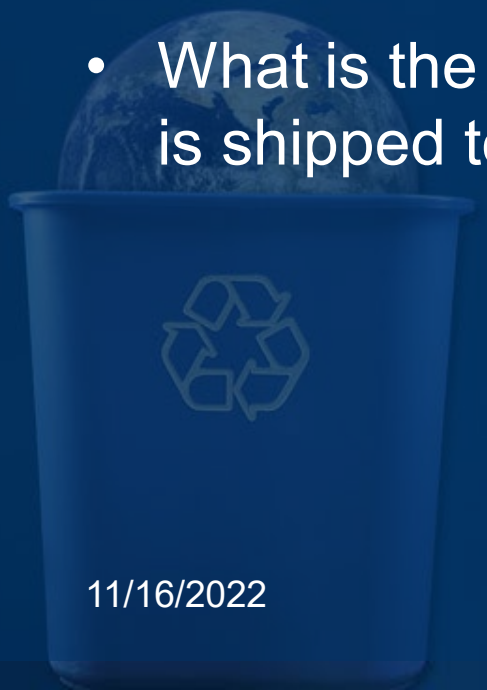


As easy as 1,2,3….

- Scope 1 – direct emissions: Scope 1 emissions include direct emissions from the company's owned or controlled sources.
- Scope 2 - indirect emissions from purchased energy: includes indirect greenhouse gas emissions from purchased or acquired energy
- Scope 3 - indirect value chain emissions: the result of activities from assets not owned or controlled by the reporting organization, but that the organization indirectly impacts in its value chain

LCA Coefficients Most Sensitive To….

- What is the energy grid mix of the market in which I am collecting EOL material?
- What is the energy grid mix of the end market that my material is being shipped to?
- What are the total kilometers traveled to collect waste
- What is the distance to the end market that my material is shipped to?



What tools are available?

- US EPA WARM: Publicly available, robust documentation, limited flexibility/customization. Does not reflect Canadian conditions
- EcoInvent/SimaPro: Largest LCA dataset in the world, highly customizable, high cost (annual licensing fee)
- Gabi/Sphera: Similar to EcoInvent in terms of functionality and flexibility, high cost
- Open LCA: Publicly available, very robust dataset, customizable, steep learning curve (not user friendly)

The importance of understanding chain of custody

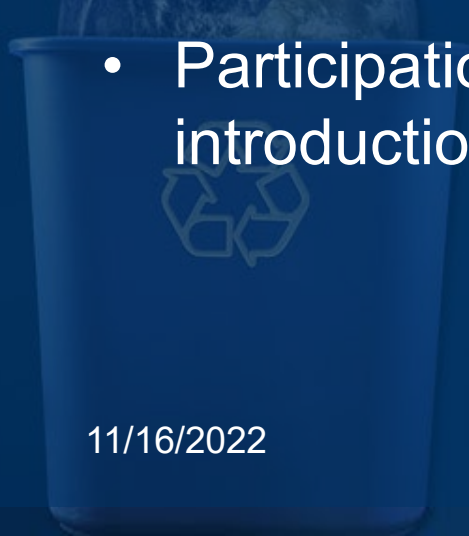
- Where possible, a mass balance should be conducted to better understand the flow of EOL materials (what goes where)
- Commodity markets for EOL materials are dynamic, and the flow of materials may change
- How do I count material being managed on site?

The Waste Management Heirarchy

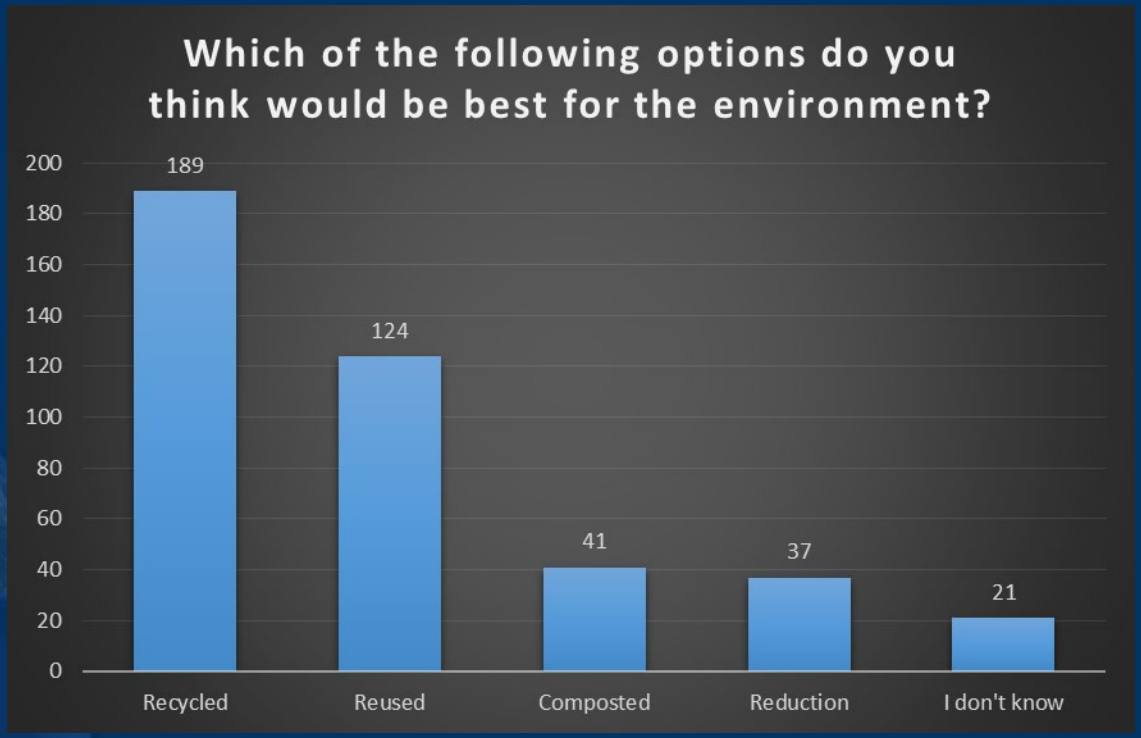
- Reduce, Reuse, Recycle is not just a clever catch phrase – it's the order of preference for waste management options

Canadian Environmentalism

- Canada, and Ontario specifically, has one of the highest recycling rates for printed paper and packaging in the world
- Waterloo Ontario was the first municipality to offer a Blue box program
- Recycling has been both a legislative and policy focus for much of the past three decades
- Participation in the Blue Box is often our earliest introduction to environmentalism and stewardship

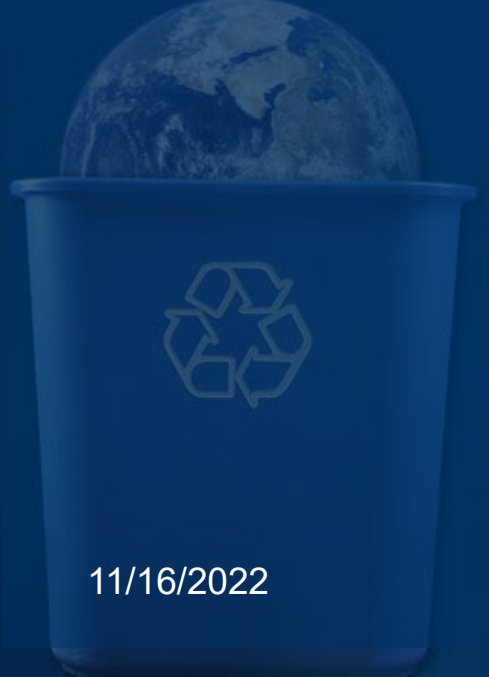


Canadian Environmentalism



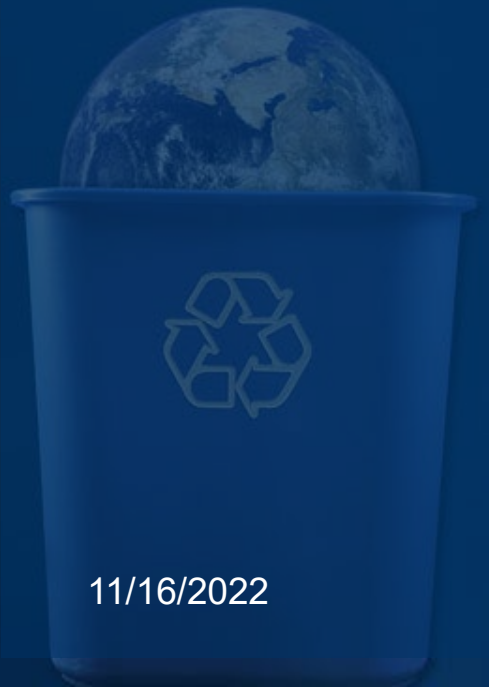
The difference between recyclable and recyclability

- Terracycle and the recyclable coffee butt
- Recyclable is a technical question
- Recyclability involves economic, environmental, infrastructural and social considerations
- Green Washing is very real and very dangerous



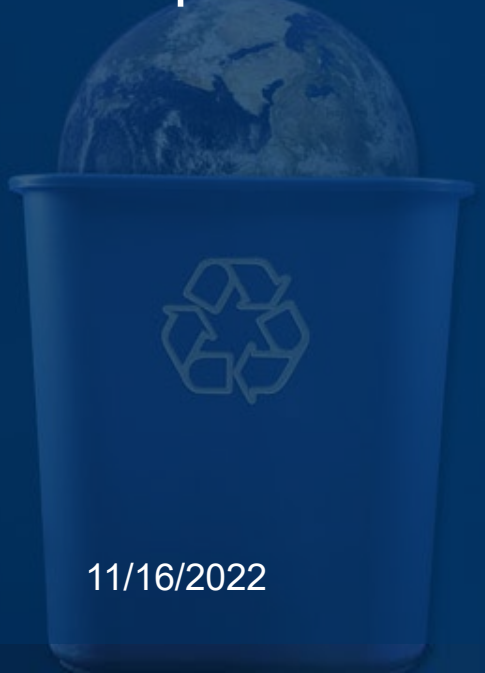
What is Green Washing?

- What is Green Washing?
- Why does it matter?
- Examples of Green Washing
- Implications of Green Washing



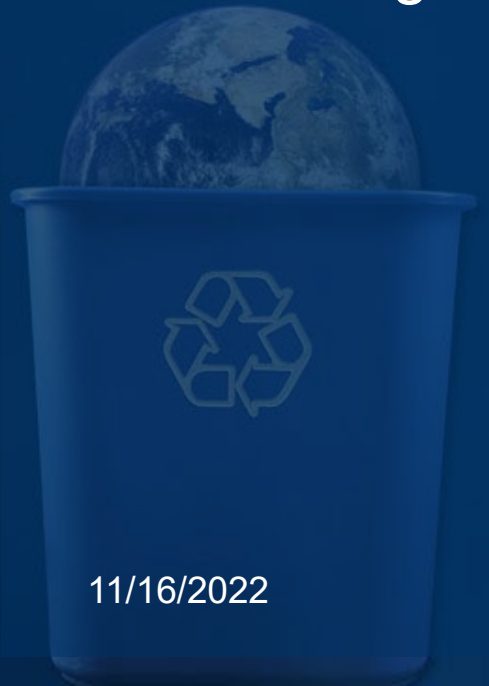
The Marginal Tonne

- Where will our next diverted tonne come from?
- Is all recycling made equal?
- What happens when we can’t recycle a product?
- Are there materials or waste streams that we need to prioritize?



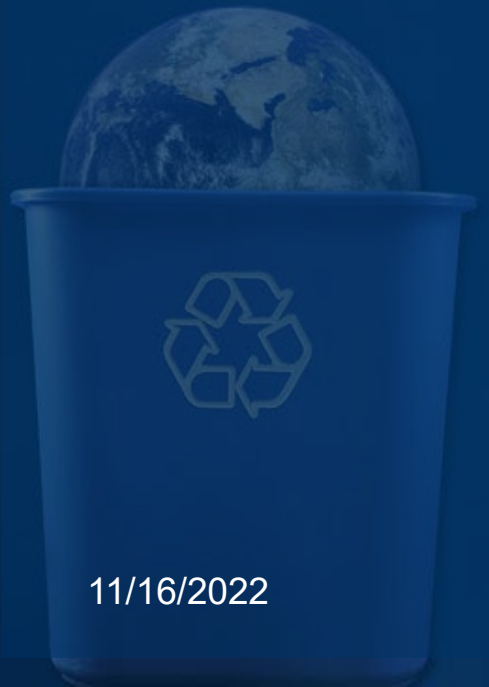
Single Use Plastics: Good or Bad?

- We don’t have a plastic problem, we have a waste management problem
- The role of plastic packaging in promoting sustainability
- Challenges of managing packaging waste



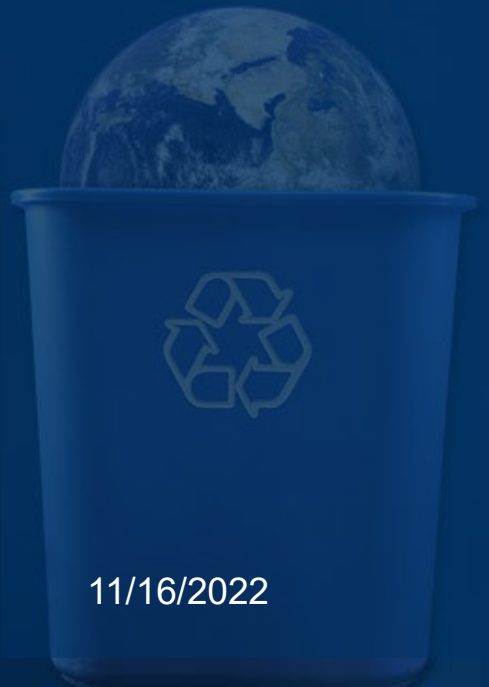
Limitations of Mechanical Recycling

- We need think outside of the Blue Box
- Packaging is a heterogenous waste stream
- Mechanical recycling vs. Chemical recycling



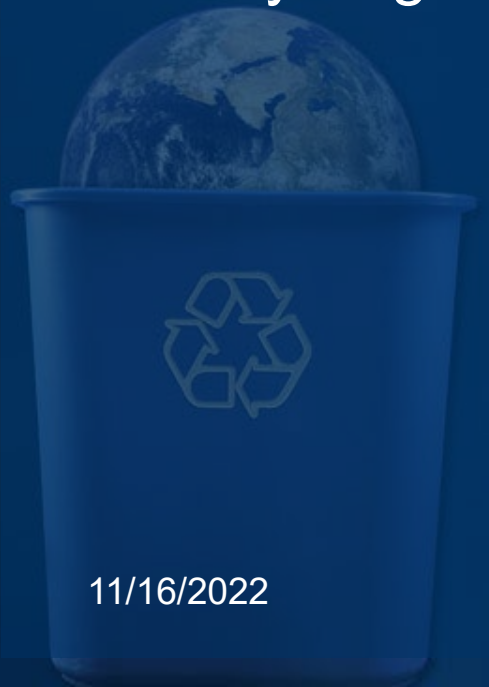
Behavioral Change

- Theory of planned behavior:
- 1) Attitudes/Values
- 2) Normative Influences
- 3) Perceived Behavioral Control



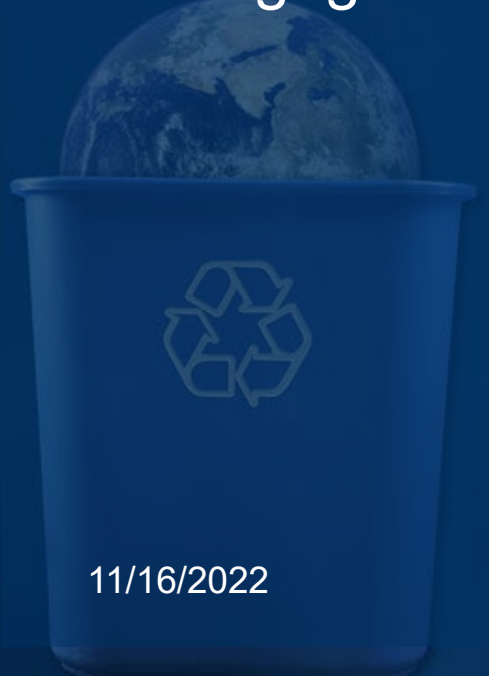
What drives sustainable waste management behaviors?

- Stated behaviors vs. Revealed Behaviors
- Value Action Gap – We are lying to ourselves, and each other
- Convenience is the most significant predictor of recycling/diversion behavior



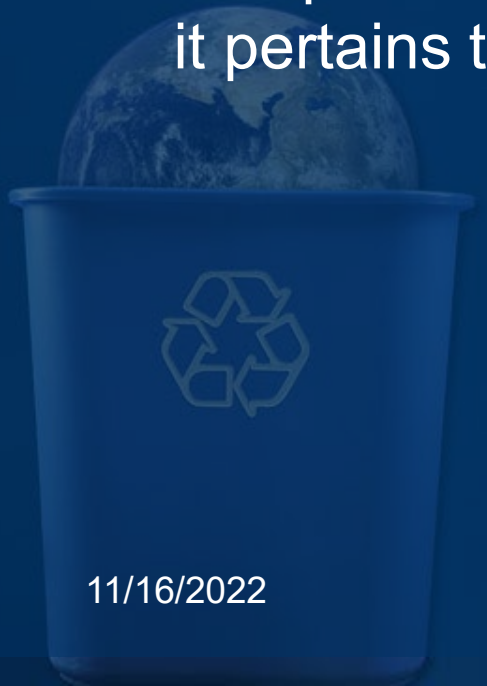
What drives sustainable waste management behaviors? Con't

- Role of race and ethnicity in affecting sustainable waste management behaviors and practices
- Not all people participate for the same reasons
- Gap between first and second generation immigrants
- Engagement needs to be culturally relevant



Limitations of Legislation

- Legislation isn't magic – there are economic and technical constraints on desired behaviors
- Cause and effect: Affect on markets and the price of consumer goods
- The price of going green – social justice and equity as it pertains to waste



Questions

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