Rethink Plastics: The Impacts of Plastics on Planet Earth

OLLI - March 13, 2025

Bob Gedert, XU Adjunct Professor

gedertr@xavier.edu
www.linkedin.com/in/bobgedert

The Traditional Plastic Issues

Recycling Plastics is problematic and confusing

- Recycling can vary – from town to town and even differ where you work, live, and play in your community.
- Some locations may have an expanded list of recyclable plastics while others may restrict plastics and have an expanded list of other recyclables
- Labels on containers may be inconsistent and confusing – causing cross-contamination

Climate Issue: the elephant in the room!

Plastic production and use impact the climate.

- We *surpassed 1.5 degrees C* – The Earth is passing certain *tipping points* and needs our attention!
- To return to a habitable future Earth, the IPCC advises we need to go to Net Zero on Fossil Fuel use
- Net Zero means no production of fossil fuels - Zero.
- For a safe Earth, we need to stop producing and using coal, gas and oil products that create CO^2 emissions.

Climate Issue: the elephant in the room!

Plastic production and use impact the climate.

- All forms of synthetic plastics are made from fossil fuels. We need to do a phase-out of plastics made from fossil fuels!
- From the extraction of minerals and gas to transport, to processing and refining, to the manufacturing of plastics – impacts the Earth.
- In every step of plastic creation, there are Carbon Dioxide (CO2) and Methane (CH4) emissions – directly impacting the climate

Climate Issue: the elephant in the room!

Plastic production and use impact the climate.

- There are significant climate impacts in the extraction, production, packaging, transportation, and disposal of plastic products and plastic packaging
- 1 metric ton plastics = 2 GtCO2e of emissions
- From the creation of plastics through its lifespan, there are continuous environmental and human impacts that are unmitigated.
- Plastics impact humans, the environment, and the climate!

LCA of Plastics - Nature Sustainability Study, 2015

Recycling Issue: the 2nd elephant

Plastic recycling impacts the climate.

- Only 9% of all plastics produced is recycled.
- Film plastics, polystyrene, PVC, automotive plastics, and small format plastics cannot be recycled
- 40% of plastics produced is dedicated to packaging
- Recycling is not broken – however, plastics recycling is problematic and expensive: plastics recycling is broken!
- We cannot recycle our way out of the Plastic Crisis!

Data: USEPA 2019

Human Health Issues: Plastics Impacts

Plastics are formed from *fracked gas* or *drilled oil*

- Fracking releases toxic air contaminants such as benzene, toluene, ethylbenzene, and xylene; fine particulate matter (PM2.5); hydrogen sulfide; silica dust; and nitrogen oxides and volatile organic compounds to local communities.
- Human health effects of gas and oil air emissions, including respiratory and neurological problems, cardiovascular damage, endocrine disruption, congenital disabilities, cancer, and premature mortality.

Human Health Issues: Plastics Impacts

Plastics are formed with *chemical additives* (plasticizers)

- Plastic production often utilizes toxic chemicals such as 1,3-butadiene, benzene, styrene, toluene, ethane, propylene, and propylene oxide.
- Petrochemical additives (i.e. bisphenol A, lead, brominated flame retardants) can cause nervous system disorders, reproductive impairments, developmental problems, cancer, and genetic impacts.
- These conditions result from breathing in off-gases, ingestion of plastic particles, and skin contact absorption.

Human Health Issues: Plastics Impacts

Plastics are *ingested* through drinking and food

- PFAS and PFO are common additives to plastic food packaging, plastic food storage containers, cookware.
- PFAS (poly-fluoroalkyl substances) and PFO (Perfluorooctanesulfonic acid) are petrol-based chemicals.
- Both have been found in the bloodstream of 98% of Americans in health studies, as well as a majority of the drinking water systems in the U.S.,
- with no known remedies for removal due to the persistence of the chemicals.

Human Health Issues: Plastics Impacts

Plastics are *ingested* through drinking and food

- PFOA is a polymer (a form of plastic), although not used in the same sense as a formed plastic straw or plastic cup.
- Instead, PFOAs are used as an additive surface in consumer and industrial products, with the desired effect to repel water or oil. Common uses include non-stick frying pans, carpets, raincoats, and boots.
- Exposure has been linked to thyroid disorders, chronic kidney disease, liver disease, and testicular cancer

Human Health Issues: Plastics Impacts

Plastics are *ingested* through drinking and food

- Recycled black plastics may contain decaBDE, a banned toxic flame retardant found in household electronics, and often have toxic elements such as antimony, bromine, cadmium, mercury, and lead.
- Recycled black plastic is remanufactured into kitchen utensils, consumer toys, clothing, sports equipment, single-use packaging, and food trays.
- Heat accelerates the transfer of plastics and chemicals to food.

Environmental Issues: Plastics Impacts

Plastics are *discarded into the environment*

- Plastic bags are mistaken as food by certain animals.
- Plastic straws and bag entanglement can be deadly.
- Single-use bottles littering the natural landscape.
- Plastic gyres: Great Pacific Garbage Patch
- Microplastics found on Mt Everest, in the deepest oceans, and in Antarctica.
- Microplastics escape the municipal filtration systems and leach into our natural waterways

Environmental Issues: Plastics Impacts

Microplastics *harm humans* as well as the environment

- Human exposure to microplastics through ingesting contaminated food or drink, inhaling through contaminated air, or dermal absorption from contaminated surfaces, clothing, or abrasion.
- Microplastics “are believed to migrate across body membranes to the gastrointestinal tract, circulatory system, and lungs.”
- Many researchers believe that microplastics are carcinogens and carriers of toxins.

Solution: Bridge to Phase out Plastics

IPCC warns us of an Earth heating up.

- 180 Countries are planning for “Net Zero” on Fossil Fuel use by 2040/2050.
- The obvious next step is to stop using plastics, as we stop producing and utilizing fossil fuels.
- The global market value of plastics is forecast to grow to more than $750 billion in 2027.
- More plastics = more harm
- A bridge, or series of bridges, is necessary to move us toward replacing plastics.

Solution: Bridge to Phase out Plastics

WE have done this before on an international scale.

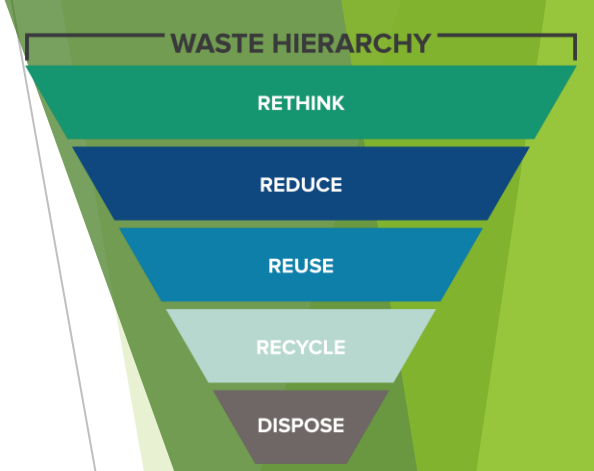
- Between 1986 and 2021, all nations across the world banned lead-based fuel.
- Replaced lead-based fuels with unleaded fuels .
- Between 1987 and 2000, all nations banned chlorofluorocarbons (CFCs) utilized in refrigeration, vehicles' air conditioning, and HVAC air conditioning.
- Hydrofluorocarbon (HFC) refrigerants were used as replacements – with less impact on the climate.

Phase 1: Ban New Plastics Production

<u>Stop the bleeding</u>. Stop the harm to future generations.

- Universal worldwide ban on producing new virgin plastics.
- This is being discussed in the Global Plastics Treaty conversations.
- Classify plastics as a “hazardous waste” pertaining to international trade.
- The goal of the Basel Convention is “to protect human health and the environment against the adverse effects of hazardous wastes.”

Phase 2: Reduce Plastics Consumption



<u>Reduction</u> is not Recycling: It is a higher priority

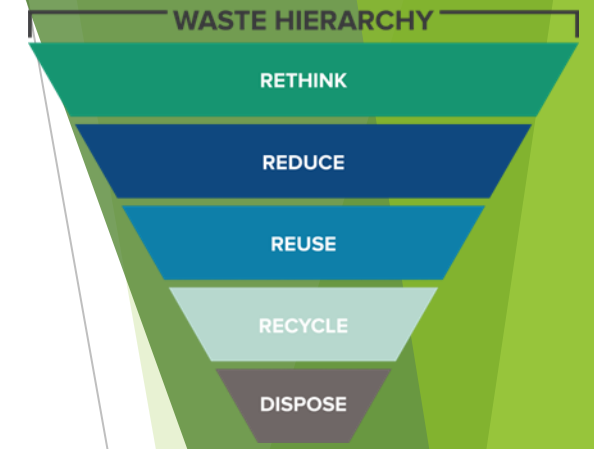
- Reduce the <u>consumption</u> of Plastics
- Start with reduction of use of *<u>Single-Use Plastics</u>*
- Then reduce *<u>unnecessary</u>* plastics
- Global plastic waste generation <u>doubled</u> from 2000 to 2019 to 353 million tons.
- 50% of all plastic has a lifetime of under one day
- 40% of all plastic comes from packaging

Data from OCED, 2022 and USEPA 2019

Phase 3: Reuse of Recovered Plastics

<u>Reuse</u> is not Recycling: Reuse is higher priority

- Replace SU plastic bags with cloth bags
- Replace plastic dishware with washables
- Replace single-use carry-outs with reusables
- Replace bottled water with refillable containers
- Replace disposables with repair clinics
- The CO2 emissions from disposable plastic and polystyrene cups are 3 to 10 times greater than those of reusable ceramic, stainless steel, and glass when compared over their life cycles



Data from Upstream, Switch to Reuse, 2024

Phase 4: Recycle Existing Flows of Plastics

Recycle Existing Plastics – Avoid new production

- Recycle Ocean Recovered Plastics
  - Oceans Plastics Recovery Project
  - Ocean Titans
  - OceanWorks
- Avoid Chemical Recycling – Support Mechanical Recycling Processes to preserve the integrity
- Avoid the creation of new plastic from oil/gas
- Earth911 Recycling Database

Phase 5: Introduce Plastic Substitutes

Research and Development for <u>Substitutes</u>

- 12 percent of the total demand for oil in 2017 was for production of plastics: 12 million barrels per day
- An estimated 25 percent fracked gas dedicated for plastics
- Significant <u>business opportunities</u> for expansion into replacement products <u>utilizing materials that substitute for plastics</u>
- Creativity could be applied with the entrepreneurial spirit!

Data: International Energy Agency, 2018

Phase 6: Phase out all existing production of plastics

Eliminate the production of all plastics

- An existential threat of climate change drives the need to shut down new proposed plants and existing plastic production plants based on Carbon Dioxide and Methane emissions and human harm.
- From the moment of creation through the infinite lifespan of each plastic product, continuous environmental impacts are unmitigated and infinitely ongoing.
- The choice is to save the Earth or continue to use plastics.

Plastics Elimination - Consensus Building

We need to work together in collaboration

- US Plastic Pact goal is to eliminate certain plastic items by 2030 voluntarily through industry participation.
- The *US Plastic Pact* has engaged Workgroups to create innovative solutions to eliminate *unnecessary and problematic plastics*.
- The Pact is composed of more than 120 "Activators" representing trade associations, retail businesses, recycling converters, recycling reclaimers, raw material suppliers, material recycling processors, consultants, technology innovators, and not-for-profits.
- https://usplasticspact.org/problematic-materials/

Plastics Elimination - Consensus Building

Plastics Elimination - Your Part

We need to work together in collaboration

- Shop smart – look for plastic free alternatives
- Eliminate the straw at restaurants
- Reuseable Bags to replace plastic bags
- Beyond Plastics Beyond Plastics - Working To End Single-Use Plastic Pollution
- Green America Green Living | Green America
- Greenpeace Learn About Plastic Pollution - Greenpeace International
- Plastic Free July Plastic Free July – Be Part of the Plastic Pollution Solution
- Do Not use the **Hefty Orange Bags**
  - Hefty Bags promote more plastic usage – Climate Impacts
  - Hefty Bags counters the waste avoidance message
  - Hefty Bags promotes Chemical Recycling – Climate Impacts

Rethink Plastics: The Impacts of Plastics on Planet Earth

OLLI - March 13, 2025

Bob Gedert, XU Adjunct Professor

gedertr@xavier.edu
www.linkedin.com/in/bobgedert