



RUTGERS HEALTH

Environmental and Occupational
Health Sciences Institute

Plastic Pollution: “What you don’t see...”

7th Annual Environmental Health and Justice Summit

Plastic Pollution, Human Health, and Vulnerable Populations: Uncovering Critical Issues

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<https://blog.cleanhub.com/plastic-pollution-facts>





<https://www.nationalgeographic.com/environment/article/plastic-pollution>

Five Ocean Gyres









Credit: The Ocean Cleanup

Micro- and/or
Nanoplastics



October 16, 2024

The New York Times

<https://www.nytimes.com/2024/10/16/climate/dolphin-plastic-breath.html>

These Scientists Tested Dolphin Breath. They Found Plastic.

Researchers studying bottlenose dolphins found polyester and other plastics in every animal they tested.

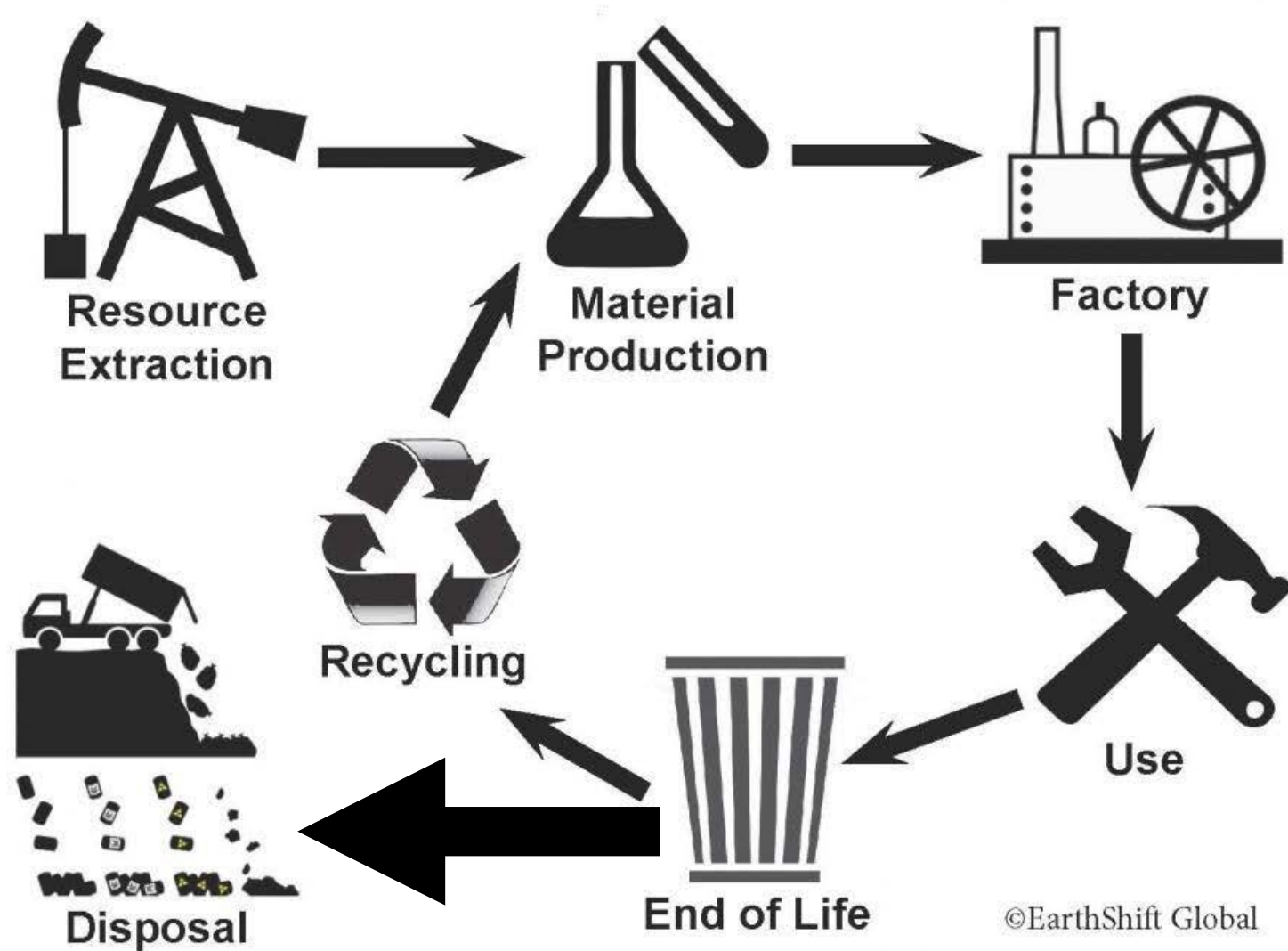
But yet there is more that may not see...

- Pollution from raw material extraction
- Pollution from plastic production
- Pollution from plastic-related transportation
- Pollution during plastic use
- Pollution following disposal of plastic on land

ie. pollution throughout the lifecycle of plastic

The Lifecycle of Plastic

Hundreds of Years in the Environment



What is plastic, and where does it come from?

- We know it when we see it (most of the time)
- “A synthetic material made of polymers that can be molded into solid objects”
- Durable, infinitely shapeable, lightweight, and very cheap
- A myriad of recognizable uses: packaging, fabrics, automobile interiors, building materials, etc.
- Plastic polymers also found in other products such as paints, coatings, and automobile tires
- The vast majority of plastics are derived from crude oil and gas

The plastic pollution problem has been growing since the plastic industry started in the 1950s



There are many common types of plastic. Three are recyclable (at least sometimes).



PETE



HDPE



PVC



LDPE



PP



PS



OTHER

polyethylene terephthalate

soft drink bottles, mineral water, fruit juice container, cooking oil

high-density polyethylene

milk jugs, cleaning agents, laundry detergents, bleaching agents, shampoo bottles, washing and shower soaps

polyvinyl chloride

trays for sweets, fruit, plastic packing (bubble foil) and food foils to wrap the foodstuff

low-density polyethylene

crushed bottles, shopping bags, highly-resistant sacks and most of the wrappings

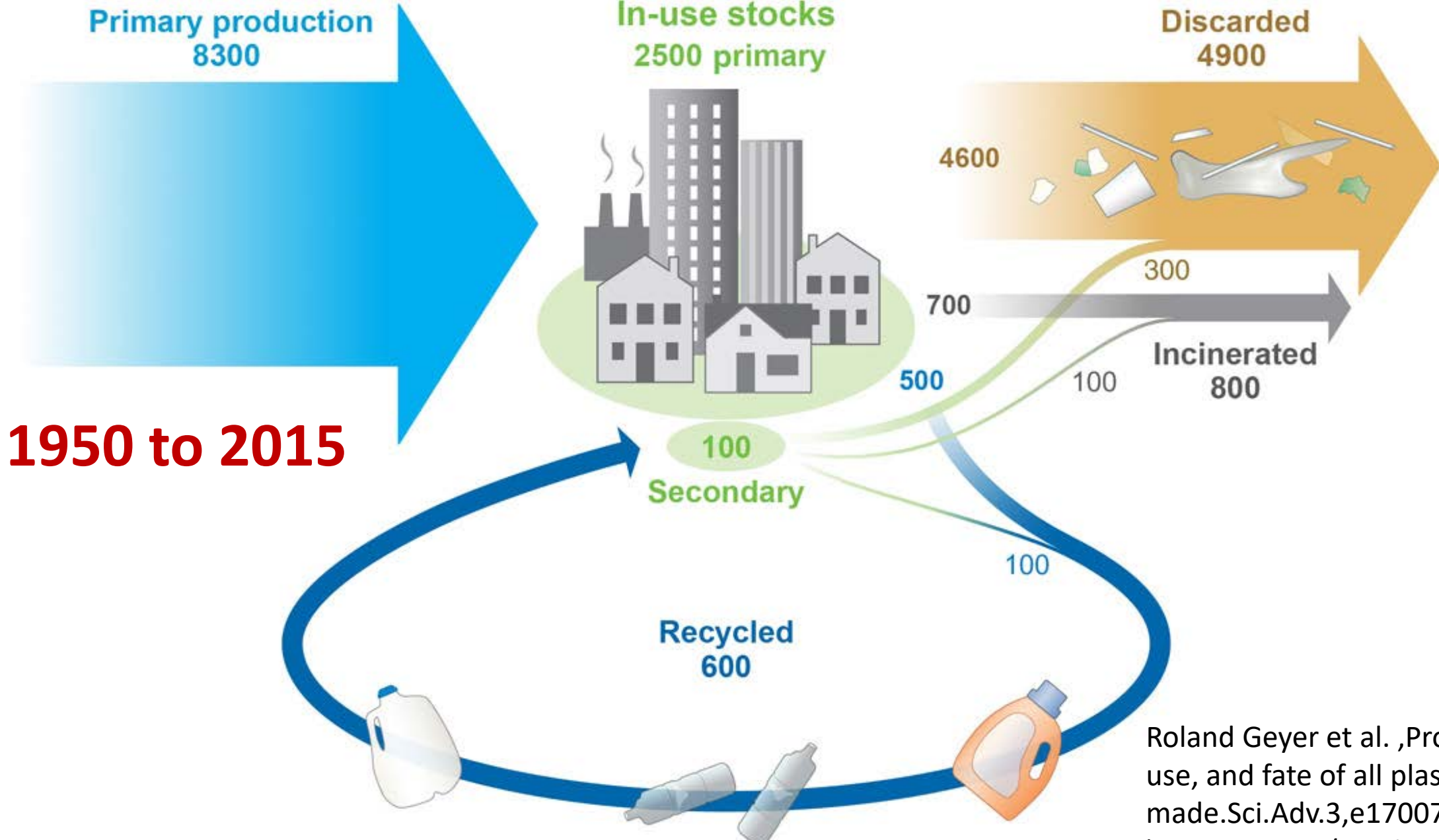
polypropylene

furniture, consumers, luggage, toys as well as bumpers, lining and external borders of the cars

polystyrene

toys, hard packing, refrigerator trays, cosmetic bags, costume jewellery, CD cases, vending cups

other plastics, including acrylic, polycarbonate, polyactic fibers, nylon, fiberglass



1950 to 2015

Roland Geyer et al. ,Production, use, and fate of all plastics ever made.Sci.Adv.3,e1700782(2017).DOI:10.1126/sciadv.1700782

Step 1: Extraction

- About 14% of global oil and 8% of gas consumption
- In the US, 2/3 of oil and gas are now fracked
- Hazards: spills, accidents, toxic air emissions, CO₂ and methane
- Share of oil and gas production to double in 20 years



2. Production of plastic feedstocks: ethylene, propylene, butylene, benzene, toluene, xylene, etc.



Bayway Refinery, Linden and Elizabeth NJ.

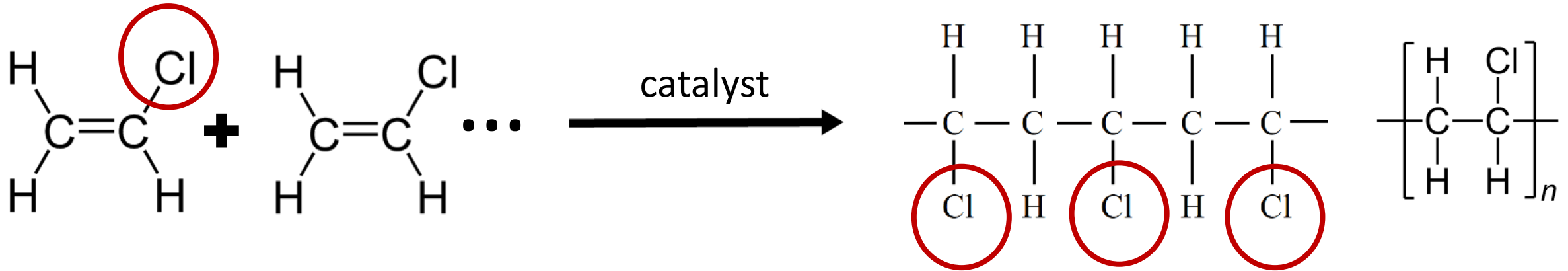
3. Transportation of oil, gas and feedstock chemicals



**Lac-Mégantic Quebec
crude oil train derailment,
blasts, and fire in 2013**

Town center destroyed: 47
people killed, and the
downtown of 70 buildings
destroyed.

Vinyl chloride to polyvinyl chloride (PVC)



Vinyl chloride

A toxic gas known to cause liver cancer



5. Potential Toxic Exposures from Use of Plastics

- Plastic components, e.g. vinyl chloride in PVC
- Plasticizers
 - Bisphenol A (BPA) – used in epoxy resins and polycarbonate plastics
 - Phthalates – used to make plastics more flexible and durable
 - Others??
 - Often used in food packaging
- Flame retardants
 - Polybrominated Biphenyls (PDBEs)
- Per- and polyfluoroalkyl substances (PFAS)

Disposal

- Only about 5 - 9% of plastic waste is recycled in US and globally
- The remainder is
 - Landfilled: 79% - 85%
 - Incinerated: ~12%
 - Exported <1%
 - Mismanaged – improper disposal, litter: up to 23% worldwide (OECD)
 - 0.5% of global plastic waste ends up in the ocean

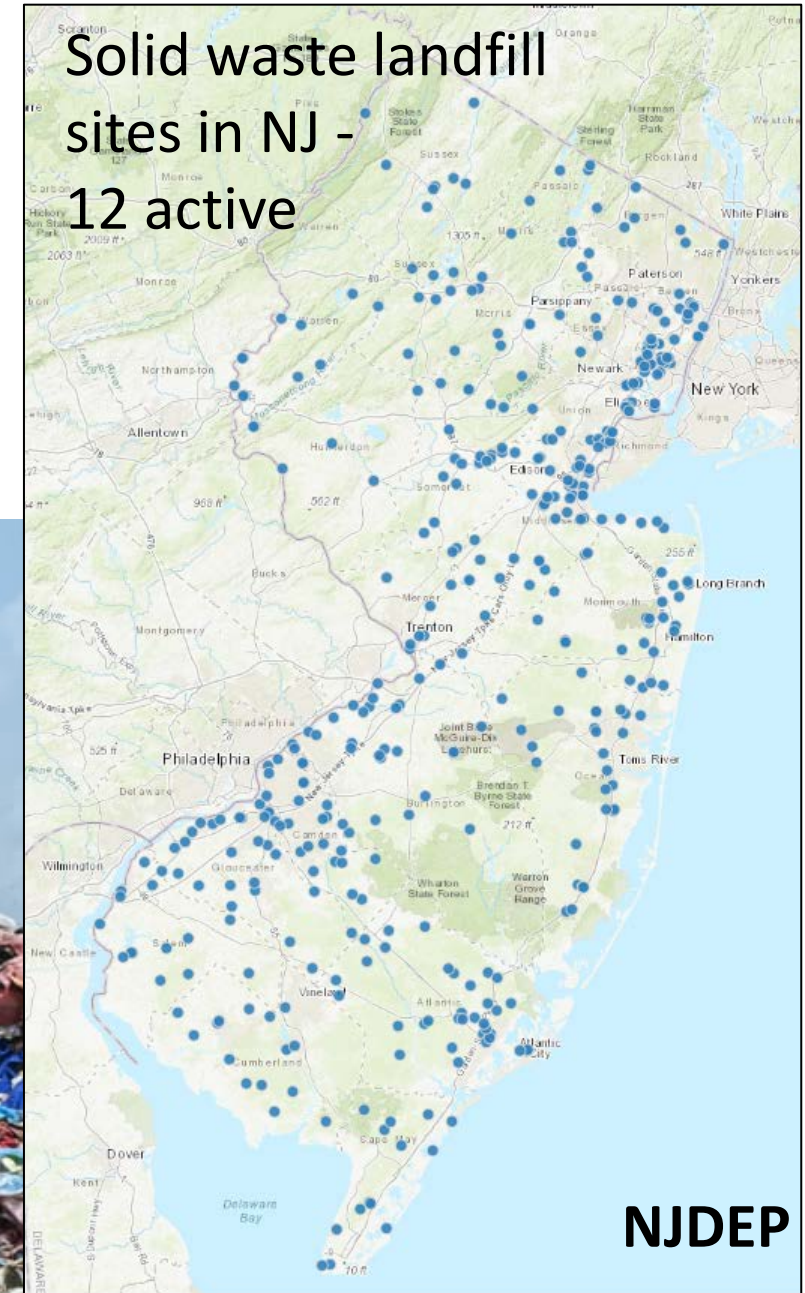
6. Disposal

- Waste transfer stations: an environmental justice issue



Landfilling

Laid to rest for hundreds of years, breaking down into smaller and smaller pieces



NJDEP

Incineration

Reworld
municipal waste
incinerator,
Newark, NJ



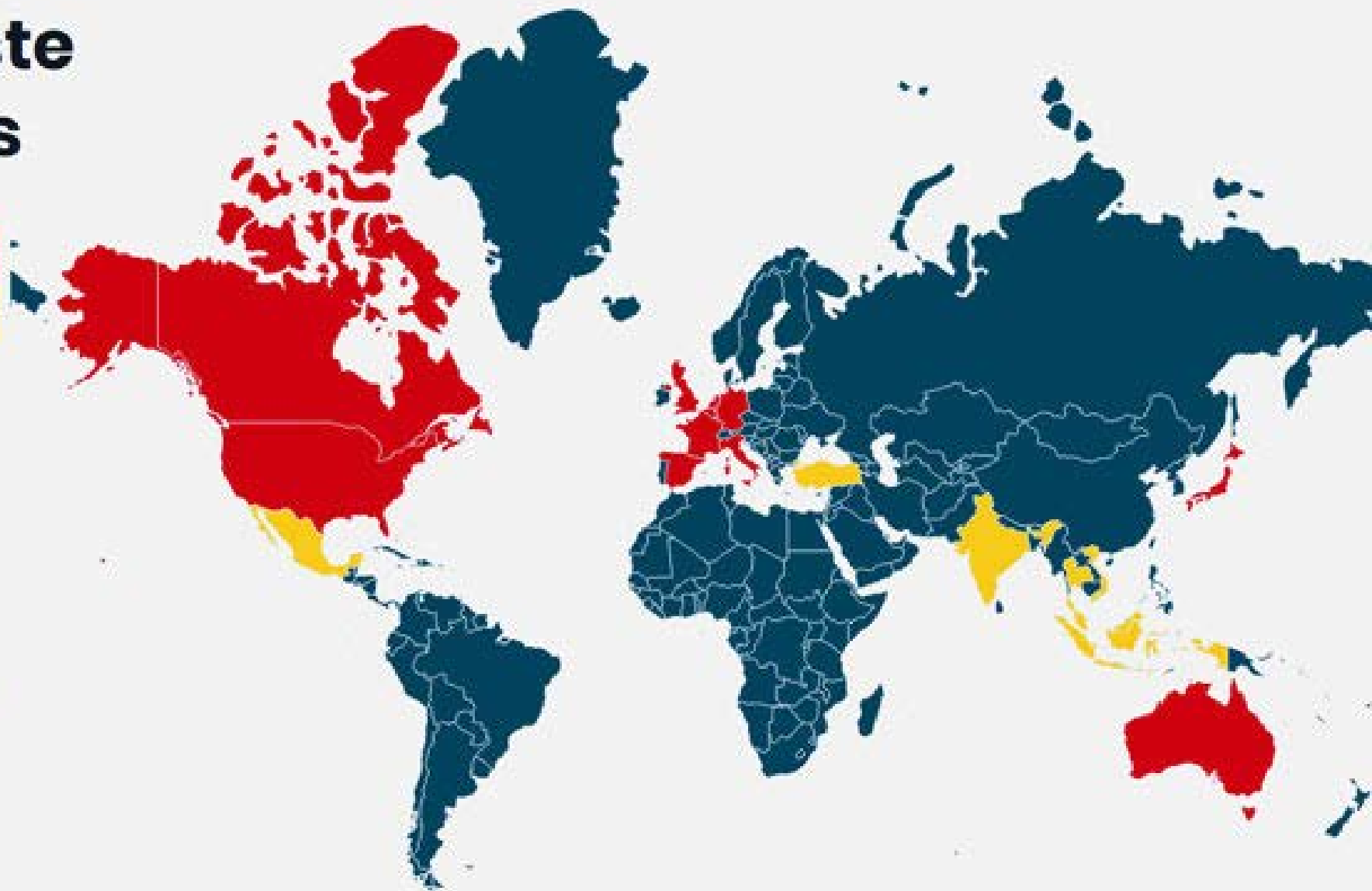
Exportation of Plastic Waste

Top Plastic Waste Trading Regions

Primary Exporting Regions/Countries

Primary Importing Countries

- | | |
|-------------------|-------------|
| ● United States | ● Malaysia |
| ● Canada | ● Indonesia |
| ● United Kingdom | ● Turkey |
| ● European Union | ● Vietnam |
| ● Germany | ● Hong Kong |
| ● The Netherlands | ● India |
| ● Australia | ● Thailand |
| ● Japan | ● Mexico |



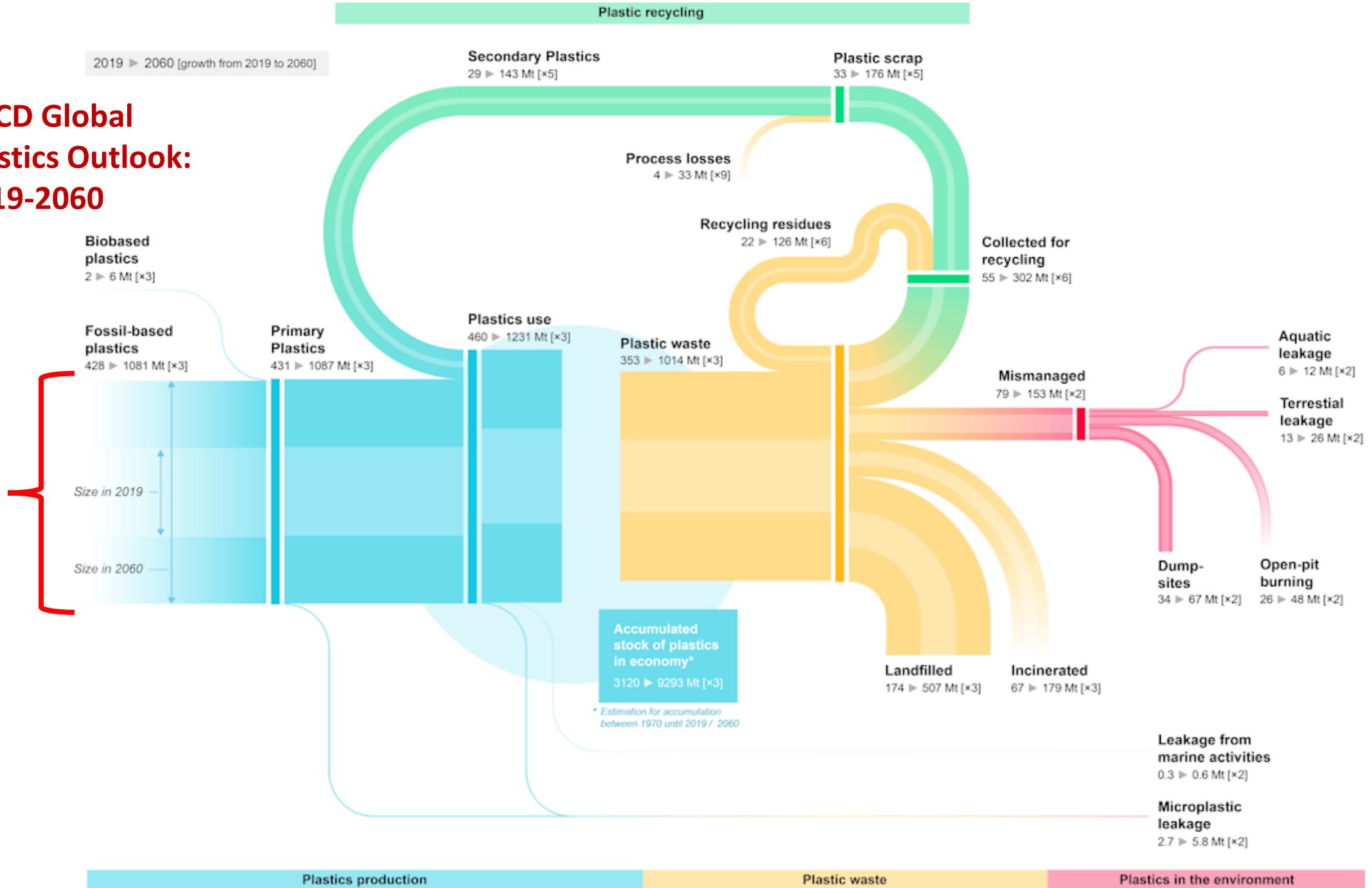
New Jersey Exports about 10 pounds per person per year

Where are we headed?

- Plastic production is the fastest growing industry in the manufacturing sector of the US economy
- The World Economic Forum predicts plastic production will double in the next 20 years.

OECD Global Plastics Outlook: 2019-2060

2019 ▶ 2060 [growth from 2019 to 2060]



Assessing and Solving the Plastic Crisis

- We need to consider the pollution “externalities” throughout the lifecycle of plastic
- We are addicted to plastic like we are addicted to fossil fuels
- These are vast, systemic, twin problems that are both solvable by collective human effort
- How to do it equitably and cost-effectively are the main issues
- Will necessitate circular economics instead of the current linear “take-make-consume-throw away” economics

Plastic Pollution, Human Health, and Vulnerable Populations: Uncovering Critical Issues

1. Community Panel: How Plastic Pollution Impacts Communities from Production to Waste Disposal (10:00-11:15)
2. Research Panel on Micro- and Nanoplastics (11:15- 12:30)
3. Lunch (12:30- 1:00)
4. Comments from Senator Bob Smith (1:00-1:15)
5. Facilitated Conversation between Researchers and Community (1:15-2)
6. Solutions Panel (2:00-3:00PM).