

LIVING WITH PLASTICS

Roland Clift

University of Surrey, UK

University of British Columbia, Canada

Chalmers University, Sweden

Ealing U3A, 26 May 2022





MARINE POLLUTION **Science**

13 Feb 2015

Plastic waste inputs from land into the ocean

Jenna R. Jambeck,^{1*} Roland Geyer,² Chris Wilcox,³ Theodore R. Siegler,⁴
Miriam Perryman,¹ Anthony Andrady,⁵ Ramani Narayan,⁶ Kara Lavender Law⁷



SCIENCE ADVANCES | RESEARCH ARTICLE

19 July 2017

PLASTICS

Production, use, and fate of all plastics ever made

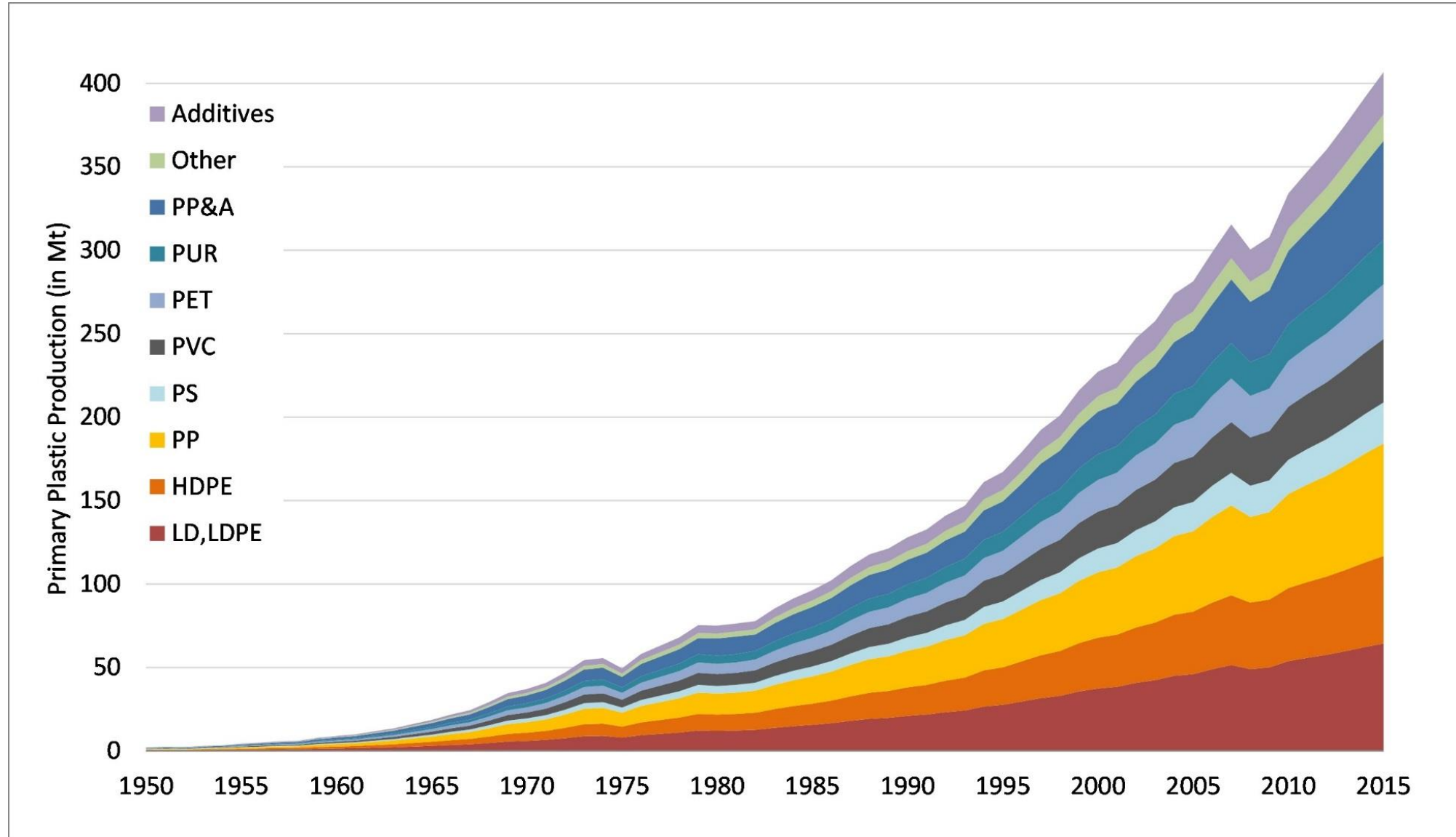
Roland Geyer,^{1*} Jenna R. Jambeck,² Kara Lavender Law³

ASSERTION 1:

A plastic free economy is a nonsense – plastics provide important functions.

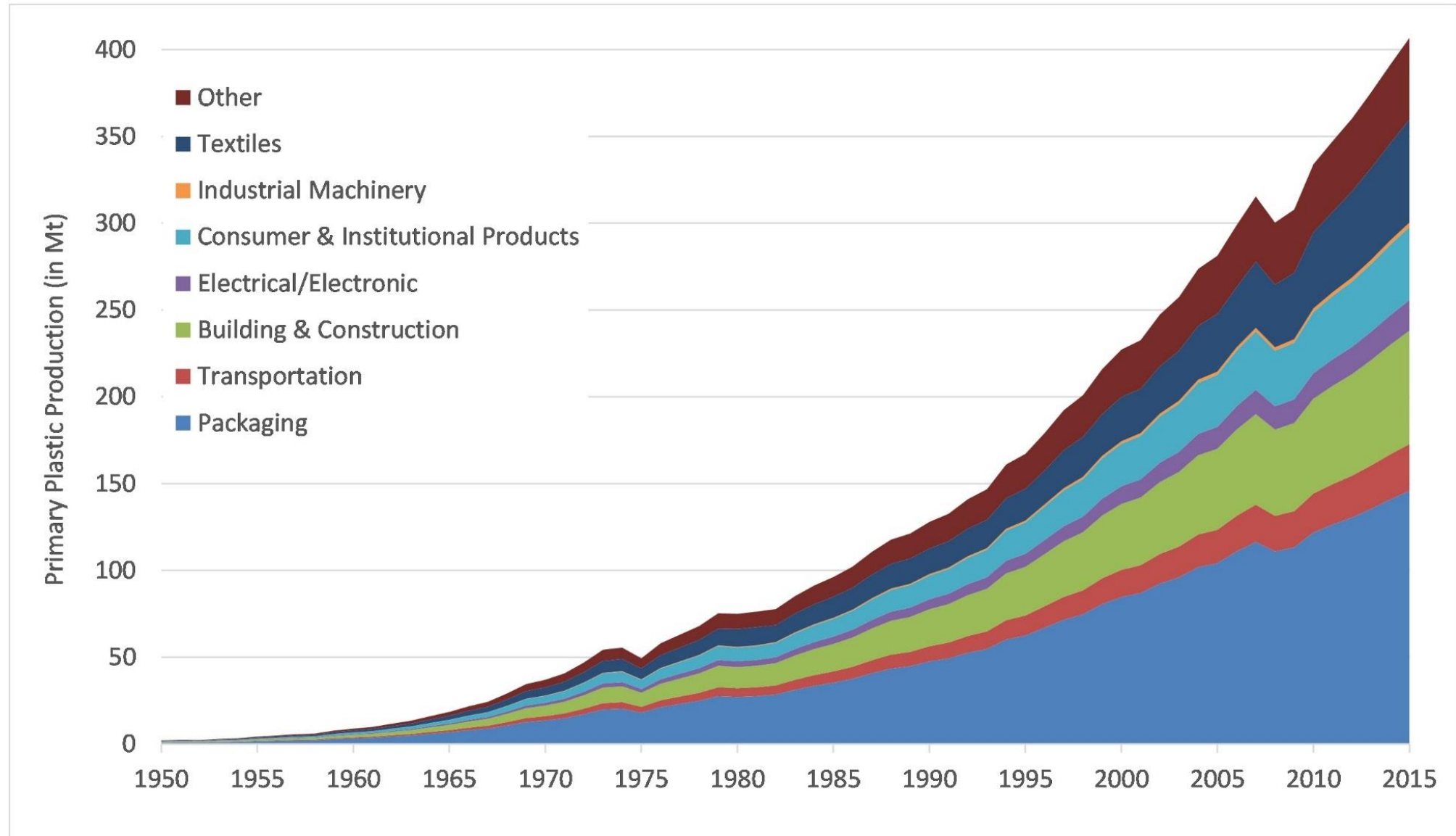
- Distinguish between durable and single-use plastics
- Packaging is not the only source of plastics in the environment
- Without plastic packaging, food wastage would be even worse
- To eliminate packaging, avoid secondary packaging or eliminate whatever is packaged
e.g. bottled water

Primary plastic production by polymer type (1950 to 2015, in million metric tonnes)



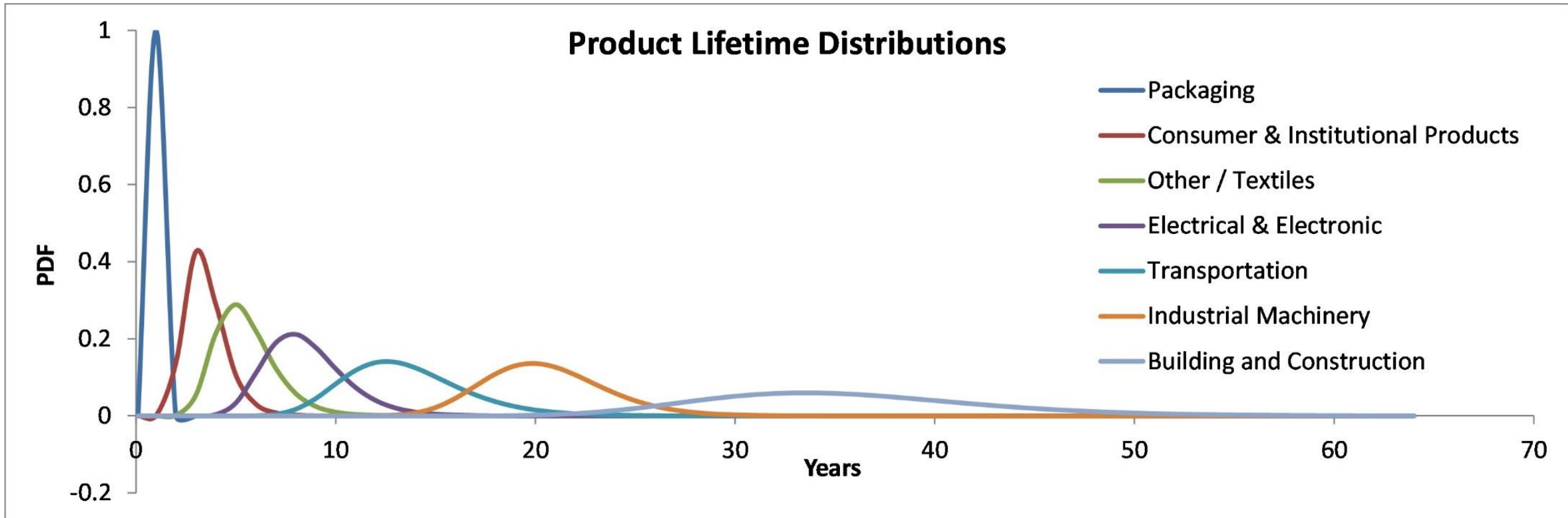
Source: Geyer et al., Science Advances 2017

Primary plastic production by consuming sector (1950 to 2015, in million metric tonnes)

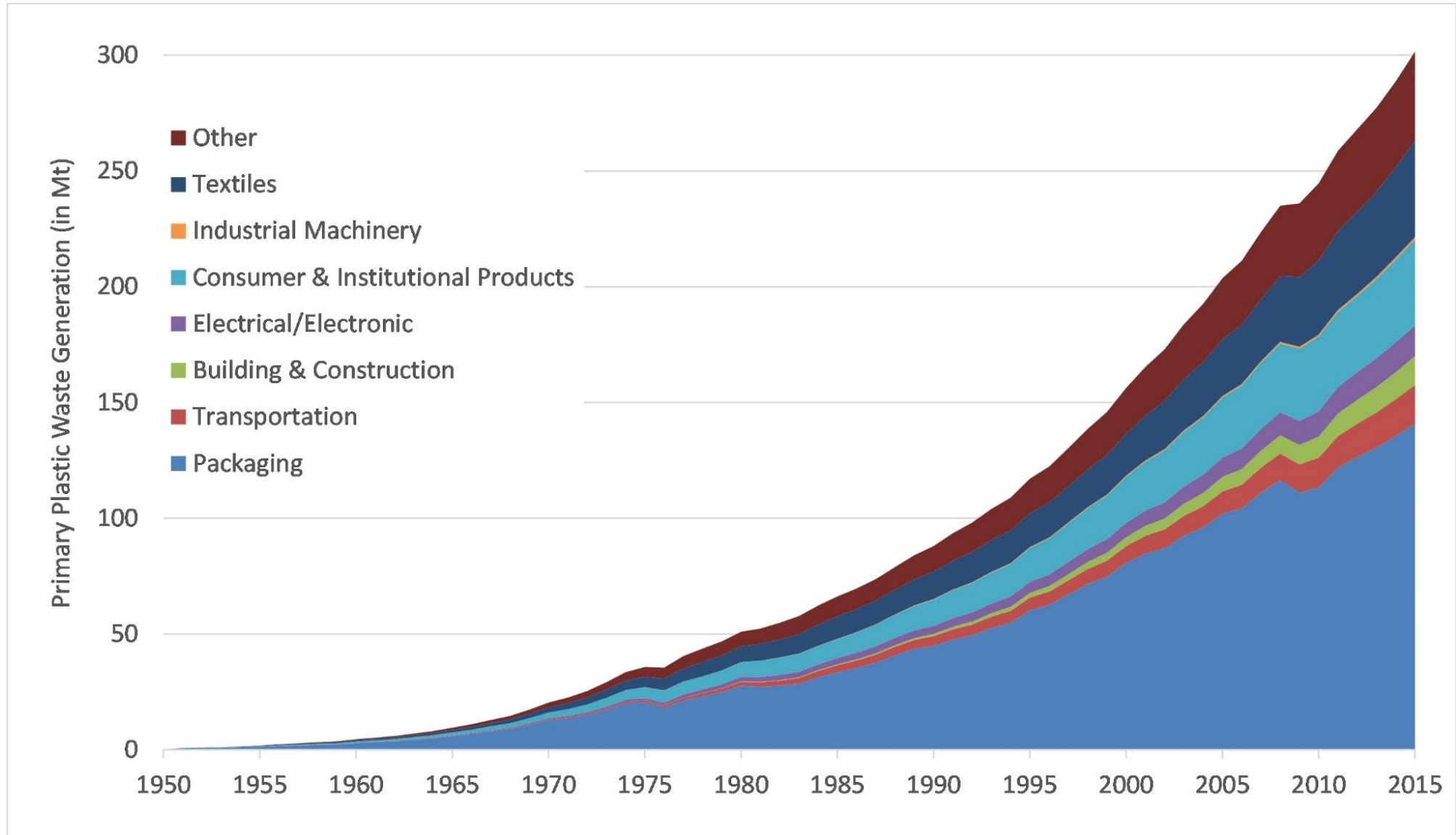


Source: Geyer et al., Science Advances 2017

Use



Waste Generation



Source: Geyer et al., Science Advances 2017

ASSERTION 2:

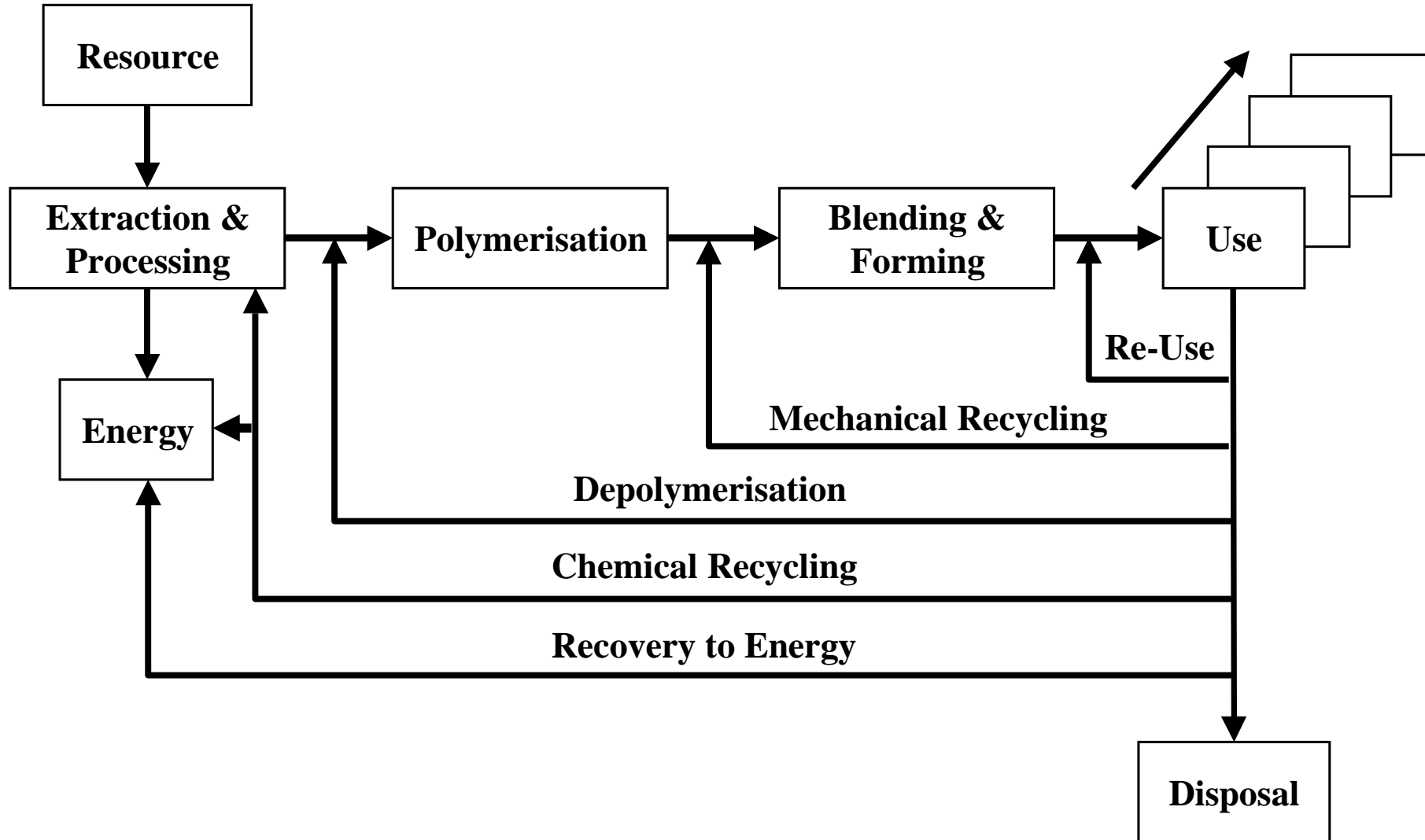
Resource use is not a significant issue

- We already know the whereabouts of far more oil and gas than we can burn without ruining the biosphere through climate change
- For a cotton bag to require less resources than a single-use polythene bag, it must be used more than 100 times

ASSERTION 3:

Plastics are to some extent already used in a “circular” ecology

INDUSTRIAL ECOLOGY FOR PLASTICS

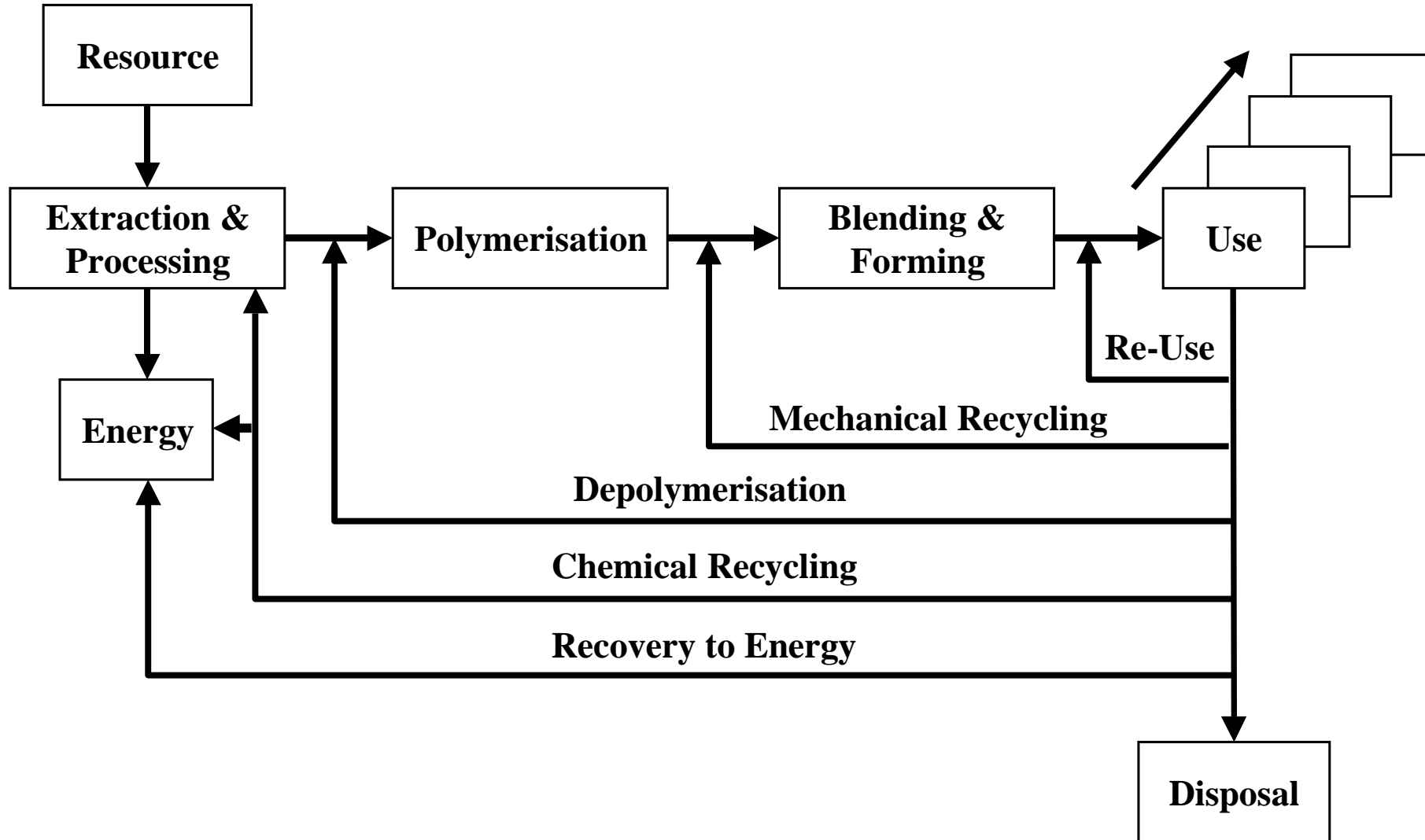


ASSERTION 3:

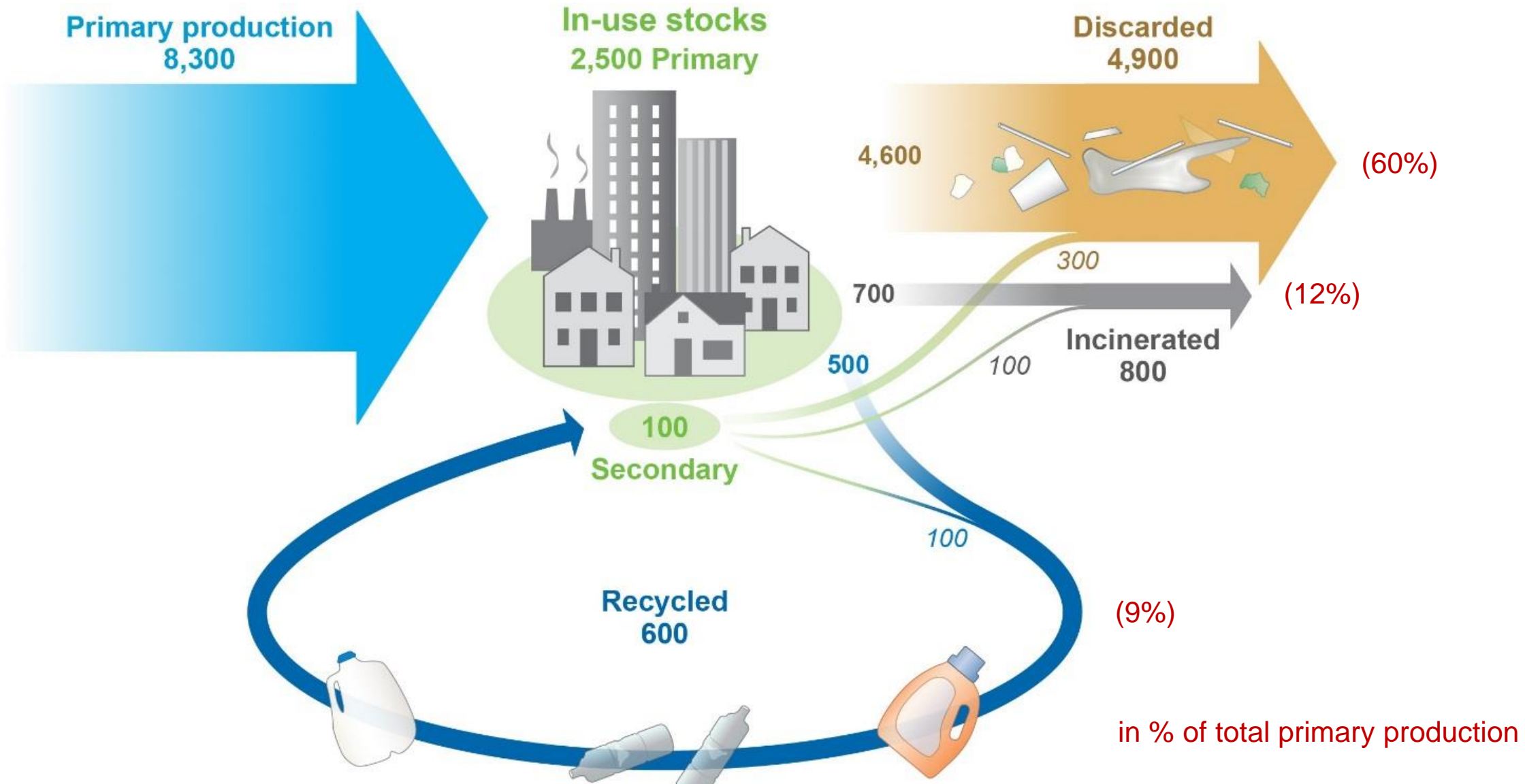
Plastics are to some extent already used in a “circular” ecology

- Re-use is usually more “environmentally efficient” than recycling but it requires effective deposit/return systems and also standardisation of packaging.
- The possibility of recycling mixed plastics is at best limited. Therefore, energy recovery must be seen as part of “circular” use.

INDUSTRIAL ECOLOGY FOR PLASTICS



Global production, use, and fate of polymer resins, synthetic fibers, and additives (1950 to 2015; in million metric tons)



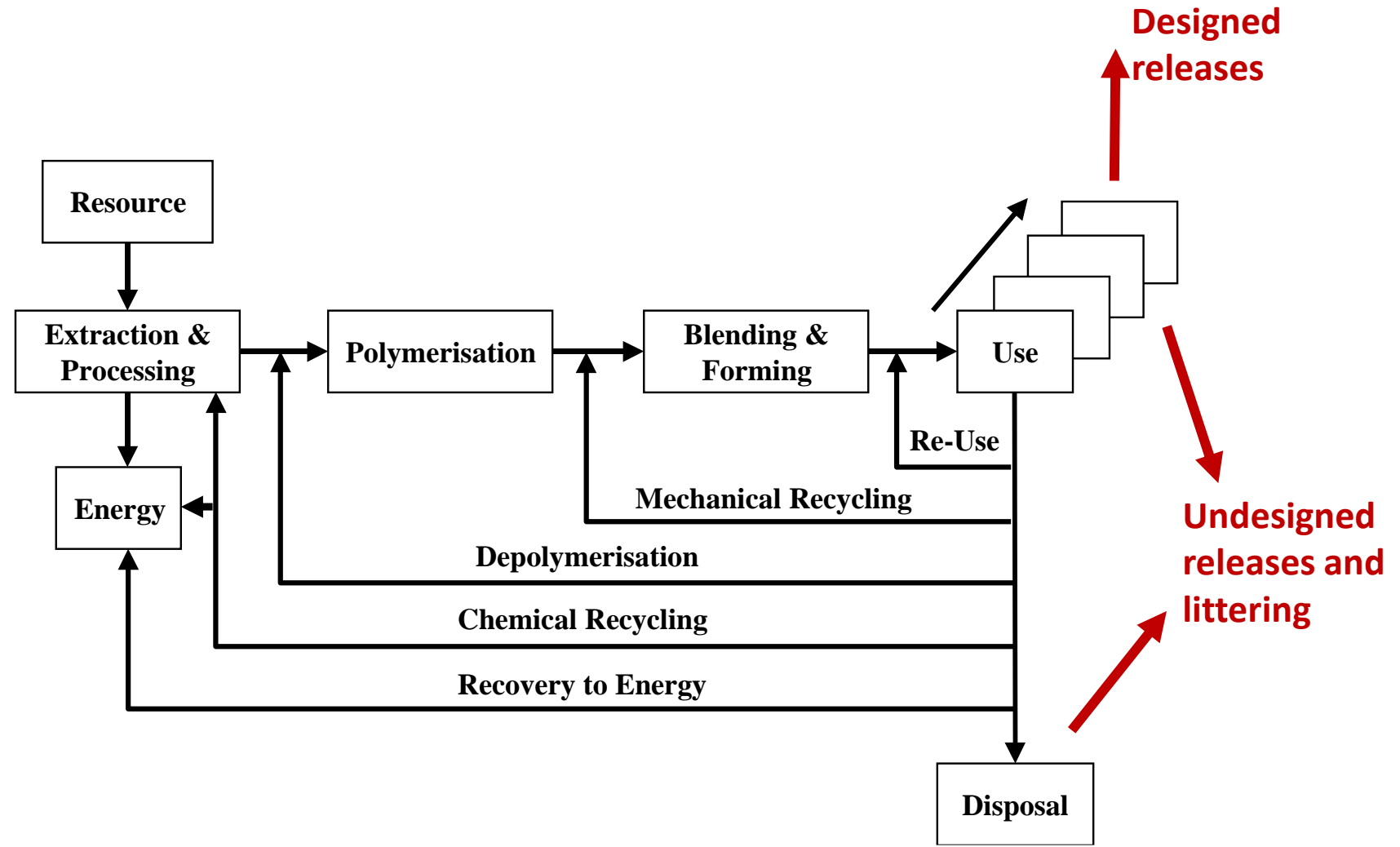
Source: Geyer et al., Science Advances 2017

ASSERTION 3:

Plastics are to some extent already used in a “circular” ecology

- Re-use is usually more “environmentally efficient” than recycling but it requires effective deposit/return systems and also standardisation of packaging
- Energy recovery must be seen as part of “circular” use
- The environmental impacts of plastics arise mainly from dispersed or “fugitive” losses: littering, dumping and planned releases

DESIGNED AND UNDESIGNED RELEASES



EXAMPLES OF DESIGNED RELEASES:

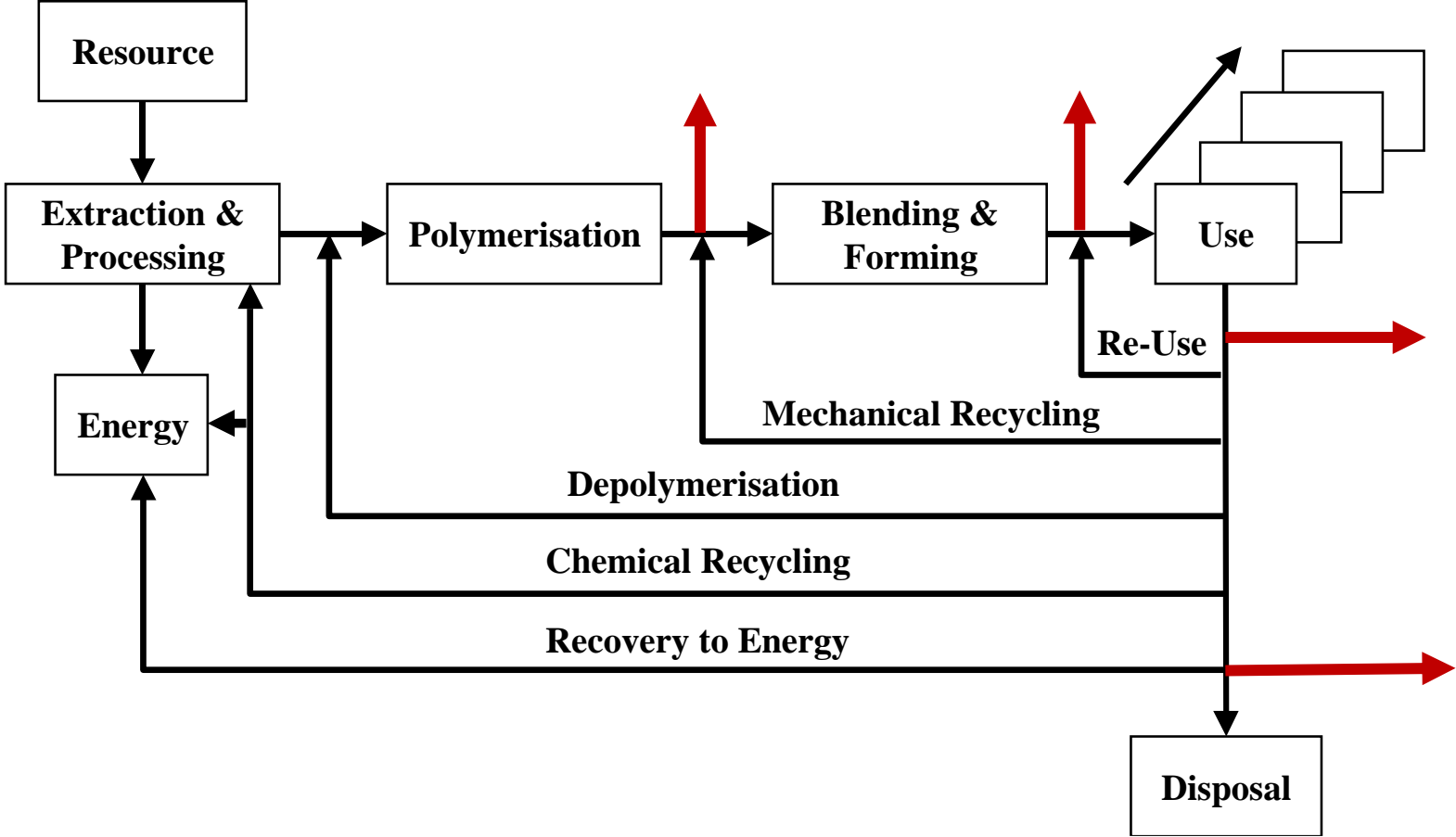
Microbeads and “glitter” in personal care products and cosmetics

Confetti

Balloons

Agricultural and horticultural products

LOSSES FROM TRANSPORT & TRANSPORT PACKAGING



OTHER PROBLEMS:

Biodegradability is at best a partial solution; tests of biodegradability may not be representative

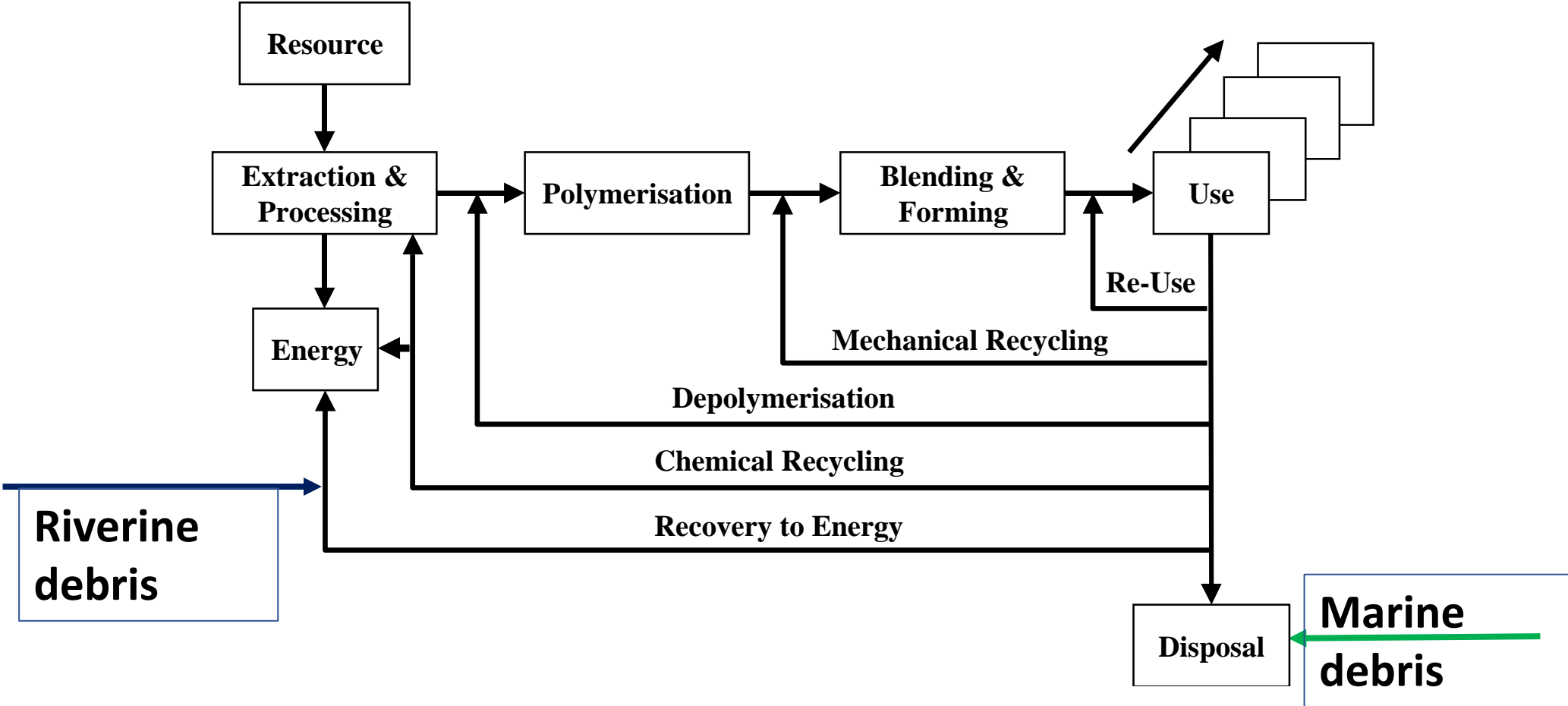
Fragmentation may make impacts worse

In the marine environment, materials and volumes are more important than number of items

Other dispersed sources, such as dust from tyres, are significant

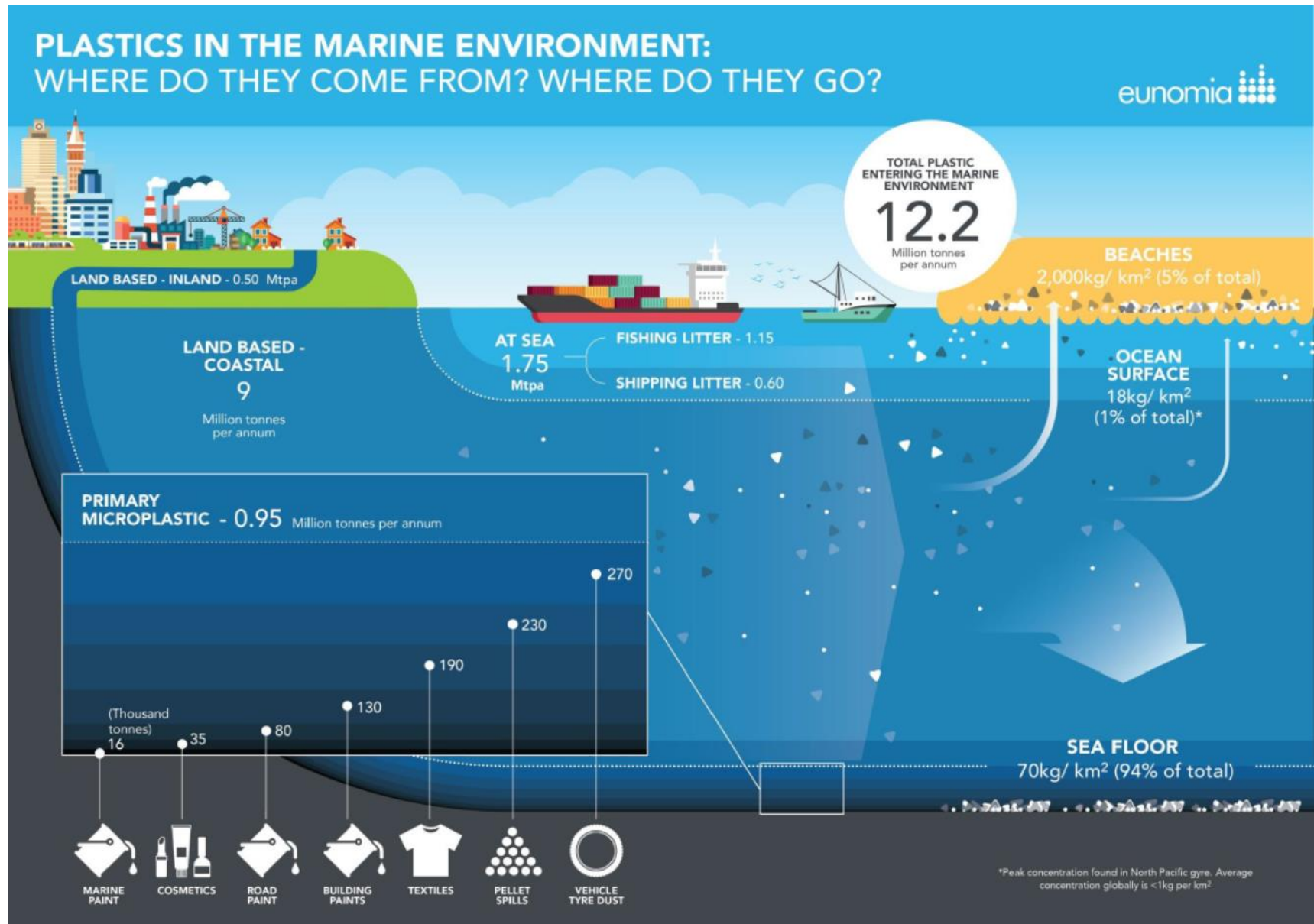
Riverine transport means that sources away from coasts are significant; therefore the published estimates of plastics entering the oceans are probably too low ...

RECOVERED DEBRIS



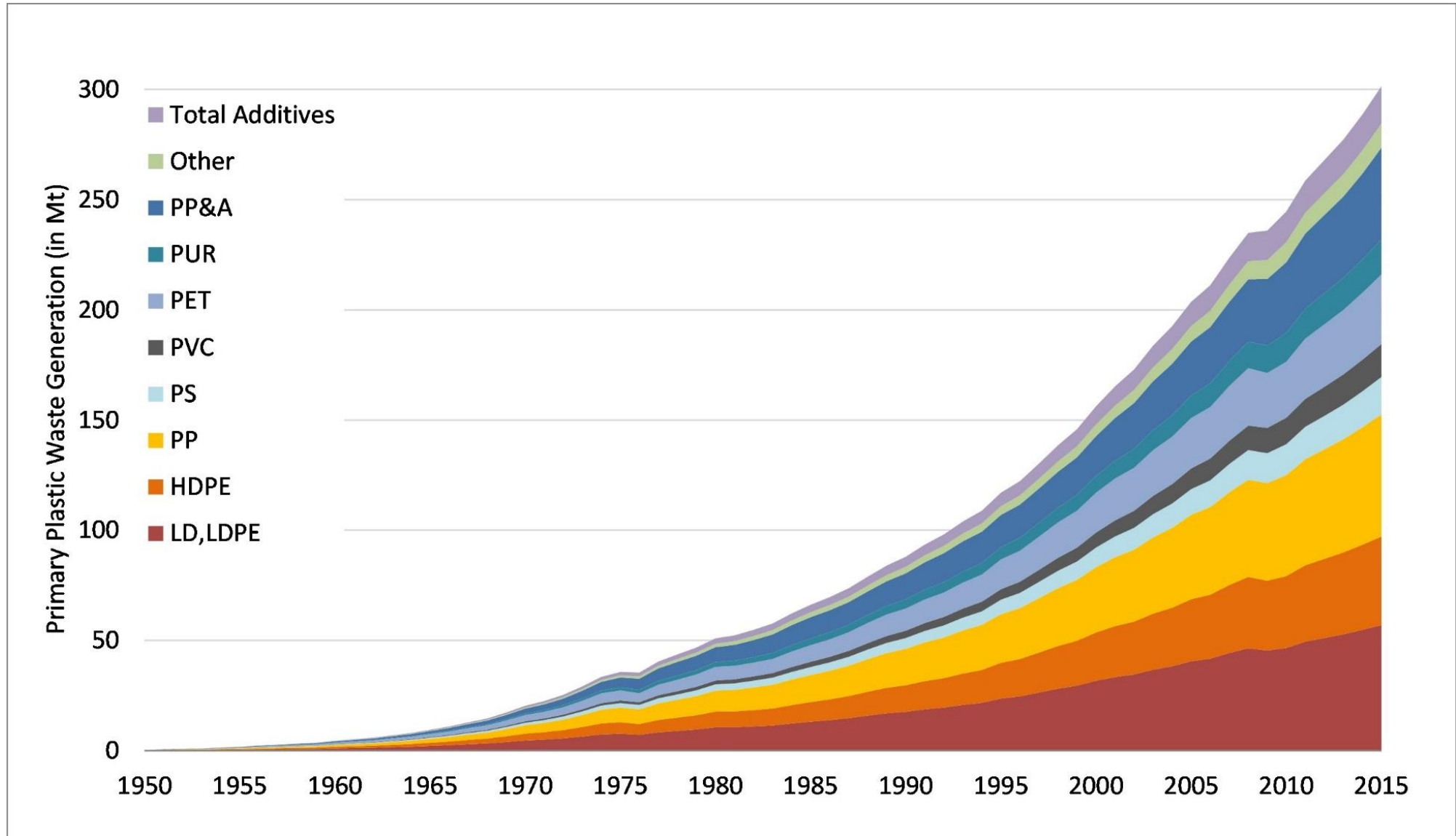
ADDITIONAL SLIDES





Source: Eunomia - 2016 - Plastics in the Marine Environment

Waste Generation



Source: Geyer et al., Science Advances 2017