

U.S. Government Activities Related to Nanoplastics

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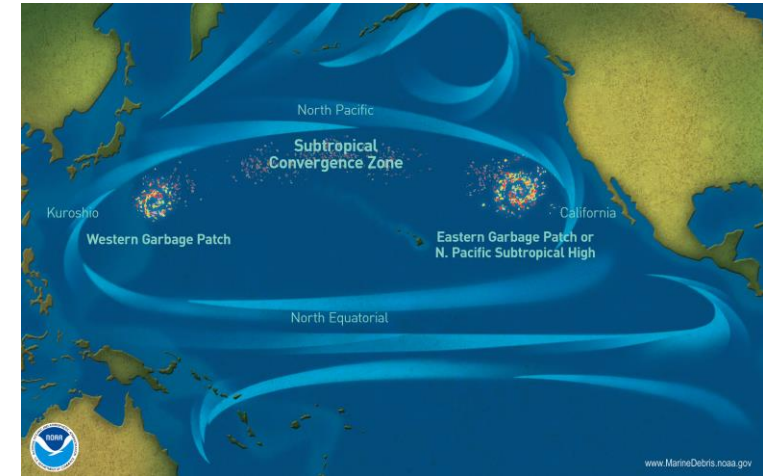
U.S. Food & Drug Administration

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*Disclaimer: The views expressed are of the presenter and should not be considered
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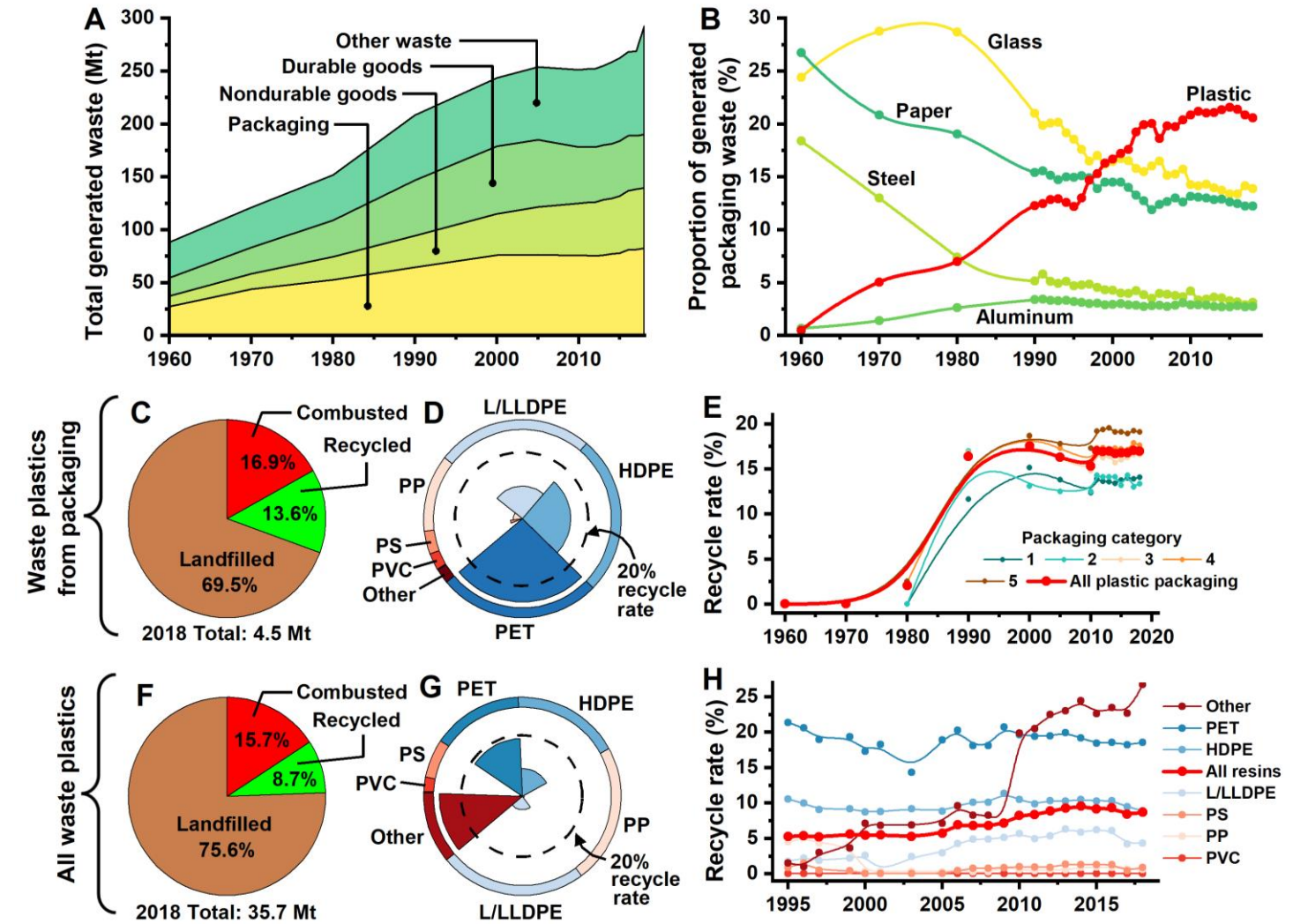
Plastic Pollution: A Global Problem

- A large variety of plastics sources
- Plastic debris in environment can degrade into micro/nanoplastics, leading to biopersistence, bioaccumulation, and exposure
- Human exposure can occur through inhalation, ingestion and dermal routes
- Significant knowledge gaps exist, especially for nanoplastics, for the detection, identification, and quantitation, to conduct exposure, hazard and risk assessment



Generation and fate of plastics in municipal waste in US

- Increase in solid waste, especially plastic waste in US
- Various different compositions
- Very low recycling rates that remained constant over the past few decades
- Most waste end up in landfills



Informal Interagency Nanoplastics Interest Group

Origins and Purpose

- Formed in 2019 under Nanoscale Science, Engineering, and Technology (NSET) Subcommittee
- Staff support from the National Nanotechnology Coordination Office (NNCO)
- Purposes include:
 - Share information
 - Enhance collaborations and coordinate research
 - Minimize redundancies, leverage resources and capabilities
 - Understand knowledge gaps
- Thrust areas:
 - Collection & Characterization
 - Hazard, Exposure, & Risk Assessment
 - Reduction & Mitigation
- Members from 20 government agencies

What are Micro and Nanoplastics

- Micro and nanoplastics can be engineered particles or generated from bulk plastics through degradation
- No standard definitions exists

Microplastics
1 μm – 5 mm

Nanoplastics
1 nm-1000 nm

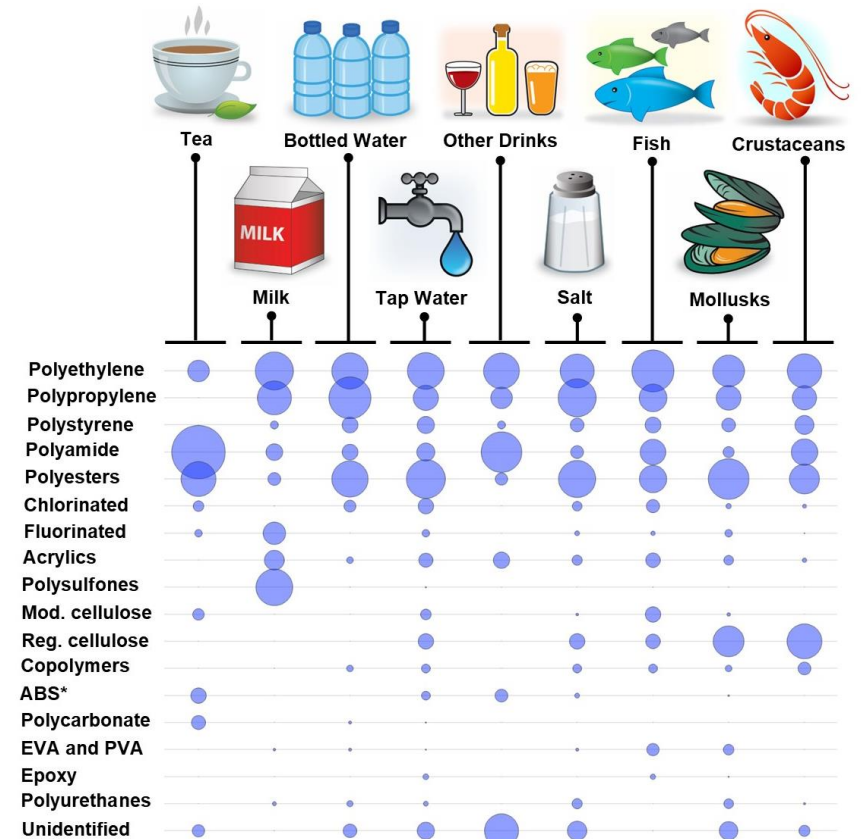
Fragments, Fibers, Spheroids, Granules, Pellets,
Flakes, Beads

- Primary particles: Particle made commercially in micron or nano size range
- Secondary particles: Particles from degradation of bulk/primary particles



Microplastics

- Microplastics are ubiquitous & found in bottled water, milk, beverages, food, sea food, salt, tap water
- Various compositions of these MPs are found to variable extent
- It is difficult to conduct a meta analysis of the various polymer types, size, concentration due to data variability
- Recent publications indicate microplastics presence in blood, urine, and different organs



N = approx. 90 studies

National Nanotechnology Initiative: Webinars on Micro and Nanoplastics

Overview of U.S. Government Activities Addressing Micro- and Nanoplastics Issues - Research Agencies

https://www.youtube.com/watch?v=Axr4_b7Jlho

- National Institute of Standards and Technology (NIST): Kate Beers
- National Science Foundation (NSF): Anne-Marie Schmoltner
- U.S. Department of Agriculture (USDA): Hongda Chen
- Department of Energy (DOE): Ben Maurer
- National Oceanic and Atmospheric Administration (NOAA), Marine Debris Program: Amy Uhrin
- U.S. Geological Survey (USGS): Shawn Fisher
- National Institute of Environmental Health Sciences (NIEHS): Nigel Walker

Overview of U.S. Government Activities Addressing Micro- & Nanoplastics Issues: Regulatory Agencies

<https://www.youtube.com/watch?v=QfnDG16OGjg>

- Department of State (DOS): Rob Wing
- Environmental Protection Agency (EPA): Kay Ho
- Food and Drug Administration (FDA): Stacey Wiggins
- Center for Disease Control (CDC); ATSDR & NCEH: Custodio Muianga, Gaston Casillas, Max Zarate-Bermudez
- Consumer Products Safety Commission (CPSC): Joanna Matheson

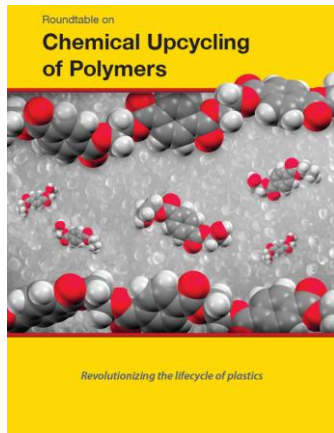
Examples of Agency Activities, Reports, Funding in USA

Environmental Protection Agency (EPA)

- Workshops
- Internal Research
- Reference Materials and Methods
- Sample Collection, Analysis, Monitoring
- Research Funding
- Exposure, Hazard, Risk Assessment

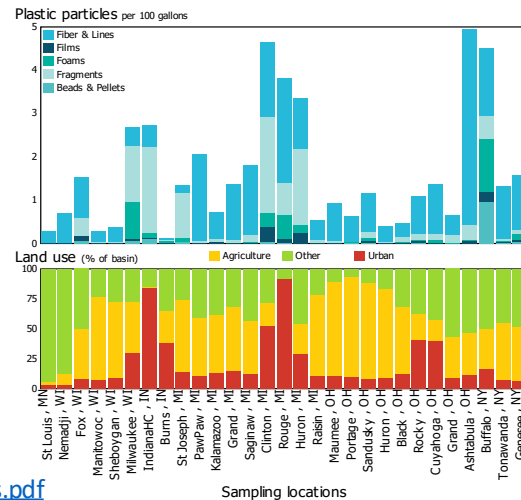


Department of Energy (DOE)



https://science.osti.gov/-/media/bes/pdf/reports/2020/Chemical_Upcycling_Polymers.pdf
<https://www.energy.gov/science/articles/department-energy-announces-25-million-investment-polymer-upcycling-research>

US Geological Survey



<https://owi.usgs.gov/vizlab/microplastics/>

<https://www.epa.gov/trash-free-waters>
<https://www.epa.gov/trash-free-waters/science-case-studies>
<https://www.epa.gov/water-research/microplastics-research>

US Agencies activity

- DOE Waterborne Plastics Assessment and Collection Technologies (WaterPACT) (<https://mooreplasticresearch.org/waterpact-project/>)
 - Launched in 2022, Will study four major river systems under varying conditions (low water, high water, flood): Mississippi, Delaware, Los Angeles, Columbia.
 - Goal is a 50% reduction in plastic emissions to water in the next 25 years.
- USGS Urban Waters Federal Partnership project: water sampling for identification/quantification of microplastic particles and fibers (<https://www.usgs.gov/mission-areas/water-resources/science/urban-waters-federal-partnership-cooperative-matching-funds>)
 - Implementing ASTM standard methods for collection (D8332-20) and preparation (D8333-20) of water samples for identification/quantification of microplastics and fibers
- Microfiber Pollution (<https://www.federalregister.gov/documents/2022/09/15/2022-19939/request-for-public-comment-on-report-on-microfiber-pollution>)
 - Required by Save our Seas Act 2.0. Interagency Marine Debris Coordinating Committee (IMDCC)-coordinated effort led by EPA and NOAA.
 - EPA Trash-Free Waters program draft report released for public comment on Federal Register, 9/15/22: <https://marinedebris.noaa.gov/interagency-marine-debris-coordinating-committee-reports/report-microfiber-pollution>.

FDA Interest related to Micro Nanoplastics

- Evidence suggests that microplastics may be present in several FDA regulated products such as bottled water, sea food, animal food & feed, salt, sugar, and beverages.
- FDA has been monitoring scientific literature and research on micro nanoplastics and collaborating with other federal agencies through to address scientific questions and knowledge gaps
- FDA actively participates in discussions with regulatory entities from across the globe, organized global summits and workshops to understand the implications of these contaminants



FDA Website: Microplastics and Nanoplastics in Foods:

<https://www.fda.gov/food/environmental-contaminants-food/microplastics-and-nanoplastics-foods>

Regulatory Science Perspective on the Analysis of Microplastics and Nanoplastics in Human Food

<https://pubs.acs.org/doi/full/10.1021/acs.analchem.3c05408>

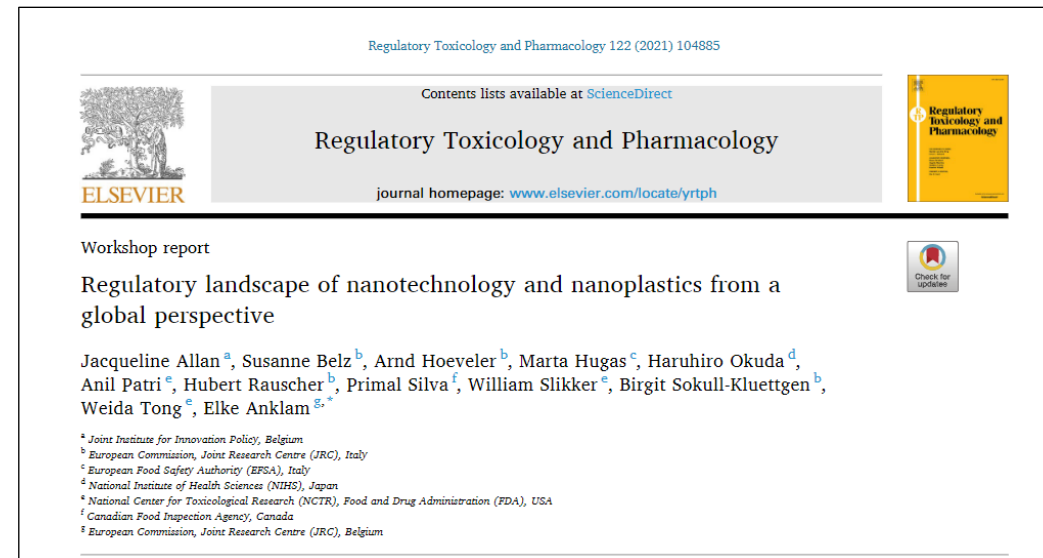
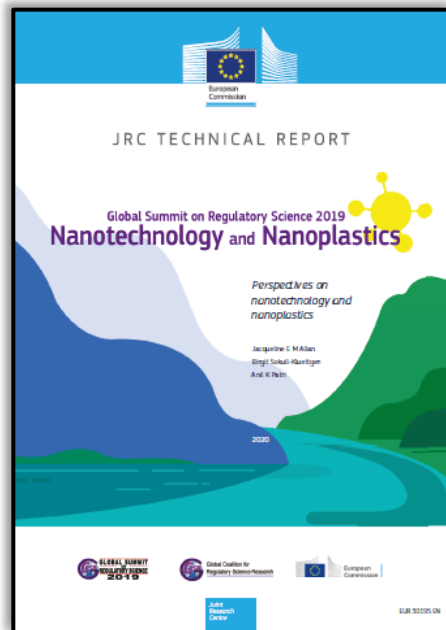
Comprehensive analysis of common polymers using hyphenated TGA-FTIR-GC/MS and Raman spectroscopy towards a database for micro- and nanoplastics identification, characterization, and quantitation <https://pubmed.ncbi.nlm.nih.gov/37196807/>

GSRs19 Nanotechnology and Nanoplastics

Sept 24-26, 2019; Stresa, Italy.

Co-hosted by the Joint Research Center/EC

- Attended by 200 scientists from 36 countries
- Identified knowledge gaps, Research needs for regulatory purposes
- Coordination and collaboration
- Standards development



Report: <https://ec.europa.eu/jrc/en/publication/global-summit-regulatory-science-2019-nanotechnology-and-nanoplastics>

APEC Workshop on Nanoplastics in Marine Debris

DEC 13 - 15, 2021

REGISTER



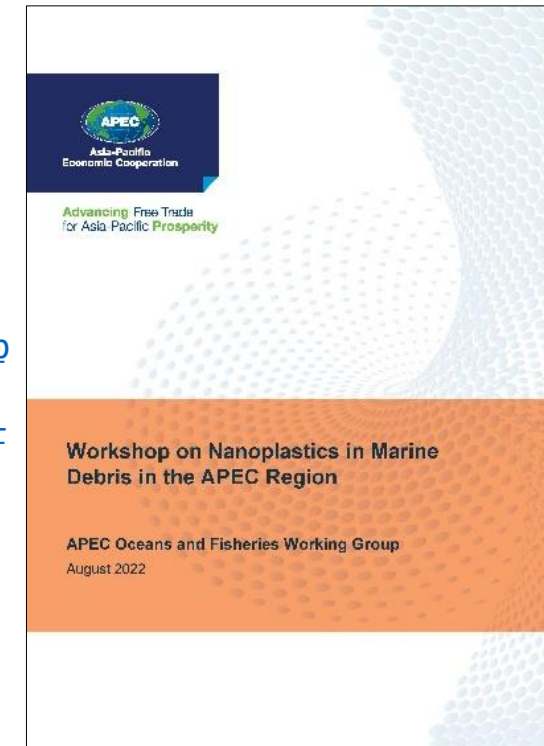
- Oceans and Fisheries Working Group (OFWG)
- Co-sponsoring economies: Chile, Korea, Chinese Taipei, Thailand
- www.nanoplasticworkshop.org
- Videos of the workshop available

Sessions

- Best practices and research methods
- Environment and human exposure
- Terminology
- MNP mitigation, remediation, and recycling
- Regulations on intentionally used plastics
- Approaches for addressing nanoplastic

APEC Workshop on Nanoplastics in Marine Debris:

- https://www.apec.org/docs/default-source/publications/2022/8/workshop-on-nanoplastics-in-marine-debris-in-the-apec-region/222_ofwg_workshop-on-nanoplastics-in-marine-debris-in-the-apec-region.pdf



Recent Global Engagement

- UNEA resolution, May 2022: Goal of legally binding agreement to end plastic pollution (https://wedocs.unep.org/bitstream/handle/20.500.11822/39812/OEWG_PP_1_INF_1_UNEA%20resolution.pdf)
 - Latest in series of related UN Environment Assembly resolutions since 2014
 - Goal is to negotiate “international legally binding instrument” by 2024.
- Interagency Policy Committee (IPC) on Plastic Pollution and a Circular Economy, Effort to Develop a National Action Plan on Plastics (<https://www.whitehouse.gov/briefing-room/statements-releases/2023/04/21/fact-sheet-president-biden-signs-executive-order-to-revitalize-our-nations-commitment-to-environmental-justice-for-all/>)
- Collaboration with Europe and Other Global Regions on Micro- and Nanoplastics Research
 - EPA, NIST, and FDA involved in collaborations with the EU about micro- and nanoplastics research, methods and reference materials development
 - FDA co-organizing the Global Summit on Regulatory Science in Parma, Italy, Sept. 27-28, 2023, which included a focus on food-related micro-nanoplastics issues.
 - U.S.-EU nanoEHS Communities of Research (CORs) workshop, Nov. 16-17, 2023 also included focused discussions on micro-/nanoplastics issues. Keynote presentation from Korea highlighted the need for increased collaboration on this topic with APEC region. (<https://us-eu.org/2023-u-s-eu-nanoehs-communities-of-research-workshop/>)

Data Needs: Methodology

A consistently applied toolset will improve the **reliability of individual studies** and facilitate **cross-study comparisons**.

- Consensus terminology, definitions and fit-for-purpose metrics
- Standards and certified reference materials
- Standardized sampling methods, including steps to reduce sample contamination before and during measurement
- Fit-for-purpose, standardized, and validated methods for detecting, characterizing/confirming, and quantifying unknown MPs **and NPs** and their mixtures in relevant food commodities
- Further development of mass-based MP **and NP** quantification methods to complement the current particle-centric quantification tool set
- Use of real-world mixtures and concentrations of MPs **and NPs** in method development initiatives

Thank you