ANATOMY OF PLASTICS WHAT'S IN MY PLASTICS?



1 2 3 $(\mathbf{4})$

MONOMERS AND POLYMERS

constitute main building blocks of plastic material

ADDITIVES

bring desired functionality to the plastic material

OTHER INTENTIONALLY ADDED SUBSTANCES

such as starting materials and catalysts

NON-INTENTIONALLY ADDED SUBSTANCES such as solvents, cleaning agents, or impurities from manufacturing or recycling 34%

28%

13%

25%

BREAKDOWN

most widely produced plastic additivies*

*Source: Geyer et al. 2017

Plasticizers

to make plastic softer and flexible e.g. phthalates, chlorinated parafins

Fillers

that occupy space without changing functional properties e.g. mica, talc or clay

Flame retardants

to reduce flammability and prevent spread of fire - e.g. brominated and chlorinated flame retardants

•• Other

including colorants, antioxidants, heat and light stabilizers, lubricants, biocides or antistatic agents

Source: United Nations Environment Programme and Secretariat of the Basel, Rotterdam and Stockholm Conventions (2023). **Chemicals in plastics: a technical report.** Geneva.

CHEMICALS IN PLASTICS PRIORITY USE SECTORS

environment programme

Source: United Nations Environment Programme and Secretariat of the Basel, Rotterdam and Stockholm Conventions (2023). Chemicals in plastics: a technical report. Geneva.



CHEMICALS IN PLASTICS OVERVIEW

Source: United Nations Environment Programme and Secretariat of the Basel, Rotterdam and Stockholm Conventions (2023). **Chemicals in plastics: a technical report.** Geneva.



*NIAS = non-intentionally added substances, including (1) break-down products of polymers, additives and other chemicals in plastics, (2) impurities, (3) contaminants from processing such as production and recycling, and (4) reaction byproducts.



CHEMICALS OF CONCERN IN YOUR PLASTICS



HUMAN EXPOSURE TO CHEMICALS IN PLASTICS

SOURCES



EVERYDAY PLASTIC PRODUCTS, e.g. plasticbased food contact materials, building materials, electronics, textile, clothing and personal care and household products



CHILDREN'S products e.g. toys, clothing or furniture.



OCCUPATIONAL exposure at various stages of the plastic value chain

EXPOSURE PATHWAYS examples

inhalation of contaminated air

ingestion of contaminated food, water and dust

dermal contact

ADVERSE HEALTH EFFECTS examples

abnormal hormone functions

reduced fertility

damaged nervous system

hypertension/ cardiovascular disease

lung and liver cancer



Source: United Nations Environment Programme and Secretariat of the Basel, Rotterdam and Stockholm Conventions (2023). **Chemicals in plastics: a technical report.** Geneva.

HAZARDOUS CHEMICALS ALONG THE PLASTIC LIFE CYCLE

Source: United Nations Environment Programme and Secretariat of the Basel, Rotterdam and Stockholm Conventions (2023). **Chemicals in plastics: a technical report.** Geneva.

Hazardous chemicals can be released from plastics along the entire life cycle, finding their way to air, water and soils.



EXTRACTION and processing of raw materials



RECYCLING Additives can make recycling of plastics challenging, and limit material circularity e.g. by contaminating new

PLASTIC PRODUCTION

Chemicals are added e.g. as additives to make material stronger, softer, colorful or fire resistant



PLASTIC PRODUCT MANUFACTURE

Chemicals are added to enhance the product properties





USE OF PLASTIC PRODUCT Chemicals can be released during the use of plastic products



DISPOSAL

Open-burning of plastic waste can release toxic chemicals such as dioxins and furans

OPTIONS FOR ADDRESSING CHEMICALS ALONG THE PLASTIC LIFE CYCLE

Source: United Nations Environment Programme and Secretariat of the Basel, Rotterdam and Stockholm Conventions (2023). **Chemicals in plastics: a technical report.** Geneva.







REGULATIONS:

ADDRESS fragmentation and gaps in legal frameworks to cover chemicals along plastic life cycles RESTRICT chemicals of

concern in plastics globally



SCIENCE:

DEVELOP more robust methodologies to assess human and ecosystem exposure, and further research on impacts, in particular with respect to mixtures and multiple exposure pathways.



TRANSPARENCY:

IMPROVE transparency and information-sharing on chemicals along the plastic value chain



RAISE awareness on workplace safety and exposure reduction measures along the plastic value chain