



Chemicals in plastic packaging: Prioritization of hazardous substances

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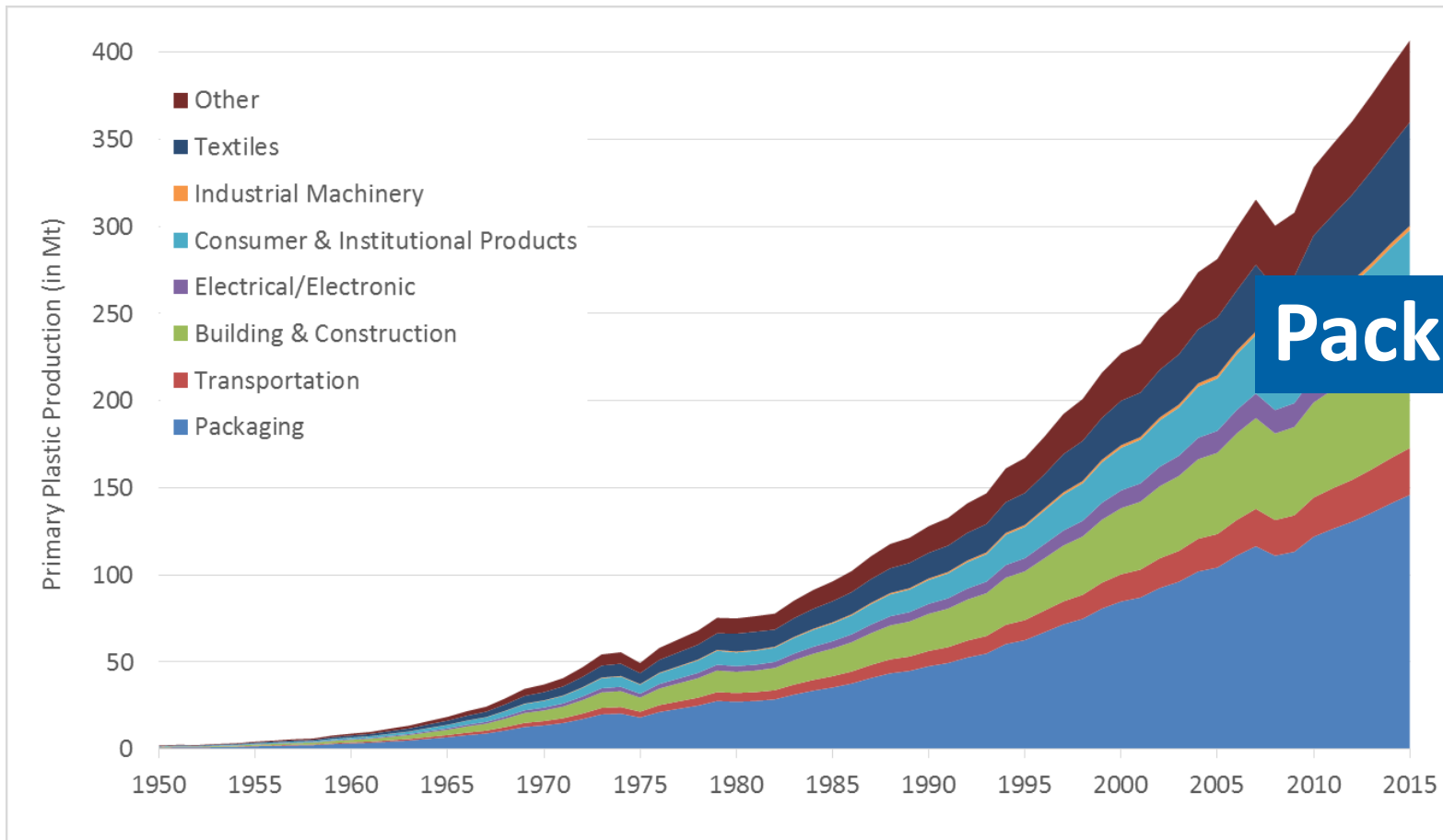
⁵ independent consultant, USA

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<https://www.foodpackagingforum.org/about-us/research-project>



Global plastics production by use (Geyer et al. 2017)



Packaging: ~40%



Geyer, Roland, Jenna R. Jambeck, and Kara Lavender Law (2017) Production, use, and fate of all plastics ever made. Science Advances 3(7). <http://advances.sciencemag.org/content/3/7/e1700782.full>

Project on hazardous chemicals in plastic packaging – Introduction

Motivation

- packaging is largest plastics use with significant environmental pollution
- concerns about environmental and human health effects of chemicals in plastics but: many data gaps and unknowns

Aims

- identify chemicals associated with plastic packaging
- assess and rank their hazards
- identify priority hazardous substances for substitution

Method

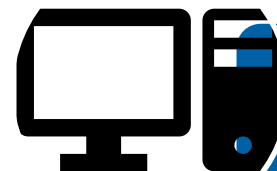
U.S. EPA's Chemicals and Product Categories database CPCat

<http://actor.epa.gov/cpcat/>

selected books and reports on analytics and use of chemicals in plastics

commercial web-sites on plastics additives

Database of chemicals associated with plastic packaging
CPPdb



Indicative CLP (QSARs)

CLP harmonized hazard data

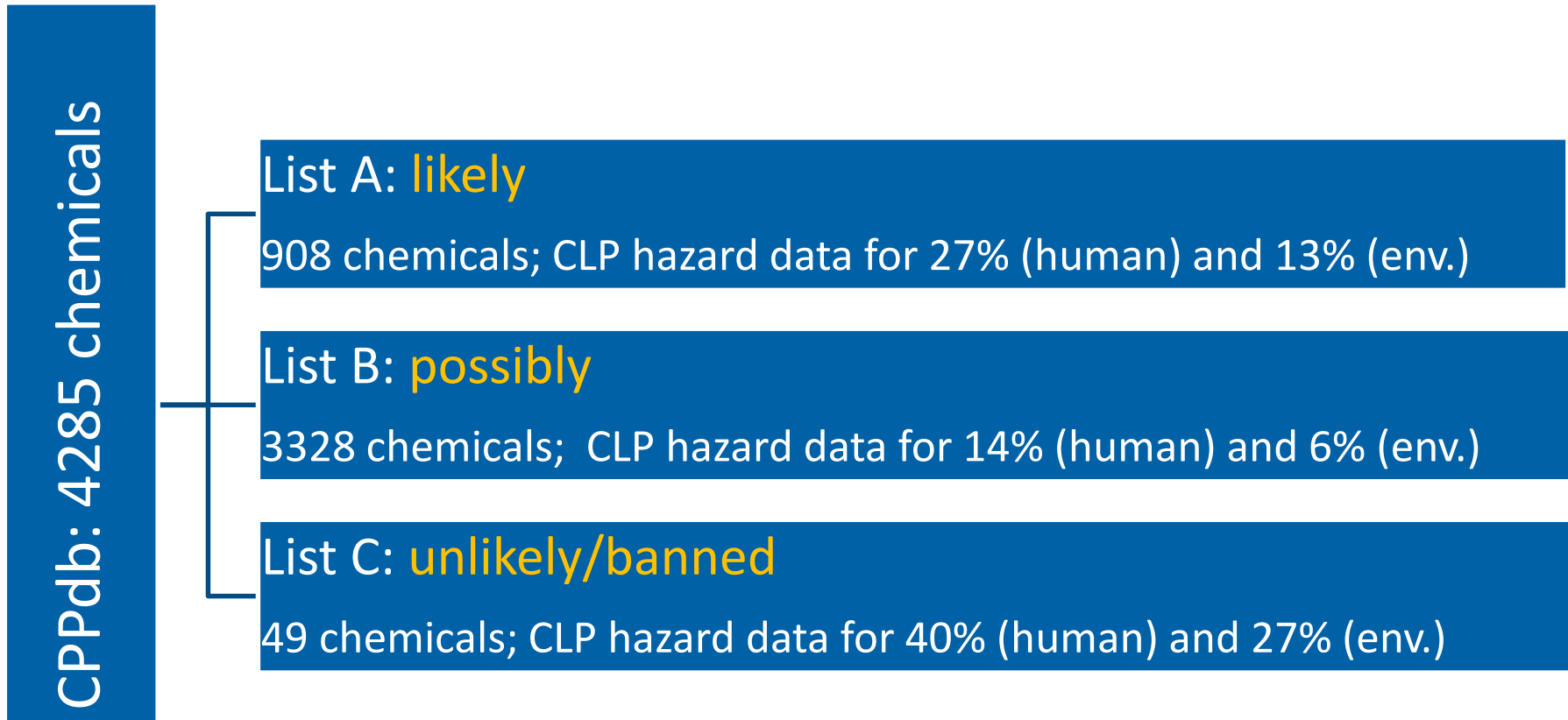


EDC and PBT/vPvB classifications in the EU



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Chemicals associated with plastic packaging (CPPdb): use and hazard information



- information on the actual use and levels in products challenging to obtain and compile
- systematic assessment of non-intentionally added substances impossible, many unknowns
- many gaps in hazard data, requires more dedicated work to compile

Ranking of hazardous chemicals (List A)

Hazard ranking according to method by Delila Lithner et al. (2011)

harmonized CLP for human health (sum hazard score 10000-32100)

64

harmonized CLP for environment (sum hazard score 1100):

68

indicative CLP for human health (sum hazard score 1000-2110):

102

EDC classification, REACH:

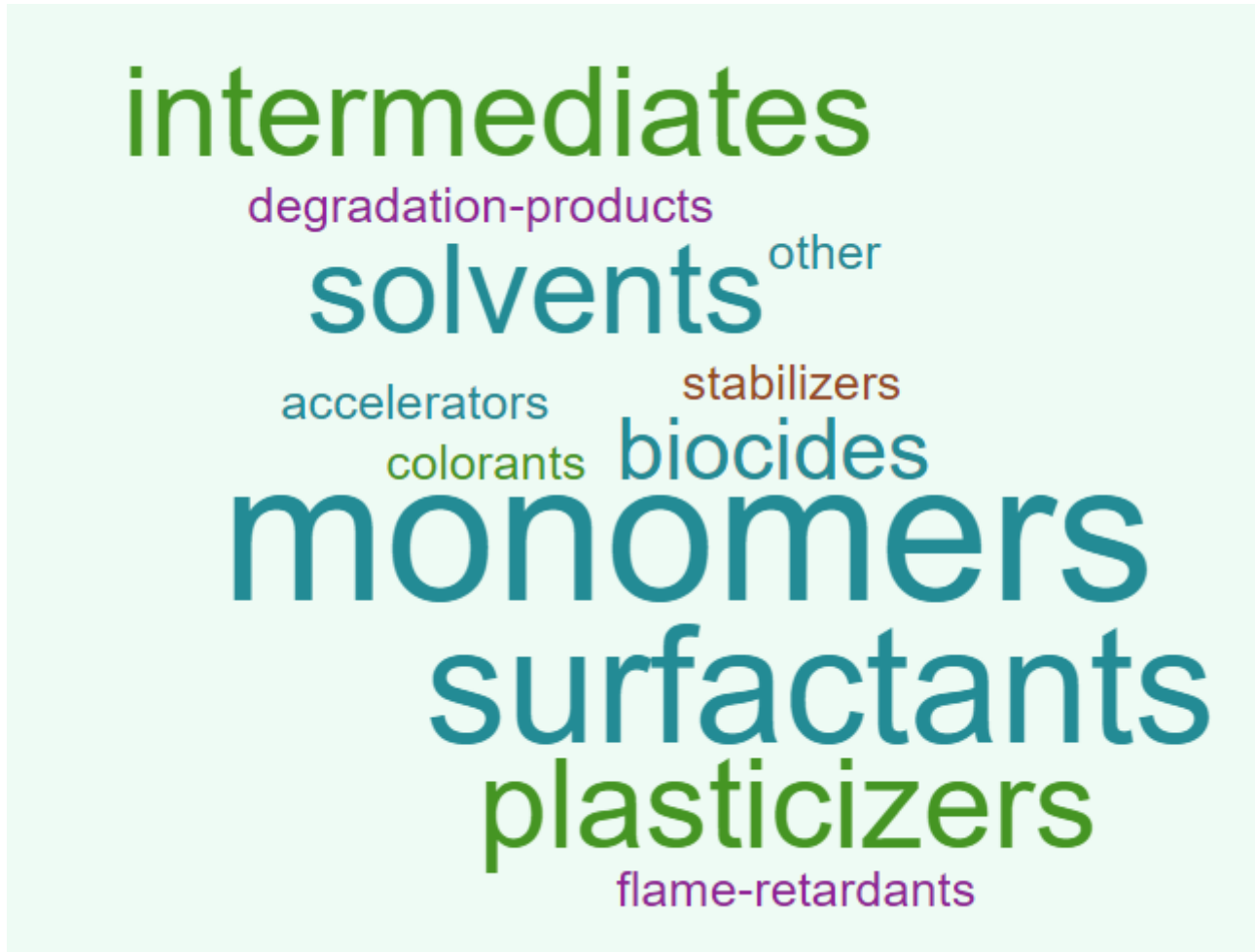
15

PBT or vPvB classification, EU:

7

Lithner, D. et al. 2011 Environmental and health hazard ranking and assessment of plastic polymers based on chemical composition. Science of The Total Environment 409(18):3309-3324.

Functions of the highest ranking hazardous chemicals on List A



Chemical Hazard Data Commons: <https://commons.healthymaterials.net>



Assessments Discussions Comparisons Library

Home

My Chemical Comparisons / Comparison of selected monomers and additives in plastic packaging

Comparison of selected monomers and additives in plastic packaging

Shared privately by Michel Dedeo, Chemist, Healthy Building Network

User notes:

Example comparison of selected monomers and additives used in the manufacture of plastic packaging, extracted from the bigger list which will be later this year. See the Plastic Packaging Chemicals Discussion for more info.

[Export to Excel](#)

Actions	CASRN	Chemical Name	Score	Group I Human										Group II and II* Human								Ecotox			Fate		Physical		Non-GSLT			Mult		Other
				C	M	R	D	E	AT	ST	ST	N	N	SnS	SnR	Irs	Ire	AA	CA	ATB	P	B	Rx	F	PBT	GW	O	Mult	Other					
				sin	rep	sin	rep	sin	rep	sin	rep	sin	rep	sin	rep	sin	rep	sin	rep	sin	rep	sin	rep	sin	rep	sin	rep	sin	rep	sin	rep			
	80-05-7	BISPHENOL A (BPA)	BM-1	M	L	M	H	H	L	M	M	DG	DG	M	L	L	vH	H	L	-	L	vL	L	L	-	-	-	-	R					
	80-09-1	Bisphenol S (BPS)	LT-P1					H-M	L							M	H											U	R					
	84-66-2	DIETHYL PHTHALATE (DEP)	LT-P1	H-L				H-M	M					H	M	H	M	H		M	vH-H							M	R					
	85-68-7	BUTYL BENZYL PHTHALATE (BBP)	LT-1	M		H-M	H	H	L						M	M		vH	H		pC	vH						H	R					
	131-11-3	DIMETHYL PHTHALATE (DMP)	LT-P1	H-L				H-M	H						M		H	M		M	vH-H							M	R					
	117-84-0	DI-N-OCTYL PHTHALATE (DNOP)	LT-P1			M-L	H-M	H-M							M						pC	pC						U	R					
	119-07-3	1,2-Benzenedicarboxylic acid, decyl	LT-UNK												M													U	R					
	103-23-1	DI(2-ETHYLHEXYL)ADIPATE (DEHA)	LT-P1	M		M		H-M								M					pC	pC						U	R					
	128-37-0	Butylated hydroxytoluene	LT-P1	M		M	M-L	H-M	M					H			M	vH	vH	M				pC				vH	R					
	2440-22-4	2-[2'-HYDROXY-5'-METHYLPHENYL]	LT-UNK											H														U	R					
	25013-16-5	BUTYLATED HYDROXYANISOLE (B...	LT-1	H		M	M-L	H-M	M					H			H	H	M									U	R					
	25973-55-1	2-[2H-BENZOTRIAZOL-2-YL]-4,6-D	LT-1																	vH		vH				vH		H	R					
	3896-11-5	BUMETRIZOLE	LT-P1											H			H		M			vH						U	R					
	6846-50-0	2,2,4-trimethyl-1,3-pentanediol diis	LT-P1					H-M														vH						U	R					
	3864-99-1	PHENOL 2-(5-CHLORO-2H-BENZC	LT-1						M													vH-H					vH		U	R				
	36437-37-3	2-(2H-benzotriazol-2-yl)-4-(tert-bu	LT-1																			vH					vH		H	R				
	137-30-4	ZIRAM	LT-P1	H-L	H	M	M-L	H-M	vH	M	M			H		M	vH	vH	vH	M	vH-H							vH	R					
	112-90-3	(Z)-9-OCTADECEN-1-AMINE	LT-P1						M	M	M						H	vH	vH	vH	M							H	R					
	76-87-9	TRIPHENYL TIN HYDROXIDE	LT-1	H		M	H	H-M	vH	M	H			H		H	vH	vH	vH	M									vH	R				
	900-95-8	STANNANE, ACETOXYTRIPHENYL	LT-1	M		M	M	H-M	vH	M	H			H		H	vH	vH	M										vH	R				
	106-89-8	EPICHLOROHYDRIN	LT-1	H	H	H		H-M	vH-H	M				vH-L	H		vH	vH	M	H	vH-H		M						vH	R				
	85535-85-9	MEDIUM-CHAIN CHLORINATED PA	LT-1	M			H	H-M	H											vH	H		vH-H	vH		H		H	R					
	108-45-2	M-PHENYLENEDIAMINE	LT-P1	M	M	M		H						H			H	vH	H	M	vH-H								vH	R				
	683-18-1	DI-N-BUTYL TIN DICHLORIDE	LT-1	M	M	H	H-M	H-M	vH		H						vH	vH	vH	vH	H								vH	R				
	26523-78-4	NONYLPHENOL PHOSPHITE (3:1)	LT-1				H	H	H-M	M				H-M			vH		vH	H					pC			H	R					
	136-23-2	ZINC DIBUTYLDITHIOCARBAMATE	LT-P1	H-L						M				H-M	M	H	H	vH	vH		vH-H								H	R				
	104-40-5	4-Nonylphenol (linear)	LT-1				H	H	H	M															pC			M	R					
	90-66-4	6,6'-di-tert-butyl-2,2'-thiodi-p-cres	LT-UNK																										U					
	20170-32-5	3-(3,5-di-tert-butyl-4-hydroxyphen	LT-UNK																										U					
	620-92-8	bisphenol F	LT-P1					H-M																						R				



Conclusions

- **4236 chemicals** are associated with plastic packaging
- Information on use, levels and toxicity is challenging or impossible to access: **new approach** using Data Commons
- Many **data gaps** prevail
 - *assessing non-intentionally added substances and mixture effects requires different strategy* **Poster TH284**



Thank you!

www.foodpackagingforum.org

SAVE THE DATE: 4 Oct 2018

Food Packaging Forum Workshop

**“Predicting the safety of food contact articles:
New science and digital opportunities”**

Funding: MAVA Foundation

[More: https://www.foodpackagingforum.org/about-us/research-project](https://www.foodpackagingforum.org/about-us/research-project)

