



From Signals to Strategy – Evaluating Chemical Vulnerability in Your Ingredient Portfolio

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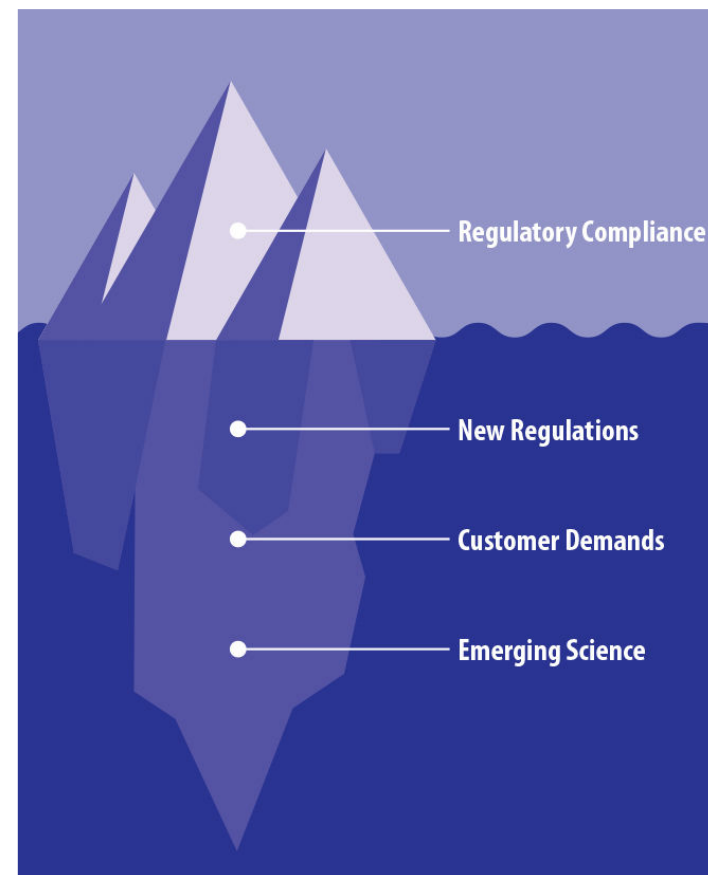
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Society for Chemical Hazard Assessment

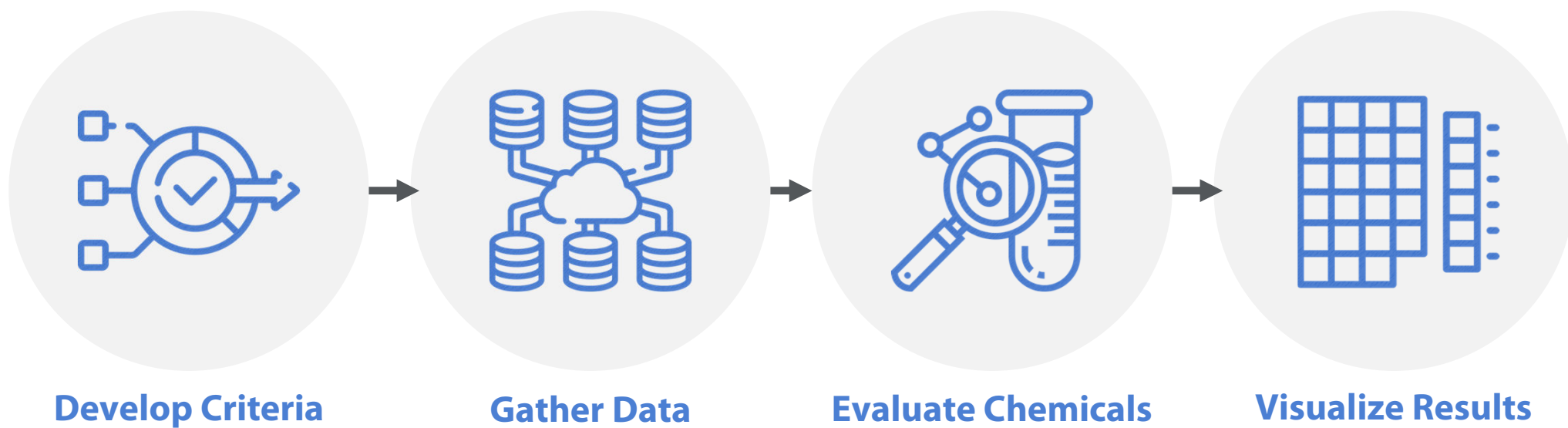
October 7, 2026

Overview of Vulnerability Assessment

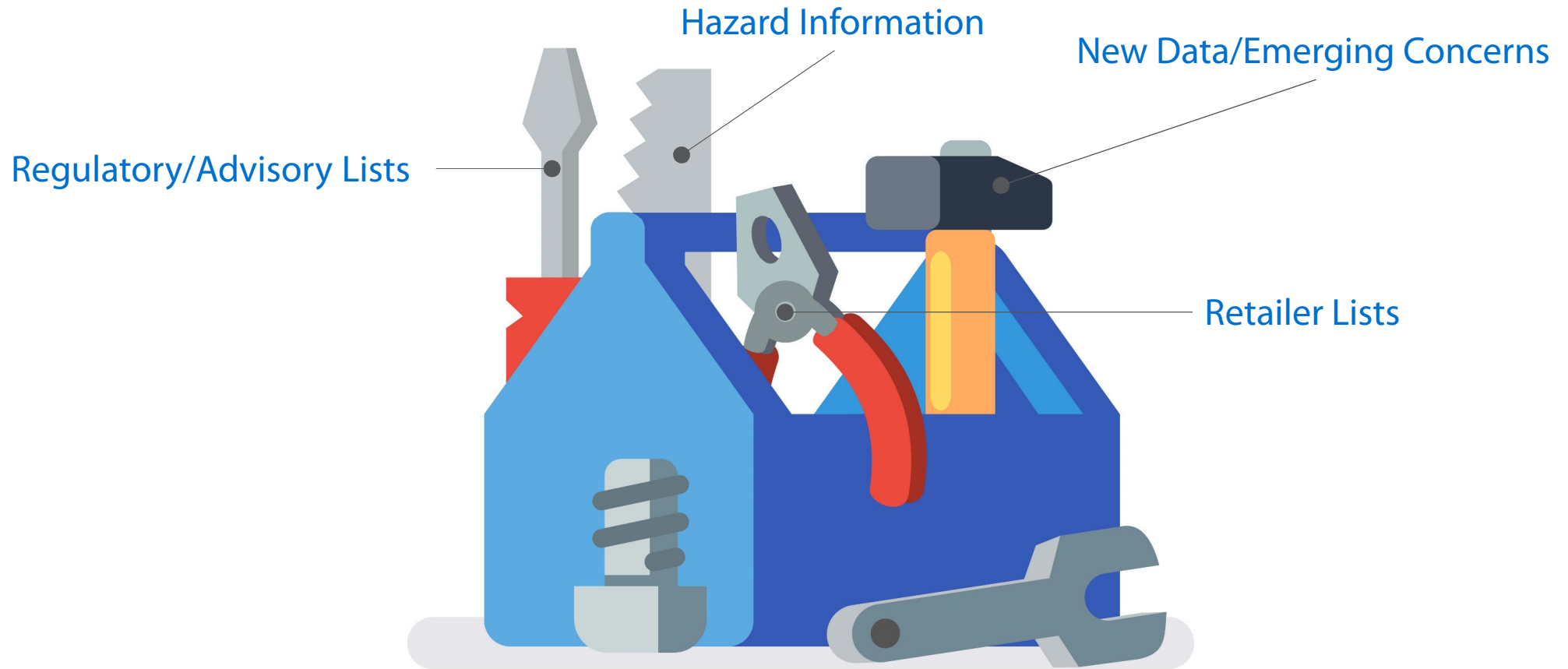
- Integrates hazard and regulatory information with forward-looking data to support decision-making across various product stewardship contexts:
 - Identify chemical vulnerabilities in anticipation of upcoming regulations or emerging topics
 - Prioritize chemicals for review or increased scrutiny
 - Evaluate a company's sustainability efforts/progress



Vulnerability Assessment Approach



Vulnerability Assessment Toolbox



Vulnerability Assessment Toolbox

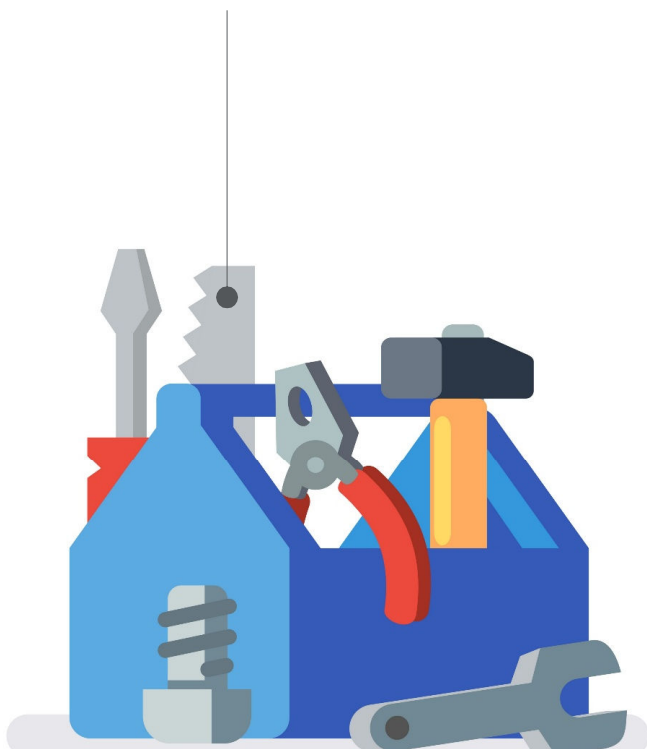
Regulatory/Advisory Lists: Higher scores reflect **greater regulatory burden, labeling obligations, or formal hazard concern**, while negative scores may reflect affirmative safety conclusions from authoritative agencies



- Formal agency cancer classifications (*e.g.*, IARC, NTP, US EPA)
- State-level labeling laws
- Sector-specific agency or advisory lists (*e.g.*, CIR, GRAS, Food Additives Lists)

Vulnerability Assessment Toolbox

Hazard and Risk Information: Presence here reflects **intrinsic hazard classifications** or exposure-based risk



- GHS hazard classifications
- (Q)SAR predictions (*e.g.*, mutagenicity, skin sensitization)
- *In vitro* databases (*e.g.*, endocrine activity)
- Low hazard lists (*e.g.*, Safer Choice, GreenScreen)
- Margin of Exposure (MoE) or Margin of Safety (MoS) calculations
- Detailed toxicological assessment

Vulnerability Assessment Toolbox

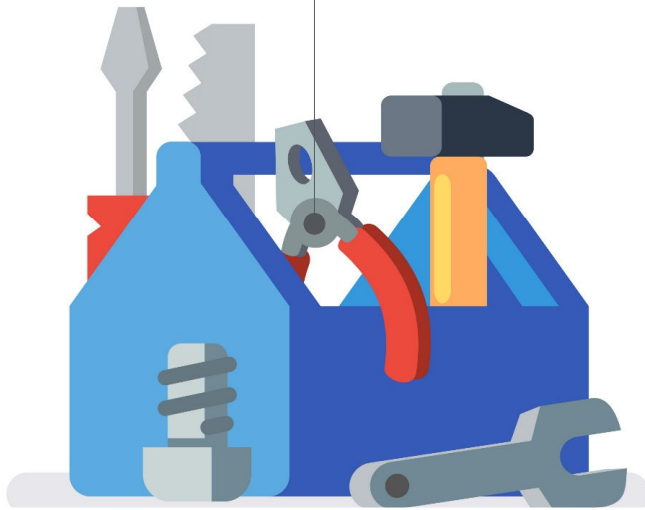
New Data/Emerging Concerns: Scoring in this category reflects **regulatory momentum, potential for new data, and scientific uncertainty**, not confirmed hazard



- Recently published studies in REACH dossiers
- On-going regulatory activity under REACH
- Lists of known/potential endocrine disrupting chemicals (EDCs)
- Peer-reviewed publications
- Lists of “emerging” chemicals of concern or “horizon scanning” lists

Vulnerability Assessment Toolbox

Retailer Lists and NGO programs: Scoring reflects **likelihood of retailer pushback or reformulation pressure**, not regulatory non-compliance



- Sector-related retailer/brand restricted substance lists (RSLs)
- Retailer's Restricted Substances Lists (*e.g.*, Walmart, Target, RiteAid, Sephora, Whole Foods, Home Depot, Staples)
- Brand-Specific Restricted Substance Lists or Labels (*e.g.*, "Clean at Sephora", "Kroger Everyday Essentials", "Target Clean", Publix "GreenWise")
- NGO program scores (*e.g.*, EWG, ThinkDirty)

Developed a screening approach to evaluate personal care ingredients based on vulnerabilities related to safety, regulatory compliance, consumer demands, and emerging concerns.

Case Study 1: Due Diligence Project for Personal Care Products

Develop Criteria

Potential New Data / Emerging Concerns

- Regulatory attention signals (CLH intentions, new REACH dossier studies)
- Early warnings that an ingredient may become more restricted over time (*e.g.*, lists of potential endocrine disruptors)

Hazard Information

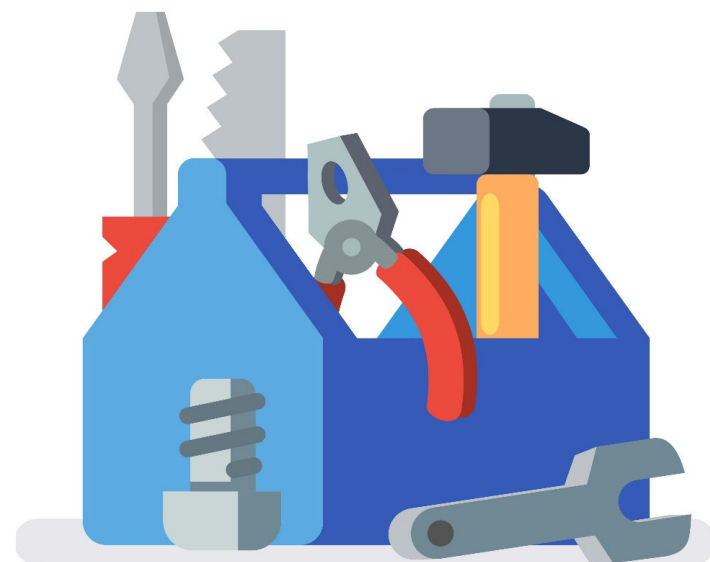
- Harmonized and self-classifications for hazards (*e.g.*, EU, Korea)
- “Low” hazard lists (*e.g.*, US EPA Safer Choice Ingredient List, GreenScreen)

Retailer Lists

- Commercial friction risk, indicator of consumer trends
- Likelihood of restriction by retailers even in absence of regulation

Regulatory / Advisory Lists

- Formal prohibitions and restrictions (*e.g.*, EU Cosmetics Products Regulation, California regulations)
- Authoritative science-based bodies (*e.g.*, CIR, IARC, IFRA)



Example of Weighted Scoring System

Quantitative scoring scheme across various indicators, with higher score indicating higher vulnerability

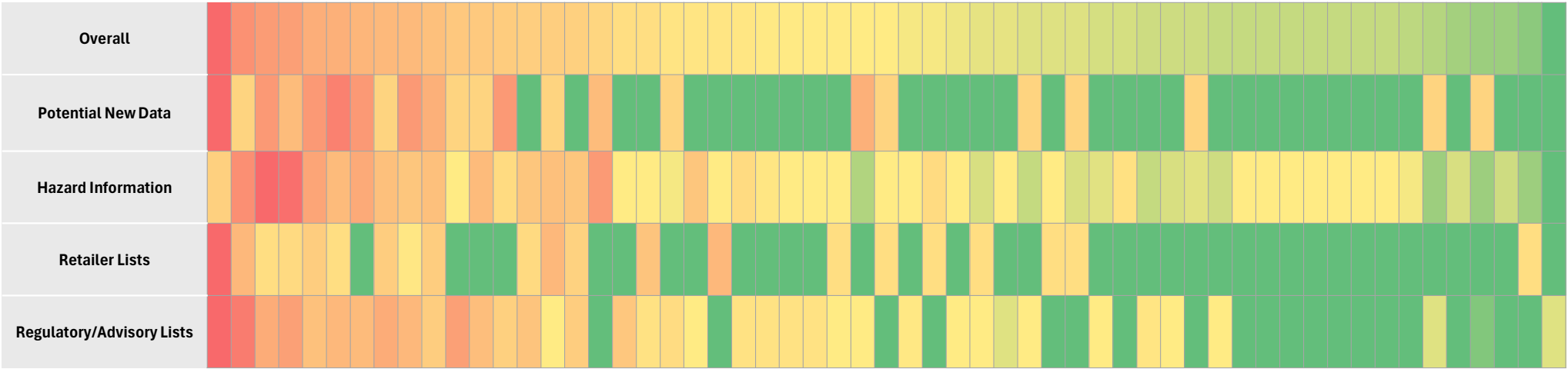
Category	Source	Scoring Options			
Potential New Data/Emerging Concerns	eChem Portal - REACH Dossier Tox Studies	New studies available/planned (since 2020) - CMR, Repeated Dose, Skin Sensitization	New studies available/planned (since 2020) - All Other Endpoints		No new studies available
		50	25		0
	PACT Tool - On-going REACH Regulatory Activity	Present on > 1 list	Present on 1 list	No on-going PACT activity	Not in ECHA website
		40	20	-10	0
	Campaign for Safe Cosmetics	The Red List - Tier 2 - Emerging Chemicals of Concern and Harmful to the Environment			Not Listed
		20			0
		The Red List - Tier 2 - Prohibited Chemicals of Concern For Black Women			
		20			
	Walgreens Boots Alliance (WBA) - Restricted Substances List	Horizon Scanning List			Not Listed
		20			0
	TEDX List of Potential Endocrine Disruptors	Present on list			Not Listed
		20			0
	EU National Authority Endocrine Disruptors Lists	List I Health	List II Health	List III Health	Not Listed
		50	30	15	0
		List I - Environment	List II - Environment	List III - Environment	Not Listed
		25	15	10	0
Max Score		Max Score			
		245			

Gather Data and Evaluate Chemicals

A		B		BA		BB		BC		BD		BE		BF		BG		BH		BI		BJ		BK		BL		BM		BN		BO		BP		BQ		BR		BS		BT		BU		BV		BW		BX		BY		BZ		C		CA		CB		CC		CD		CE		CF		CG		CH		CI		CJ		CK		CL		CM		CN		CO		CP		CQ		CR		CS		CT		CU		CV		CW		CX		CY		CZ		D		DA		DB		DC		DD		DE		DF		DG		DH		DI		DJ		DK		DL		DM		DN		DO		DP		DQ		DR		DS		DT		DU		DV		DW		DX		DY		DZ		E		EA		EB		EC		ED		EE		EF		EG		EH		EI		EJ		EK		EL		EM		EN		EO		EP		EQ		ER		ES		ET		EU		EV		EW		EX		EY		EZ		F		FA		FB		FC		FD		FE		FF		FG		FH		FI		FJ		FK		FL		FM		FN		FO		FP		FQ		FR		FS		FT		FU		FV		FW		FX		FY		FZ		G		GA		GB		GC		GD		GE		GF		GG		GH		GI		GJ		GK		GL		GM		GN		GO		GP		GQ		GR		GS		GT		GU		GV		GW		GX		GY		GZ		H		HA		HB		HC		HD		HE		HF		HG		HH		HI		HJ		HK		HL		HM		HN		HO		HP		HQ		HR		HS		HT		HU		HV		HW		HX		HY		HZ		I		IA		IB		IC		ID		IE		IF		IG		IH		II		IJ		IK		IL		IM		IN		IO		IP		IQ		IR		IS		IT		IU		IV		IW		IX		IY		IZ		J		JA		JB		JC		JD		JE		JF		JG		JH		JI		JJ		JK		JL		JM		JN		JO		JP		JQ		JR		JS		JT		JU		JV		JW		JX		JY		JZ		K		KA		KB		KC		KD		KE		KF		KG		KH		KI		KJ		KK		KL		KM		KN		KO		KP		KQ		KR		KS		KT		KU		KV		KW		KX		KY		KZ		L		LA		LB		LC		LD		LE		LF		LG		LH		LI		LJ		LK		LL		LM		LN		LO		LP		LQ		LR		LS		LT		LU		LV		LW		LX		LY		LZ		M		MA		MB		MC		MD		ME		MF		MG		MH		MI		MJ		MK		ML		MN		MO		MP		MQ		MR		MS		MT		MU		MV		MW		MX		MY		MZ		N		NA		NB		NC		ND		NE		NF		NG		NH		NI		NJ		NK		NL		NM		NN		NO		NP		NQ		NR		NS		NT		NU		NV		NW		NX		NY		NZ		O		OA		OB		OC		OD		OE		OF		OG		OH		OI		OJ		OK		OL		OM		ON		OO		OP		OQ		OR		OS		OT		OU		OV		OW		OX		OY		OZ		P		PA		PB		PC		PD		PE		PF		PG		PH		PI		PJ		PK		PL		PM		PN		PO		PP		PQ		PR		PS		PT		PU		PV		PW		PX		PY		PZ		Q		QA		QB		QC		QD		QE		QF		QG		QH		QI		QJ		QK		QL		QM		QN		QO		QP		QQ		QR		QS		QT		QU		QV		QW		QX		QY		QZ		R		RA		RB		RC		RD		RE		RF		RG		RH		RI		RJ		RK		RL		RM		RN		RO		RP		RQ		RR		RS		RT		RU		RV		RW		RX		RY		RZ		S		SA		SB		SC		SD		SE		SF		SG		SH		SI		SJ		SK		SL		SM		SN		SO		SP		SQ		SR		SS		ST		SU		SV		SW		SX		SY		SZ		T		TA		TB		TC		TD		TE		TF		TG		TH		TI		TJ		TK		TL		TM		TN		TO		TP		TQ		TR		TS		TT		TU		TV		TW		TX		TY		TZ		U		UA		UB		UC		UD		UE		UF		UG		UH		UI		UJ		UK		UL		UM		UN		UO		UP		UQ		UR		US		UT		UU		UV		UW		UX		UY		UZ		V		VA		VB		VC		VD		VE		VF		VG		VH		VI		VJ		VK		VL		VM		VN		VO		VP		VQ		VR		VS		VT		VU		VV		VW		VX		VY		VZ		W		WA		WB		WC		WD		WE		WF		WG		WH		WI		WJ		WK		WL		WM		WN		WO		WP		WQ		WR		WS		WT		WU		WV		WW		WX		WY		WZ		X		XA		XB		XC		XD		XE		XF		XG		XH		XI		XJ		XK		XL		XM		XN		XO		XP		XQ		XR		XS		XT		XU		XV		XW		XX		XY		XZ		Y		YA		YB		YC		YD		YE		YF		YG		YH		YI		YJ		YK		YL		YM		YN		YO		YP		YQ		YR		YS		YT		YU		YV		YW		YX		YY		YZ		Z		ZA		ZB		ZC		ZD		ZE		ZF		ZG		ZH		ZI		ZJ		ZK		ZL		ZM		ZN		ZO		ZP		ZQ		ZR		ZS		ZT		ZU		ZV		ZW		ZX		ZY		ZZ		AA		AB		AC		AD		AE		AF		AG		AH		AI		AJ		AK		AL		AM		AN		AO		AP		AQ		AR		AS		AT		AU		AV		AW		AX		AY		AZ		BA		BB		BC		BD		BE		BF		BG		BH		BI		BJ		BK		BL		BM		BN		BO		BP		BQ		BR		BS		BT		BU		BV		BW		BX		BY		BZ		CA		CB		CC		CD		CE		CF		CG		CH		CI		CJ		CK		CL		CM		CN		CO		CP		CQ		CR		CS		CT		CU		CV		CW		CX		CY		CZ		DA		DB		DC		DD		DE		DF		DG		DH		DI		DJ		DK		DL		DM		DN		DO		DP		DQ		DR		DS		DT		DU		DV		DW		DX		DY		DZ		EA		EB		EC		ED		EE		EF		EG		EH		EI		EJ		EK		EL		EM		EN		EO		EP		EQ		ER		ES		ET		EU		EV		EW		EX		EY		EZ		FA		FB		FC		FD		FE		FF		FG		FH		FI		FJ		FK		FL		FM		FN		FO		FP		FQ		FR		FS		FT		FU		FV		FW		FX		FY		FZ		GA		GB		GC		GD		GE		GF		GG		GH		GI		GJ		GK		GL		GM		GN		GO		GP		GQ		GR		GS		GT		GU		GV		GW		GX		GY		GZ		HA		HB		HC		HD		HE		HF		HG		HH		HI		HJ		HK		HL		HM		HN		HO		HP		HQ		HR		HS		HT		HU		HV		HW		HX		HY		HZ		IA		IB		IC		ID		IE		IF		IG		IH		II		IJ		IK		IL		IM		IN		IO		IP		IQ		IR		IS		IT		IU		IV		IW		IX		IY		IZ		JA		JB		JC		JD		JE		JF		JG		JH		JI		JJ		JK		JL		JM		JN		JO		JP		JQ		JR		JS		JT		JU		JV		JW		JX		JY		JZ		KA		KB		KC		KD		KE		KF		KG		KH		KI		KJ		KK		KL		KM		KN		KO		KP		KQ		KR		KS		KT		KU		KV		KW		KX		KY		KZ		LA		LB		LC		LD		LE		LF		LG		LH		LI		LJ		LK		LL		LM		LN		LO		LP		LQ		LR		LS		LT		LU		LV		LW		LX		LY		LZ		MA		MB		MC		MD		ME		MF		MG		MH		MI		MJ		MK		ML		MN		MO		MP		MQ		MR		MS		MT		MU		MV		MW		MX		MY		MZ		NA		NB		NC		ND		NE		NF		NG		NH		NI		NJ		NK		NL		NM		NN		NO		NP		NQ		NR		NS		NT		NU		NV		NW		NX		NY		NZ		OA		OB		OC		OD		OE		OF		OG		OH		OI		OJ		OK		OL		OM		ON		OO		OP		OQ		OR		OS		OT		OU		OV		OW		OX		OY		OZ		PA		PB		PC		PD		PE		PF		PG		PH		PI		PJ		PK		PL		PM		PN		PO		PP		PQ		PR		PS		PT		PU		PV		PW		PX		PY		PZ		QA		QB		QC		QD		QE		QF		QG		QH		QI		QJ		QK		QL		QM		QN		QO		QP		QQ		QR		QS		QT		QU		QV		QW		QX		QY		QZ		RA		RB		RC		RD		RE		RF		RG		RH		RI		RJ		RK		RL		RM		RN		RO		RP		RQ		RR		RS		RT		RU		RV		RW		RX		RY		RZ		SA		SB		SC		SD		SE		SF		SG		SH		SI		SJ		SK		SL		SM		SN		SO		SP		SQ		SR		SS		ST		SU		SV		SW		SX		SY		SZ		TA		TB		TC		TD		TE		TF		TG		TH		TI		TJ		TK		TL		TM		TN		TO		TP		TQ		TR		TS		TT		TU		TV		TW		TX		TY		TZ		UA		UB		UC		UD		UE		UF		UG		UH		UI		UJ		UK		UL		UM		UN		UO		UP		UQ		UR		US		UT		UU		UV		UW		UX		UY		UZ		VA		VB		VC		VD		VE		VF		VG		VH		VI		VJ		VK		VL		VM		VN		VO		VP		VQ		VR		VS		VT		VU		VV		VW		VX		VY		VZ		WA		WB		WC		WD		WE		WF		WG		WH		WI		WJ		WK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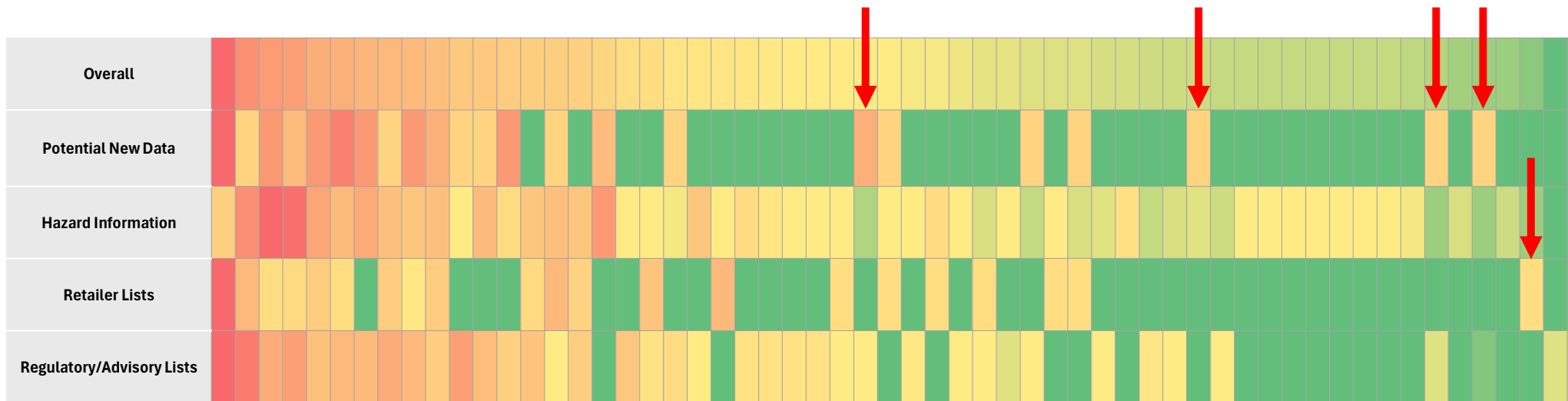
Visualize and Interpret Results

- “Where are our ingredients most vulnerable, and why?”
- Scores are summed within each of the four vulnerability dimensions and overall
- Results visualized using a heatmap to show relative vulnerability across indicators and ingredients and easily identify outliers
- Screening-level assessment; may serve as a starting point for more in-depth review



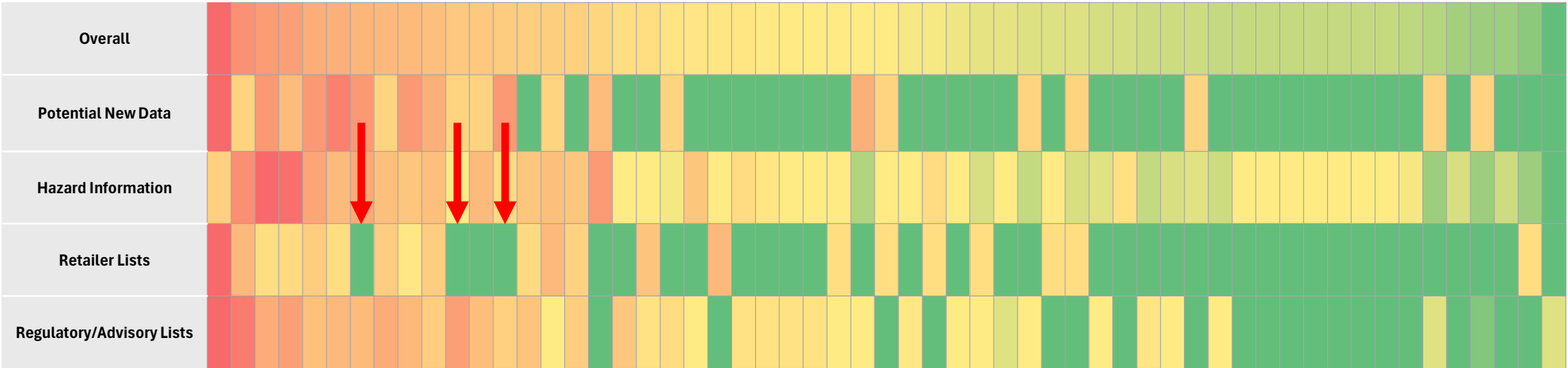
Visualize and Interpret Results

- Moderate or low overall scores, with higher scores in a particular category (*e.g.*, emerging data/hazard concerns?)



Visualize and Interpret Results

- High scores overall, with very low retailer scores → hazards associated with functional class?

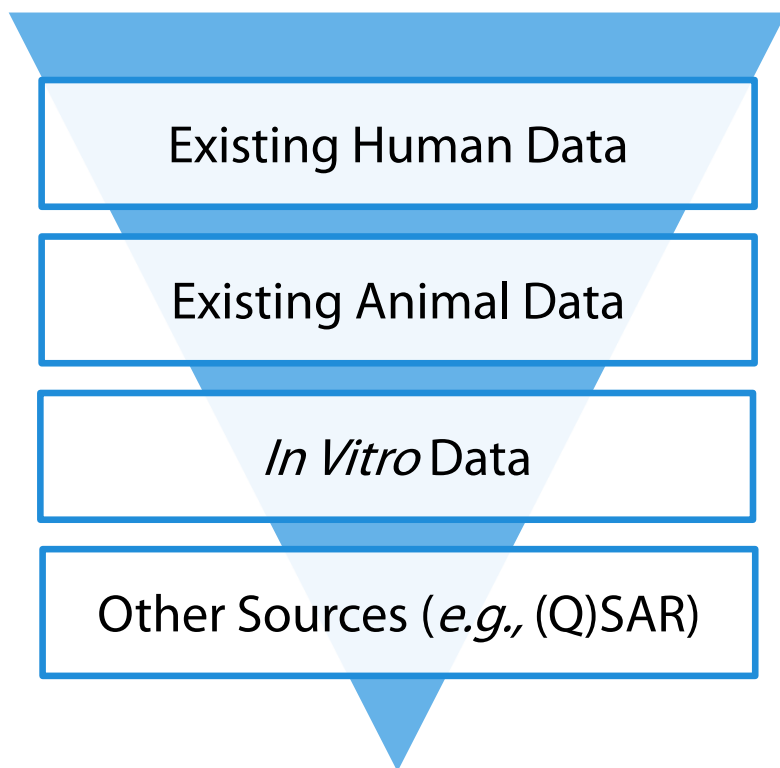


Assessed available endocrine disruption data for a large portfolio of chemicals to identify candidates for potential hazard classification

Case Study 2: Evaluate Oil and Gas Chemicals for Endocrine Disruption

Recent Regulatory Developments in the EU: New ED Hazard Classes under CLP

Weight-of-Evidence Approach Using Existing Data



Source: [Microsoft Word - CLP_Guidance_ED_revised_with_headings.docx \(europa.eu\)](#)

Endocrine Activity

+

Adverse Effect

+

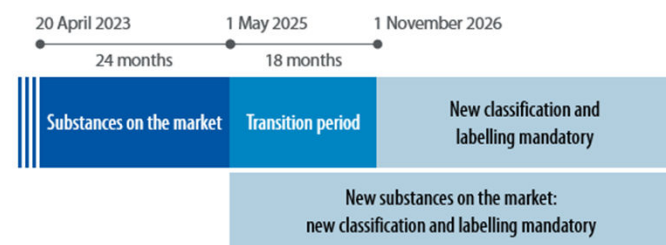
**Biologically
Plausible Link**

=

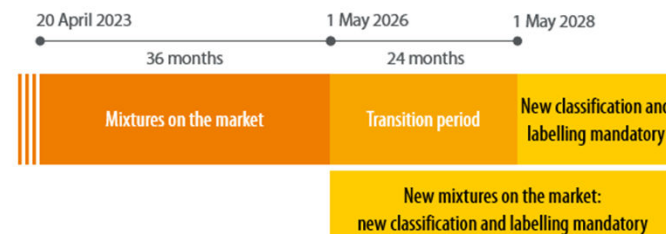
**Endocrine
Disruptor**



Substances

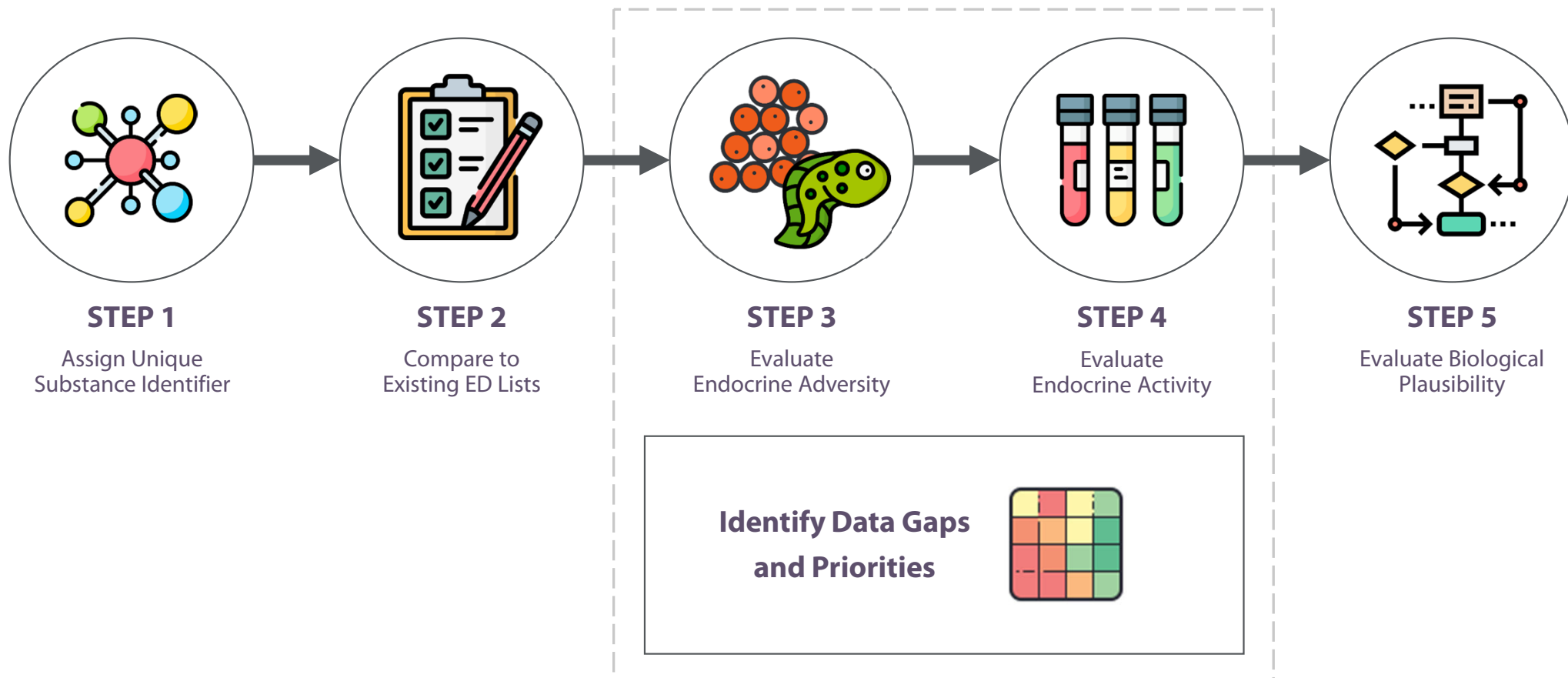


Mixtures



Source: <https://echa.europa.eu/new-hazard-classes-2023>

Evaluating Your Ingredient Portfolio for ED



Compare to Existing ED Lists



- Certain EU ED assessments are adequate to classify under CLP
 - ED under BP/PPP procedures → Assigned ED HH 1 and ED ENV 1 in CLP
 - SVHC for ED under REACH → Assigned ED HH 1 and ED ENV 1 in CLP
- Other screening lists
 - ECHA's ED Assessment list (<https://echa.europa.eu/ed-assessment>)
 - Candidate list of SVHC for ED under REACH (<https://www.echa.europa.eu/candidate-list-table>)
 - ED lists (<https://edlists.org/the-ed-lists>)
 - UNEP lists (https://wedocs.unep.org/bitstream/handle/20.500.11822/25633/EDC_report1.pdf?sequence=1&isAllowed=y)
 - ChemSec SIN list (<https://sinlist.chemsec.org/endocrine-disruptors/>)
 - Japan SPEED '98 list (<https://www.env.go.jp/en/chemi/ed/speed98/sp98t3.html>)
 - TEDX list (<https://endocrinedisruption.org/interactive-tools/tedx-list-of-potential-endocrine-disruptors/search-the-tedx-list>)

Evaluate Existing Endocrine **Adversity** Data (Human Health)

STEP 1



STEP 2



STEP 3



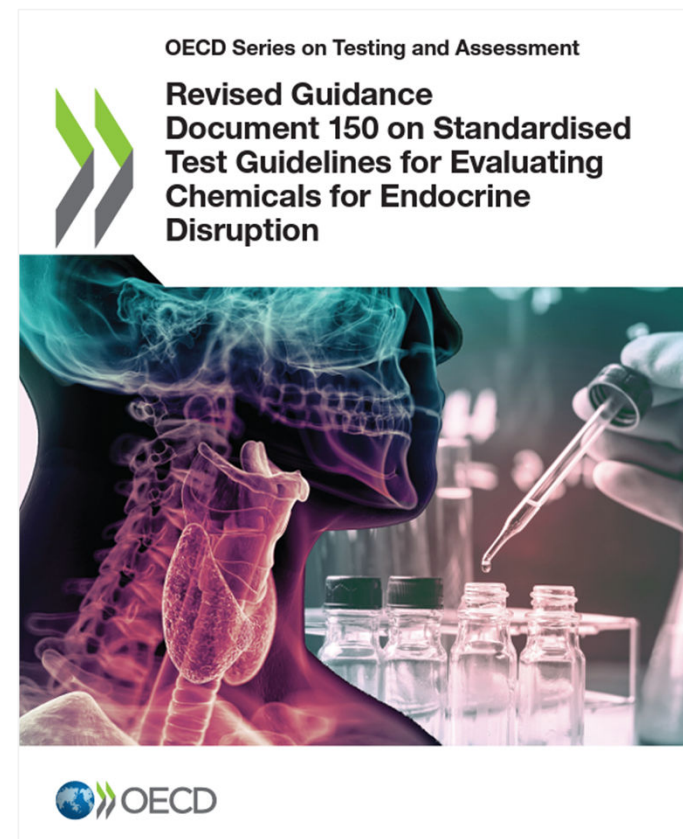
STEP 4



STEP 5



OECD Level	Test/Data Type	Example Endpoints
Level 3	<ul style="list-style-type: none"> • Uterotrophic bioassay in rodents • Hershberger bioassay (H assay) 	<ul style="list-style-type: none"> • Possible liver weight increase (in combination with other thyroid-related endpoints) • Changes in serum T4 and T3
Level 4	<ul style="list-style-type: none"> • 28/90-day repeated dose study • Reproduction/developmental toxicity screening test • Combined chronic toxicity and carcinogenicity studies 	<ul style="list-style-type: none"> • Changes in sperm parameters: sperm numbers, sperm motility, sperm morphology • Histopathologic changes in the above organs and in mammary glands • Serum T4, T3 decreased, TSH increased; histopathologic changes in thyroid gland
Level 5	<ul style="list-style-type: none"> • Extended one-generation reproductive toxicity study • Two-generation reproduction toxicity study 	<ul style="list-style-type: none"> • Litter size, sex ratio (F1, F2), litter/pup weight, pup survival index, abnormalities in pup development • Anogenital distance



Identify Data Gaps and Priorities Based on Endocrine Adversity (Heat Map Approach)



ED Potential	Criteria – Estrogenic Activity
Highest	Clear endocrine mediated effect in Level 3-5 animal study with observed adverse effects
High	Suggested endocrine mediated effect in Level 3-5 animal study with observed adverse effects
Medium	Adverse effects suggestive of endocrine disruption in non-guideline studies
Low	No observed adverse effects
Lacking Data	No relevant animal studies

Evaluate Endocrine **Activity** (Human Health and Environment)

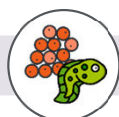
STEP 1



STEP 2



STEP 3



STEP 4



STEP 5



Activity Assessment

OECD Level	Test/ Data Type	Example information
Level 1	Existing data and non-test information	<ul style="list-style-type: none">Physical and chemical propertiesAll available (eco)toxicological data from (non-) standardized testsRead-across, chemical categories, QSARs and <i>in silico</i> predictionScientific literature
Level 2	<i>In vitro</i> mechanistic assays (mammalian and non-mammalian methods)	<ul style="list-style-type: none">ER/AR binding and transactivation assaySteroidogenesis <i>in vitro</i>Aromatase assayThyroid disruption assaysHigh-throughput screens

Primary Data Sources

- US EPA's ToxCast™
- US EPA's Collaborative Estrogen Receptor Activity Prediction Project (CERAPP)
- US EPA's Collaborative Modeling Project for Androgen Receptor Activity (CoMPARA)
- QSAR DataBank (QsarDB)
- Danish (Quantitative) Structure-Activity Relationship [(Q)SAR] Database

Identify Data Gaps and Priorities Based on Endocrine Activity (Heat Map Approach)



ED Potential	Criteria – Estrogenic Activity
Highest	<u>ToxCast/ In vitro Assay</u> : ER Agonist, ER Antagonist
High	<u>QsarDB OR Danish (Q)SAR Database</u> : ER activator <u>Danish (Q)SAR Database</u> : ER binder (Parent substance only)
Medium	<u>CERAPP</u> : "very weak" or "weak" potency level for a substance under ER Agonist, ER Antagonist, or ER Binding
Low	Inactive for ER Activation, ER Agonist, ER Antagonist, and ER Binding
Lacking Data	No data available for ER Activation, ER Agonist, ER Antagonist, and ER Binding

Identify Action Using Heat Map



Example: Estrogen-Human Health EFSA Assessment

Chemical	List	Adversity data	Activity Data	Outcome
1	None	Two-gen study: No adverse effects	No data	Unlikely concern; Not Classified No action needed
2	None	No Data	ToxCast: Active	Possible Concern Not Classified Monitor for new adversity data
3	Yes (advisory)	Effects suggestive of ED effect in animal study	ToxCast: Active	ED Concern Conduct a plausibility assessment
4	Assigned as HH ED 1 (ECHA)	Effects Indicative of ED effect in animal study	Positive endocrine activation (in vitro)	ED Concern Classify

Conducted detailed hazard assessments aligned with a regulatory agency's evaluation criteria to predict the likelihood of new data or conclusions for key endpoints

Case Study 3: Identify Hazard Vulnerabilities for Food and Beverage Ingredients

Develop Criteria

Independent Hazard Evaluation

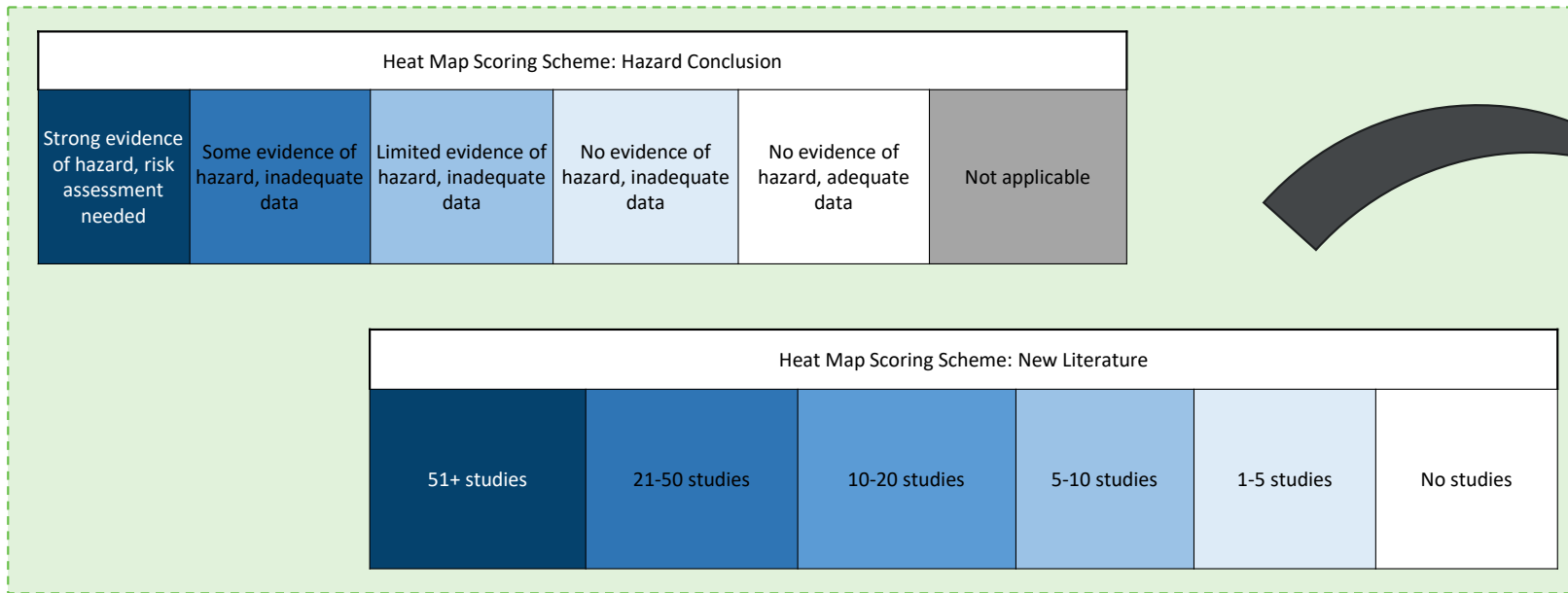
- Detailed review of available data in the context of agency-specific criteria (*e.g.*, OECD test guidelines)
- No evidence (adequate data), no evidence (inadequate data), limited evidence, some evidence, or strong evidence of hazard

New Literature

- Forward literature searches of peer-reviewed literature (*i.e.*, PubMed and SCOPUS)
- Quantify number of relevant results

Conclusion	Criteria
No evidence of hazard, adequate data	<ul style="list-style-type: none"> ▪ No indication of neurotoxicity in humans AND ▪ No structural alerts or information from similar substances to indicate potential neurotoxicity AND adequately performed acute (<i>e.g.</i>, OECD 423), reproductive (<i>e.g.</i>, OECD 414, OECD 421, OECD 422, OECD 443) and repeated dose toxicity (<i>e.g.</i>, OECD 407, OECD 408, OECD 452) tests show no indication of neurotoxic potential OR ▪ Adequately performed acute, reproductive, or repeated dose toxicity tests show some indication of neurotoxic potential, which was further investigated and sufficiently addressed. Weight of evidence indicates no neurotoxicity or DNT concern based on adequate information (may include <i>in vitro</i> DNT battery). Follow-up <i>in vivo</i> studies specific to neurotoxicity may include: <ul style="list-style-type: none"> Neurotoxicity study in rodents (OECD 424); Developmental neurotoxicity (DNT) study (OECD 426); OECD 443 with additional endpoints for motor activity (<i>e.g.</i>, open field test), motor/sensory function (<i>e.g.</i>, grip strength, rotarod) or cognitive function (<i>e.g.</i>, maze tests); and Delayed neurotoxicity study (<i>e.g.</i>, OECD 418, OECD 419, EU Annex B.38).
No evidence of hazard, inadequate data	<ul style="list-style-type: none"> ▪ No indication of neurotoxicity in humans AND ▪ No structural alerts or information from similar substances to indicate potential neurotoxicity but inadequate experimental data exist.
Limited evidence of hazard	<ul style="list-style-type: none"> ▪ A structural alert or information from similar substances indicates potential neurotoxicity but no experimental data exist OR ▪ <i>In vitro</i> findings (may include DNT battery) suggest neurotoxicity, but concerns have not been sufficiently addressed in follow-up <i>in vivo</i> studies specific to neurotoxicity. Adequately performed acute, reproductive, or repeated dose toxicity tests show no indication of neurotoxic potential.
Some evidence of hazard	<ul style="list-style-type: none"> ▪ Some indication of neurotoxicity in humans without supporting mechanistic or animal studies OR ▪ Adequately performed acute, reproductive, or repeated dose toxicity tests show some indication of neurotoxic potential but concerns have not been sufficiently addressed in follow-up <i>in vivo</i> studies specific to neurotoxicity. More information is needed to draw a conclusion with confidence. ▪ Indications of potential neurotoxicity from standard repeated dose toxicity tests may include: <ul style="list-style-type: none"> Clinical observations (<i>e.g.</i>, lethargy, postural, or behavior changes) if not at doses near or above those causing lethality; Histopathology changes to the brain, spinal cord or sciatic nerve; Effects on motor activity; and Effects observed in functional observational battery.
Strong evidence of hazard	<ul style="list-style-type: none"> ▪ Clear indication of neurotoxicity in humans OR ▪ Some indication of neurotoxicity in humans with supporting mechanistic and/or animal studies OR ▪ Sufficient <i>in vivo</i> neurotoxicity studies show a clear indication of neurotoxicity.

Develop Criteria



Heat Map Scoring Scheme: Likelihood of Agency Requiring Testing		
Likely	Possible	Unlikely

Visualize Results

Heat Map: Hazard Potential, Recent Peer-reviewed Literature⁴, and Likelihood of EFSA Requiring Further Testing on Subsequent Opinions

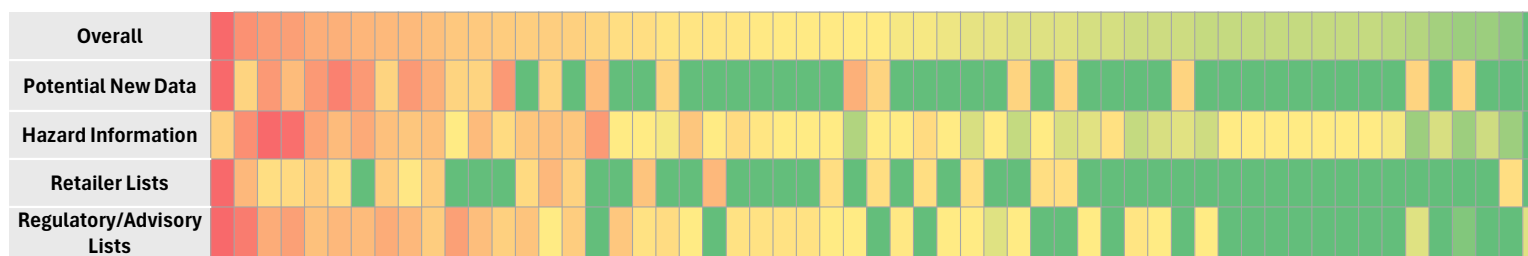
Common Name	CAS Number	Genotoxicity			Neurotoxicity			Immunotoxicity			EATS Endocrine Disruption			Non-EATS Endocrine Disruption			Nanomaterial Toxicity		
		Genotoxicity: Hazard Conclusion	Genotoxicity: New Literature	Genotoxicity: Likelihood of EFSA Testing	Neurotoxicity: Hazard Conclusion	Neurotoxicity: New Literature	Neurotoxicity: Likelihood of EFSA Testing	Immunotoxicity: Hazard Conclusion	Immunotoxicity: New Literature	Immunotoxicity: Likelihood of EFSA Testing	EATS Endocrine Disruption: Hazard Conclusion	EATS Endocrine Disruption: New Literature	EATS Endocrine Disruption: Likelihood of EFSA Testing	Non-EATS Endocrine Disruption: Hazard Conclusion	Non-EATS Endocrine Disruption: New Literature	Non-EATS Endocrine Disruption: Likelihood of EFSA Testing	Nanomaterial Toxicity: Hazard Conclusion	Nanomaterial Toxicity: New Literature	Nanomaterial Toxicity: Likelihood of EFSA Testing
Propylene glycol	57-55-6	No evidence of hazard, adequate data	No studies	Unlikely	Some evidence of hazard, inadequate data	1 adverse study (3 studies total)	Possible	No evidence of hazard, adequate data	No studies	Unlikely	No evidence of hazard, adequate data	No studies	Possible	No evidence of hazard, inadequate data	No studies	Unlikely	Not applicable	No studies	Unlikely
Dimethylpolysiloxane	9006-65-9 & 63148-62-9	No evidence of hazard, inadequate data	1 adverse study (1 study total)	Possible	No evidence of hazard, inadequate data	No studies	Possible	No evidence of hazard, inadequate data	No studies	Possible	No evidence of hazard, inadequate data	No studies	Possible	No evidence of hazard, inadequate data	No studies	Unlikely	Not applicable	No studies	Unlikely
Phosphoric acid	7664-38-2	No evidence of hazard, adequate data	No studies	Unlikely	No evidence of hazard, adequate data	No studies	Unlikely	No evidence of hazard, adequate data	No studies	Unlikely	No evidence of hazard, adequate data	No studies	Possible	No evidence of hazard, inadequate data	No studies	Unlikely	Not applicable	No studies	Unlikely
Silicon dioxide	7631-86-9	No evidence of hazard, adequate data	6 adverse studies (7 studies total)	Likely	No evidence of hazard, adequate data	3 adverse studies (3 studies total)	Unlikely	Limited evidence of hazard, inadequate data	2 adverse studies (2 studies total)	Possible	No evidence of hazard, adequate data	2 adverse studies (2 studies total)	Unlikely	No evidence of hazard, inadequate data	1 adverse study (1 study total)	Unlikely	Limited evidence of hazard, inadequate data	48 adverse studies, 9 unclear studies (60 studies total)	Likely
Caffeine	58-08-2	Some evidence of hazard, inadequate data	8 adverse studies, 16 unclear studies (47 studies total)	Possible	No evidence of hazard, inadequate data	53 adverse studies, 58 unclear studies (199 studies total)	Possible	No evidence of hazard, inadequate data	29 adverse studies, 30 unclear studies (139 studies total)	Possible	Limited evidence of hazard, inadequate data	19 adverse studies, 20 unclear studies (72 studies total)	Possible	No evidence of hazard, inadequate data	34 adverse studies, 24 unclear studies (105 studies total)	Unlikely	Not applicable	No studies	Unlikely
Sodium carboxymethyl cellulose	9004-32-4	No evidence of hazard, inadequate data	No studies	Unlikely	No evidence of hazard, inadequate data	1 unclear study (1 study total)	Possible	No evidence of hazard, inadequate data	1 adverse case report (No studies)	Possible	No evidence of hazard, inadequate data	No studies	Possible	No evidence of hazard, inadequate data	No studies	Possible	Not applicable	No studies	Unlikely
Polysorbate 60	9005-67-8	No evidence of hazard, inadequate data	No studies	Possible	No evidence of hazard, inadequate data	No studies	Possible	No evidence of hazard, inadequate data	No studies	Possible	No evidence of hazard, inadequate data	No studies	Likely	No evidence of hazard, inadequate data	No studies	Unlikely	Not applicable	No studies	Unlikely
Sorbitan monostearate	1338-41-6	No evidence of hazard, inadequate data	No studies	Possible	No evidence of hazard, inadequate data	No studies	Possible	No evidence of hazard, inadequate data	No studies	Likely	No evidence of hazard, adequate data	No studies	Possible	No evidence of hazard, inadequate data	No studies	Unlikely	No evidence of hazard, inadequate data	No adverse studies (1 study total)	Unlikely
Glycerin	56-81-5	No evidence of hazard, adequate data	No studies	Unlikely	No evidence of hazard, adequate data	No studies	Possible	No evidence of hazard, adequate data	No studies	Possible	No evidence of hazard, inadequate data	No studies	Unlikely	No evidence of hazard, inadequate data	No studies	Unlikely	Not applicable	No studies	Unlikely
Sucrose acetate isobutyrate (SAIB)	126-13-6	No evidence of hazard, adequate data	No studies	Unlikely	No evidence of hazard, adequate data	No studies	Unlikely	No evidence of hazard, adequate data	No studies	Unlikely	Limited evidence of hazard, inadequate data	No studies	Possible	Limited evidence of hazard, inadequate data	No studies	Possible	Not applicable	No studies	Unlikely
Sorbic acid and potassium sorbate	110-44-1, 24634-51-5, 590-00-1	Some evidence of hazard, inadequate data	3 adverse studies (3 studies total)	Possible	Some evidence of hazard, inadequate data	No adverse studies (2 studies total)	Possible	No evidence of hazard, inadequate data	3 adverse studies (5 studies total)	Unlikely	Some evidence of hazard, inadequate data	1 adverse study (2 studies total)	Likely	Limited evidence of hazard, inadequate data	No studies	Possible	Not applicable	No adverse studies (1 study total)	Unlikely
Ascorbic acid	8730-29-6	No evidence of hazard, inadequate data	2 adverse studies, 2 unclear studies (34 studies total)	Possible	No evidence of hazard, inadequate data	2 adverse studies, 3 unclear studies (127 studies total)	Possible	No evidence of hazard, inadequate data	1 adverse study, 6 unclear studies (71 studies total)	Possible	Limited evidence of hazard, inadequate data	1 adverse study, 7 unclear studies (102 studies total)	Possible	No evidence of hazard, inadequate data	2 adverse studies, 4 unclear studies (27 studies total)	Unlikely	Not applicable	2 adverse studies (11 studies total)	Unlikely
Sodium benzoate	532-32-1	No evidence of hazard, inadequate data	1 adverse study (1 study total)	Possible	Some evidence of hazard, inadequate data	7 adverse or unclear studies (22 studies total)	Likely	Some evidence of hazard, inadequate data	2 adverse studies (3 studies total)	Likely	Limited evidence of hazard, inadequate data	2 adverse studies (2 studies total)	Likely	No evidence of hazard, inadequate data	No studies	Unlikely	Not applicable	No studies	Unlikely
Ammoniated glycyrhizin	53956-04-0	No evidence of hazard, inadequate data	No studies	Possible	Some evidence of hazard, inadequate data	No studies	Possible	No evidence of hazard, inadequate data	No adverse studies (6 studies total)	Possible	Limited evidence of hazard, inadequate data	No studies	Likely	Some evidence of hazard, inadequate data	No studies	Likely	No evidence of hazard, inadequate data	No adverse studies (3 studies total)	Unlikely
Trisodium citrate	88-04-2	No evidence of hazard, adequate data	No studies	Unlikely	No evidence of hazard, inadequate data	No adverse studies (1 study total)	Possible	No evidence of hazard, inadequate data	No adverse studies (1 study total)	Possible	No evidence of hazard, adequate data	No adverse studies (1 study total)	Possible	No evidence of hazard, adequate data	No adverse studies (1 study total)	Unlikely	Not applicable	No studies	Unlikely

Summary

- Flexible framework to accommodate different project objectives and data types
 - Quantitative *vs.* qualitative scoring systems
- Reliance on both easily accessible and manually gathered data, as needed
 - Compile data that is often considered separately to aid in decision-making
 - May utilize data from “outside the box” (*e.g.*, ThinkDirty)
- Visualize results using heatmap for high-level communications while retaining details for potential follow-up

Other Applications

- Material Selection/Product Development
 - Internal company communication regarding preferred/sustainable materials
 - Target “vulnerable” chemicals to prioritize for substitution
- Track or quantify sustainability goals
- Overlay with use/sales data to further qualify product risk
- Expand to other sustainability endpoints (*e.g.*, CO₂ emissions, environmental justice, recycled content, waste streams, *etc.*)



Thank You!

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