

# NORMAN WG-1 "Prioritisation of contaminants of emerging concern"

Valeria Dulio, Nikiforos Alygizakis, Peter von der Ohe, Jaroslav Slobodnik



Seminar Nordic countries : 26-27 October 2021







controlling risks for sustainable development

# **NORMAN Network**



# Network of reference laboratories, research centers and related organisations for monitoring of emerging environmental substances

More than 80 members from EU leading organisations from 21 European countries, and Canada, US, Asia

Mission:

- **Exchange** information on emerging substances
- Improve data quality
- Promote synergies among research teams and more efficient transfer of research findings to policy-makers

Vision:

- Independent, transparent and open network working for a sustainable environment
- Leading European network for emerging substances in the environment
- Watch-dog for emerging environmental threats
- Bridge between science and policy-making
- Platform for innovative bottom-up initiatives to **explore new monitoring challenges**

## **NORMAN Working Groups**



# Why do we need to prioritise substances?

- Most frequent questions:
  - What are the most problematic substances for HH and ecosystems and what are their sources?
  - We tend to concentrate on well-known substances and emerging contaminants may be overlooked: what should we monitor better?
  - What are the priority substances for improvement of (eco)toxicity assessment?
  - What are the priority 'difficult to measure' compounds for which actions need to be launched to improve analytical performance and harmonisation of methods?
- We have developed a scheme to tackle these questions



# NORMAN Prioritisation workflow for target

## monitoring data



Prioritisation indicators Ranking compounds within each action category

## **Exposure indicators (cat. 1, 3, 6)**

- Frequency of quantification
  - Nb analysis or sites with concentration >LOQ / Total Nb of analysis or sites

## Risk indicators (cat. 1, 3, 6)

- Extent of Exceedance of the PNEC = MEC95 / Lowest PNEC
- Frequency of Exceedance of the PNEC = Nb of sites with MECsite > Lowest PNEC / Nb of sites where the substance was measured

## Hazard indicators (all categories)

- PBT, PMT criteria (based on Half-life, Kow, Koc, BCF.....)
- CMR classification (CLP classification, etc.)
- ED potential (EU lists, literature data)



# New challenges: evolution of the system

- At the beginning: focus on a list of 800 substances (CECs) – now we deal with more 100,000 substances at the same time
- More powerful analytical tools
  - HRMS-based screening
  - Effect-based tool
- ECOTOX data
  - Experimental data, but also more robust predictive models
- PBT assessment
  - New models, e.g. Janus model
- Mixture toxicity
  - Cumulative risk assessment
- Grouping

To assess all that, we need a common database platform to collect and exploit information

## **NORMAN Database System**



		NO	ORMAN Database System		
NO	RMAN organises the development and maintenance	of variou:	s web-based databases for the collection & evaluation environment	on of data i	/ information on emerging substances in the
-	SEARCH All Databases				
	Searching for individual substance or group(s) of substa	ances in al	databases		
	Note: Click on a link below to go to an individual databa	ase home	page		
	Substance Database	2	Chemical Occurrence Data	99	Ecotoxicology
-	A merged list of NORMAN substances; Central Database to access various lists of substances for suspect screening and prioritisation		A database of geo-referenced monitoring data on emerging substances		A platform for systematic collection and evaluation of ecotoxicity studies for harmonised derivation of environmental quality standards
000	Suspect List Exchange Central Database to access various lists of substances for suspect screening and prioritisation	×	Antibiotic Resistance Bacteria/Genes A database of ARBs/ARGs in environmental matrices	44	MassBank Europe A database of mass spectra of emerging substances to support identification of unknown substances
ł	Digital Sample Freezing Platform	*	Indoor Environment A database of data in indoor environment matrices	$Q^{0}_{0}$	Passive Sampling A database of data obtained with passive samplers
	A database of mass chromatograms obtained by LC-HR-MS for retrospective screening of environmental samples				
E	Substance Factsheets	latit	Prioritisation		Bioassays Monitoring Data
	A summary information on individual substances		Results of prioritisation of NORMAN substances	-	A database of data obtained by analysis of

https://www.norman-network.com/nds/

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environment

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## Substance Database

A merged list of NORMAN substances; Central Database to access various lists of substances for suspect screening and prioritisation

#### Suspect List Exchange

Central Database to access various lists of substances for suspect screening and prioritisation

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## Digital Sample Freezing Platform

A database of mass chromatograms obtained by LC-HR-MS for retrospective screening of environmental samples

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## Substance Factsheets

A summary information on individual substances from all NORMAN Database System modules

## Chemical Occurrence Data

A database of geo-referenced monitoring data on emerging substances

SusDat

SLE

## Antibiotic Resistance Bacteria/Genes

A database of ARBs/ARGs in environmental matrices

## Indoor Environment

A database of data in indoor environment matrices

## Ecotoxicology

SARS-CoV-2 in sewage

A platform for systematic collection and evaluation of ecotoxicity studies for harmonised derivation of environmental quality standards



## MassBank Europe

A database of mass spectra of emerging substances to support identification of unknown substances

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## **Passive Sampling**

A database of data obtained with passive samplers

#### Prioritisation

Results of prioritisation of NORMAN substances using the NORMAN Prioritisation Framework



## **Bioassays Monitoring Data**

A database of data obtained by analysis of environmental samples with bioassayss

https://www.norman-network.com/nds/ & https://www.norman-network.com/nds/SLE/ & https://www.norman-network.com/nds/susdat

# NORMAN Suspect List Exchange (SLE)



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## https://www.norman-network.com/nds/SLE/

NORMAN SUBSTANCE DATABASE

## NORMAN Suspect List Exchange – NORMAN SLE

# > 84 lists > 100,000 substances



# NORMAN SusDat Database

- <a href="https://www.norman-network.com/nds/susdat/">https://www.norman-network.com/nds/susdat/</a>
- Interactive merged and curated list of ALL substances of the Suspect List Exchange initiative → today 106,486 single compounds

		Q NORMAN DATABASE SYSTEM (./)   ★ HOME (INDEX.PHP)   ▲)	MY PROFILE (PROFILE PHP)   (+ LOGOUT (LOGOUT.PHP) ADMIN AREA ~	Source
	Suspect List Exchange Search (index.php) / Results		L Valeria Dulio	- 11
	LExport to CSV LExport to XLSX			
For	each com	pound exh	austive	info is
	provided	for identif	ication	of
con	npounds	with HRMS	(exact	mass,
	RTI, addu	ucts, fragmo	ents, et	c.)
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## https://www.norman-network.com/nds/empodat/



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https://www.norman-network.com/nds/ecotox/

SARS-CoV-2 in sewage

Ecotoxicology

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https://www.norman-network.com/nds/ & https://www.norman-network.com/nds/SLE/ & https://www.norman-network.com/nds/susdat

# NORMAN ECOTOX database

## **Constant evolution**

- QSAR prediction for:
- → ~ 80,000 substances (2020)

Aalizadeh R, et al. (2017) Environ. Sci.: Processes Impacts, 19: 2050-7887

- Experimental ecotox data for:
- →~ 5,000 compounds (2020)

Extraction script for retrieval of data from ECOTOX Knowledgebase of the US EPA

- Collection of existing PNEC for:
- →~ 1000 experimentally-based PNEC (2020)

Compiled from the open literature and authorisation documents

		<b>n</b> erman <u></u>	Search E	cotox data	CRED evaluation Sea	rch Quality targets PNEC	# HOME   derivation Lowest PNE	A YOUR
		NORMAN — ECOTOX	Database					1
cotox da Freshwa	ta for: Triclosan		₩ Go	to CRED evalu	uation 🏾 🏶 Go to Quali	ty targets 🕨 Go to PNE	C derivation	
iotest ID 👙	AII V	All 🗸	All 🗸	All 👽	All 🗸	All 🗸	[µg/L] ♦ ♦ Effect value	Reference
P42102037	alnaa	Anahaana flovanuaa	EC50	98.h	population	evoerimentel result	= 12	EPA344
PA2102404	crustaceans	Daphnia magna	EC50	48 h	intoxication	experimental result	= 420	EPA344
PA2106603	flowers, trees, shrubs, ferns	Lemna gibba	EC50	7 d	population	experimental result	> 62.5	EPA344
PA2108119	algae	Pseudokirchneriella subcapitata	EC50	96 h	population	experimental result	= 3.4	EPA344
PA2109662	crustaceans	Daphnia magna	EC50	48 h	intoxication	experimental result	= 390	EPA344
PA2112411	fish	Oncorhynchus mykiss	LC50	96 h	mortality	experimental result	= 288	EPA344
PA2113796	fish	Lepomis macrochirus	LC50	96 h	mortality	experimental result	= 38200	EPA344
A12713 aphnia magna	crustaceans	Daphnia magna	EC50	48 h	mortality	(Q)SAR	= 488.28329797455	Environme Science 1
A12713 elenastrum spricornutum	algae	Selenastrum capricornutum	EC50	72 h	mortality	(Q)SAR	= 281.305468387177	Environm Science 1
PA2047352	fish	Oryzias latipes	NOEC	6 d	behaviour	experimental result	= 170	EPA1533
A2047353	fish	Oryzias latipes	NOEC	7 d	feeding behavior	experimental result	= 170	EPA1533
PA2047354	fish	Onyzias latipes	NOEC	8 d	feeding behavior	experimental result	= 170	EPA1533
A2047355	fish	Onzias latipes	NOEC	9 d	feeding behavior	experimental result	= 170	EPA1533
PA2047358	fish	Onzias latines	NOEC	7.4	behavior	experimental result	= 170	EPA1533
A2047359	fish	Onzias latines	LOEG	8.4	behavior	experimental result	= 170	EPA1533
PA2099959	algae	Scenedestrus subspicatus	EC50	72 h	population	experimental result	= 120	EPA344
\$42116418	mistereens	Danhnia manna	EC50	48 h	intervication	experimental result	> 180	EPA344
	0000000	baprinte integra	2000			experimental reson		
12110418	Group careful	Daphnia magna	EC90	40 H	NUCCORDON	entrequences service	> 100	ENTON

- Derivation of new PNEC for:
- →~ 10 experimentally-based PNEC (2021)

## https://www.norman-network.com/nds/ecotox/lowestPnecsIndex.php



I 👫 NORMAN WEBSITE | 🚱 NORMAN DATABASE SYSTEM | 🍈 HOME | 🍰 MY PROFILE | 🕩 LOGOUT

SEARCH ECOTOX DATA CRED EVALUATION PNEC DERIVATION SEARCH QUALITY TARGET LOWEST PNECS DCT DOWNLOAD

NORMAN Ecotoxicology Database — Search Ecotox data

Peter von der Ohe

Conter compound

#### Ecotox data for: Triclosan

Freshwater acute		
Freshwater chronic		

Marine water acute

#### Marine water chronic

	AII 🗸	All 🗸	All 🗸	All 🗸	AII 🗸	All 🗸	All 🗸	All 🗸	All 🗸	AII 🗸	All 🗸	AII ~	AII ~	All 🗸
Biotest 🔺	Taxonomic group	Scientific 🖕	Endpoint 🝦	Duration	Effect measurement	Test type ∲	Standard	Effect based on	¢ pH      ♦	Exposure 🖕	Purity [%]	♦ Effect value [µg/L]	Measured or nominal	Reliability score
EPA2008758	Fish	Oryzias latipes	NOEC	n.r.	n.r.	experimental result	no	active ingredient	n.r.	yolk	= 98	= 5	nominal	5
EPA2008774	Fish	Oryzias latipes	NOEC	n.r.	n.r.	experimental result	no	active ingredient	n.r.	yolk	= 98	= 1	nominal	5
EPA2111176	Algae	Skeletonema costatum	EC50	96 h	yield	experimental result	no	active ingredient	n.r.	static	= 99.5	> 66	n.r.	5
EPA2130898	Algae	Skeletonema costatum	NOEL	96 h	yield	experimental result	no	active ingredient	n.r.	static	= 99.5	< 12.6	n.r.	5
EPA2154636	Insects	Algae	EC50	96 h	yield	experimental result	no	active ingredient	n.r.	aquatic - not reported	> 95	= 0.000001846	nominal	5

Showing 5 entries

Use of study: change

So far, the Ecotox module focuses on aquatic species. But we are planning to expand to all matrices!

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# Digital Sample Freezing Platform – DSFP - A digital specimen bank of HRMS data



# Archive of geo-referenced HRMS data to support retrospective screening of large lists of emerging compounds across Europe and beyond

DCT



Alygizakis et al., NORMAN digital sample freezing platform: A European virtual platform to exchange liquid chromatography high resolution-mass spectrometry data and screen suspects in "digitally frozen" environmental samples. TrAC Trends in Analytical Chemistry (2019), Volume 115, DOI: 10.1016/j.trac.2019.04.008

# Data in Digital Sample Freezing Platform







- Frequency of Appearance (FoA) = n/N (0-1)
   n = Nb. of sites where the substance /feature was detected
   N = Nb. of investigated sites
- Frequency of PNEC exceedance (FoE) Based on semi-quantified data (structure similarity approach)









# NORMAN Prioritisation workflow for target monitoring data: current status



# NEW workflow TARGET + SUSPECT SCREENING

(both for POS and NEG ionization modes; two parallel categorisation exercises and then compare the assigned categories )



Category (\*): when experimental mass spectra are available



# Key elements of the new prioritisation scheme 2021

- Creation of the EMPODAT SUSPECT DB presented by Jaroslav
  - Dedicated platform on suspect screening data in support of prioritisation
- Identification Point score
  - A simplified and transparent IP-based system to identify substances with *sufficient / insufficient* identification evidences and communication of the confidence.
  - An automated and fully interpretable machine learning approach for classification of the identifications from wide-scope suspect screening using NORMAN Digital Sample Freezing Platform
- Semiquantification method
  - Already possible to obtain semiquantified concentration data using various approaches
  - A NORMAN ILS is on-going to decide the most accurate approach

Revised categories for suspect screening 6 categories (similar to the TARGET prioritisation scheme)

Indicators for categorisation / prioritisation:

□ Frequency of Appearance (FoA):

- Nb of sites with detection / Total Nb of sites with measurements
- □ Frequency of Exceedance of PNEC (FoE):
  - Nb of sites with conc. > PNEC / Total Nb of sites with measurements
- □ Extent of Exceedance of PNEC (EoE)
  - MEC95/PNEC (where, MEC95 = P95 of all measured concentrations)
- □ Hazard score :
  - (P, B, M, T, ED, CMR)





# Prioritisation indicators

Categories	Exposure score	Risk score	Hazard score	Final score
Cat1; Cat3	FoA	FoE + EoE	To be discussed	FoA+FoE+EoE
Cat2; Cat5	FoA		To be discussed	FoA
Cat4	FoA		To be discussed	FoA
Cat6	FoA		To be discussed	FoA

	EoE	Score
	MEC95 / PNEC <1	0
	MEC95 / PNEC ≥1≤10	0.1
‡ or alike 🗲	MEC95 / PNEC >10≤100	0.25
	MEC95 / PNEC >100 ≤1000	0.5
	MEC95 / PNEC >1000	1



Case study on WW effluents to test the new workflow

- Prioritisation based on Suspect screening – DSFP / SUSPECT DB:
  - 65,690 substances from SusDat
  - From 2017 to 2020
  - 13 countries
  - 57 sites
  - 84 (24h composite) Wastewater effluents samples
  - Analytical technique employed for NTS data acquisition: LC-HRMS bbCID and AutoMS

- Prioritisation based on **Target monitoring** - EMPODAT:
  - 2,557 substances
  - From 2009 to 2021
  - 19 countries
  - 248,542 analysis



# **Distribution of SusDat compounds in Categories**

Categories	Number of compounds NTS	Number of compounds Target
1	23	32
2	105	311
3	1,228	160
4 A (+)	39,333	147
4 C (-)	19,347	
5	5,619	1,785
6	35	123
Sum	65,690	2,557

## Cat 1 SUSPECT: Expo + Risk + Exp PNEC

	Lowest	Final	Score				Final
Compounds	PNECfw	Category	final_SUS	FoA_final	FoE_final	EoE_final	Category
	[µg/I]	SUS	(POS/NEG)				EMPODAT
Diclofenac	0,05	1	1,77	0,90	0,62	0,25	1A
Carbamazepine	0,05	1	1,68	0,95	0,48	0,25	1A
17beta-Estradiol	1,00E-04	1	1,36	0,18	0,18	1,00	4A
Venlafaxine	0,038	1	1,35	0,83	0,42	0,10	2A
Styrene	0,006	1	1,33	0,62	0,46	0,25	4A
Tolyltriazole	8	1	1,18	1,00	0,10	0,10	2A
Bisphenol A	0,24	1	0,98	0,70	0,18	0,10	2A
Climbazole	0,52	1	0,93	0,92	0,01	0,00	6
Nonanoic acid	0,5	1	0,89	0,87	0,02	0,00	#N/A
4-(1,1,3,3-Tetramethylbutyl)pheno	0,1	1	0,89	0,65	0,13	0,10	2A
Dibutyl phthalate	2,3	1	0,82	0,52	0,05	0,25	2A
vinyl neodecanoate	1	1	0,78	0,61	0,07	0,10	#N/A
Cinerin I	0,0014	1	0,62	0,06	0,06	0,50	4A
Terbutryn	0,065	1	0,58	0,57	0,01	0,00	18
Carbendazim	0,15	1	0,54	0,30	0,14	0,10	18
Estrone	0,0036	1	0,54	0,02	0,01	0,50	2A
Propyphenazone	0,8	1	0,52	0,51	0,01	0,00	6
Levofloxacin	0,021	1	0,43	0,21	0,12	0,10	2A
Estriol	0,06	1	0,39	0,08	0,06	0,25	2A
Dioxacarb	0,27	1	0,33	0,32	0,01	0,00	2A
17beta-Trenbolone	0,0013	1	0,30	0,04	0,01	0,25	4A
Flufenacet	0,04	1	0,25	0,13	0,02	0,10	6
Methsuximide	1,7	1	0,18	0,17	0,01	0,00	2A

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	[µg/I]	SUS	(POS/NEG)				EMPODAT	
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Styrene							- <b>- -</b>	
Tolyltriazole	• Good	agreen	nent betv	veen ta	arget and	a suspe	ect	
Bisphenol A	screer	ning (e.	g. diclofe	nac, ca	irbamaz	epine v	vith high	
Climbazole	ovpos	uro and	1 ovcoda	, nco of		I	0	
Nonanoic acid	expos	ule and	i exceeua		FNEC			
4-(1,1,3,3-Tetramethylbutyl)pheno	0,1	1	0,89	0,65	0,13	0,10	2A	
Dibutyl phthalate	2,3	1	0,82	0,52	0,05	0,25	2A	
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Cinerin I	0,0014	1	0,62	0,06	0,06	0,50	4A	
Terbutryn	0,065	1	0,58	0,57	0,01	0,00	18	
Carbendazim	0,15	1	0,54	0,30	0,14	0,10	18	
Estrone	0,0036	1	0,54	0,02	0,01	0,50	2A	
Propyphenazone	0,8	1	0,52	0,51	0,01	0,00	6	
Levofloxacin	0,021	1	0,43	0,21	0,12	0,10	2A	
Estriol	0,06	1	0,39	0,08	0,06	0,25	2A	
Dioxacarb	0,27	1	0,33	0,32	0,01	0,00	2A	
17beta-Trenbolone	0,0013	1	0,30	0,04	0,01	0,25	4A	
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rman

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Nonanoic acid	0,5	1	0,89	0,87	0,02	0,00	#N/A
4-(1,1,3,3-Tetramethylbutyl)pher-	0.1	4	0.99	0.65	0.12	0.10	24
Dibutyl phthalate	<ul> <li>Also</li> </ul>	Catego	ry 1 in EN	/IPODA	T but lov	wer prie	ority
vinyl neodecanoate	1	1	0,78	0,61	0,07	0,10	#N/A
vinyl neodecanoate Cinerin I	1 0,0014	1	0,78	0,61 0,06	0,07	0,10	#N/A 4A
vinyl neodecanoate Cinerin I Terbutryn	1 0,0014 0,065	1 1 1	0,78 0,62 0,58	0,61 0,06 0,57	0,07 0,06 0,01	0,10 0,50 0,00	#N/A 4A 1B
vinyl neodecanoate Cinerin I Terbutryn Carbendazim	1 0,0014 0,065 0,15	1 1 1 1 1	0,78 0,62 0,58 0,54	0,61 0,06 0,57 0,30	0,07 0,06 0,01 0,14	0,10 0,50 0,00 0,10	#N/A 4A 1B 1B
vinyl neodecanoate Cinerin I Terbutryn Carbendazim Estrone	1 0,0014 0,065 0,15 0,0036	1 1 1 1	0,78 0,62 0,58 0,54 0,54	0,61 0,06 0,57 0,30 0,02	0,07 0,06 0,01 0,14 0,01	0,10 0,50 0,00 0,10 0,50	#N/A 4A 1B 1B 2A
vinyl neodecanoate Cinerin I Terbutryn Carbendazim Estrone Propyphenazone	1 0,0014 0,065 0,15 0,0036 0,8	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0,78 0,62 0,58 0,54 0,54 0,54	0,61 0,06 0,57 0,30 0,02 0,51	0,07 0,06 0,01 0,14 0,01 0,01	0,10 0,50 0,00 0,10 0,50 0,00	#N/A 4A 1B 1B 2A • 6
vinyl neodecanoate Cinerin I Terbutryn Carbendazim Estrone Propyphenazone Levofloxacin	1 0,0014 0,065 0,15 0,0036 0,8 0,021	1 1 1 1 1 1 1	0,78 0,62 0,58 0,54 0,54 0,52 0,43	0,61 0,06 0,57 0,30 0,02 0,51 0,21	0,07 0,06 0,01 0,14 0,01 0,01 0,12	0,10 0,50 0,00 0,10 0,50 0,00 0,10	#N/A 4A 1B 1B 2A 6 2A
vinyl neodecanoate Cinerin I Terbutryn Carbendazim Estrone Propyphenazone Levofloxacin Estriol	1 0,0014 0,065 0,15 0,0036 0,8 0,021 0,06	1 1 1 1 1 1 1 1	0,78 0,62 0,58 0,54 0,54 0,52 0,43 0,39	0,61 0,06 0,57 0,30 0,02 0,51 0,21 0,08	0,07 0,06 0,01 0,14 0,01 0,01 0,12 0,06	0,10 0,50 0,00 0,10 0,50 0,00 0,10 0,25	#N/A 4A 1B 1B 2A 6 2A 2A 2A
vinyl neodecanoate Cinerin I Terbutryn Carbendazim Estrone Propyphenazone Levofloxacin Estriol Dioxacarb	1 0,0014 0,065 0,15 0,0036 0,8 0,021 0,06 0,27	1 1 1 1 1 1 1 1 1	0,78 0,62 0,58 0,54 0,54 0,52 0,43 0,39 0,33	0,61 0,06 0,57 0,30 0,02 0,51 0,21 0,08 0,32	0,07 0,06 0,01 0,14 0,01 0,01 0,12 0,06 0,01	0,10 0,50 0,00 0,10 0,50 0,00 0,10 0,25 0,00	#N/A 4A 1B 1B 2A 6 2A 2A 2A 2A
vinyl neodecanoate Cinerin I Terbutryn Carbendazim Estrone Propyphenazone Levofloxacin Estriol Dioxacarb 17beta-Trenbolone	1 0,0014 0,065 0,15 0,0036 0,8 0,021 0,06 0,27 0,0013	1 1 1 1 1 1 1 1 1 1	0,78 0,62 0,58 0,54 0,54 0,52 0,43 0,39 0,33 0,30	0,61 0,06 0,57 0,30 0,02 0,51 0,21 0,08 0,32 0,04	0,07 0,06 0,01 0,14 0,01 0,01 0,12 0,06 0,01 0,01	0,10 0,50 0,00 0,10 0,50 0,00 0,10 0,25 0,00 0,25	#N/A 4A 1B 1B 2A 6 2A 2A 2A 2A 2A 4A
vinyl neodecanoate Cinerin I Terbutryn Carbendazim Estrone Propyphenazone Levofloxacin Estriol Dioxacarb 17beta-Trenbolone Flufenacet	1 0,0014 0,065 0,15 0,0036 0,8 0,021 0,06 0,27 0,0013 0,04	1 1 1 1 1 1 1 1 1 1 1	0,78 0,62 0,58 0,54 0,54 0,52 0,43 0,39 0,33 0,30 0,25	0,61 0,06 0,57 0,30 0,02 0,51 0,21 0,08 0,32 0,04 0,13	0,07 0,06 0,01 0,14 0,01 0,01 0,02	0,10 0,50 0,00 0,10 0,50 0,00 0,10 0,25 0,00 0,25 0,10	#N/A 4A 1B 1B 2A 6 2A 2A 2A 2A 4A 6

# Category 3

- More than 1200 compounds
- Expo + RISK + Predicted PNEC
- Priority for PNEC verification
- Among top-ranked compounds =>> substances for which target monitoring data are scarce

Compounds	Final Category SUS (POS/NEG) (Cat4A =7; Cat4C=8	Score final_SUS (POS/NEG)	FoA_final	FoE_final	EoE_final	Final Category EMPODAT	Category tag
Telmisartan	3	2,87	0,93	0,94	1,00	3	pharmaceutical, antihypertensive agent
Meclofenamic acid	3	1,63	0,90	0,48	0,25	5A	pharmaceutical, NSAID, anti-inflammato
Tri(butoxyethyl)phosphate	3	1,34	0,93	0,31	0,10	#N/A	PMT
4-NITRO-2,3,5-TRIMETHYLPYRIDINE-N-OXIDE	3	1,20	0,74	0,36	0,10	#N/A	PMT
1.3-Benzenediamine	3	1.17	0.80	0.27	0.10	#N/A	PMT
Bisoprolol	3	1,14	0,76	0,13	0,25	3	pharmaceutical, antihypertensive agent,
1,2,3-Benzotriazole	3	1,09	0,93	0,06	0,10	3	industrial chemical
Mexacarbate	3	1,04	0,82	0,12	0,10	5A	pesticide
(Z)-8-Dodecen-1-ol acetate	3	1,04	0,86	0,08	0,10	#N/A	insect attractant, pesticide
Amisulpride	3	1,02	0,81	0,11	0,10	5A	antipsychotic drug
1H-Benzotriazole, 1-methyl-	3	1,00	1,00	0,01	0,00	5A	industrial chemical
1-hydroxyisoquinoline	3	1,00	1,00	0,01	0,00	#N/A	industrial chemical
8-Hydroxychinolin	3	1,00	1,00	0,01	0,00	#N/A	industrial chemical, antiseptic drug, disi
Pyrazine, 2,3-dimethyl-	3	0,99	0,80	0,10	0,10	#N/A	antifungal agent
Oxacycloheptadec-10-en-2-one	3	0,99	0,83	0,06	0,10	#N/A	industrial chemical
Ibuprofen	3	0,98	0,57	0,31	0,10	3	pharmaceutical, NSAID, anti-inflammator



# Conclusions

- Common platform and innovative tools to deal with large number of substances: integrated use of different data sources and matrices
- Different lines of evidence for prioritisation in support of regulation :
  - Allows the use of NTS data as an additional data source for identification of priority CECs among substances that are currently under-investigated
  - Allows the use of NTS data as an additional line of evidence for prioritisation of substances, for which target monitoring data are already available
- Transparent system, flexible
- Wide-scope input for a European early warning system
- Overview of critical substances in each environmental compartment =>> for future work on grouping
- Mixture toxicity effects => MTI indicator under elaboration (WG-1 JPA 2022)

Thank you! Any QUESTIONS ?