Levels of Chemicals in Freshwater

Vit Kodes

CENIA

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DHI

Date/ event: 6.-7. 12. 2010 "Chemicals and Water" Workshop, EEA, Copenhagen
Author: Vit Kodes

Introduction

- SoE reporting
- Working databases (rivers and lakes, groundwater, TCM) ETC data managers
- Waterbase – publication of selected substances at EEA website

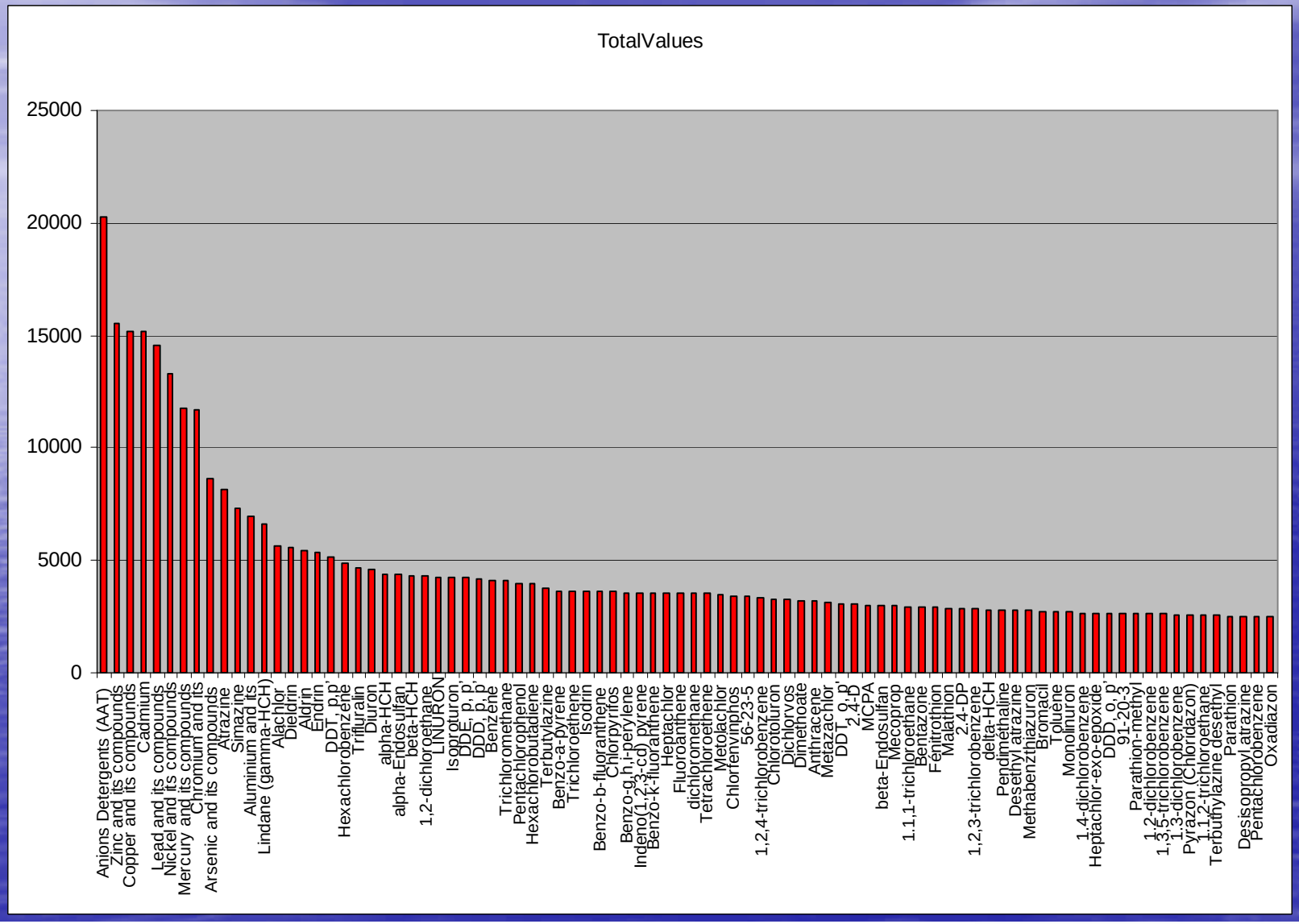
Introduction

SoE database content:

Water category	No. of substances	No. of values	No. of stations
Rivers	~900	~1 199 000	~4600
Groundwater	~250	~2 737 000	~8900

Problems:
Substance identification (naming, CAS mix-up)
Quality of data (outliers, units, various LOQ/LOD)
Spatial and temporal coverage, inconsistent time series

Introduction - Rivers



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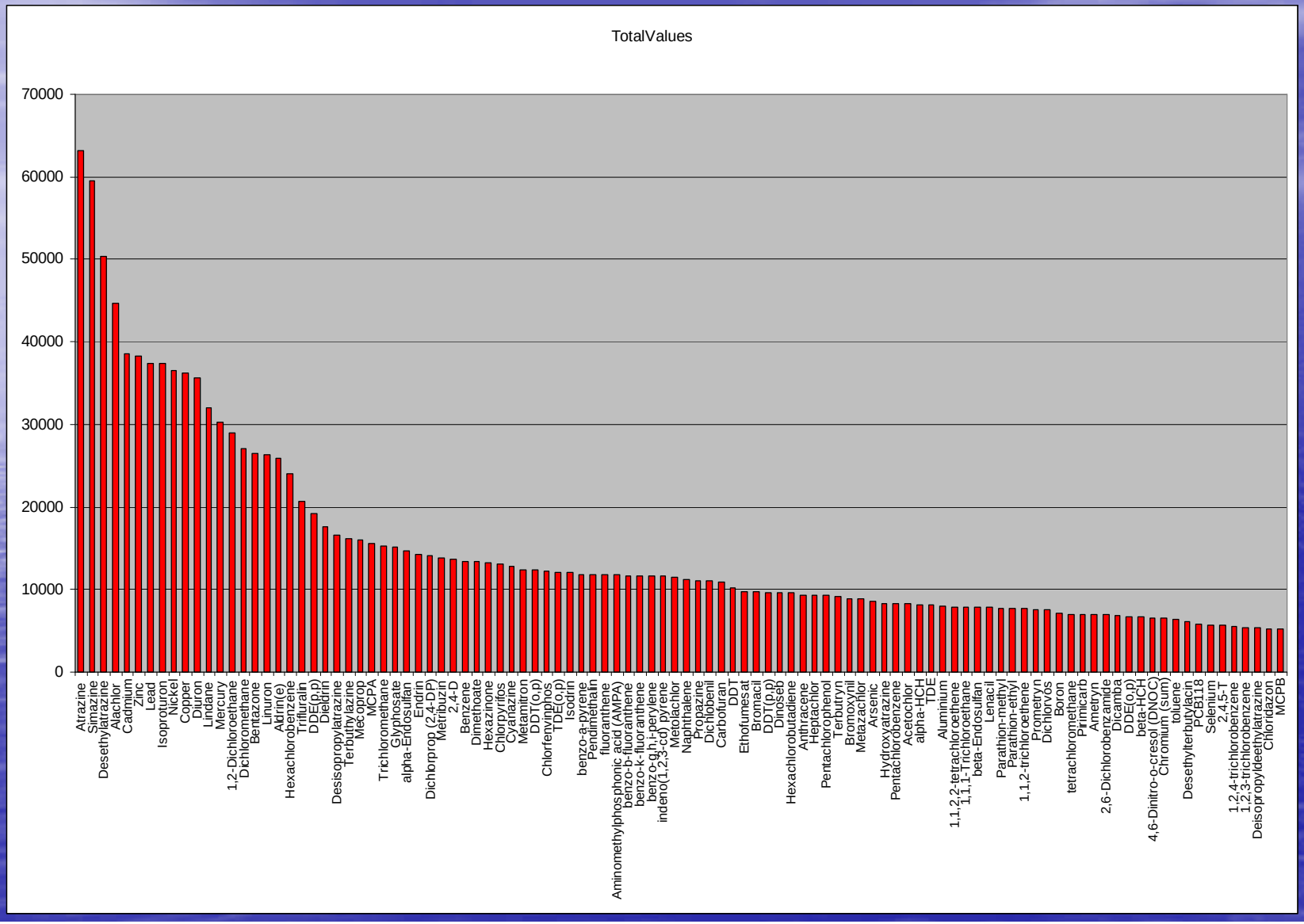
Introduction - Groundwater



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Introduction

- Definition of preferred substances for SoE reporting
- Substances partly different for each water category
- Goal - harmonisation of SoE reporting (on voluntary basis)

Selection of Substances for SoE reporting

EQS Directive (105/2008/EC)

ID used in GW an	CAS	Name	105/2008/EC	Rivers,Lakes	GW	TCM water	TCM sediments	TCM biota	HPVC
1112	127-18-4	1,1,2,2-tetrachloroethene	x	x	x	x			yes
1111	79-01-6	1,1,2-trichloroethene	x	x	x	x			yes
884	107-06-2	1,2-Dichloroethane	x	x	x	x			yes
894	104-40-5	4-Nonylphenol	x	x	x	x			no
504	15972-60-8	Alachlor	x	x	x	x			yes
825	309-00-2	Aldrin	x	x	x	x	x	x	no
845	959-98-8	alpha-Endosulfan	x	x	x	x	x	x	yes
877	120-12-7	Anthracene	x	x	x	x	x	x	yes
505	1912-24-9	Atrazine	x	x	x	x			yes
878	71-43-2	Benzene	x	x	x	x			yes
900	50-32-8	Benzo(a)pyrene	x	x	x	x	x	x	no
901	205-99-2	Benzo(b)fluoranthene	x	x	x	x	x	x	no
902	191-24-2	Benzo(g,h,i)perylene	x	x	x	x	x	x	no
903	207-08-9	Benzo(k)fluoranthene	x	x	x	x	x	x	no
808	7440-43-9	Cadmium	x	x	x	x	x	x	yes
834	72-54-8	DDD, p,p'	x	x	x	x	x	x	no
831	72-55-9	DDE, p,p'	x	x	x	x	x	x	no
827	789-02-6	DDT, o,p'	x	x	x	x	x	x	no
828	50-29-3	DDT, p,p'	x	x	x	x	x	x	yes
886	117-81-7	Di (2-ethylhexyl) phthalate (DEHP)	x	x	x	x		x	yes
835	60-57-1	Dieldrin	x	x	x	x	x	x	no
885	75-09-2	Dichloromethane	x	x	x	x			yes
508	330-54-1	Diuron	x	x	x	x			yes
836	72-20-8	Endrin	x	x	x	x	x	x	no
904	206-44-0	Fluoranthene	x	x	x	x	x	x	no
510	58-89-9	gamma-HCH (Lindane)	x	x	x	x	x	x	yes
511	118-74-1	Hexachlorobenzene (HCB)	x	x	x	x	x	x	yes
891	87-68-3	Hexachlorobutadiene (HCBD)	x	x	x	x	x	x	no
506	470-90-6	Chlorfenvinphos	x	x	x	x			no
883	85535-84-8	Chloroalkanes C10-13	x	x	x	x		x	yes
507	2921-88-2	Chlorpyrifos	x	x	x	x			yes
905	193-39-5	Indeno(1,2,3-cd)pyrene	x	x	x	x	x	x	no
916	465-73-6	Isodrin	x	x	x	x	x	x	no
512	34123-59-6	Isoproturon	x	x	x	x			yes
819	7439-92-1	Lead	x	x	x	x	x	x	yes
822	7439-97-6	Mercury	x	x	x	x	x	x	yes
892	91-20-3	Naphthalene	x	x	x	x	x	x	yes
815	7440-02-0	Nickel	x	x	x	x	x	x	yes
930	189084-64-8	PBDE100	x			x	x	x	no
931	68631-49-2	PBDE153	x			x	x	x	no
932	207122-15-4	PBDE154	x			x	x	x	no
933	41318-75-6	PBDE28	x			x	x	x	no
934	5436-43-1	PBDE47	x			x	x	x	no
935	60328-60-9	PBDE99	x			x	x	x	no
897	140-66-9	Para-tert-octylphenol	x	x	x	x			yes
898	608-93-5	Pentachlorobenzene	x	x	x	x	x	x	no
823	87-86-5	Pentachlorophenol	x	x	x	x	x		no
513	122-34-9	Simazine	x	x	x	x			yes
1113	56-23-5	Tetrachloromethane	x	x	x	x			yes
906	688-73-3	Tributyltin compounds	x	x		x	x	x	no
514	1582-09-8	Trifluralin	x	x	x	x			yes
912	67-66-3	Trichloromethane	x	x	x	x			yes

Selection of Substances for SoE reporting

Additional substances (frequent occurrence, content expert selected)

ID used in GW an	CAS	Name	105/2008/EC	Rivers,Lakes	GW	TCM water	TCM sediments	TCM biota	HPVC
1246	71-55-6	1,1,1-Trichloroethane			x				yes
861	94-75-7	2,4-D			x				yes
840	319-84-6	alpha-HCH			x	x	x	x	no
803	7440-38-2	Arsenic		x	x	x	x	x	yes
839	25057-89-0	Bentazone			x				yes
939	56-55-3	Benzo(a)anthracene					x	x	no
841	319-85-7	beta-HCH			x	x	x	x	no
813	7440-47-3	Chromium		x	x	x	x	x	yes
938	218-01-9	Chrysene					x	x	no
804	7440-50-8	Copper		x	x	x	x	x	yes
849	6190-65-4	Desethylatrazine			x				no
850	1007-28-9	Desisopropylatrazine			x				no
937	53-70-3	Dibenzo[a,h]anthracene					x	x	no
917	330-55-2	Linuron		x	x	x			yes
864	94-74-6	MCPA		x	x				yes
866	7085-19-0	Mecoprop		x	x				no
		PBDE other congeners*				x	x	x	no
923	37680-73-2	PCB101				x	x	x	no
919	31508-00-6	PCB118				x	x	x	no
924	35065-28-2	PCB138				x	x	x	no
925	35065-27-1	PCB153				x	x	x	no
926	35065-29-3	PCB180				x	x	x	no
927	35694-08-7	PCB194				x	x	x	no
928	7012-37-5	PCB28				x	x	x	no
929	35693-99-3	PCB52				x	x	x	no
1117	85-01-8	Phenanthrene					x	x	no
852	7287-19-6	Prometryn			x				no
851	139-40-2	Propazine			x				no
936	129-00-0	Pyrene					x	x	no
854	5915-41-3	Terbuthylazine			x				no
1114	108-88-3	Toluene		x		x			yes
907	36643-28-4	Tributyltin cation		x		x			no
807	7440-66-6	Zinc		x	x	x	x	x	yes

Quality Standards Comparison

CAS	Substance	EQS	GW standard	DW standard
127-18-4	1,1,2,2-tetrachloroethene	10	n/a	10*
79-01-6	1,1,2-trichloroethene	10	n/a	10*
107-06-2	1,2-Dichloroethane	10	n/a	3
56-23-5	Tetrachloromethane	12	n/a	n/a
71-43-2	Benzene	10	n/a	1
50-32-8	Benzo(a)pyrene	0.03	n/a	0.01
15972-60-8	Alachlor	0.3	0.1	0.1
1912-24-9	Atrazine	0.6	0.1	0.1
6190-65-4	Desethylatrazine	n/a	0.1	0.1
1007-28-9	Desisopropylatrazine	n/a	0.1	0.1
330-54-1	Diuron	0.2	0.1	0.1
58-89-9	gamma-HCH	0.02	0.1	0.1
2921-88-2	Chlorpyrifos	0.03	0.1	0.1
34123-59-6	Isoproturon	0.3	0.1	0.1
330-55-2	Linuron	n/a	0.1	0.1
122-34-9	Simazine	1	0.1	0.1
5915-41-3	Terbuthylazine	n/a	0.1	0.1
1582-09-8	Trifluralin	0.03	0.1	0.1
7439-92-1	Lead	7.2	n/a	10
7439-97-6	Mercury	0.05	n/a	1
7440-43-9	Cadmium	0.2	n/a	5

Rivers concentrations

Assessment according proposed HS indicator:

The hazardous substance "traffic light" indicator is based on EQS

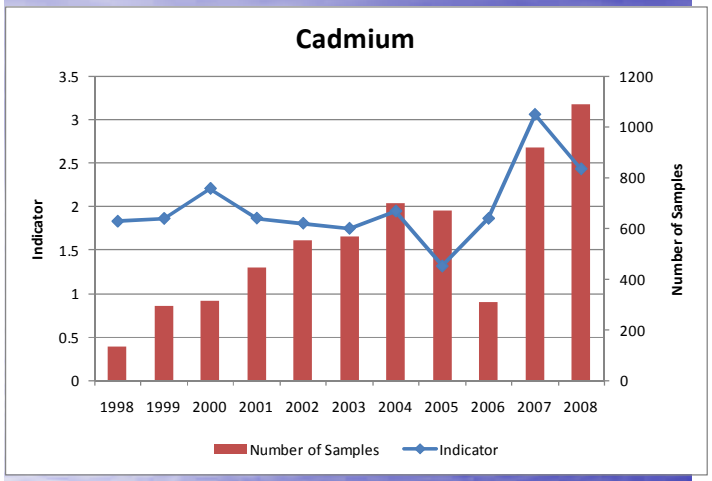
The average concentration of each hazardous substance is divided by the EQS

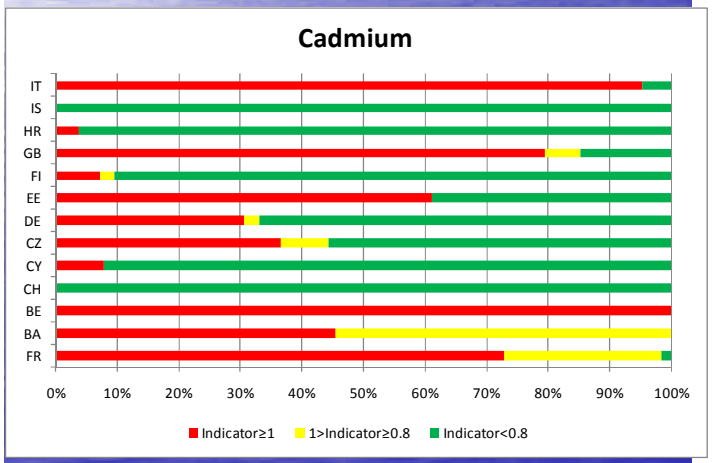
Substance with an indicator >= 1 (red light)

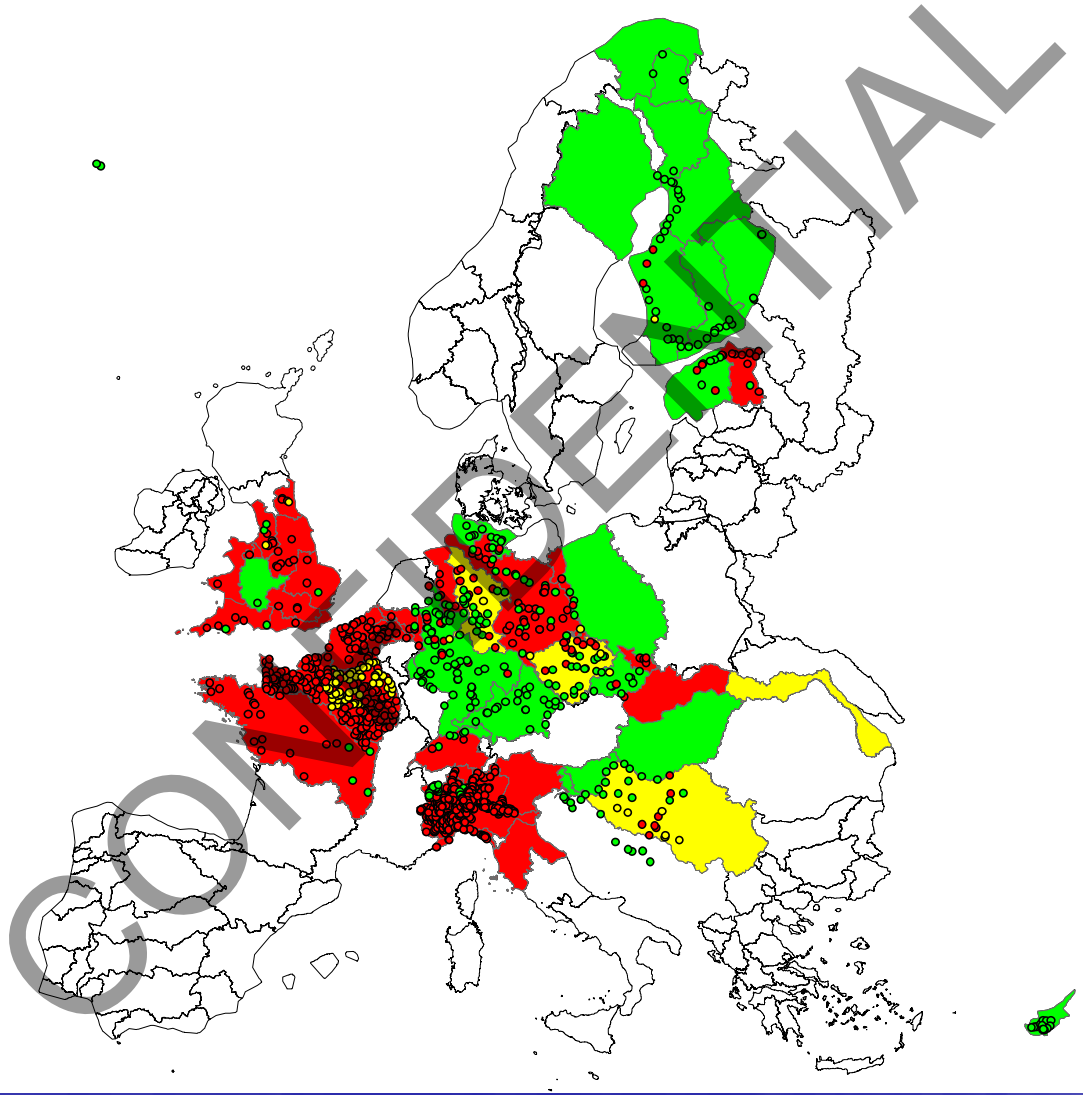
Substance with an indicator 0.8 - 1 (yellow light)

Substance with an indicator < 0.8 (green light)

Rivers concentrations - Cadmium







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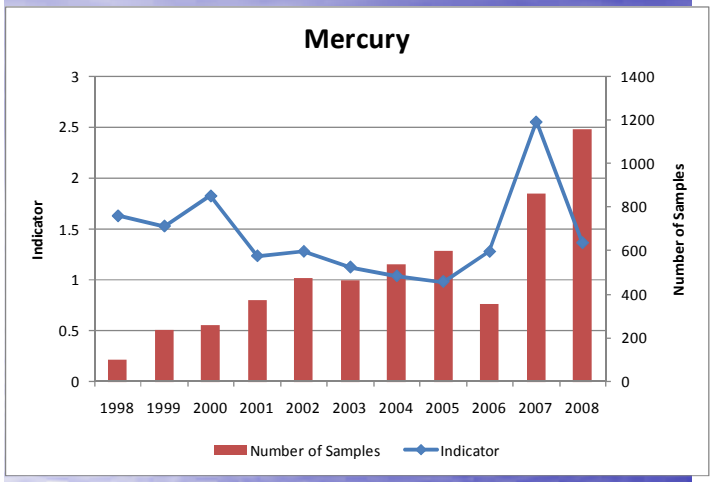
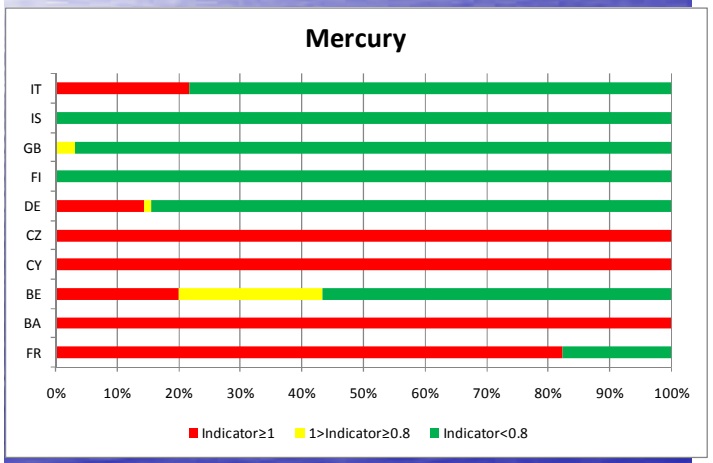
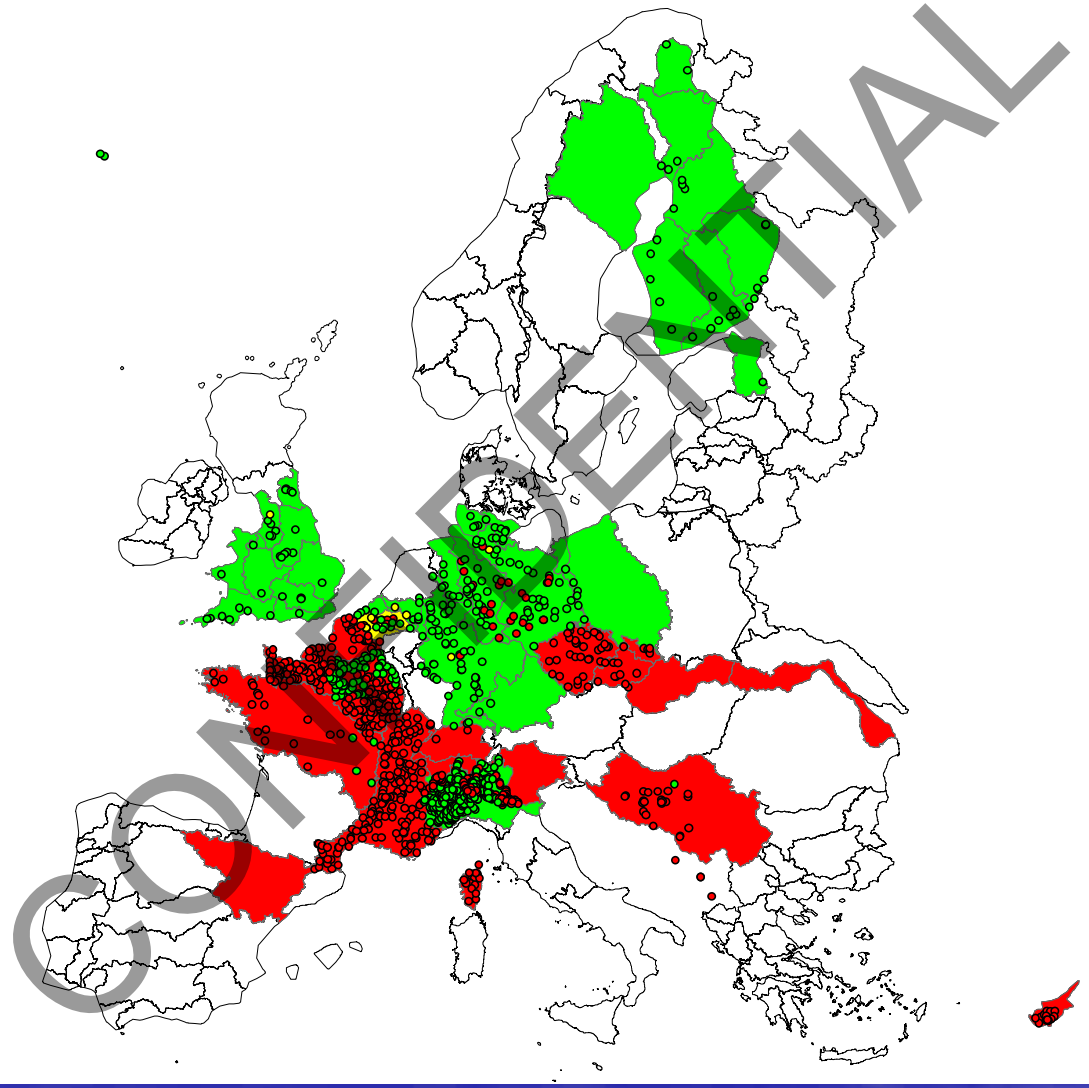
Rivers concentrations - Mercury







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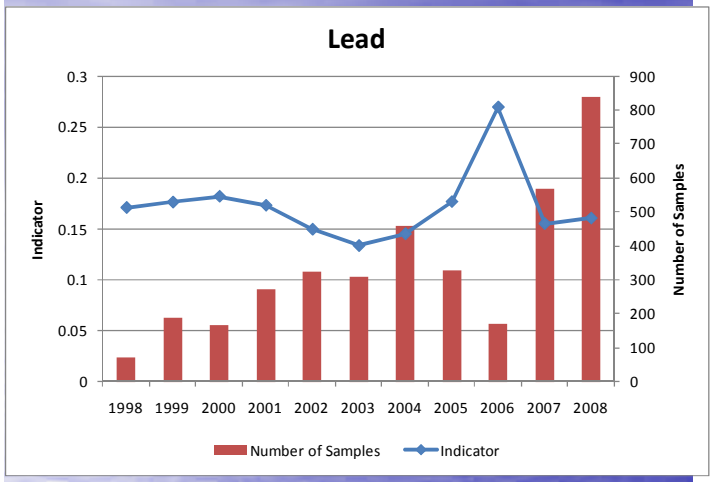
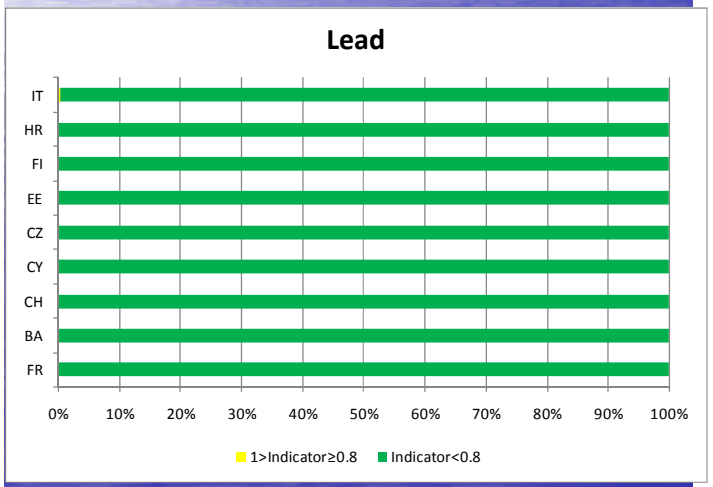
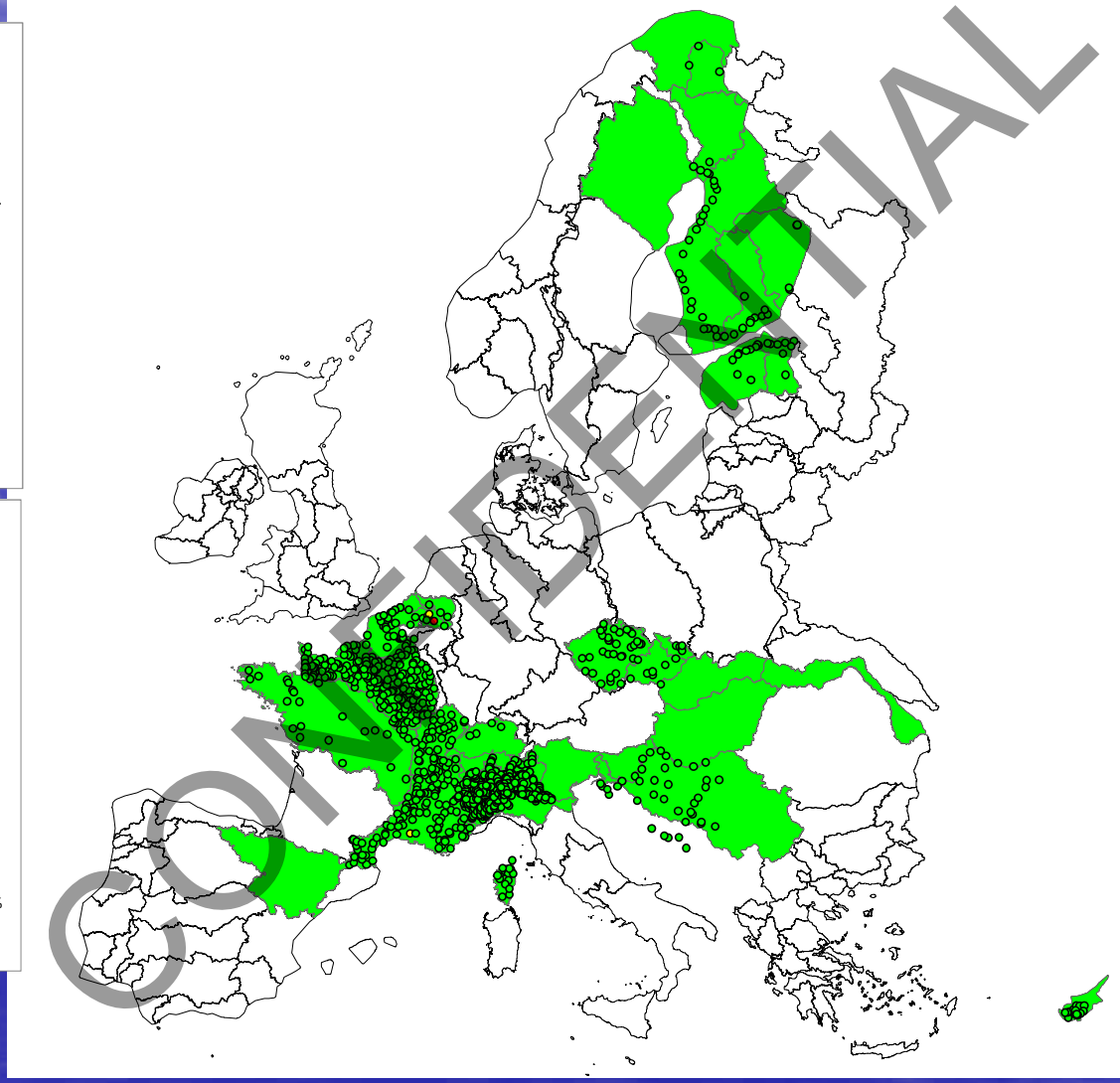
Rivers concentrations - Lead







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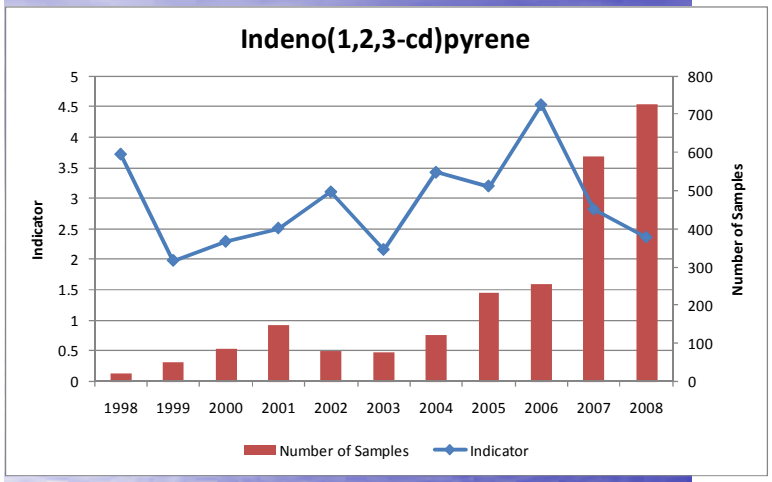
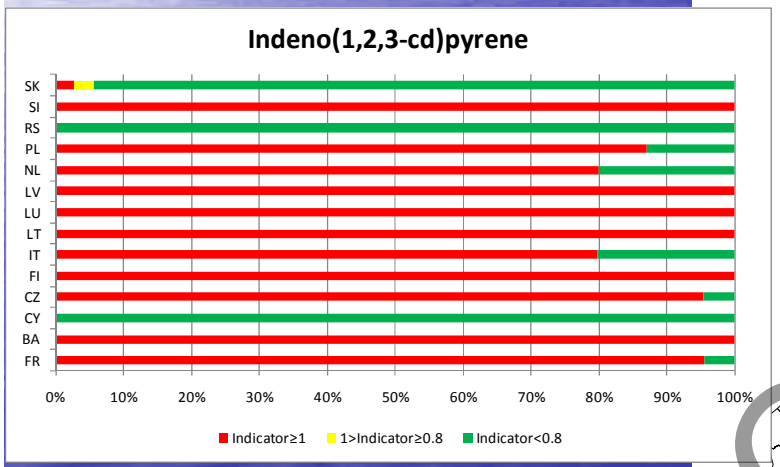
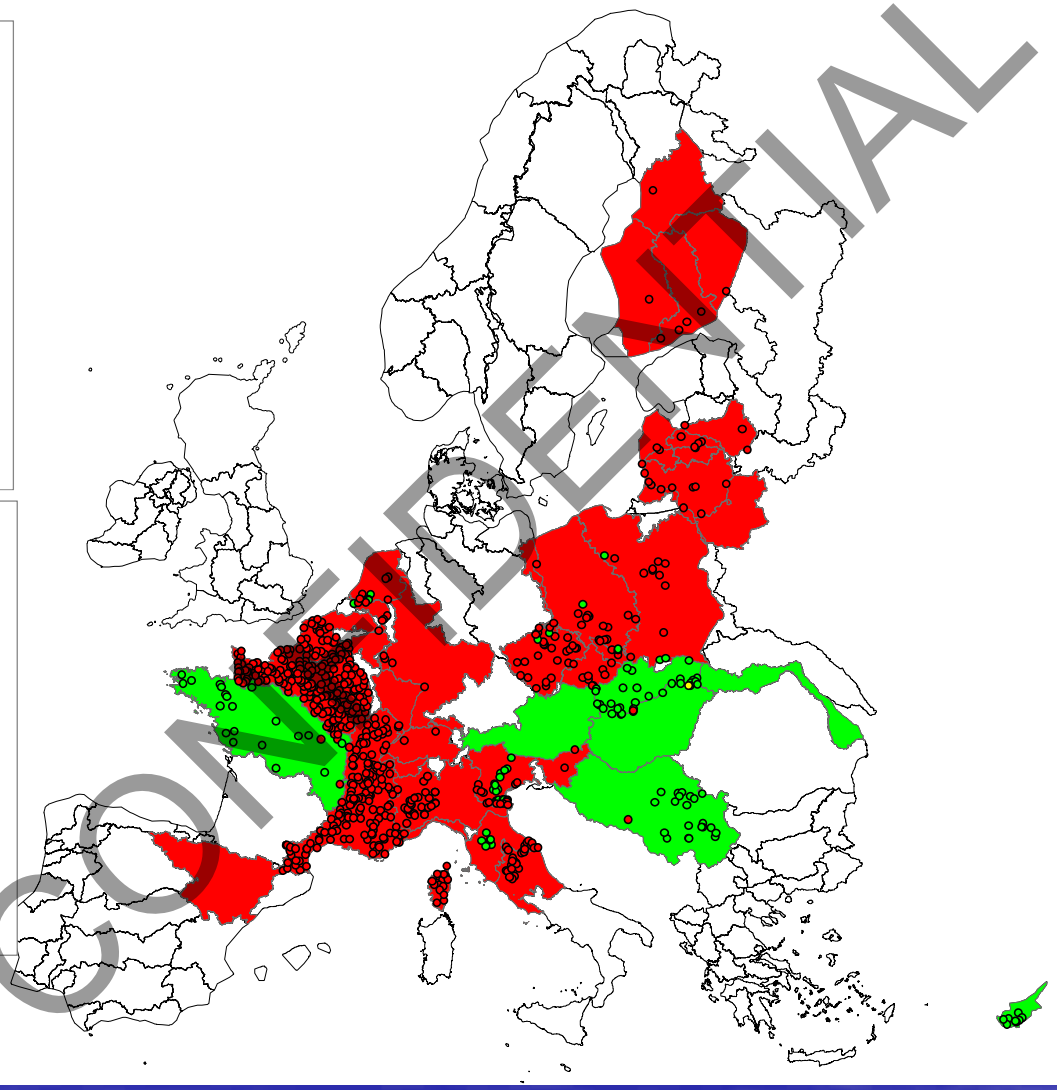
Rivers concentrations - Indeno(1,2,3-cd)pyrene







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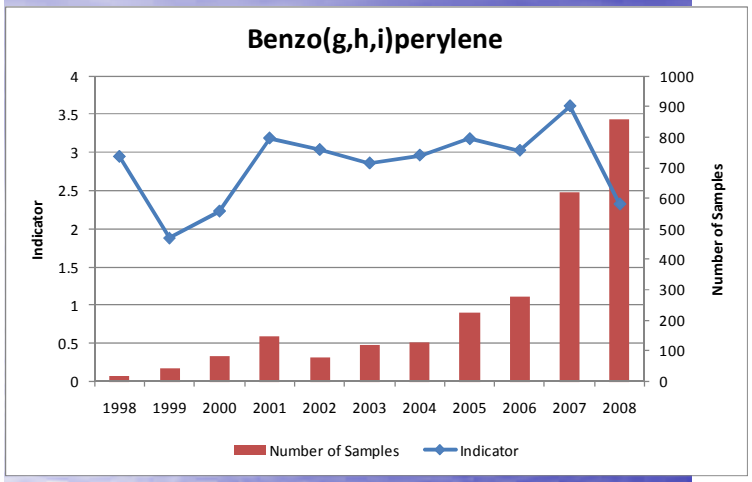
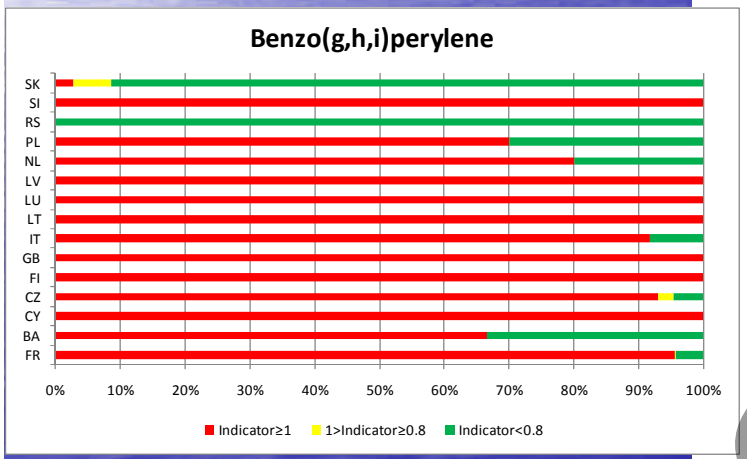
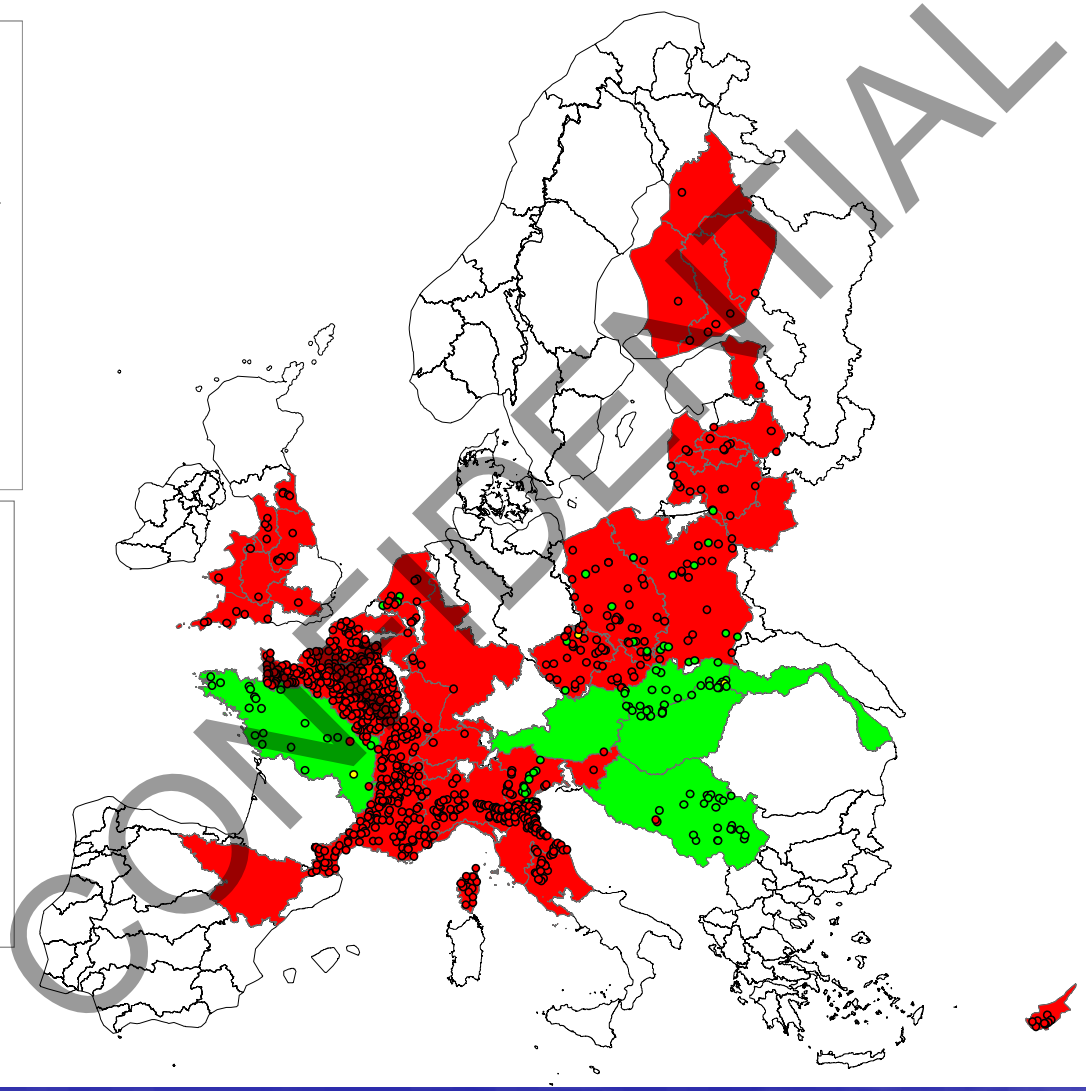
Rivers concentrations - Benzo(g,h,i)perylene







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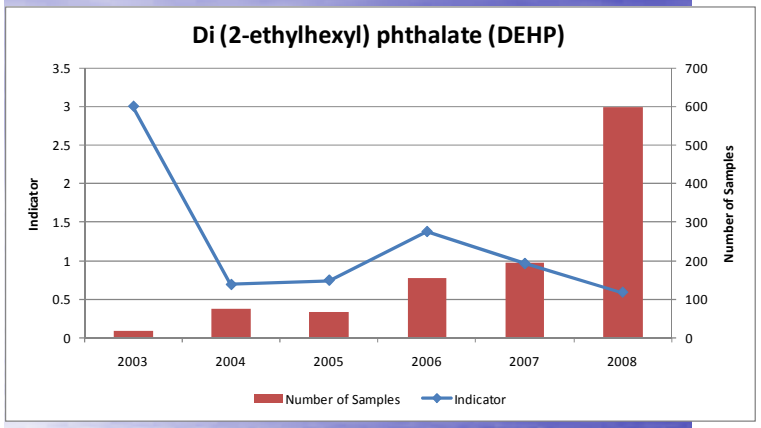
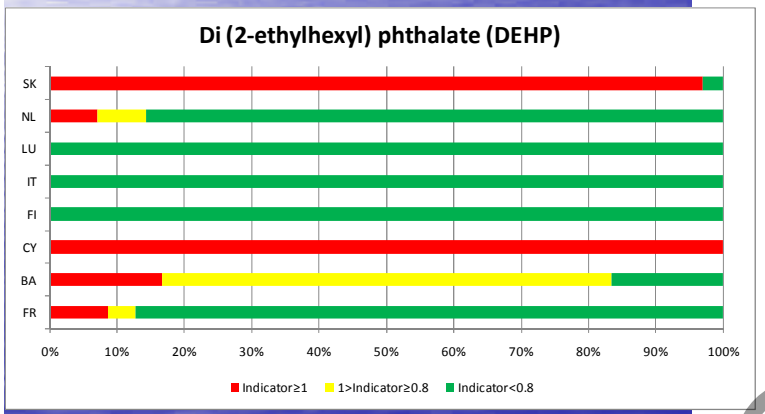
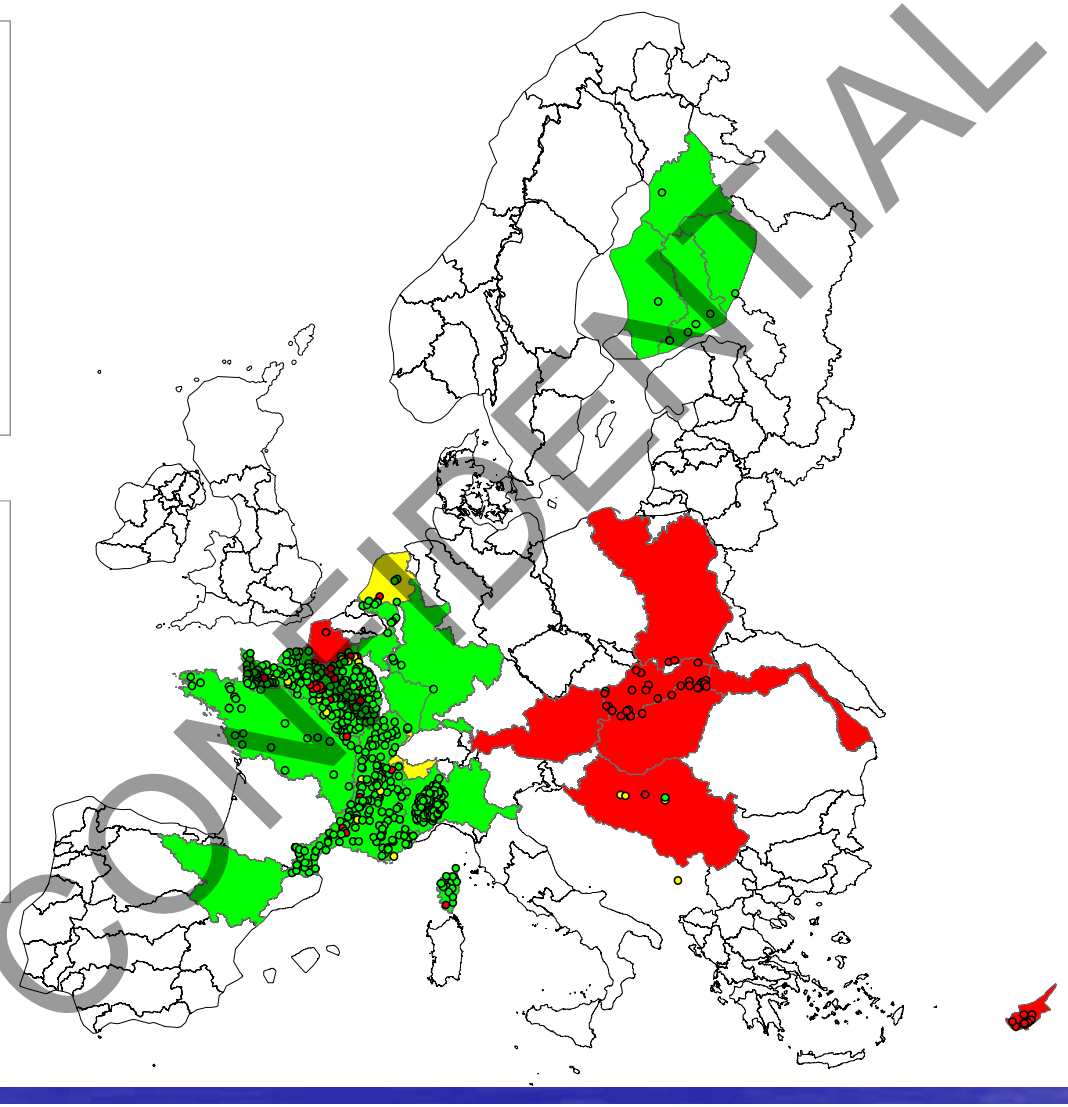
Rivers concentrations - DEHP







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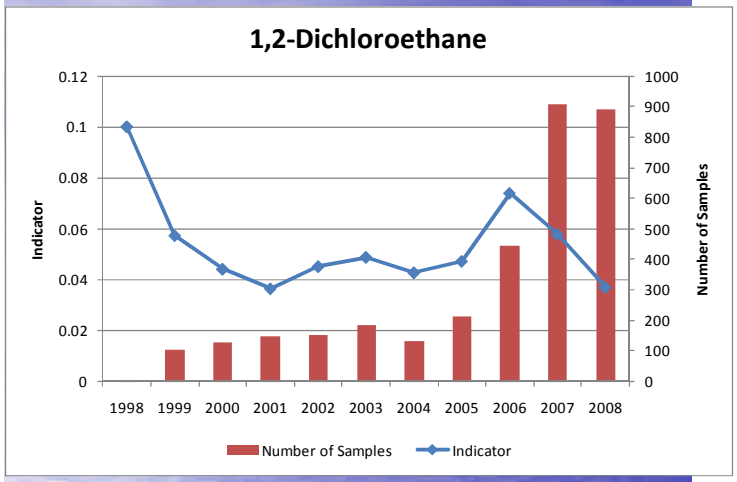
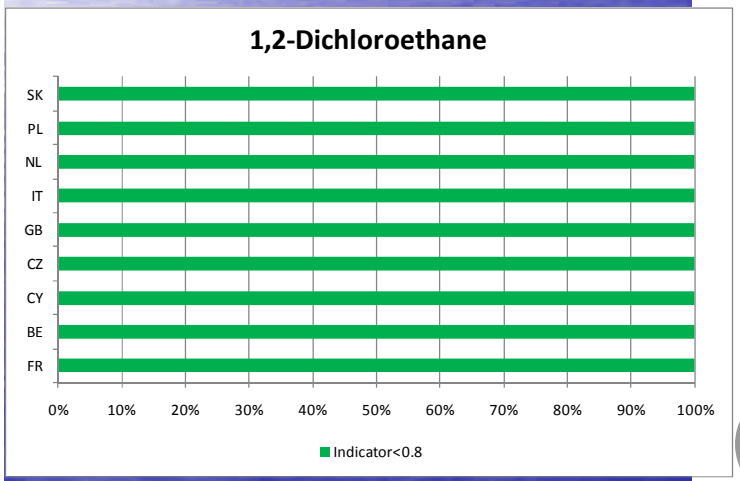
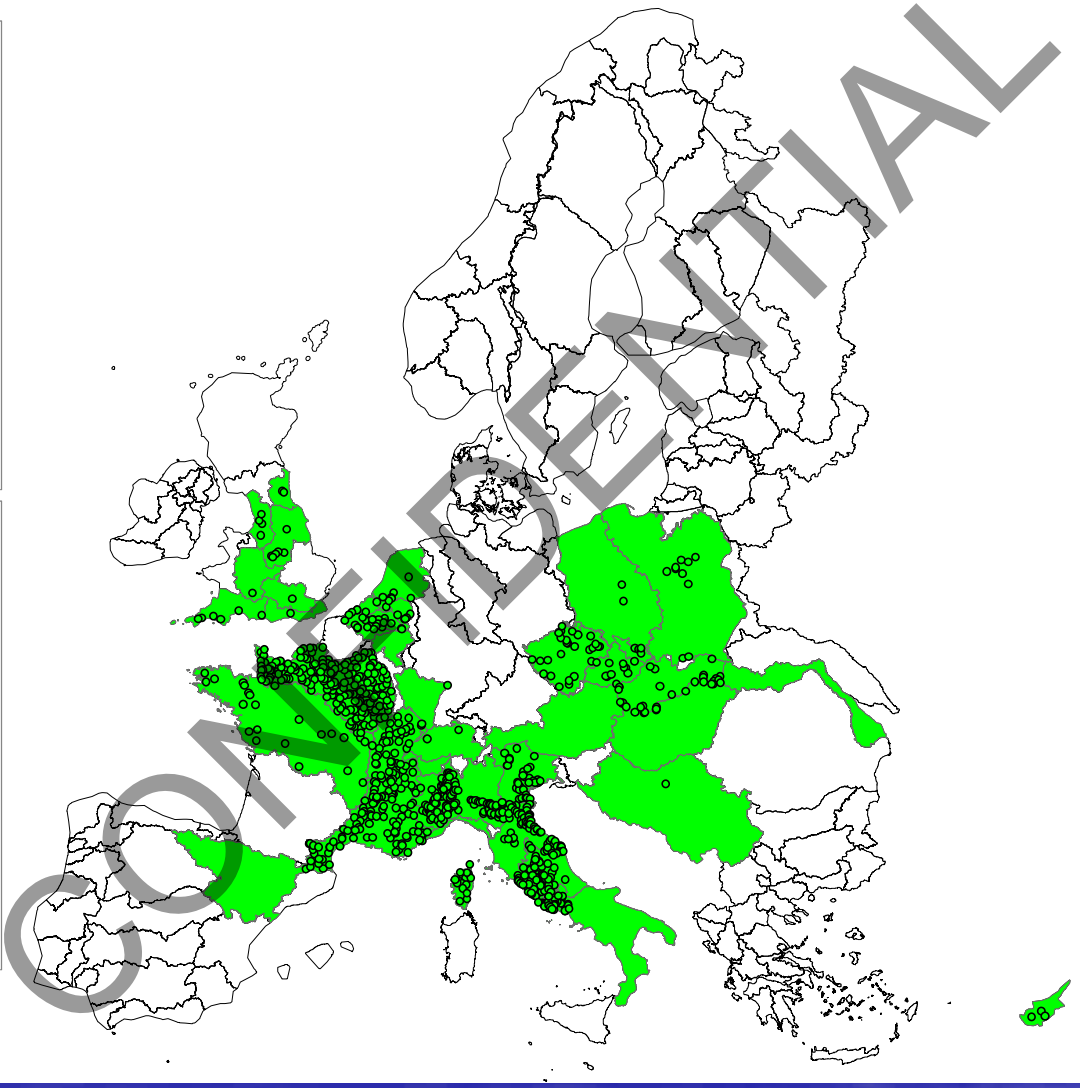
Rivers concentrations – 1,2-dichloroethane







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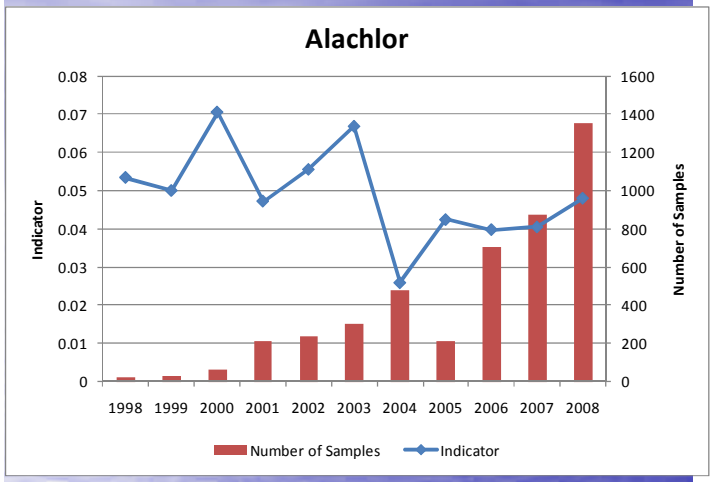
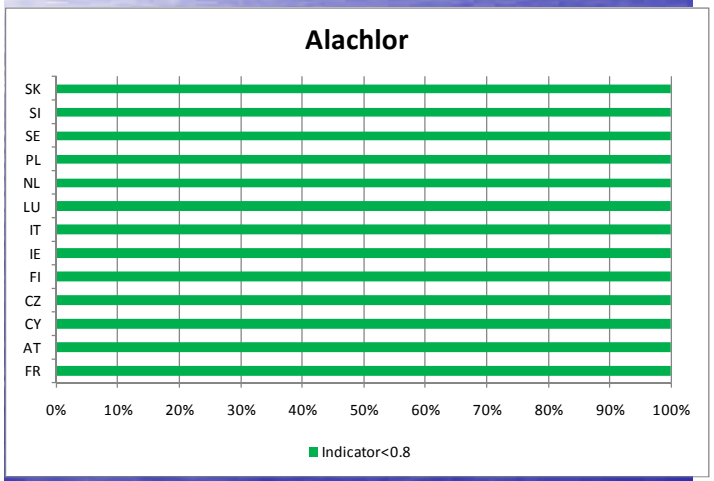
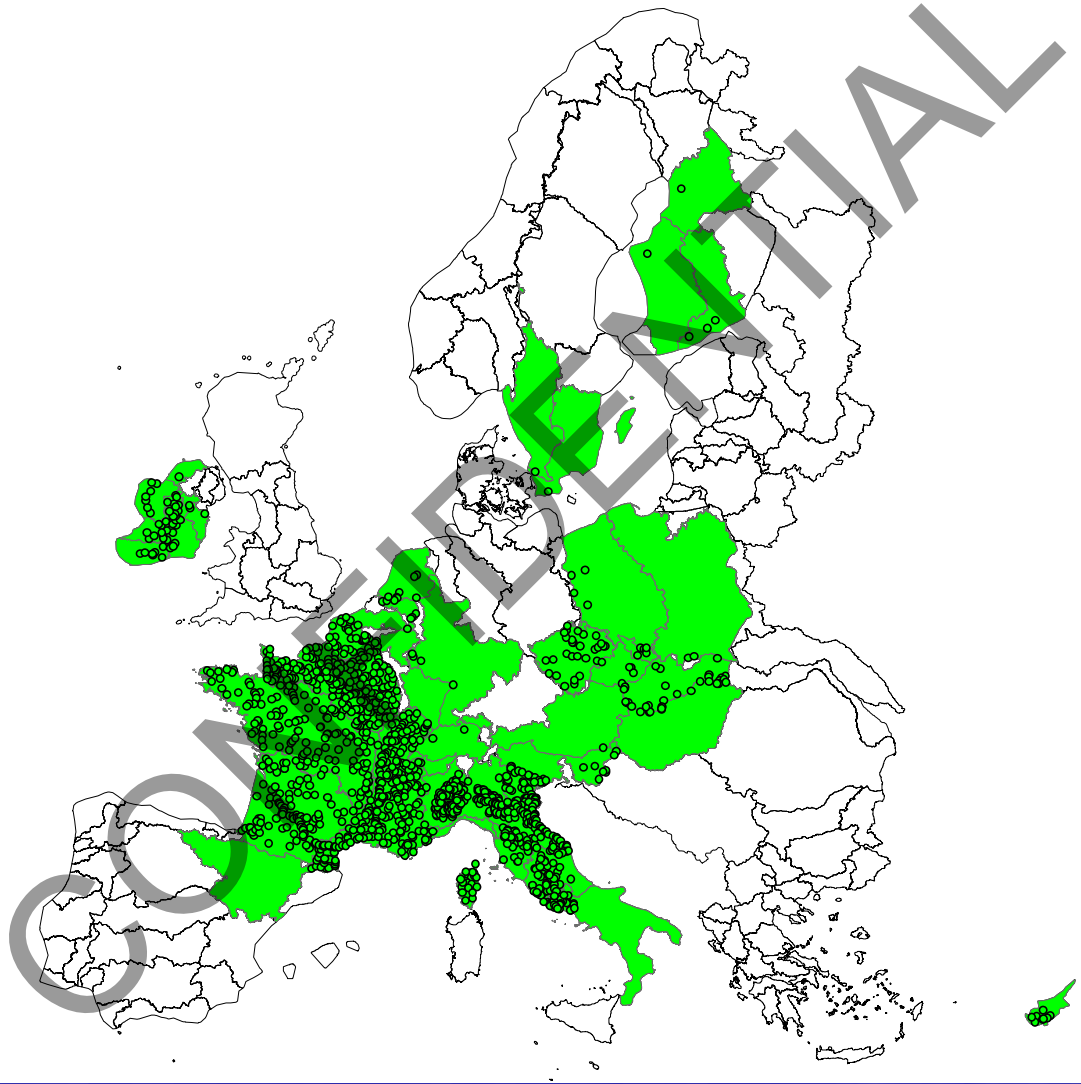
Rivers concentrations - Alachlor







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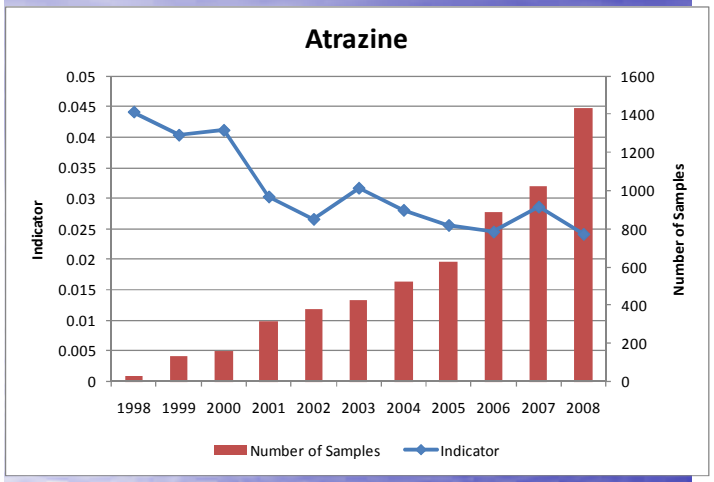
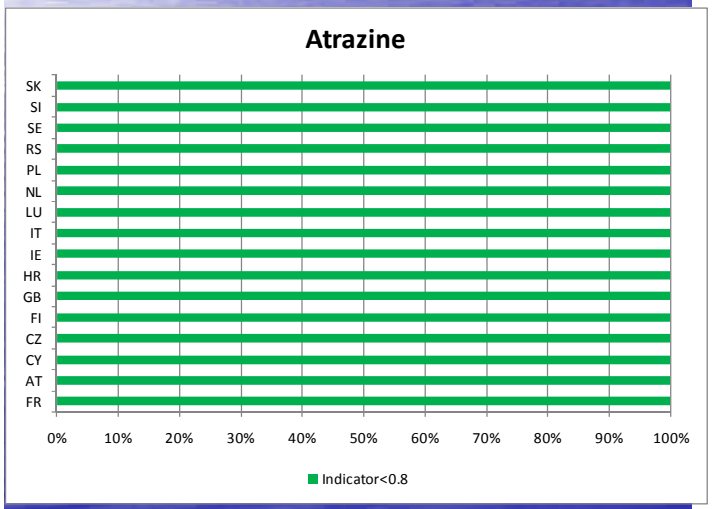
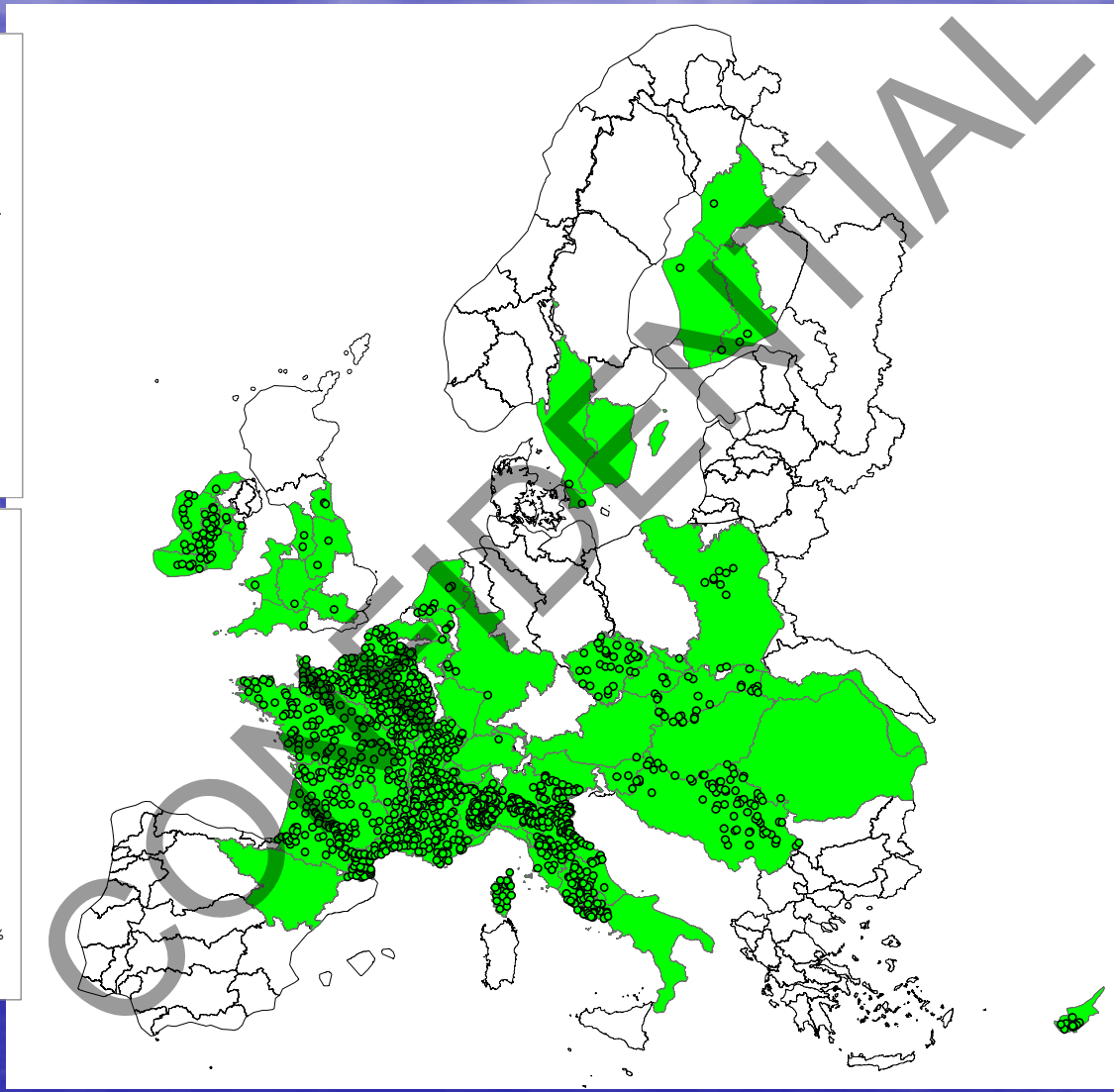
Rivers concentrations - Atrazine







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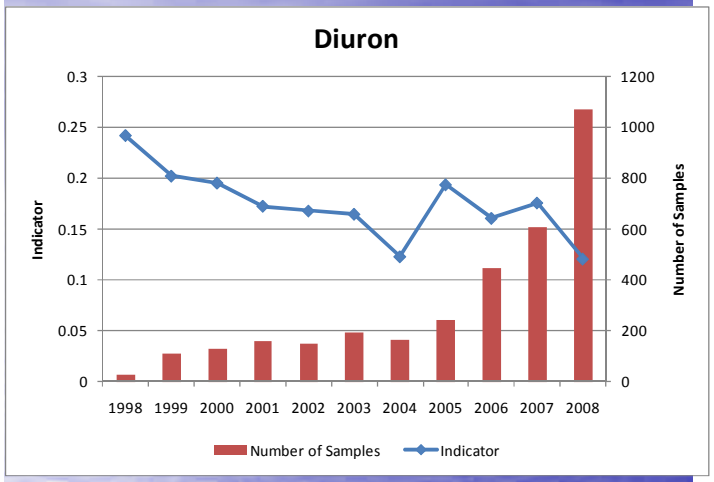
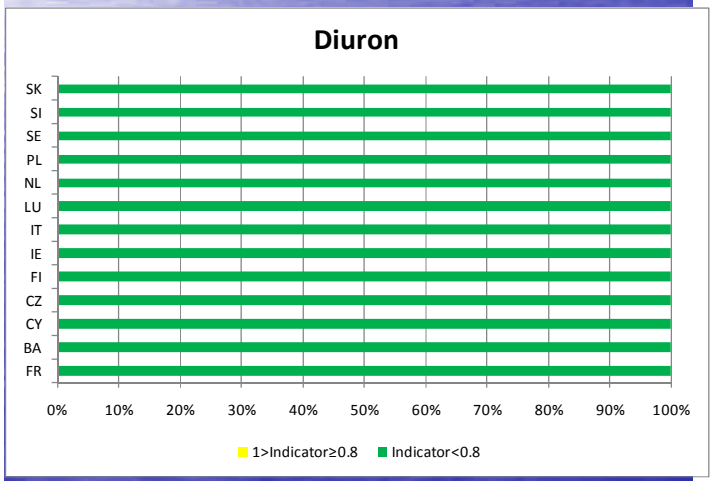
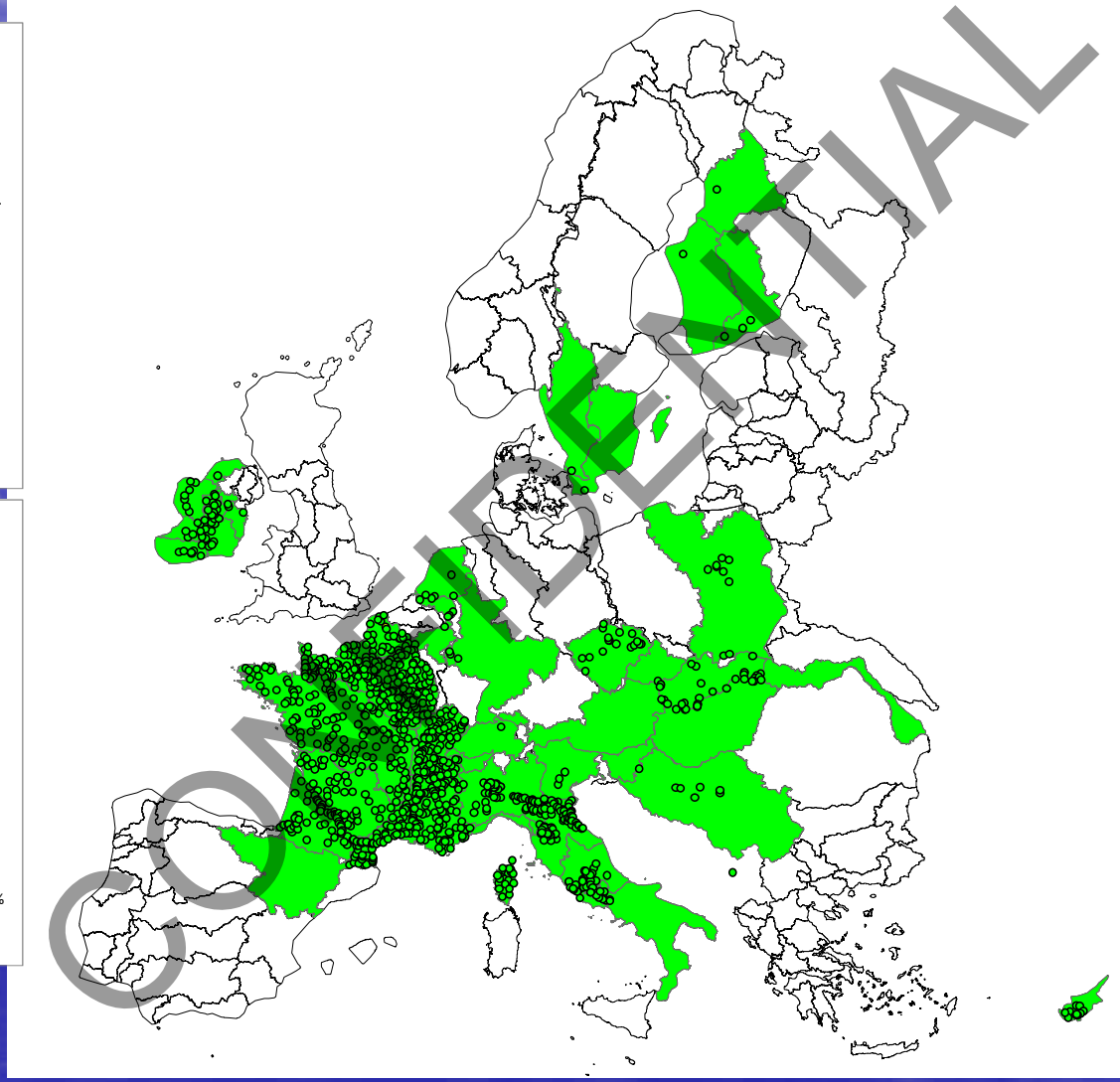
Rivers concentrations - Diuron







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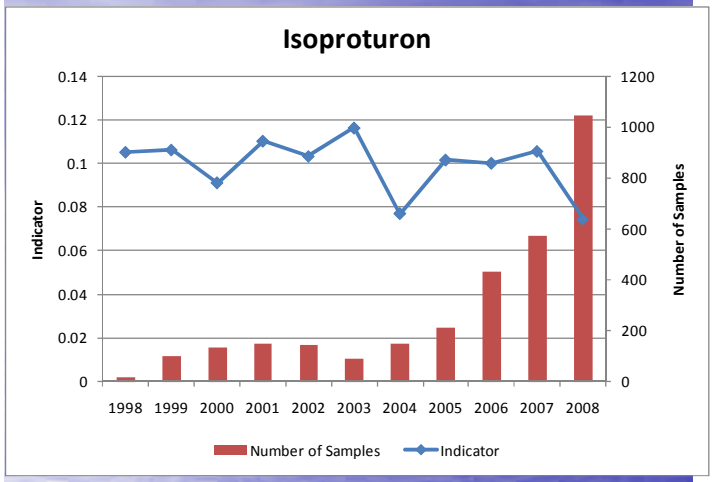
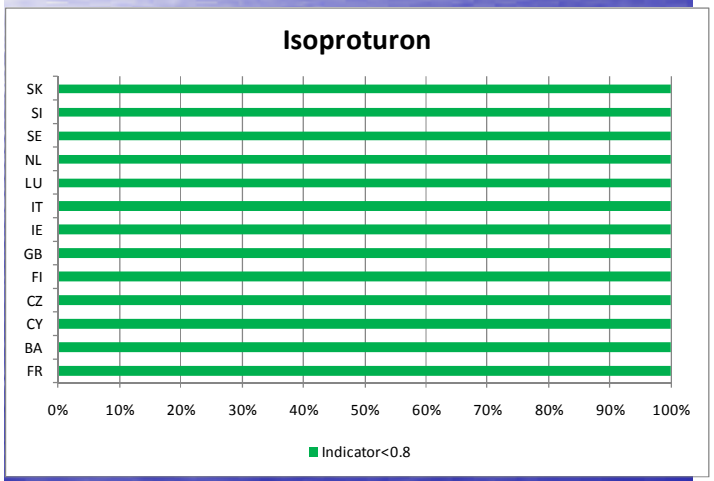
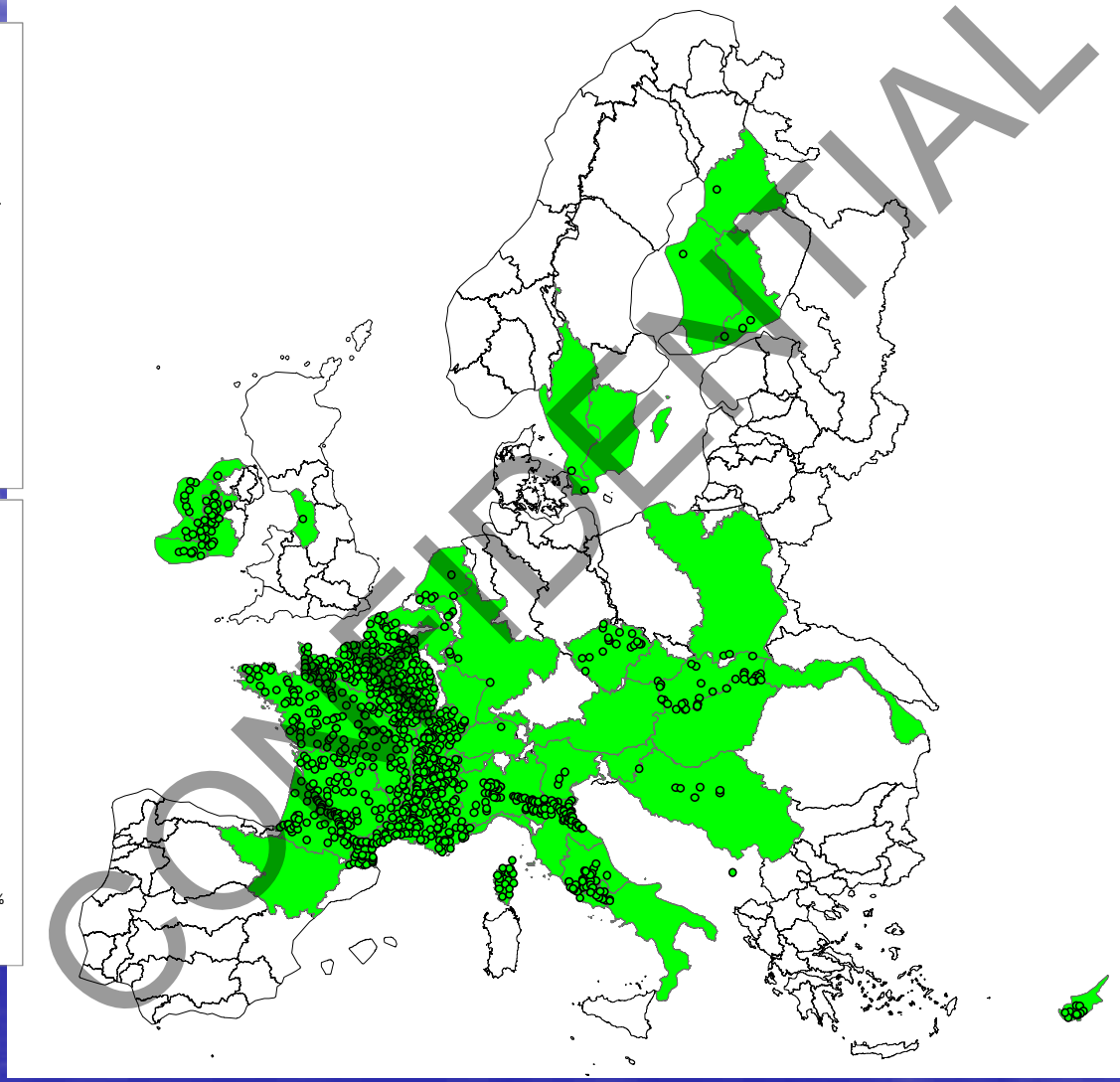
Rivers concentrations - Isoproturon







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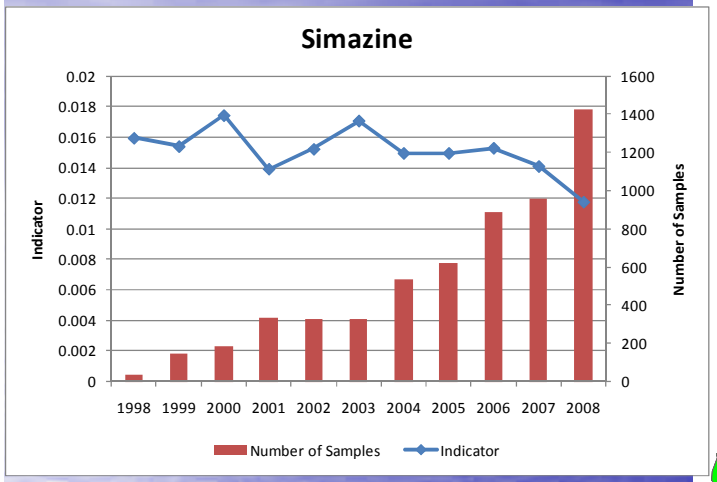
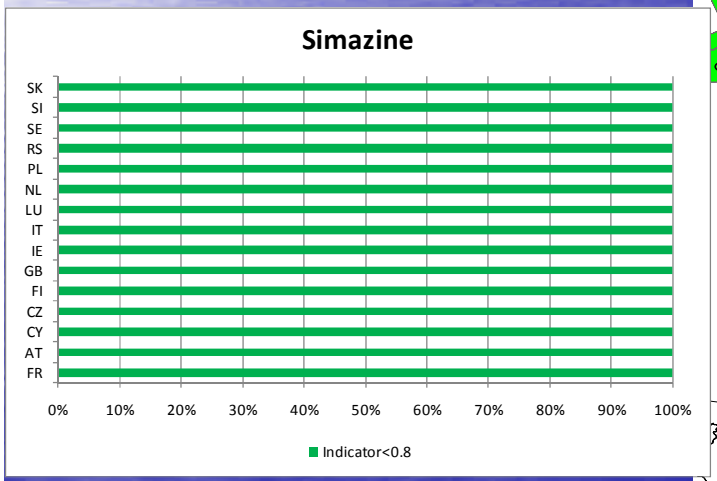
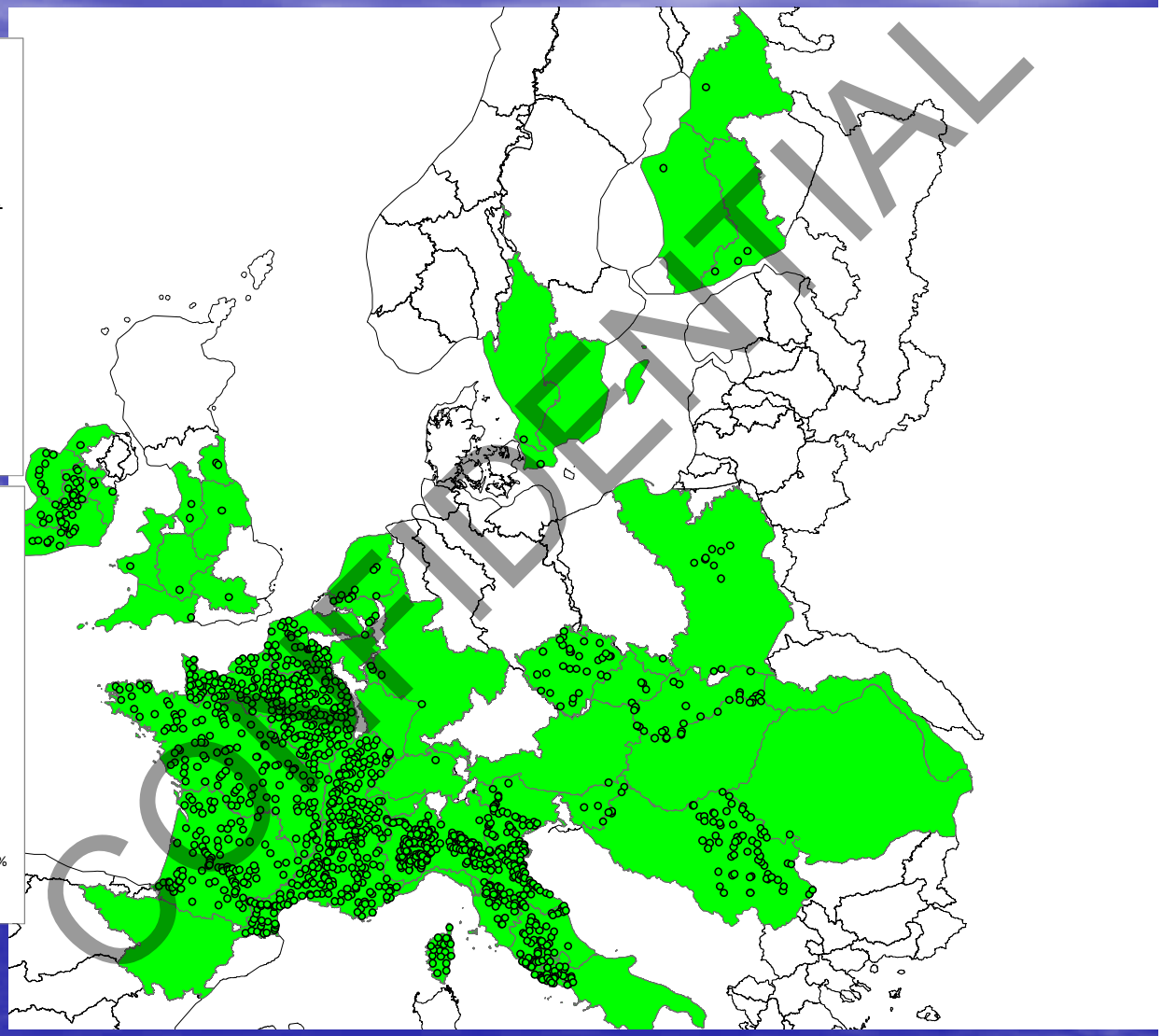
Rivers concentrations - Simazine







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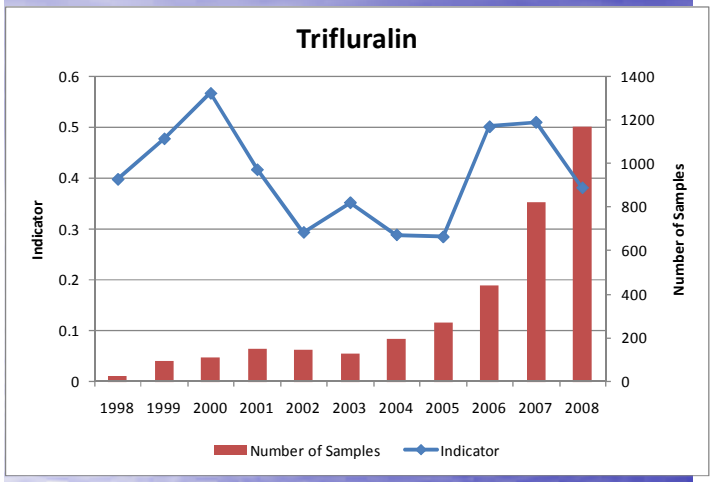
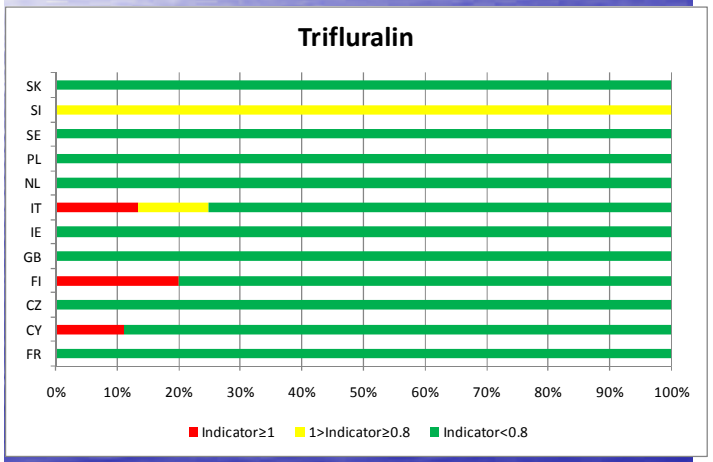
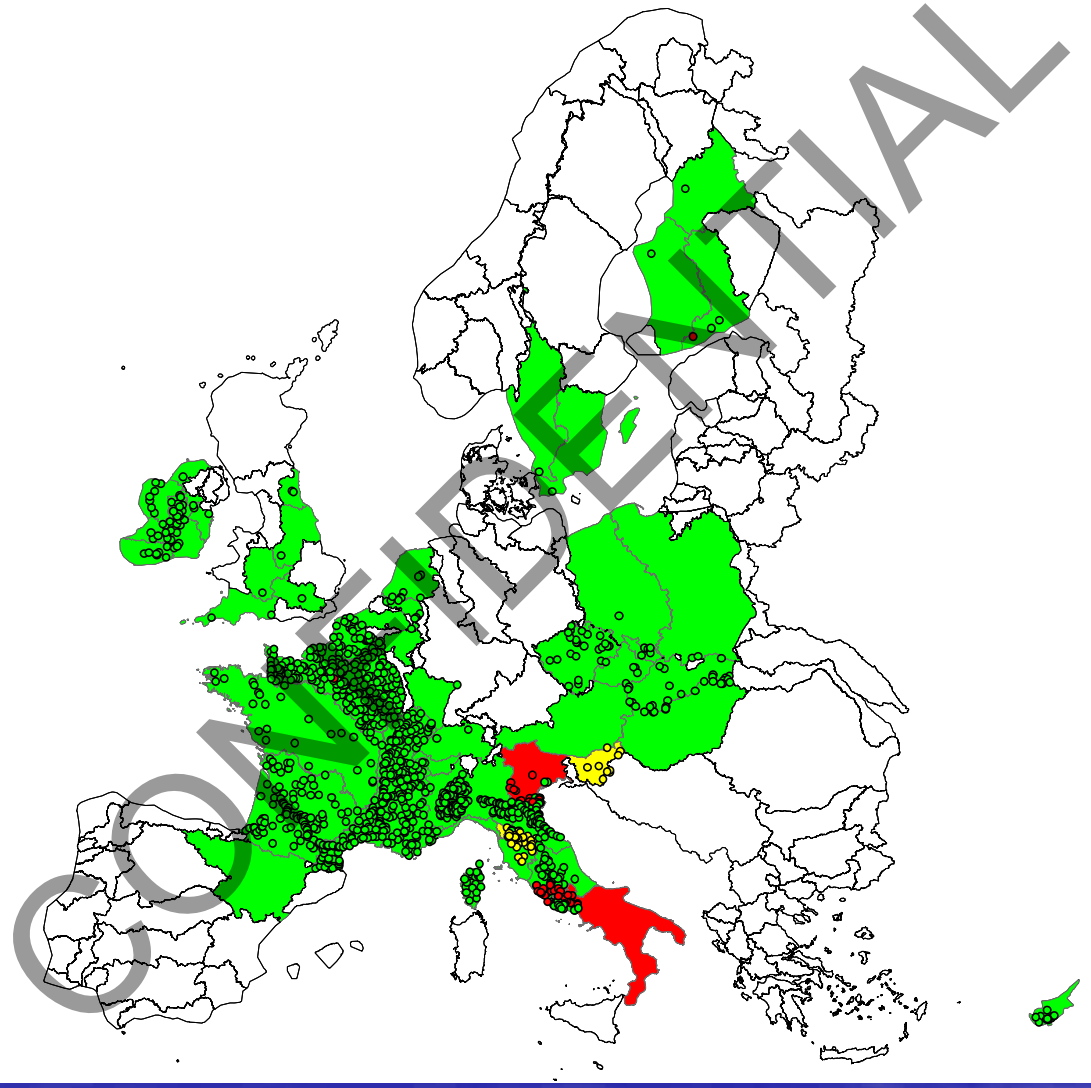
Rivers concentrations - Trifluralin







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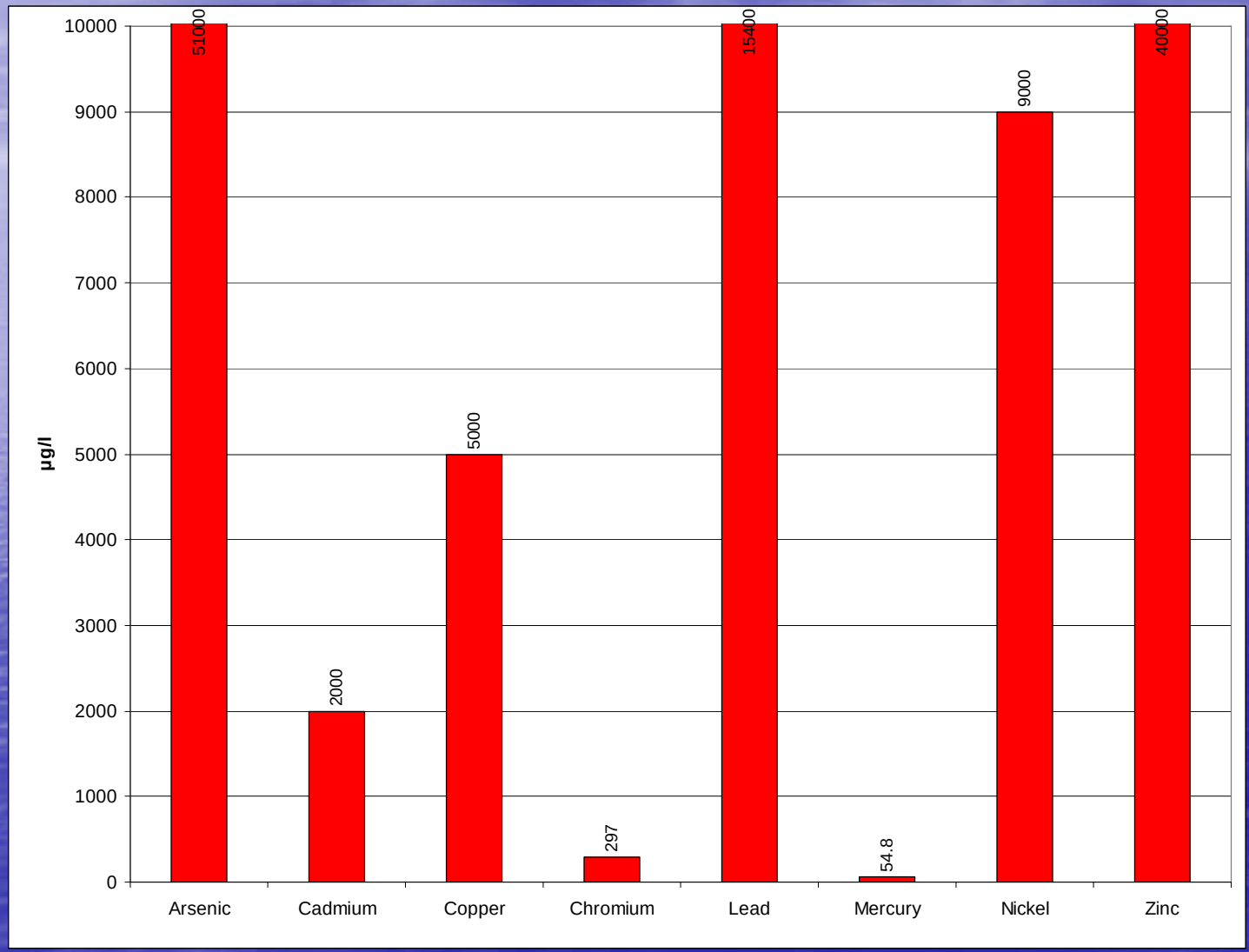
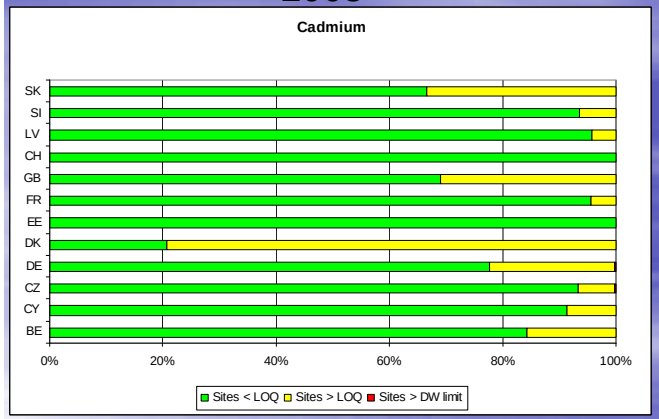
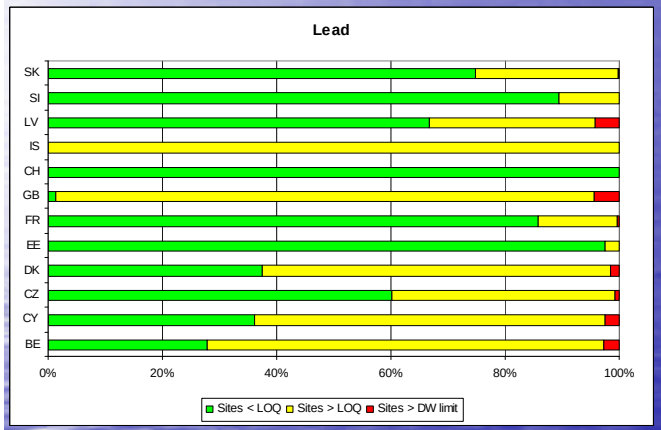
Groundwater - Maximum Concentrations

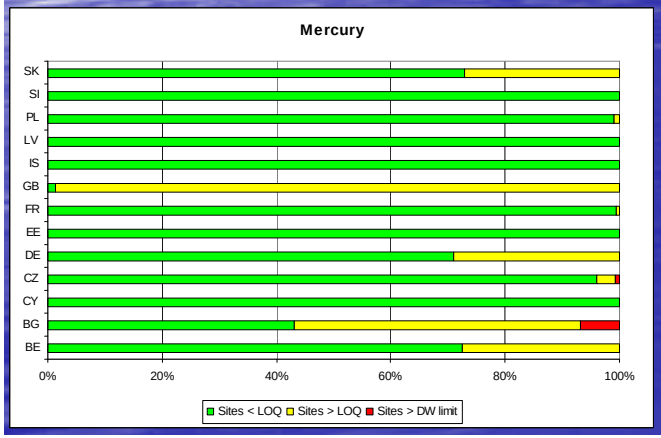


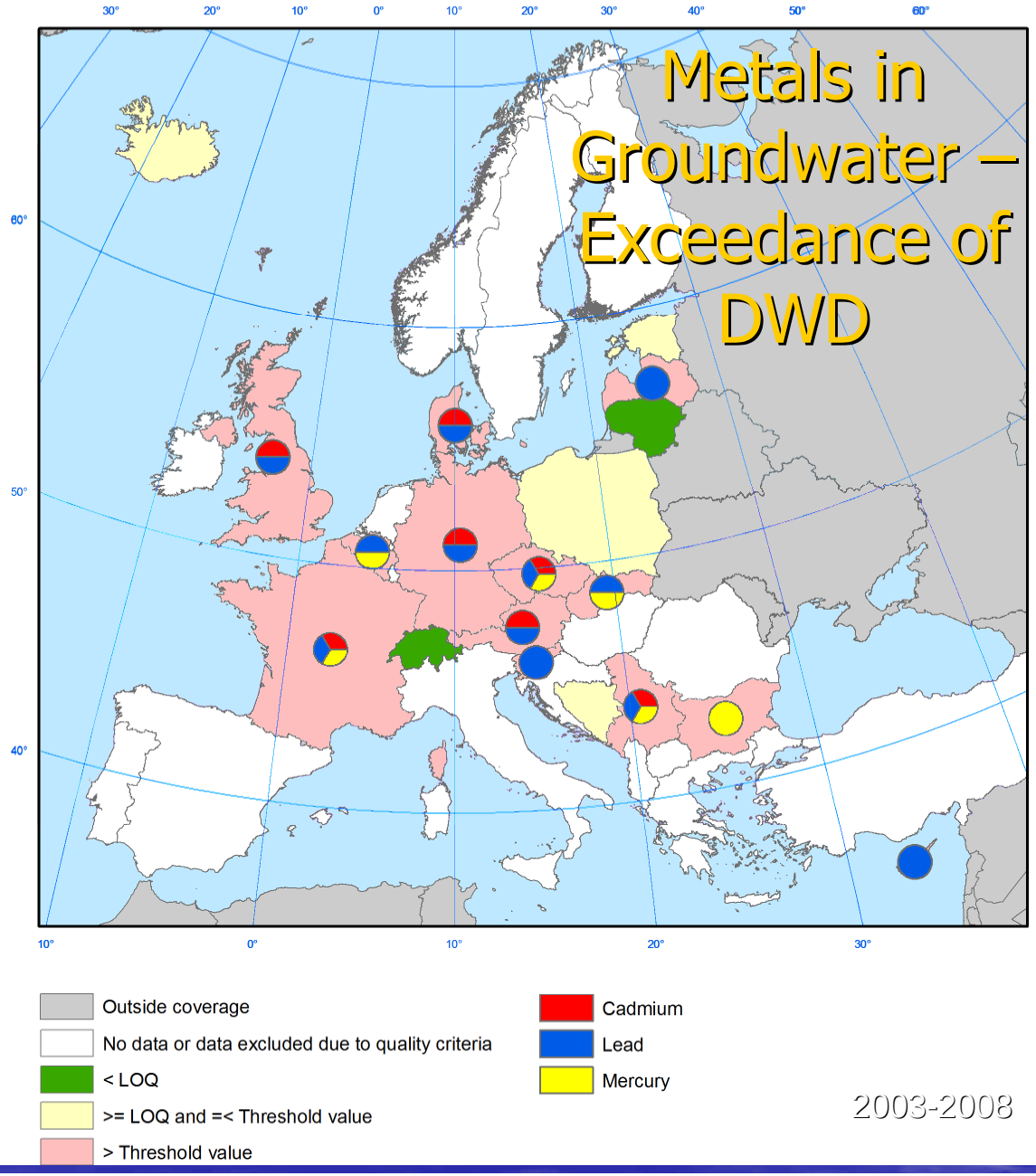
Metals in Groundwater – Exceedance of DWD

2008









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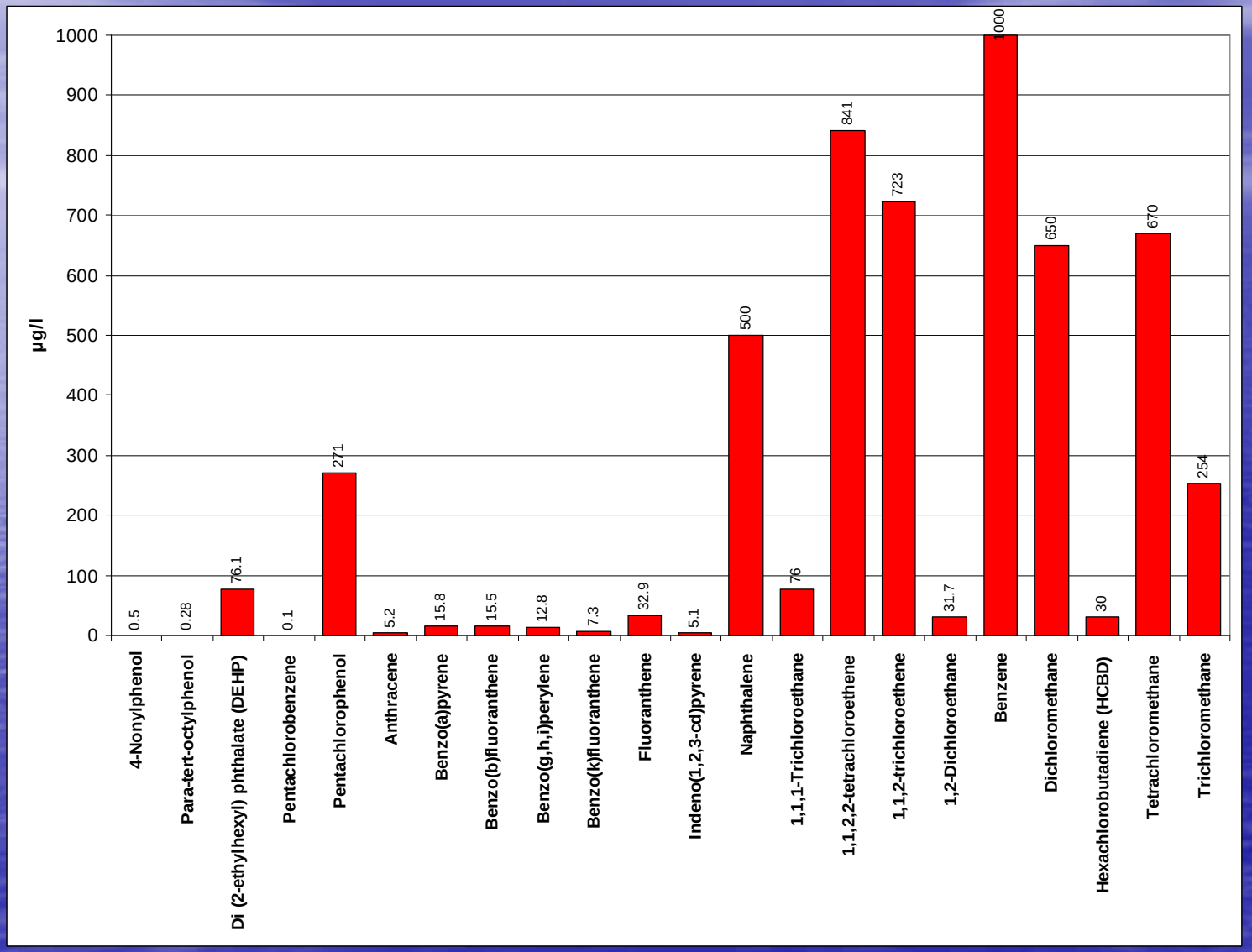
Groundwater - Maximum Concentrations



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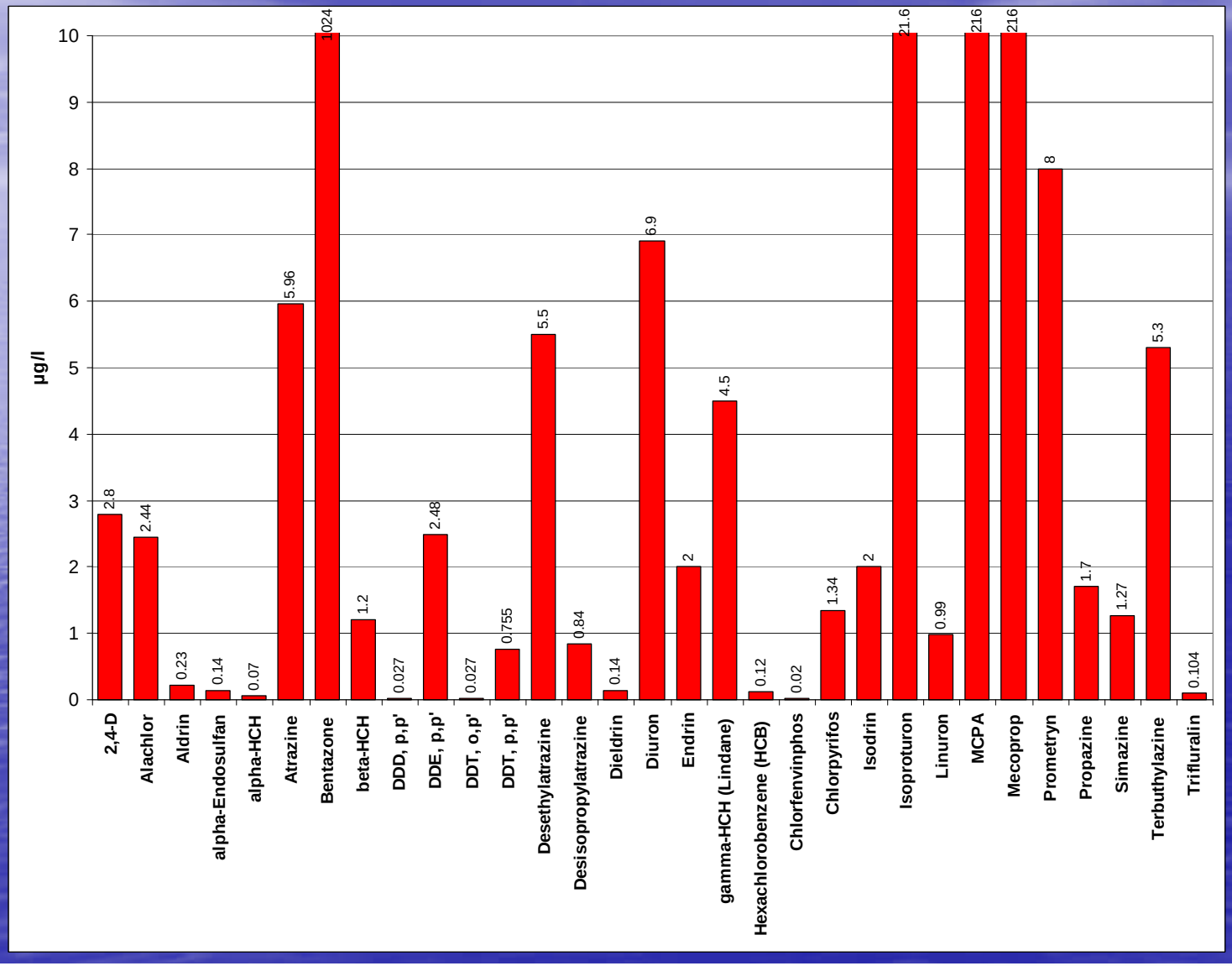
Groundwater - Maximum Concentrations



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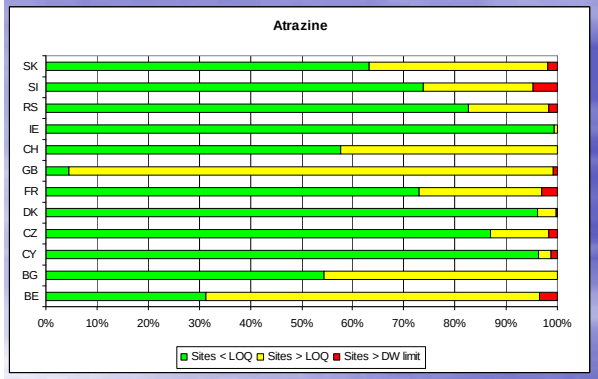
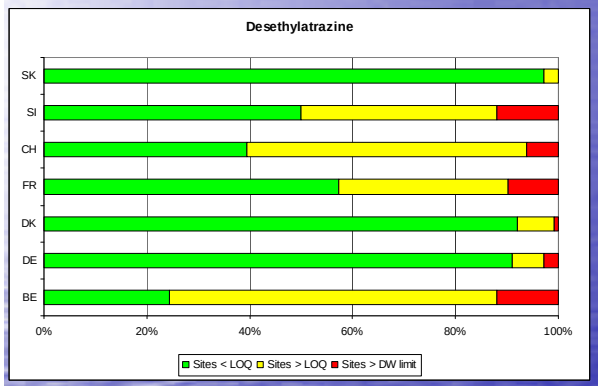
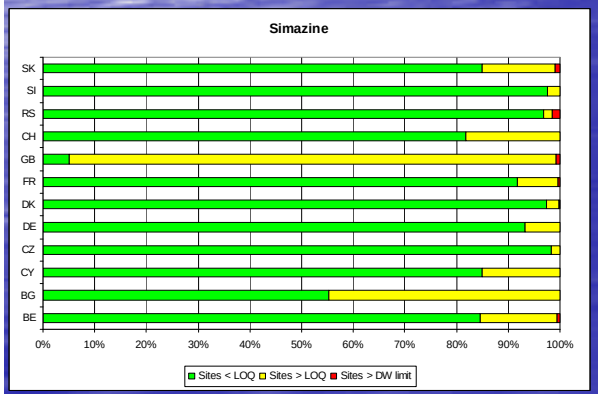
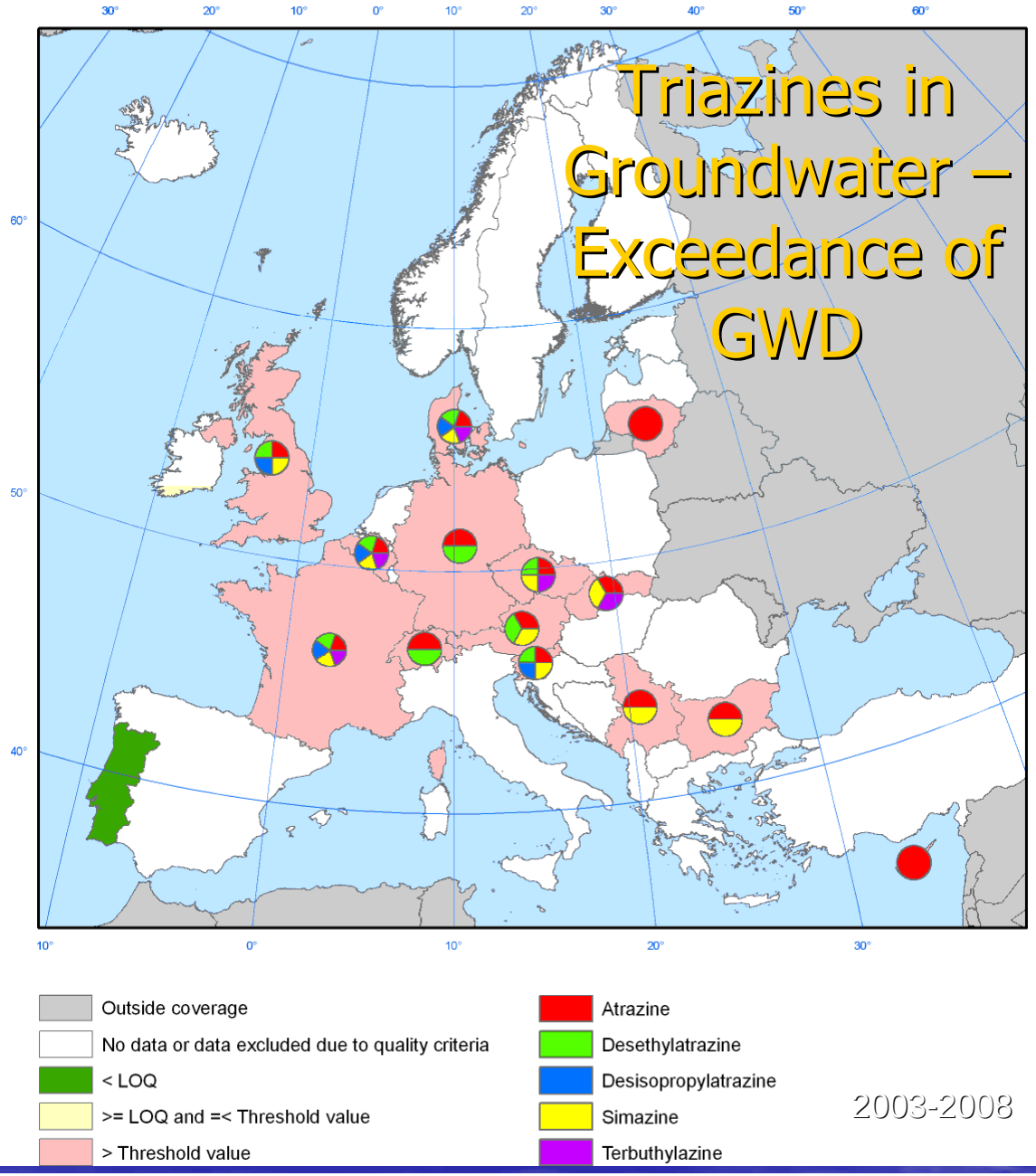
Triazines in Groundwater – Exceedance of GWD

2008









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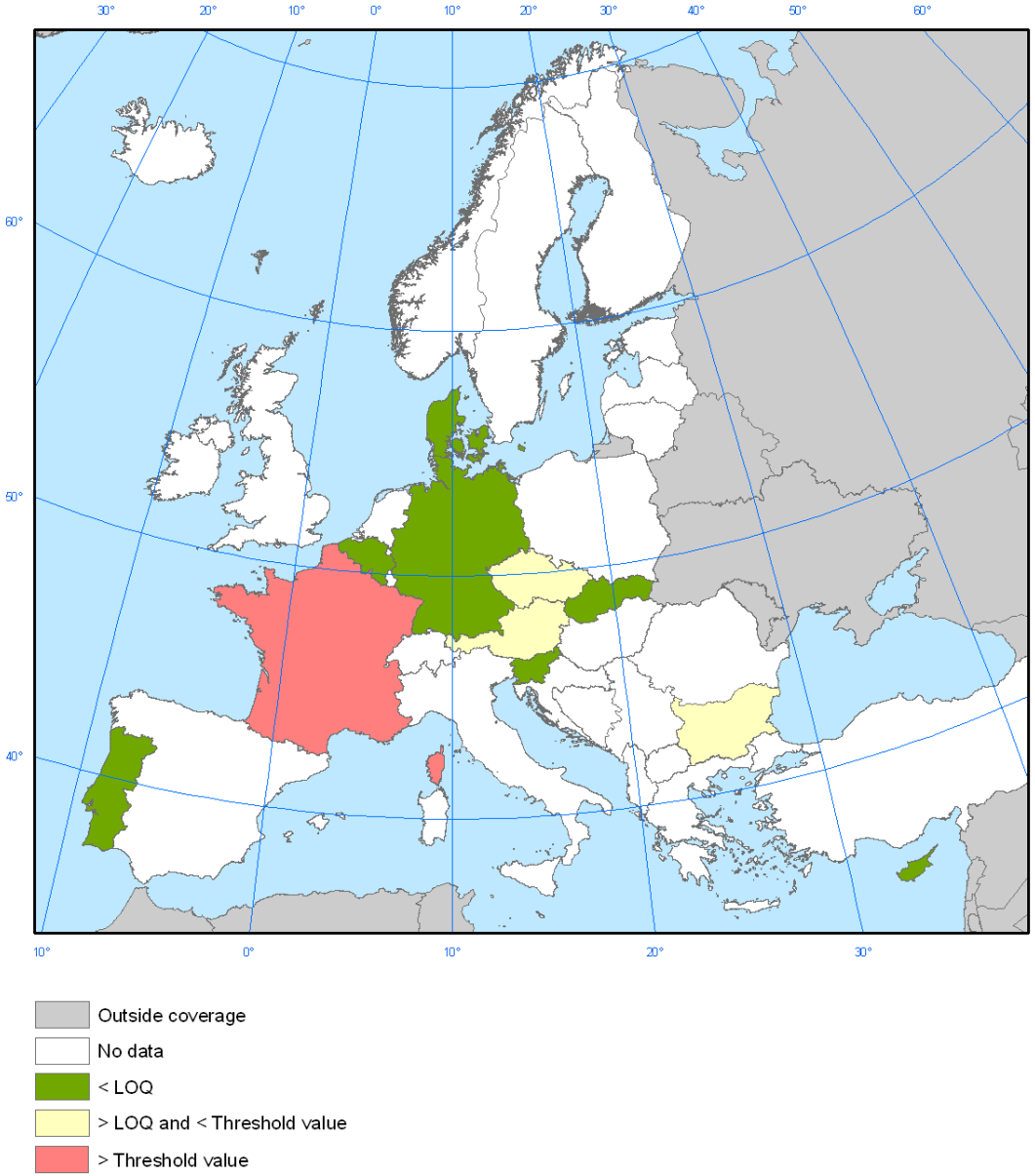
Alachlor in Groundwater – Exceedance of GWD



2003-2008

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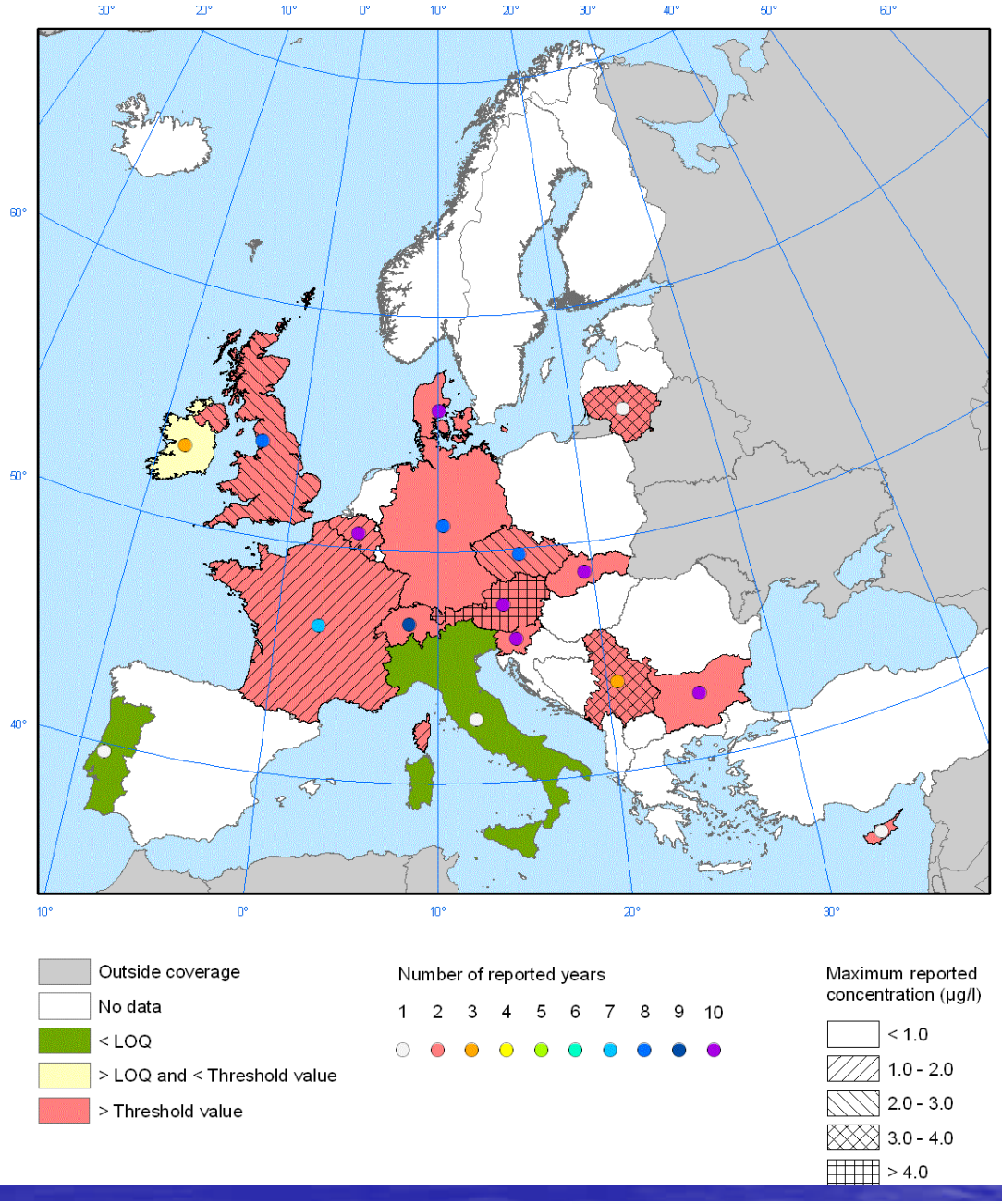
Atrazine in Groundwater – Exceedance of GWD



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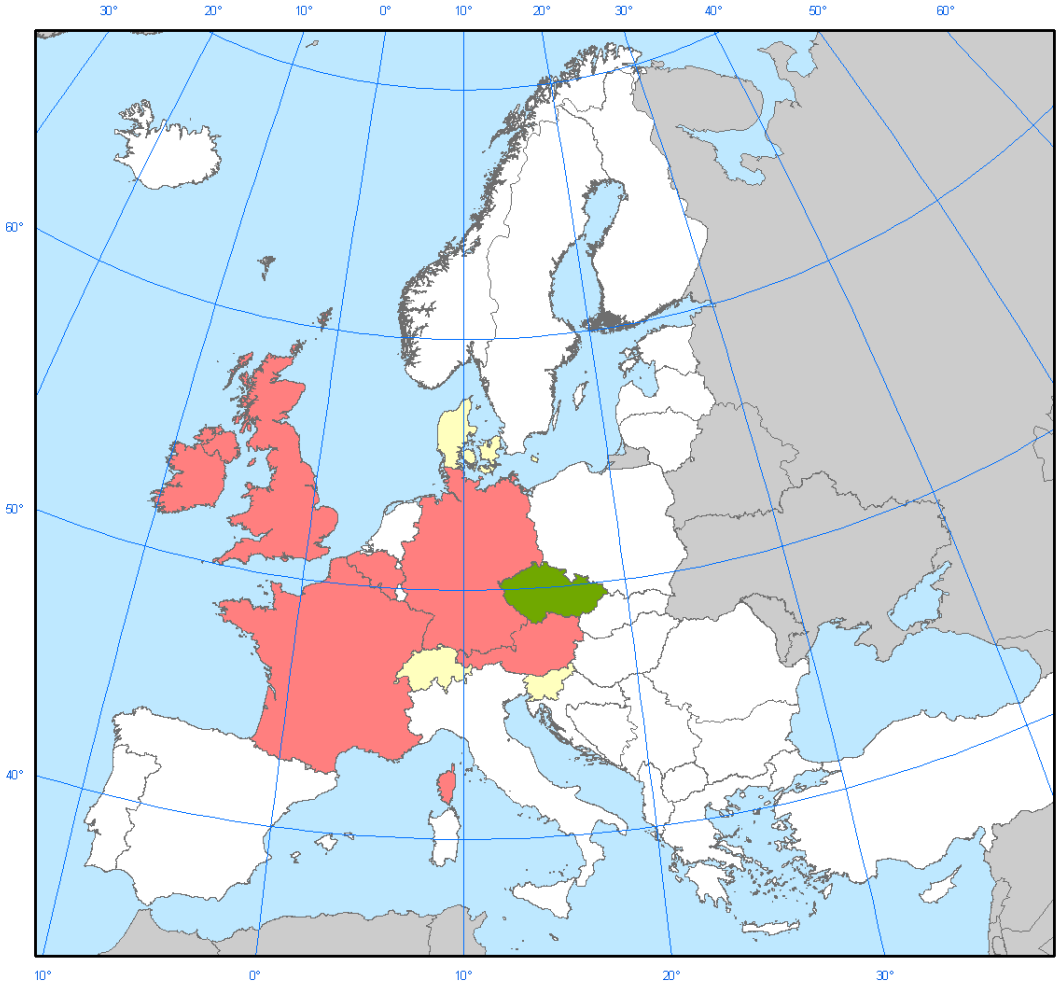
Diuron in Groundwater – Exceedance of GWD



2003-2008

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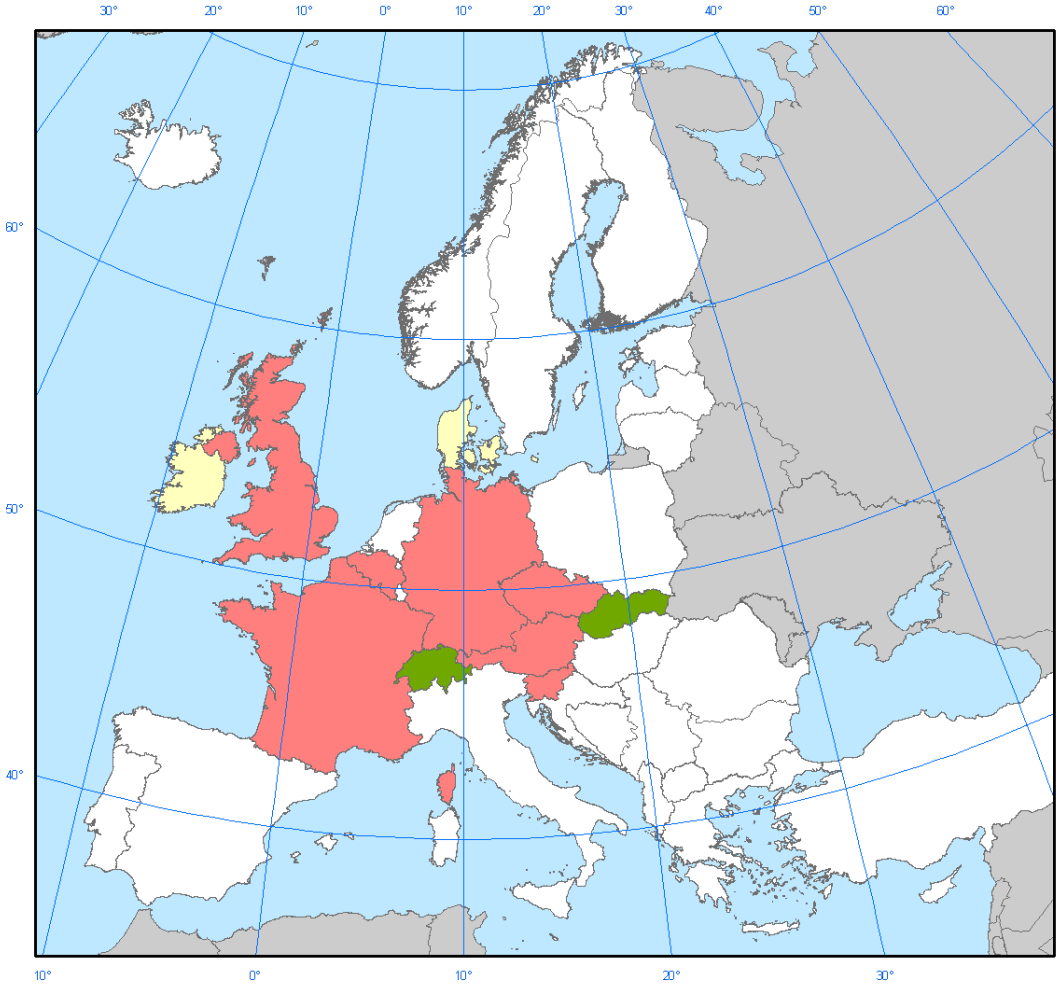
Isoproturon in Groundwater – Exceedance of GWD



2003-2008

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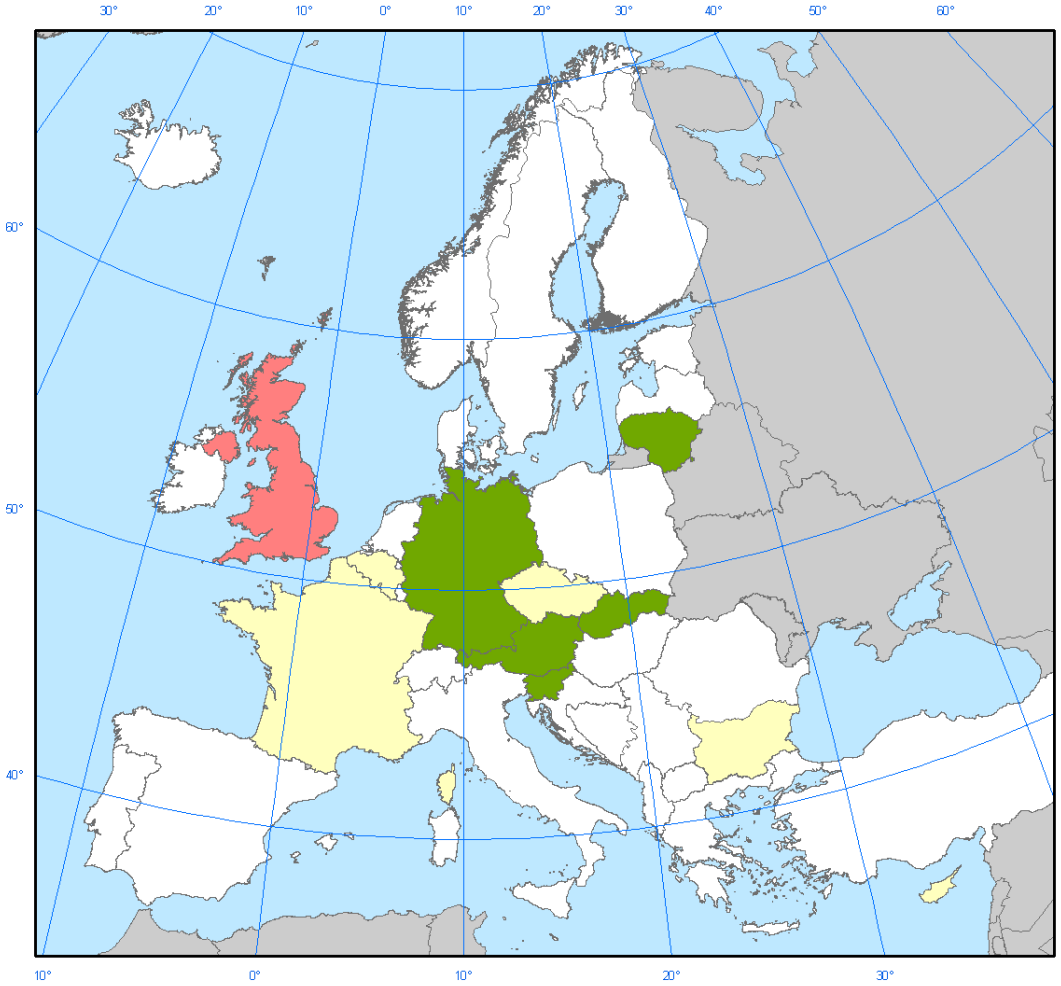
Trifluralin in Groundwater – Exceedance of GWD



2003-2008

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Conclusions

Relevancy of hazardous substance differs for rivers and groundwater

Rivers/Lakes: metals (Hg, Cd)

PAHs (Benzo(g,h,i)perylene , Indeno(1,2,3-cd)pyrene)

TBT

DEHP

Groundwater: pesticides (triazine, urea, phenoxy) and metabolites

metals (Hg, Cd, Pb)

Conclusions

SoE reporting for rivers/lakes does not cover solid matrixes that are relevant for majority of priority substances (Guidance document No. 25 on chemical monitoring of sediment and biota under WFD)

contrary to SoE for TCM that covers relevant matrixes

Conclusions

"Emerging" pollutants are not covered by SoE reporting:

Perfluorinated compounds

Pharmaceuticals

Personal Care Products

Hormones

Thank you for attention