Environmental risk assessment of pharmas in Finland - Watch List monitoring, SYKE Policy Brief and EPIC-project recommendations

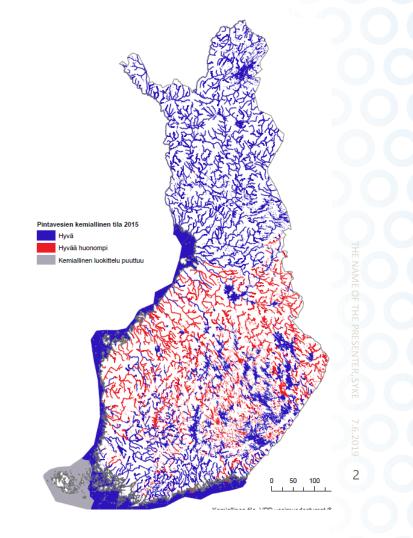
Matti Leppänen Finnish Environment Institute SYKE Nordic WFD conference, Vaasa 21.-23.5.2019



Chemical status of surface waters

- 2nd classification period
- >45 substances on list
- 6875 sites
 - > 35000 evaluations
 - Measured data, expert evaluations or modelled (Hg)
- Causing problems
 - Mainly Hg
 - Metals (Cd, Ni)
 - TBT

SYKE



Watch List monitoring

(based partly on presentation of Katri Siimes)



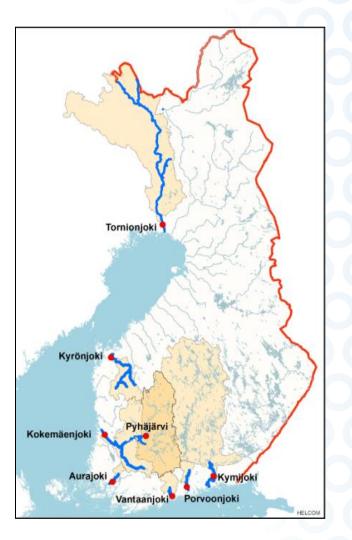


Watch List monitoring

- A minimum number of sites for FI set by the EU = 9
- 8 river sites, 1 lake
- App. once a year sampling/analyzing

SYKE

• 4 sites had exceedences



Monitoring results 2015-2018

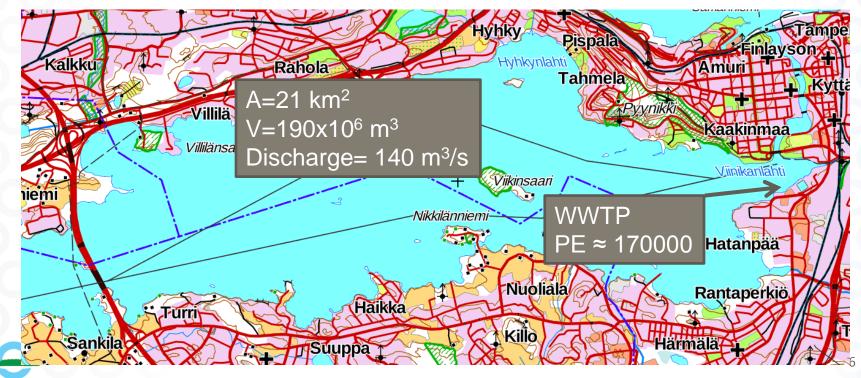
WL 2015-2018	Pain_killer	Hormones			Macrolidiar	ntibiotics		Neonicotinoid	ls				(UV-prot.)
Summary (FIN)	Diclofenac	EE2	E1	E2	Azithromyd	Erythromyd	Clarithrom	Clothianidin	Thiamethoxa	Thiacloprid	Imidad	Acetai	EHMC
Kymijoki	<loq -="" 3<="" td=""><td><loq< td=""><td><loq -="" 0,2<="" td=""><td>Ŷ</td><td><loq -="" 1<="" td=""><td><loq< td=""><td><loq-1< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq-1<></td></loq<></td></loq></td></loq></td></loq<></td></loq>	<loq< td=""><td><loq -="" 0,2<="" td=""><td>Ŷ</td><td><loq -="" 1<="" td=""><td><loq< td=""><td><loq-1< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq-1<></td></loq<></td></loq></td></loq></td></loq<>	<loq -="" 0,2<="" td=""><td>Ŷ</td><td><loq -="" 1<="" td=""><td><loq< td=""><td><loq-1< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq-1<></td></loq<></td></loq></td></loq>	Ŷ	<loq -="" 1<="" td=""><td><loq< td=""><td><loq-1< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq-1<></td></loq<></td></loq>	<loq< td=""><td><loq-1< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq-1<></td></loq<>	<loq-1< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq-1<>	<loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq<>	<loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<></td></loq<></td></loq<>	<loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<></td></loq<>	<loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<>	<loq< td=""><td><loq< td=""></loq<></td></loq<>	<loq< td=""></loq<>
Porvoonjoki	23 - 204	<loq< th=""><th>0,4 - 0,9</th><th><loq< th=""><th><loq -="" 1<="" th=""><th><loq -="" 2<="" th=""><th>2 - 11</th><th><loq -="" 1<="" th=""><th><loq -="" 1<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq -="" 40<="" th=""></loq></th></loq<></th></loq<></th></loq<></th></loq></th></loq></th></loq></th></loq></th></loq<></th></loq<>	0,4 - 0,9	<loq< th=""><th><loq -="" 1<="" th=""><th><loq -="" 2<="" th=""><th>2 - 11</th><th><loq -="" 1<="" th=""><th><loq -="" 1<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq -="" 40<="" th=""></loq></th></loq<></th></loq<></th></loq<></th></loq></th></loq></th></loq></th></loq></th></loq<>	<loq -="" 1<="" th=""><th><loq -="" 2<="" th=""><th>2 - 11</th><th><loq -="" 1<="" th=""><th><loq -="" 1<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq -="" 40<="" th=""></loq></th></loq<></th></loq<></th></loq<></th></loq></th></loq></th></loq></th></loq>	<loq -="" 2<="" th=""><th>2 - 11</th><th><loq -="" 1<="" th=""><th><loq -="" 1<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq -="" 40<="" th=""></loq></th></loq<></th></loq<></th></loq<></th></loq></th></loq></th></loq>	2 - 11	<loq -="" 1<="" th=""><th><loq -="" 1<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq -="" 40<="" th=""></loq></th></loq<></th></loq<></th></loq<></th></loq></th></loq>	<loq -="" 1<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq -="" 40<="" th=""></loq></th></loq<></th></loq<></th></loq<></th></loq>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq -="" 40<="" th=""></loq></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq -="" 40<="" th=""></loq></th></loq<></th></loq<>	<loq< th=""><th><loq -="" 40<="" th=""></loq></th></loq<>	<loq -="" 40<="" th=""></loq>
Vantaanjoki	17 - 100	<loq -="" <b="">0,76</loq>	0,2 - 1,8	<loq< th=""><th><loq -="" 1<="" th=""><th><loq -="" 3<="" th=""><th>1-26</th><th><loq -="" 21<="" th=""><th>1 - 5,5</th><th><loq -="" 1<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq></th></loq></th></loq></th></loq></th></loq<>	<loq -="" 1<="" th=""><th><loq -="" 3<="" th=""><th>1-26</th><th><loq -="" 21<="" th=""><th>1 - 5,5</th><th><loq -="" 1<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq></th></loq></th></loq></th></loq>	<loq -="" 3<="" th=""><th>1-26</th><th><loq -="" 21<="" th=""><th>1 - 5,5</th><th><loq -="" 1<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq></th></loq></th></loq>	1-26	<loq -="" 21<="" th=""><th>1 - 5,5</th><th><loq -="" 1<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq></th></loq>	1 - 5,5	<loq -="" 1<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq>	<loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""></loq<></th></loq<>	<loq< th=""></loq<>
Aurajoki	<loq -="" <b="">10</loq>	<loq< th=""><th><loq -="" 0,2<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq -="" 20<="" th=""><th><loq -="" 14<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq></th></loq></th></loq<></th></loq<></th></loq<></th></loq<></th></loq></th></loq<>	<loq -="" 0,2<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq -="" 20<="" th=""><th><loq -="" 14<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq></th></loq></th></loq<></th></loq<></th></loq<></th></loq<></th></loq>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq -="" 20<="" th=""><th><loq -="" 14<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq></th></loq></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq -="" 20<="" th=""><th><loq -="" 14<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq></th></loq></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq -="" 20<="" th=""><th><loq -="" 14<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq></th></loq></th></loq<></th></loq<>	<loq< th=""><th><loq -="" 20<="" th=""><th><loq -="" 14<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq></th></loq></th></loq<>	<loq -="" 20<="" th=""><th><loq -="" 14<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq></th></loq>	<loq -="" 14<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""></loq<></th></loq<>	<loq< th=""></loq<>
Kokemäenjoki	<loq -="" 83<="" th=""><th><loq -="" <b="">0,18</loq></th><th><loq -="" 0,2<="" th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq></th></loq>	<loq -="" <b="">0,18</loq>	<loq -="" 0,2<="" th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""></loq<></th></loq<>	<loq< th=""></loq<>
	6 - 30												
Kyrönjoki	(ELY: 95!)	<loq -="" <b="">0,72</loq>	<loq -="" 1,6<="" td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq -="" 1<="" td=""><td><loq -="" 2<="" td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq></td></loq></td></loq<></td></loq<></td></loq<></td></loq>	<loq< td=""><td><loq< td=""><td><loq< td=""><td><loq -="" 1<="" td=""><td><loq -="" 2<="" td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq></td></loq></td></loq<></td></loq<></td></loq<>	<loq< td=""><td><loq< td=""><td><loq -="" 1<="" td=""><td><loq -="" 2<="" td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq></td></loq></td></loq<></td></loq<>	<loq< td=""><td><loq -="" 1<="" td=""><td><loq -="" 2<="" td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq></td></loq></td></loq<>	<loq -="" 1<="" td=""><td><loq -="" 2<="" td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq></td></loq>	<loq -="" 2<="" td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<></td></loq<></td></loq<></td></loq>	<loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<></td></loq<></td></loq<>	<loq< td=""><td><loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<></td></loq<>	<loq< td=""><td><loq< td=""><td><loq< td=""></loq<></td></loq<></td></loq<>	<loq< td=""><td><loq< td=""></loq<></td></loq<>	<loq< td=""></loq<>
Tornionjoki	<loq< th=""><th><loq< th=""><th><loq -="" 0,2<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq -="" 1<="" th=""><th><loq< th=""><th>KLoQ - 2</th><th><loq -="" 2<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq></th></loq<></th></loq></th></loq<></th></loq<></th></loq<></th></loq></th></loq<></th></loq<>	<loq< th=""><th><loq -="" 0,2<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq -="" 1<="" th=""><th><loq< th=""><th>KLoQ - 2</th><th><loq -="" 2<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq></th></loq<></th></loq></th></loq<></th></loq<></th></loq<></th></loq></th></loq<>	<loq -="" 0,2<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq -="" 1<="" th=""><th><loq< th=""><th>KLoQ - 2</th><th><loq -="" 2<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq></th></loq<></th></loq></th></loq<></th></loq<></th></loq<></th></loq>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq -="" 1<="" th=""><th><loq< th=""><th>KLoQ - 2</th><th><loq -="" 2<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq></th></loq<></th></loq></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq -="" 1<="" th=""><th><loq< th=""><th>KLoQ - 2</th><th><loq -="" 2<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq></th></loq<></th></loq></th></loq<></th></loq<>	<loq< th=""><th><loq -="" 1<="" th=""><th><loq< th=""><th>KLoQ - 2</th><th><loq -="" 2<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq></th></loq<></th></loq></th></loq<>	<loq -="" 1<="" th=""><th><loq< th=""><th>KLoQ - 2</th><th><loq -="" 2<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq></th></loq<></th></loq>	<loq< th=""><th>KLoQ - 2</th><th><loq -="" 2<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq></th></loq<>	KLoQ - 2	<loq -="" 2<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq>	<loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""></loq<></th></loq<>	<loq< th=""></loq<>
Pyhäjärvi	7 - 33	<loq -="" <b="">0,06</loq>	<loq -="" 1,2<="" th=""><th><loq< th=""><th><loq -="" 7<="" th=""><th><loq< th=""><th><loq -="" 6<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq></th></loq<></th></loq></th></loq<></th></loq>	<loq< th=""><th><loq -="" 7<="" th=""><th><loq< th=""><th><loq -="" 6<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq></th></loq<></th></loq></th></loq<>	<loq -="" 7<="" th=""><th><loq< th=""><th><loq -="" 6<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq></th></loq<></th></loq>	<loq< th=""><th><loq -="" 6<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq></th></loq<>	<loq -="" 6<="" th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""></loq<></th></loq<>	<loq< th=""></loq<>
Päijännetunneli	<loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""><th><loq< th=""></loq<></th></loq<></th></loq<>	<loq< th=""><th><loq< th=""></loq<></th></loq<>	<loq< th=""></loq<>
Required LoQ	10	0,035	sum 0,4 ng/l		sum 19 ng/l			sum 8,3 ng/l					6000
PNEC (Loos et al. 2018)	100->50	0,035	3,6	0,4	19	200	120	130	42	50	8,3	500	6000

- No problems with the detection limits
- Diclofenac and EE2!

SYKE

Temporal variation observed (EE2)

An example and future needs for monitoring and risk assessment of pharmas (1)



s y κ ε Lake Pyhäjärvi/Tampere city: EE2 exceedences

An example and future needs for monitoring and risk assessment of pharmas (2)

- A survey of pikeperch populations of region
- Lake Pyhäjärvi had high percentage of "raw" individuals in old year classes (> 6 y)
- A connection to WWTP effluents?





An example and future needs for monitoring and risk assessment of pharmas (3)

- Watch List monitoring should be more frequent and covering more sites
 - Effect of season (winter)
 - Include other pharmas of suspected environmental effects
- Readily moved to priority substance list
- Risks of endocrine disrupters should be evaluated using effect based methods
 - E.g. ISO 19040 tests (estrogen receptors in yeast and human cell lines)
 - EBMs should be part of the chemical status assessment
- Application of other EBMs (neurotoxicity, cytotoxicity etc.)
- SYKE Survey of antimicrobial resistance (effluents/recipients)

SYKE Policy Brief 17.5.2019

Environmental drug load can be reduced

www.syke.fi/policybriefs/en SYKE https://helda.helsinki.fi/handle/10138/301744

Environmental drug load can be reduced

As the use of pharmaceuticals increases, increasing amounts of drug residues end up in sewage treatment plants. They can be harmful for fish, for example, and they can end up in soil through the utilization of wastewater sludge. More efficient removal of drug residues would bring about an estimated need for an increase of about five percent in the wastewater fees paid by consumers.

Drug emissions come from The environmental effects. The return of unused drugs Drugs also end up in households, hospitals, and the pharmaceutical industry Emissions can be reduced w introducing more adanced treatment methods at wastewater treatment lants or at the emissio

SYKE

occurring during the whole by consumers to pharmades life cycle of pharmaceutical needs to be made more products should be given efficient through consistent more consideration when raising of awareness. oharma centica la Wastage of drugs could be reduced by lowering the price of small initiation a dassification

nental impact into consid

agricultural soils through the manure of animals ing treatment. The can already be restricted or risk Compliance with restrictions on use should also he monitorer

FINNISH ENVIRONMENT INSTITUTE | SYKE.FI | YMPARISTO.FI

Fate of selected pharmaceuticals

	Paracetamol Analgesic, one of Finland's most common pharma- ceutical substances	Diu	Furosemide iretic, used in the treatm of high blood pressure, among other things	ient	Diclofena Anti-inflammato medicine, used in an gels, for exampl	ry algesic	Tetracycline Antibiotic, also used in veterinary medicine	
Amount used In wastewater to WWTP ^A From WWTP ^A to waterbodies	200 000 kg/year 10 000 kg/year 100 kg/year		2 900 kg/year 2 300 kg/year 2 300 kg/year		2 500 kg/year 1 500 kg/year 1 400 kg/yea		1 100 kg/year 660 kg/year 99 kg/year	
Removal in the activated sludge p In influent wastewater ^c In effluent wastewater ^c In the environment ^c	rocess ^{B, C} 99% 100 µg/l Not detected Water: 0,02 µg/l		0% 2 µg/l 2 µg/l Water: 0,1 µg/l		10-20% ^в 1,5 µg/l 1 µg/l Water: 0,07 µg	ŋ/I	85% ^ε 1,5 μg/l 0,1 μg/l Soil: 110 μg/kg Avg.	MINATO, OVVE . EINEAS

Annual estimates of use of pharmaceutical substances are based on sales figures for 2015-2017. Annual pharmaceutical loads have been estimated computationally. | A) Wastewater treatment plant | B) The activated sludge process is the treatment method that is usually used at wastewater treatment plants in Finland | C) Indicative results from Finnish surveys | D) Elimination of diclofenac fluctuates considerably | E) Most of the elimination of tetracycline involves the substance binding on the sludge. The load that reaches the treatment plant does not disappear. It continues its journey in the sludge processing chain.



Source: SYKE Policy Brief

Policy Brief recommendations

- Improving the WWTP treatment
 - New technologies
 - Estimated costs 15 cents/m³ (membr. filtration + oxidation)
- Use of less environmentally harmful drugs
 - Environmental classification system needed in FI
- Reduction of the drug waste
 - Package size, return instructions; consumer awareness
- Monitoring and setting limit values for emissions
 - Industry, hospitals, WWTPs



EFFICIENT TREATMENT OF PHARMACEUTICAL RESIDUE AT SOURCE -EPIC -project

(based on presentations of Taina Nysten and project members)



http://www.syke.fi/projects/epic Financed by Business Finland



EPIC work packages

- WP1 Emissions and risk identification
- WP2 pilot-scale testing of WWTP technologies
- WP3 Cost-effectiveness of WWTP solutions
- WP4 Policy recommendations
- WP5 Coordination



EPIC recommendations – Policy tools

• Environmental permits

SYKE

- WWTPs should be aware of burden and potential env. risks
- Bioassays tests for effluent
- Limit/threshold values for specific pharmas
- Management of waste (WWTP deals, collection, less haz. chems)
- Developing environmental classification of pharmaceuticals in Finland
 - To make choices in health care based on environmental aspects
 - Large stakeholder involvement needed; political issue
 - International (Nordic) collaboration?

Thank you!

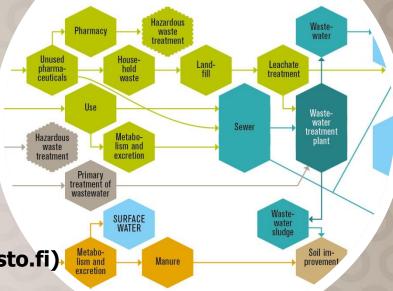
🥑 @SYKEinfo

Contacts: Watch List (katri.siimes@ymparisto.fi) EBMs (matti.t.leppanen@ymparisto.fi) Policy Brief/EPIC (taina.nysten@ymparisto.fi)

FINNISH ENVIRONMENT INSTITUTE SYKE

ACEUTICAL SUBSTANCES TAKE S. RENT ROUTES TO REACH WATERS ANL

a can end up in drinking water and can even reach crops. How, maceutical residues in crops and the drinking water supply do not a, ane food chain. The most significant risks affect organisms in the environment.



ENVIRONMENT.FI

Graph: SYKE Policy Brief



SYKE.FI

15