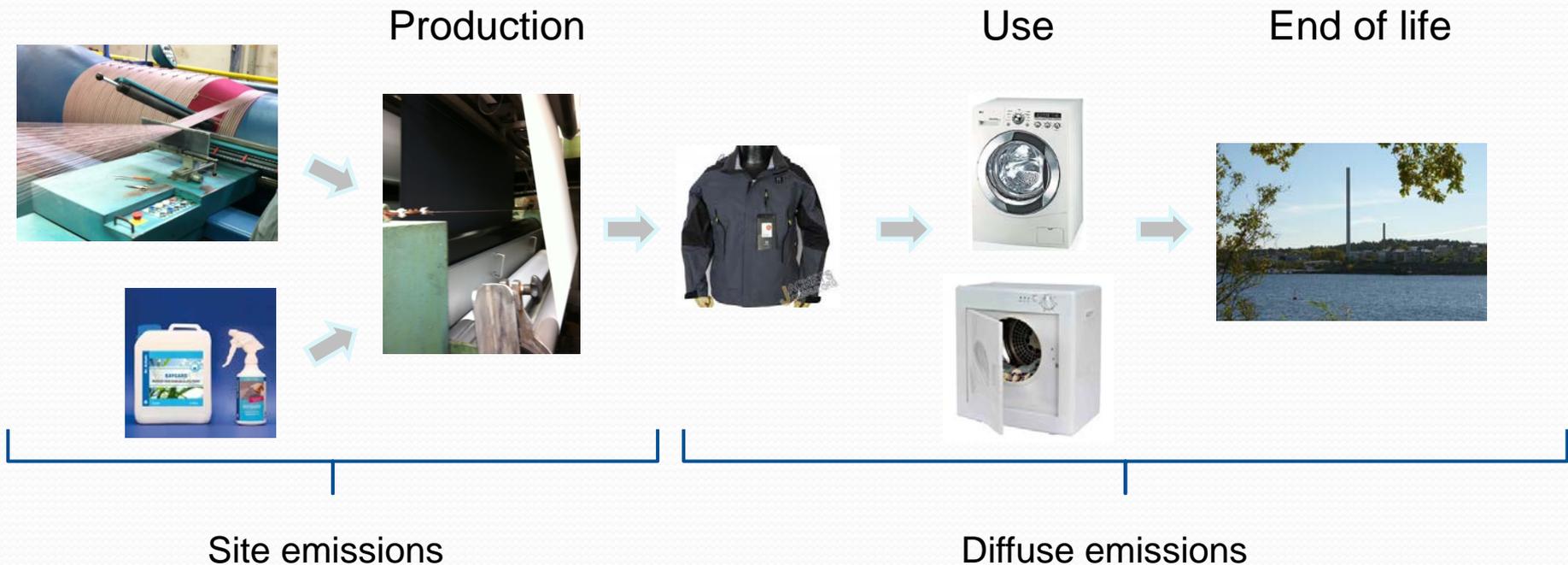# Data needs for
Life cycle assessment (LCA)
and
Quantitative risk
assessment (QRA)
in WP3

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Classic life cycle inventory (LCI) will be performed in the LCA:

Production   Use   End of life

Site emissions   Diffuse emissions
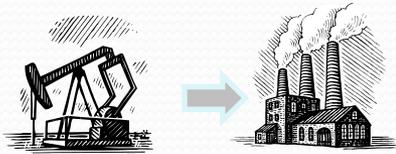
Site emissions and resource use in the production – needed for the life cycle assessment

Raw material production   Processing   Manufacturing

Data need:
Data on used amounts of energy, materials, chemicals
Emissions (indoor air, air, water, soil, sludge)
Waste

Diffuse emissions – focus for SUPFES

Emission factor air
(e.g. mg/m2)

Leaching
(e.g. mg/m3)

Emission factor air
(e.g. mg/m3)

Emission factor water
(e.g. mg/m3)

Emission factor water
(e.g. mg/m3)

Emission factor sludge
(e.g. mg/tonne)

LCA

QRA

Additional data needs:
LCA: Data on energy use, materials, chemicals, etc. at WWTP,
energy consumption for maintenance of garments etc.
QRA: Potentially data on background levels and local data

Are there other diffuse emissions that we should consider?

Development of characterisation factors for life cycle impact assessment (LCIA)

Figure 1: Main Steps of the USEtox™ assessment
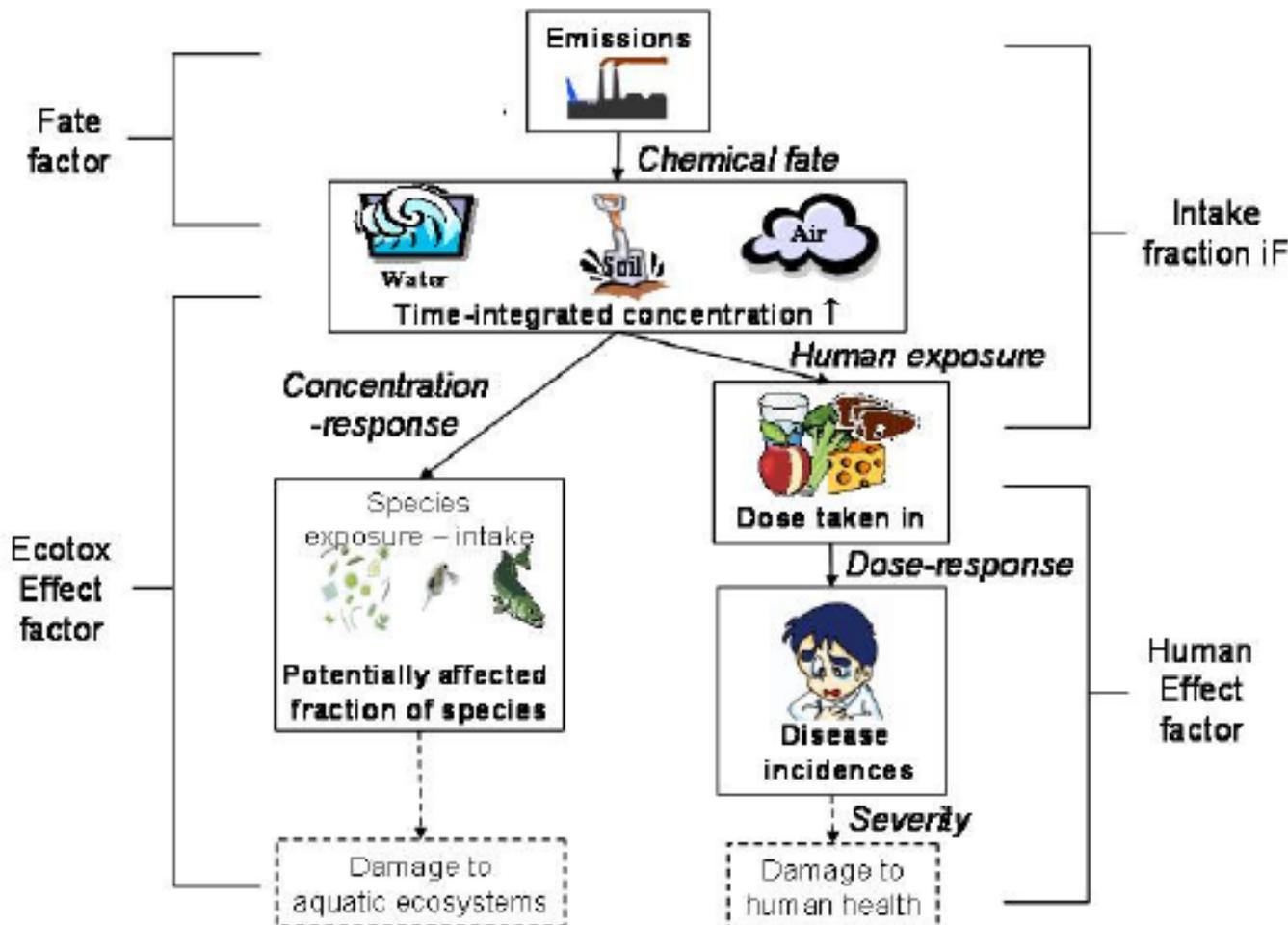
For LCA data are needed on fate (degradation, partitioning etc.), uptake (bioaccumulation) and effect ((eco)toxicological)

Similar data needs for QRA. Potentially more safeguard objects, e.g. microbial community in agricultural soils.

The impact assessment phase of LCA includes modelling the **fate**, intake and effect. Data need for fate (USEtox):

Factor	Abbrev.	Unit	Preferred source	Comment
Molecular weight	MW	g.mol-1	EPIsuite	
Partitioning coefficient between octanol and water	Kow	-	EPIsuite	
Partitioning coefficient between organic carbon and water	Koc	L.kg-1	EPIsuite	USEtox default estimate if no data: $Koc = 1.26 \times Kow^{0.81}$
Henry law coefficient (at 25°C)	KH25C	Pa.m3.mol-1	EPIsuite	USEtox default estimate if no data: Pvap25xMW/Sol25
Vapour pressure (at 25°C)	Pvap25	Pa	EPIsuite	
Solubility (at 25°C)	Sol25	mg.L-1	EPIsuite	
Partitioning coefficient between dissolved organic carbon and water	Kdoc	L.kg-1	EPIsuite	USEtox default estimate if no data: 0.08xKow
Degradation rate in air	kdegA	s-1	EPIsuite	
Degradation rate in water	kdegW	s-1	EPIsuite	
Degradation rate in sediment	kdegSd	s-1	EPIsuite	
Degradation rate in soil	kdegSl	s-1	EPIsuite	
Bioaccumulation factor in fish/biota	BAFfish	L.kgfish-1	EPIsuite	USEtox default estimate if no data: 0.05xKow

Alternative approach needed for the PFAS

The impact assessment phase of LCA includes modelling the fate, **intake** and effect. Data need for intake (USEtox):

Factor	Abbrev.	Unit	Preferred source	Comment
Degradation rates in above-ground plant tissues	kdegP	s-1	-	Estimated on the basis of the Kow, the vapour pressure and solubility
Bioaccumulation factor in root crops	BAFroot	kgveg.kgsoil-1	-	Estimated on the basis of the Kow
Bioaccumulation factor in leaf crops	BAFleaf	kgveg.kgsoil-1	-	Estimated on the basis of the Kow
Biotransfer factor for meat	BTFmeat	d.kgmeat-1	-	Estimated on the basis of the Kow
Biotransfer factor for milk	BTFmilk	d.kgmilk-1	-	Estimated on the basis of the Kow
Bioaccumulation factor in fish	BAFfish	Kgfish.kgwater-1	-	Estimated on the basis of the Kow

The impact assessment phase of LCA includes modelling the fate, intake and **effect**. Data need for effect (USEtox):

Factor	Abbrev.	Unit	Preferred source	Comment
Effect concentration	avlogEC50	mg.L-1	-	3 trophic levels for recommended, extrapolation factors from subacute->subchronic-> chronic, no specification of what effect
Effect dose	ED50inh,non canc	kg.lifetime-1	-	Extrapolation factors from animals to humans and subacute->subchronic-> chronic For non-carcinogenic effects, the ED50 can be estimated from the no-observed adverse effect level (NOAEL) by a NOAEL-to-ED50 extrapolation factor
Effect dose	ED50ing,non canc	kg.lifetime-1	-	as above
Effect dose	ED50inh,canc	kg.lifetime-1	-	Extrapolation factors from animals to humans and subacute->subchronic-> chronic For carcinogenic effects, the ED50 can also be estimated from the carcinogenic, low-dose, slope factor q* by the 1/q*-to-ED50 extrapolation factor
Effect dose	ED50ing,canc	kg.lifetime-1	-	as above