



## **ENVIRONMENTAL RISKS? BENEFICIAL REUSE?**

### **Environmental risks assessments of flame-retardant found in EPS bridge embankments**

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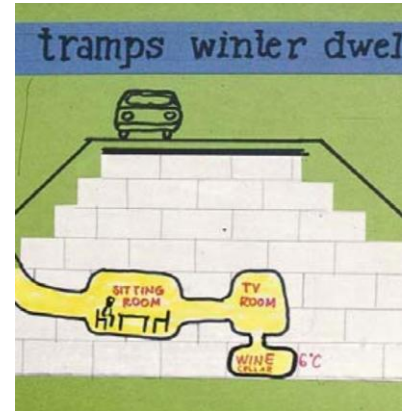
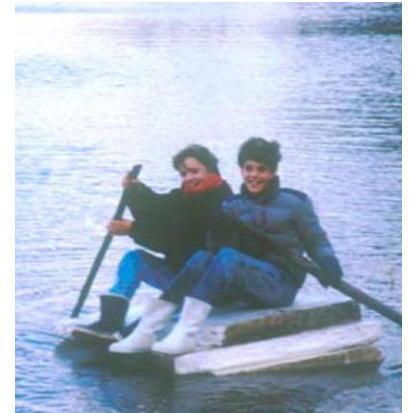
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# ENVIRONMENTAL RISKS? BENEFICIAL REUSE?

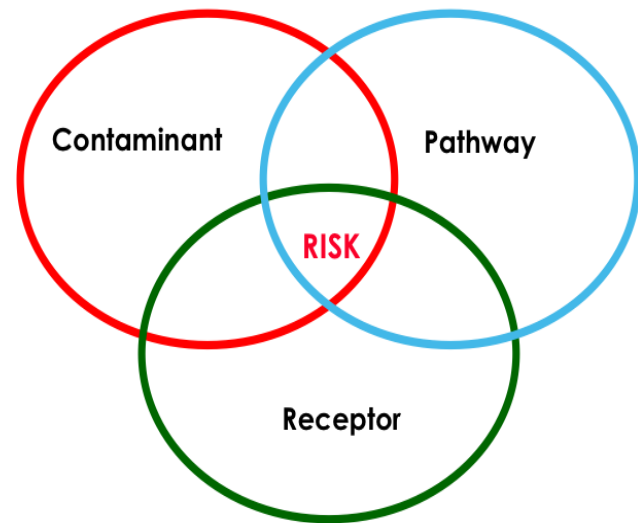
1) Goal and general message

2) The "Østfold bridges" case (2006/2011)

- Introduction
- Materials and methods
- Results
- Conclusions

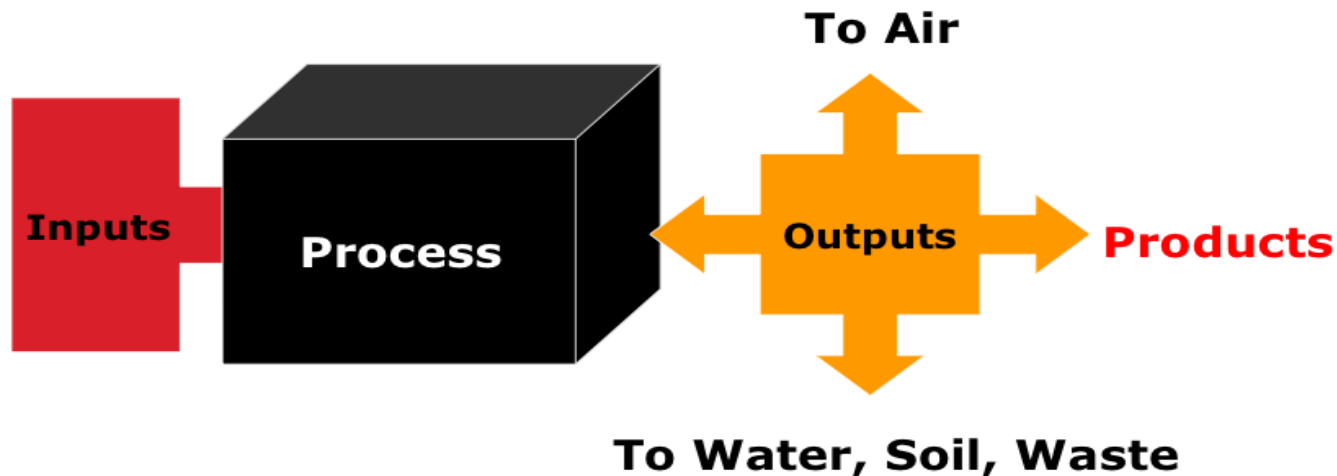
3) Beneficial reuse of EPS

- Technical/environmental/chemical/regulatory
- Overall conclusions



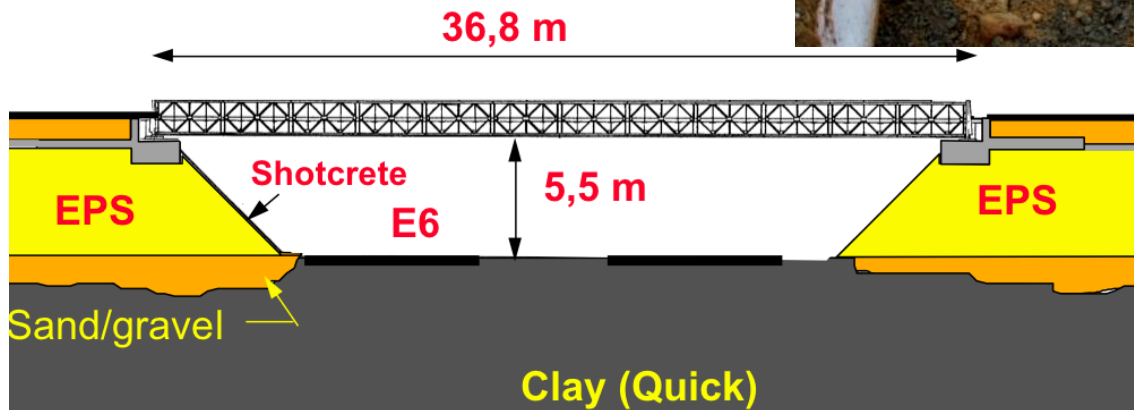
## GOAL AND GENERAL MESSAGE

- 2006-7 and 2011: Compare technical guidance values for two brominated flame retardants (BRF) found in the soil. Does the BRFs represent an environmental risk?
- Present general changes in Waste Framework Directive (WFD) and beneficial reuse of EPS.



# The “Østfold bridges” case: Introduction – Materials and methods

- Background
- Technical testing
- Soil sampling/analysis
- Guidance values

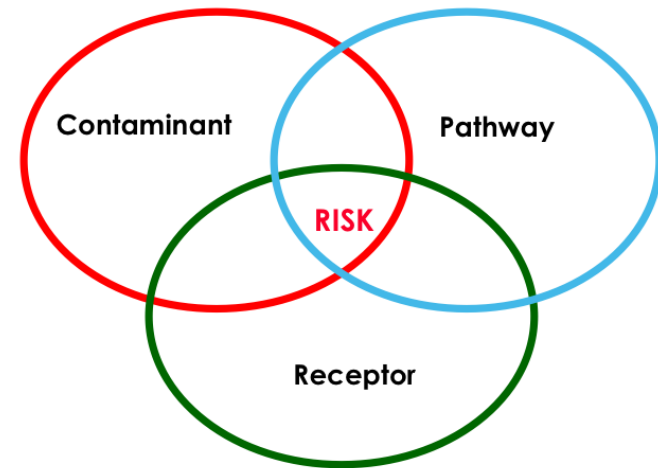
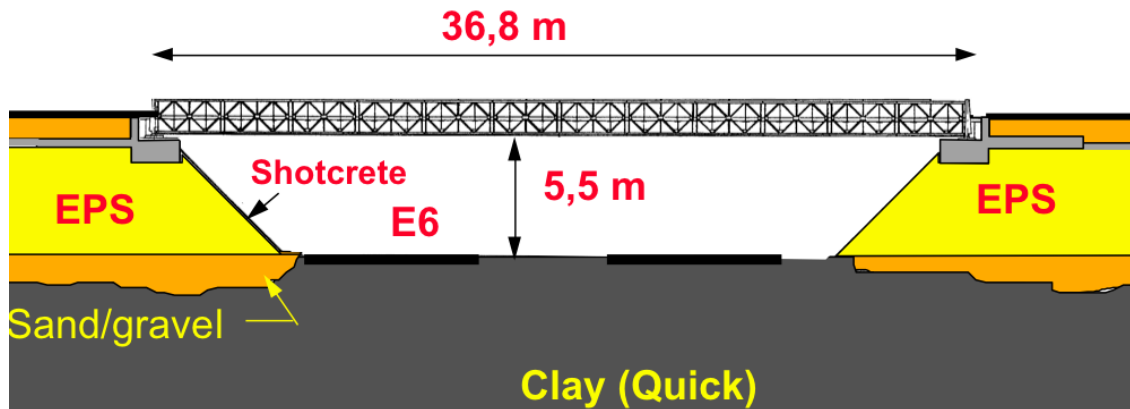


# The "Østfold bridges" case: Results

Location	Løkkeberge, Halden	Hjelmungen	Hjelmungen	Hjelmungen	Løkkeberge, Halden	Løkkeberge, Halden
Sample name/Description	EPS-plates	7/6-06 EPS-plates	Sandy layer under EPS. Level 2-5cm	Under EPS. '5 cm thick layer representing shift form sand to clay	Sandy layer under EPS. Level 2-10cm	11 m at the side. Silty- sandy approx. 5cm above clay. level 140- 145cm
Sampling date	11.05.2006	07.06.2006	25.07.2006	25.07.2006	25.07.2006	25.07.2006
Dry Weight (%)	86.5	100	93.8	81.3	94	92.1
Hexabromocyclododecan, HBCDD (µg/kg DW)	<b>1260000</b>	<b>6300000</b>	<200	<200	<200	<200
'Heksabromodiphenylether, PBDE-138 (µg/kg DW)	<5	<5	<5	<5	<5	<5
'Heksabromodiphenylether, PBDE-153 (µg/kg DW)	<20	<20	<20	<20	<20	<20
'Heksabromodiphenylether, PBDE-154 (µg/kg DW)	<5	<5	<5	<5	<5	<5
Heptabromodiphenylether, PBDE-183 (µg/kg DW)	<20	<20	<20	<20	<20	<20
Heptabromodiphenylether, PBDE-190 (µg/kg DW)	<100	<100	<100	<100	<100	<100
Pentabrombifenyl, PBB-101 (µg/kg DW)	<5	<5	<5	<5	<5	<5
Pentabromodiphenylether (sum) (µg/kg DW)	<5	<5	<b>94.9</b>	<b>44.1</b>	<b>11.6</b>	<5
Pentabromodiphenylether, PBDE-100 (µg/kg DW)	<5	<5	<b>8.7</b>	<5	<5	<5
Pentabromodiphenylether, PBDE-99 (µg/kg DW)	<5	<5	<b>86.3</b>	<b>39.9</b>	<b>10.5</b>	<5
Tetrabrombifenyl, PBB-52 (µg/kg DW)	<5	<5	<5	<5	<5	<5
Tetrabrombisfenol A, TBBFA (µg/kg DW)	<5	<5	<5	<5	<5	<5
Tetrabromodiphenylether, PBDE-47 (µg/kg DW)	<5	<5	<b>29.3</b>	<b>10.8</b>	<5	<5
Tribromodiphenylether, PBDE-28 (µg/kg DW)			<5	<5	<5	<5

# The "Østfold bridges" case: ENVIRONMENTAL RISKS?

- Site specific risk assessment
- Environmental risks?



Technical guidance derived 2006/2008			
Compound	Soil	Surface water	Remarks
HBCD	0.18/5.9	3.1/ 0.31	Based on eco-toxicological values
<u>penta-BDE</u>	0.38	0.53	Based on eco-toxicological values
	MG/KG DW	µg/ltr	

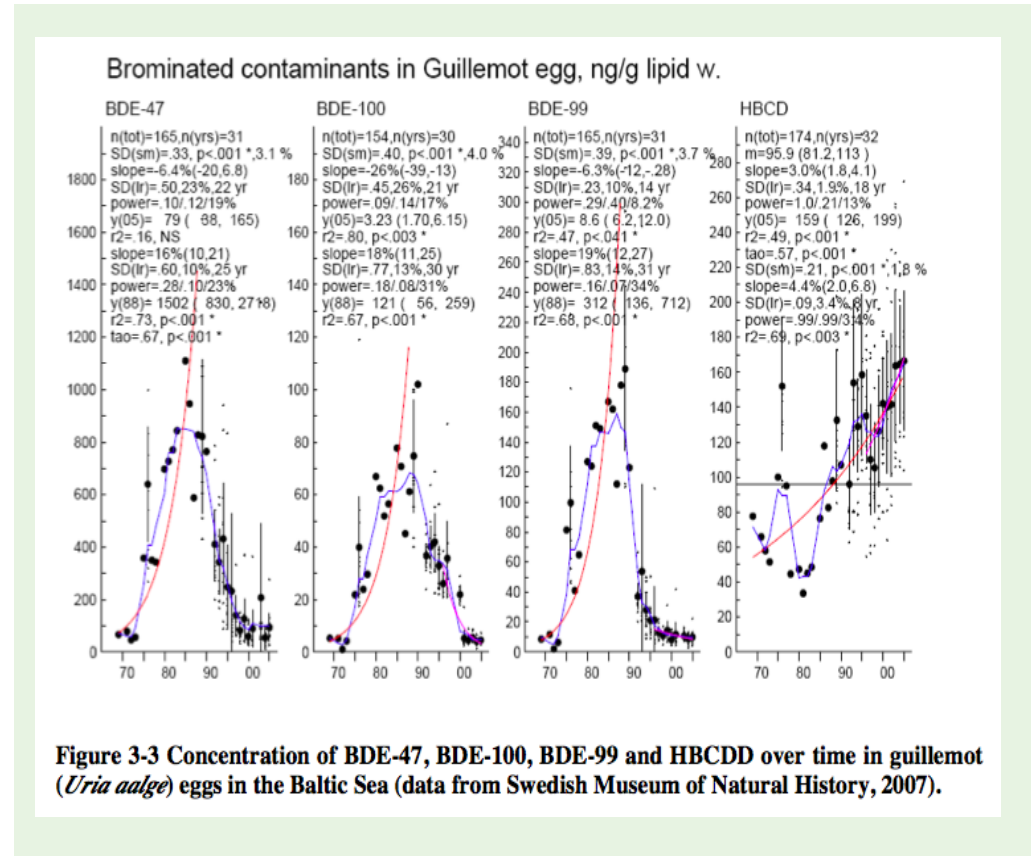
## The “Østfold bridges” case: Conclusions

- The content of HBCDD in the EPS blocks was high and at a level comparable to the expected content based on production information /1/.
- The content of HBCDD in soil below the EPS blocks was below the limit of detection (0.2 mg/kg DM), which also is the level of the guidance value from 2006 and more than 10 times less than EU PNEC value from 2008.
- The risk of exposure for humans and the environment to HBCDD is low when the EPS are used for building, in the road and when being demolished. At the end of life EPS is handled as a hazardous waste according to national regulations.
- PBDEs have not been detected in the EPS-blocks, only in the upper soil samples.
- The content of penta-BDE in soil samples was below 0.1 mg/kg DM, which is more than 3 times lower than the guidance value. This concentration level is less than predicted environmental regional agricultural soil concentration /16/. Specific sources are not located.



# BENEFICIAL REUSE

- Waste framework directive
  - 1 Prevent – 2 Reuse
  - 3 Recycle – 4 Recover
  - 5 Dispose
  
- Documentation
  - LCA/LCC
  - Environmental properties
  - Technical properties



## OVERALL CONCLUSION

- Beneficial reuse of EPS
  - Technical test standard
  - Environmental test standard
- End of life
  - Recycle raw material
  - Recover energy
  - (Landfill)
- Think right

