Waste incineration

Monitoring issues

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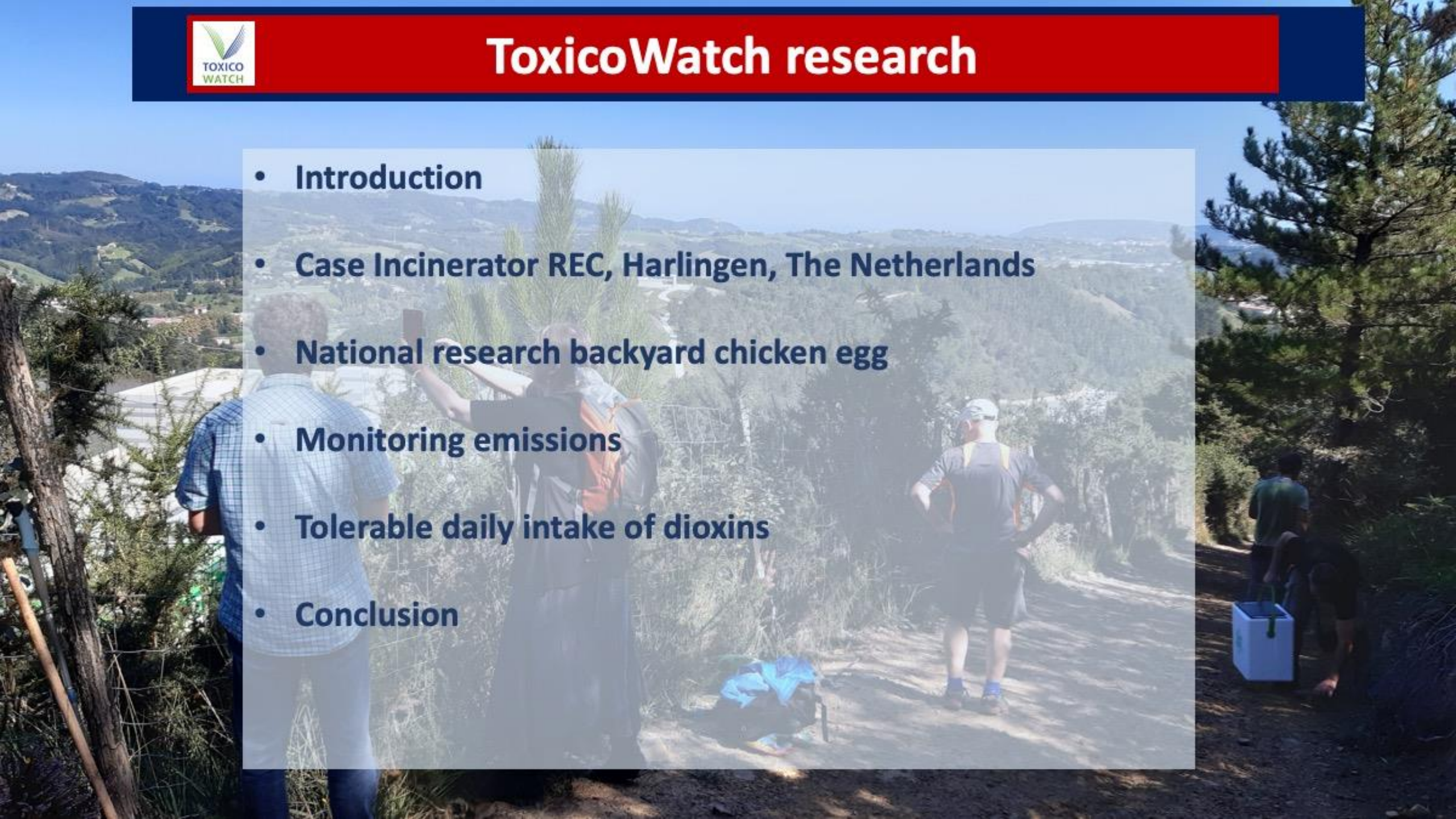
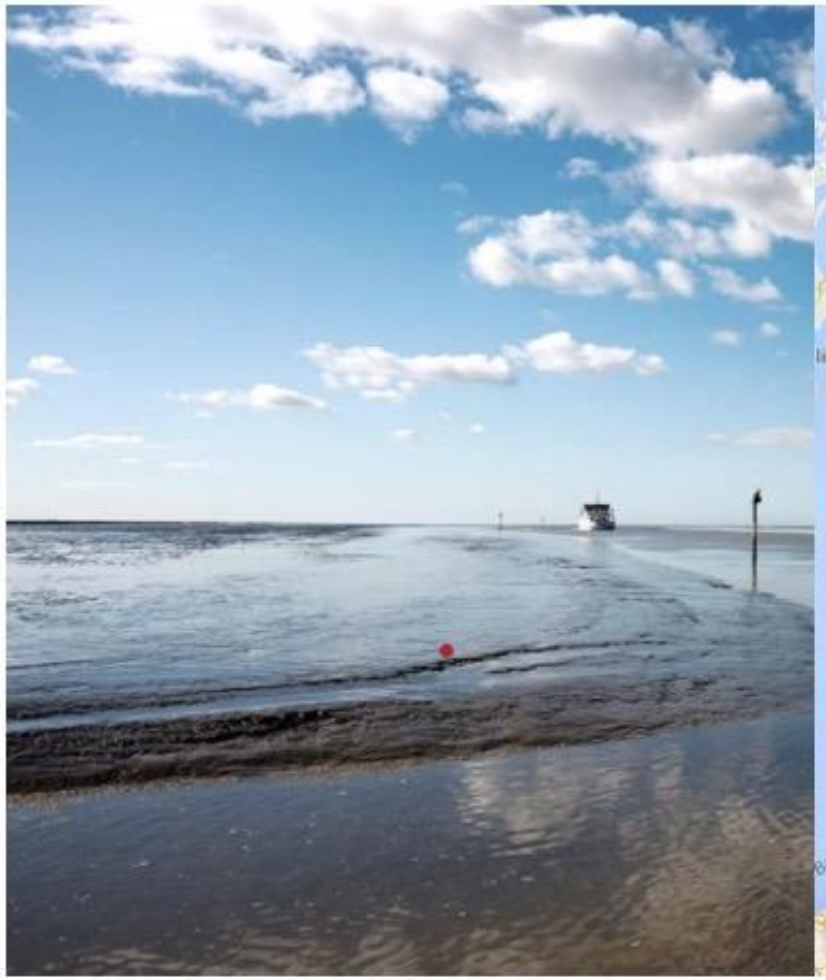
ToxicoWatch

ToxicoWatch research



- Introduction
- Case Incinerator REC, Harlingen, The Netherlands
- National research backyard chicken egg
- Monitoring emissions
- Tolerable daily intake of dioxins
- Conclusion

Case Harlingen, The Netherlands



Situated near the UNESCO Wadden Sea, mostly agricultural economy

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Incinerator REC, Harlingen, the Netherlands

2011 Waste to Energy Incinerator 'REC'
Model 'state of the art' incinerator,
the best and cleanest of Europe

Biomonitoring

Emissions of incinerators

In Nl biomonitoring by industry itself

One location
Far away

Agro-economical research

More locations
Near hotspot

Crowdfunding

ToxicoWatch biomonitoring research

Monitoring dioxins (WUR)

Incinerator REC

Biomonitoring program

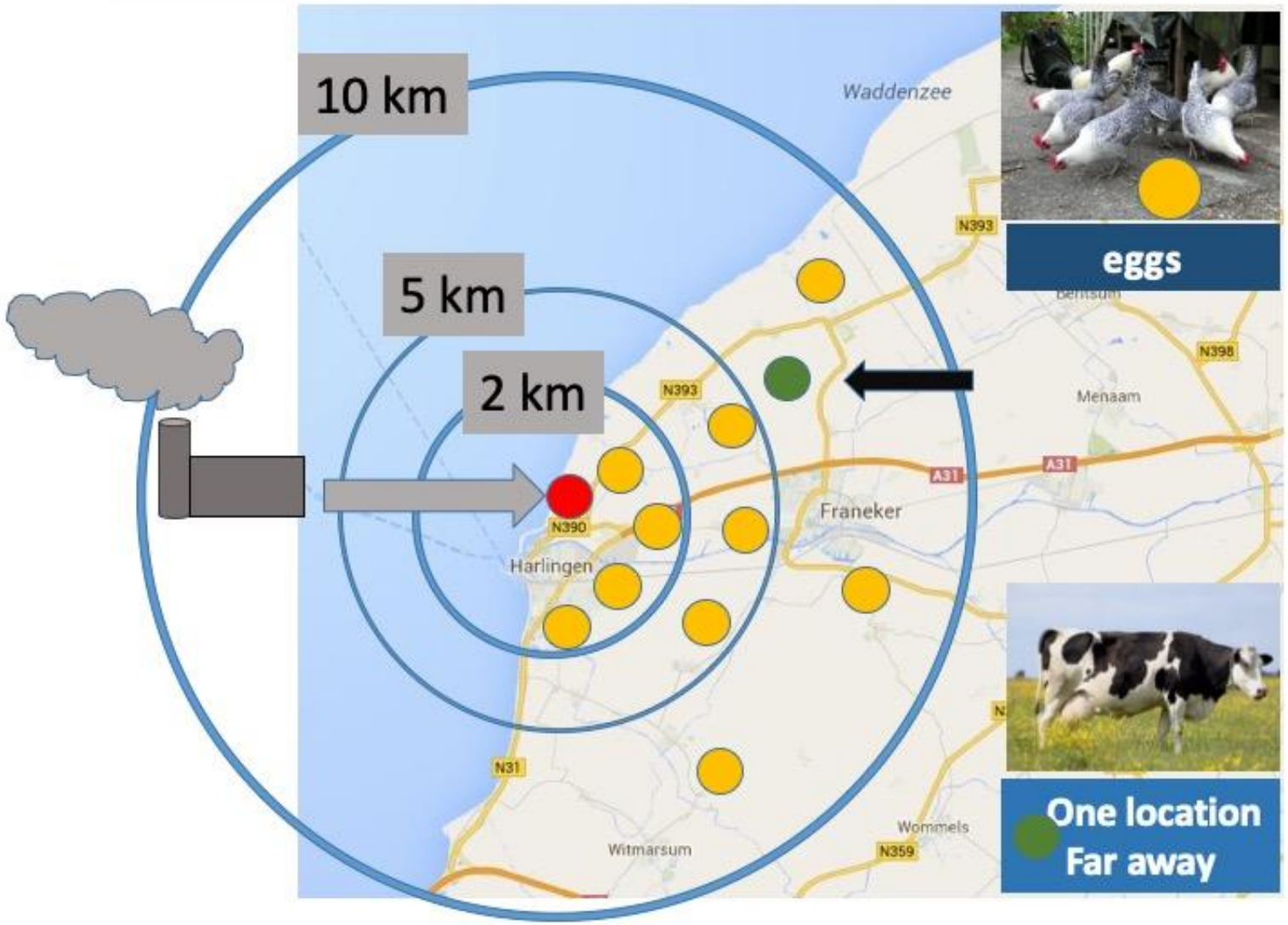
Milk of cows

> 5 km

one composite sample

WUR: Never find elevated dioxins in the environment

ToxicoWatch approach biomonitoring



TW sampling

At more (n > 10) locations(1-10 km) composite samples of 10 eggs/location of backyard chickens:

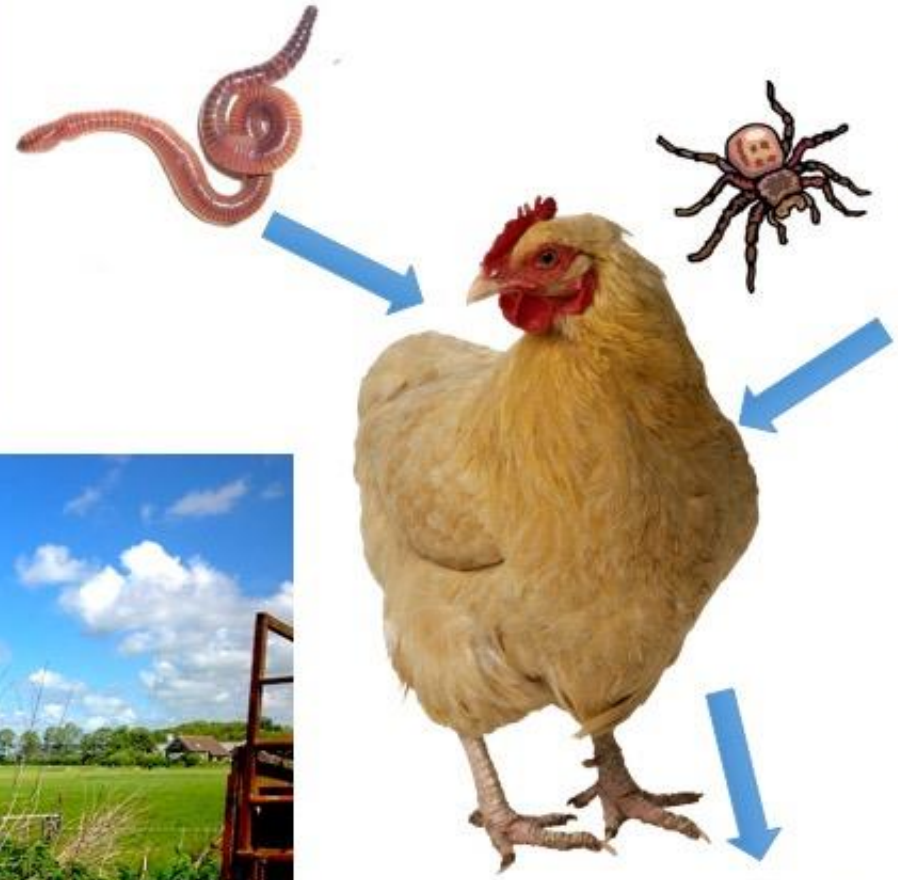
local and areal coverage = counteracting heterogeneity

Composite-sampling

More sampling

Spatial trends

Biomarker egg backyard chicken



Bioaccumulation
Biomagnification
Biotransformation
Xenobiotical metabolism

Environmental Biomarkers

CALUX

Broad spectrum of applications

Cost-efficient

Rapid and sensitive technology

Can be used as pilot screening research

Reliable in results

Chemical vs biological analysis

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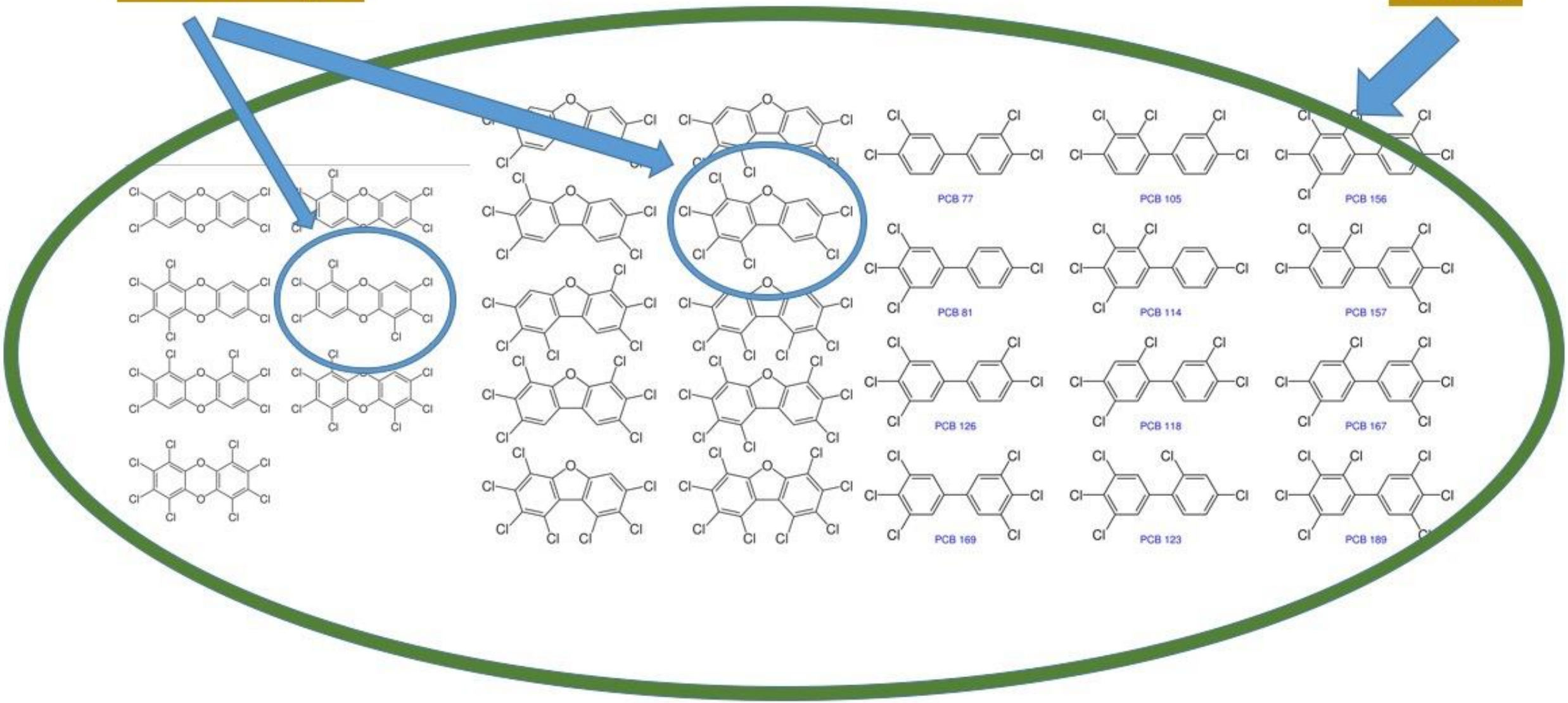
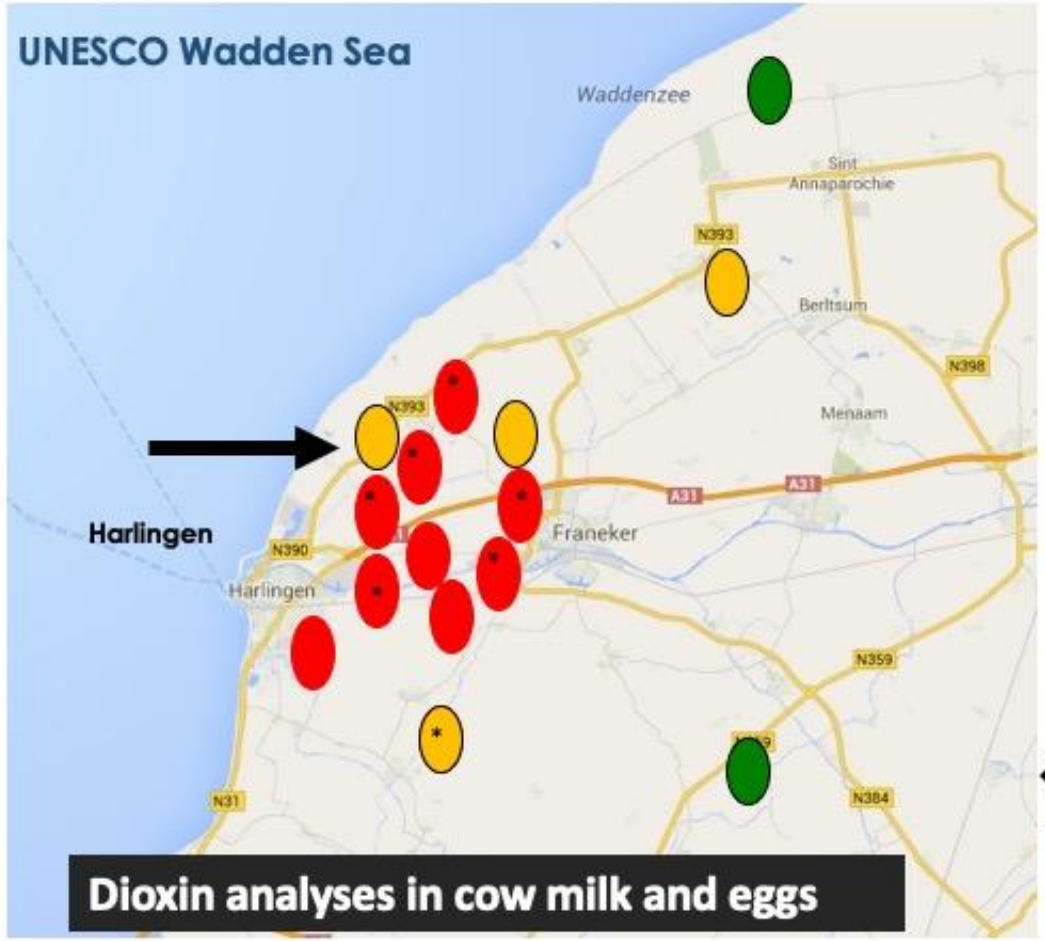
Chemical analysis

bioassay



Results eggs backyard chicken Harlingen

Bioassay



Eggs RIKILT

Eggs ToxicoWatch

DR CALUX®

> 3,4 pg BEQ /g fat

➢1,7 pg BEQ /g fat

< 1,7 pg BEQ /g fat

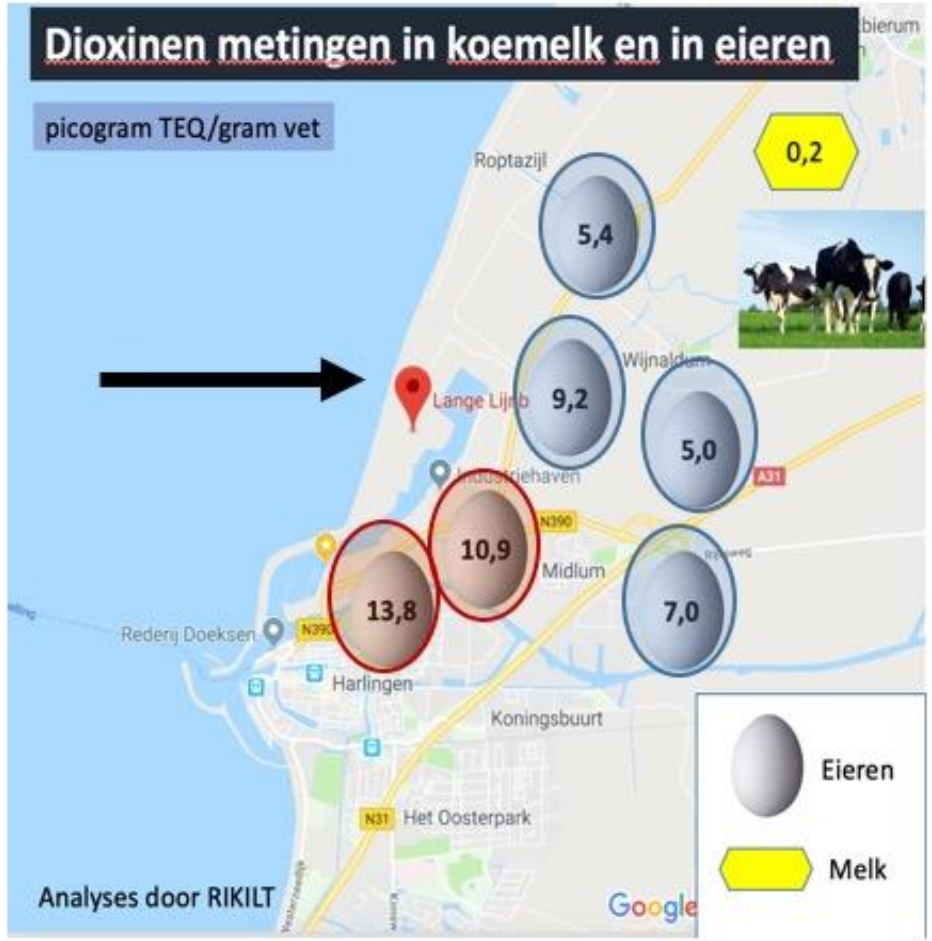
✳ GC-MS

BEQ: Bioanalytical EQuivalents

Distance

10 km

Chemical analysis



ToxicoWatch “Hidden emissions”

Offical measurements

Short-term

Sampling: 0,1 % of a year

- 12 hours measurement period (2 x 6 hours)
- Only under steady state conditions*
- Pre-announced
- Only PCDD/F

Results < 0,00001 ng TEQ/Nm3

Accurate measurements

long-term

Sampling: 95 % of a year

Adsorption **ME**thod for **SA**mpling of dioxins
AMESA

Long time measurements

Other Than Normal Conditions (OTNOC)

Continously sampling

Analysing other UPOPs

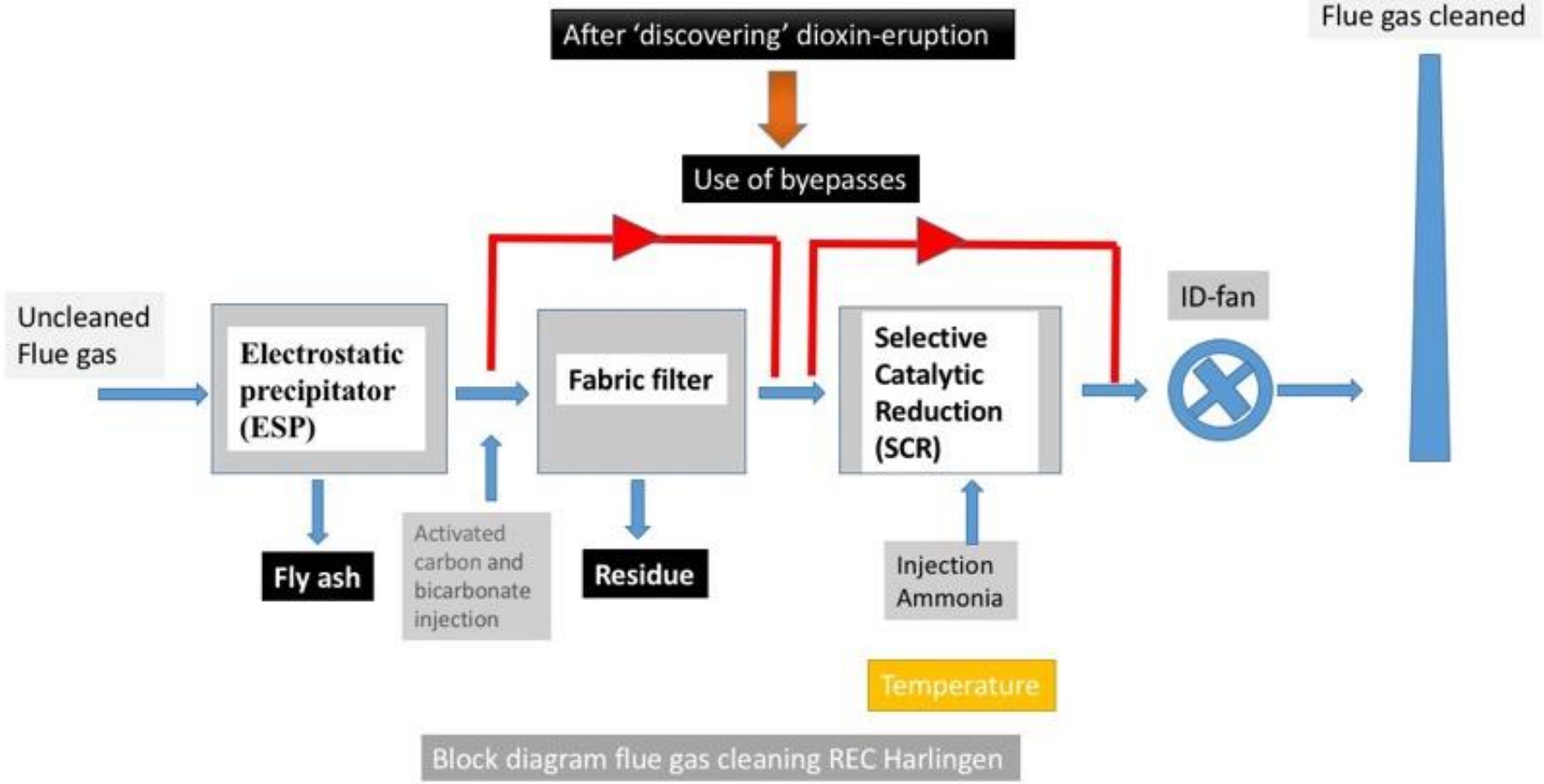
Results > 0,1 ng TEQ/Nm3

Hidden Emissions (#1 sampling error)

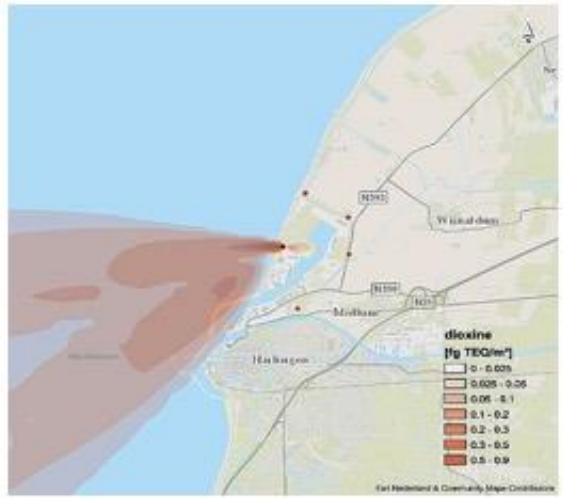
Sampling	Hours	ng TEQ/Nm3	Factor
Short-term, March 30, 2016	6	<0,00001	
Long-term, March 26– April 26, 2016	256	0,01290	>1290
Short-term, 8 March 2017	6	0,00001	
Long-term March 7 – April 5, 2017	690	0,00460	460

No representativeness of official measurements

Hidden Emissions (#2 bypasses)



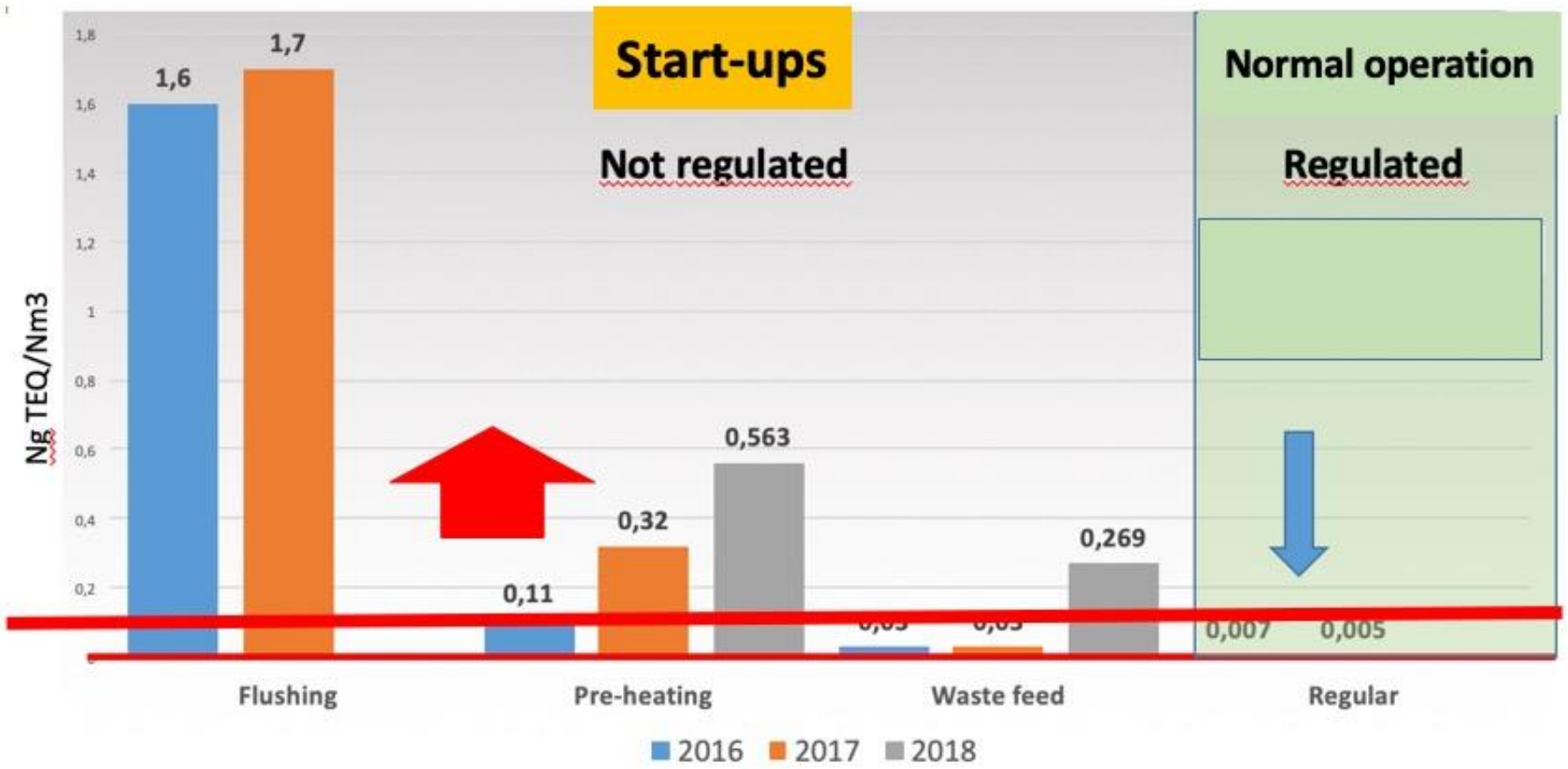
Block diagram flue gas cleaning REC Harlingen



Incinerator uses bypasses of Air Pollution Control Devices, still in Dutch juridical court (ToxicoWatch)

Hidden Emissions (#3 OTNOC)

Emissions during Other Than **Normal** Operation Conditions (OTNOC)



EU norm
0,1 ng TEQ/Nm3

Measured during three start-ups 2016, 2017 and 2018

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Emissions of other UPOPs (#4 UPOPs)

Not regulated

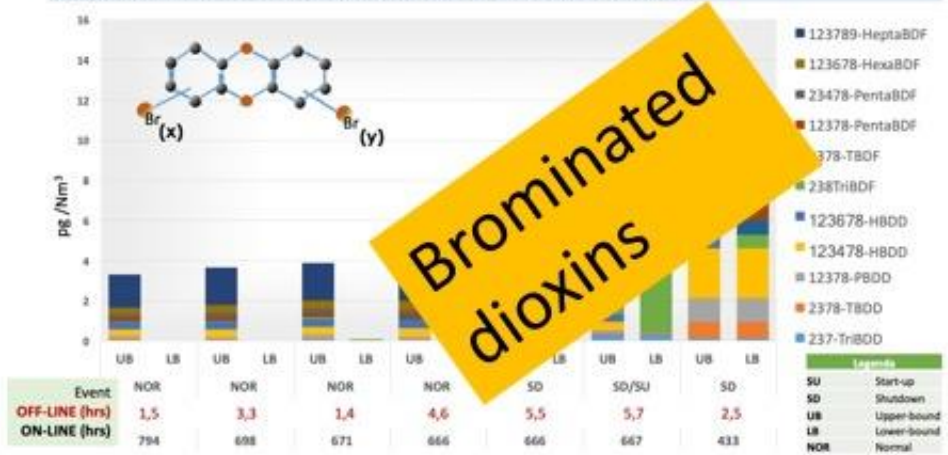
- Dioxin-like PolyChloor Biphenyls (dl-PCBs)
- PolyBrominated Biphenyls (dl-PBBs)
- PolyBrominated DiBenzoDioxines/Furans (PBDD/F)
- Mixed halogenated Dioxines & Furans (PBDD/F)
- PolyBrominated DiphenyEthers (PBDE)
- PolyAromatic Hydrocarbon (PAH)
- PFOA and PFOS

All detected in flue gas with AMESA long-term sampling

Emissions of other UPOPs (#4 UPOPs)

Perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) emissions

Polybrominated dibenzodioxins and -furans (PBDD/F) emissions



Emissions dioxin-like polychlorinated biphenyls during 7 months

Polycyclic aromatic hydrocarbon emissions from waste incineration

Long-term sampling research AMESA 2016, 2017 and 2018 at the REC Harlingen

Hidden temperatures (#5 UPOPs)

Post-Combustion-Zone

Waste

> 1% halogens

< 1% halogens

< 1% halogens

Complete Combustion

H C Cl O_2 > 1100⁰ C H C I

Complete Combustion

C H I > 850⁰ C Cl O_2 Br

Uncomplete Combustion

Dioxins

< 850⁰ C

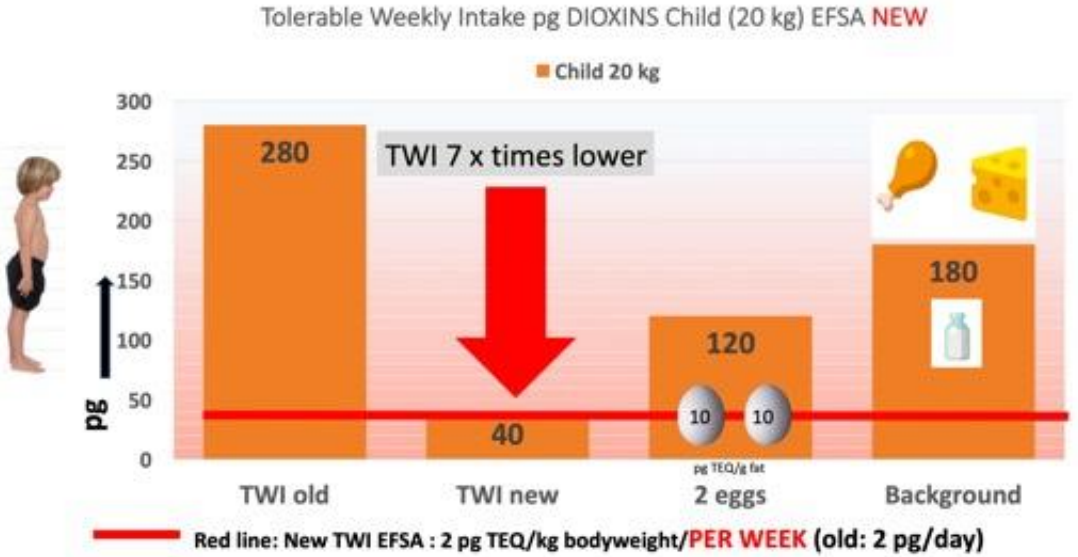
UPOPs

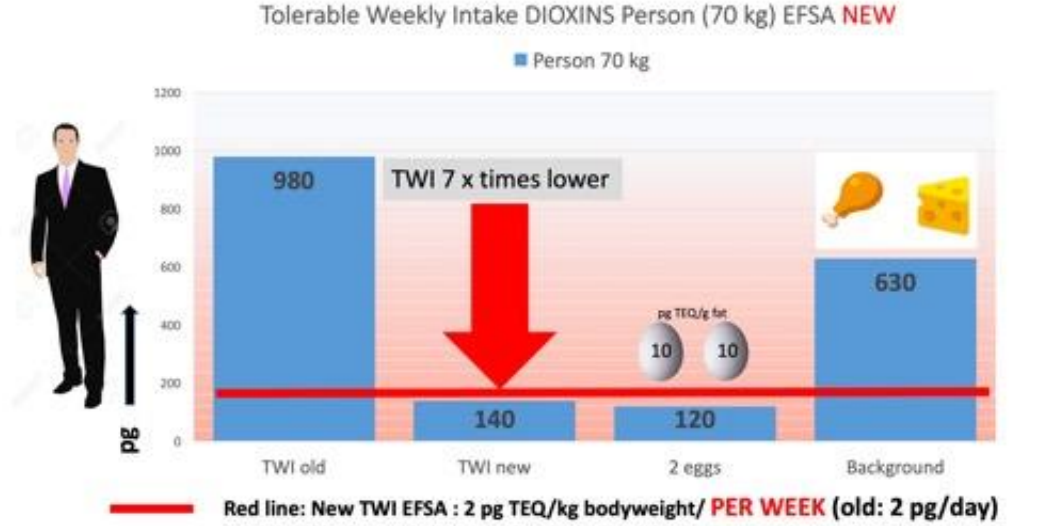
Flue gas cleanng

Emissions implications when combustion temperatures are insufficient

Tolerable intake level dioxins strongly revised downwards

Die spannende und aufschlussreiche Podiumsdiskussion wurde moderiert vom ehemaligen Leiter und Vorstandsvorsitzenden des Chemischen- und Veterinäruntersuchungsamt Münsterland-Emscher-Lippe (CVUA-MEL), Prof. Dr. Peter Fürst (4. von links). Diskutiert haben dabei die renommierten Wissenschaftler v.l.n.r. Dr. Ron Hoogenboom (Mitglied der EFSA und zuständig für Lebensmittel- und Umweltmittelkontaminationen im RIKILT Wageningen Institut Niederlande), Dr. Frank Neugebauer (leitender Wissenschaftler an der Eurofins GfA Lab Service GmbH in Hamburg), Prof. Dr. Heidelore Fiedler (Professor der Chemie, leitet derzeit ein Großprojekt zur Umweltüberwachung von POPs in Schweden) und Dr. Abel Arkenbout (Wissenschaftler und CEO der Toxicowatch Foundation für Beratung und Betreuung von Themen rund um POP's, Niederlande).





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Dioxins are still a serious issue, the health of the population is still under threat.
TOXICOWATCH
ZERO WASTE EUROPE