Chasing LAS in Laos

Parameterising a Risk Assessment Methodology for Direct Discharge Scenarios

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Conventional ERA

Exposure Assessment

EMISSION AND RELEASE ESTIMATES

FATE AND DISTRIBUTION MODELLING

PREDICTED ENVIRONMENTAL CONCENTRATION (PEC)

Effects Assessment

EFFECTS DATA

EXTRAPOLATION

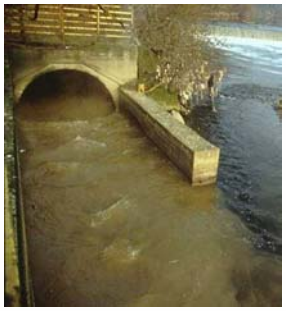
PREDICTED NO-EFFECT CONCENTRATION (PNEC)

Risk ?

PEC/PNEC > 1 ?

Direct Discharge

Under DD, stream ecology can be affected by high BOD (and low DO concentrations), free ammonia, SS and other potentially harmful constituents. So does conventional ERA make sense?



Untreated discharge of raw sewage to surface waters

ERA for DD Some guidelines

Detergent ingredients should not significantly delay or impair the recovery processes in polluted rivers.

Detergent ingredients should degrade at least as fast as BOD and ammonia.

AISE/CESIO Limlette III Workshop (1995)

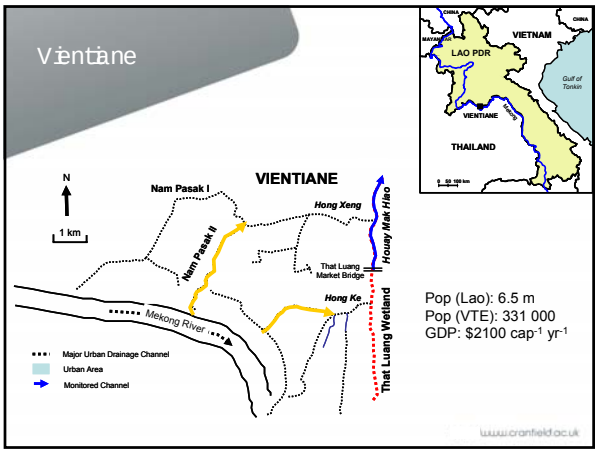
Data Requirements for DD ERA

***PNEC* for impact zone (threshold for recovery function inhibition)**

Means of estimating model parameters for operational use (e.g. using simple lab tests)

The Lao connection

Unilever


Vientiane
VIETNAM
LAO PDR
THAILAND
VIENTIANE
Gulf of Tonkin
N
1 km
Nam Pasak I
VIENTIANE
Hong Xeng
Houay Mak Hiao
Nam Pasak II
That Luang Market Bridge
Hong Ke
Mekong River
That Luang Wetland
Major Urban Drainage Channel
Urban Area
Monitored Channel
Pop (Lao): 6.5 m
Pop (VTE): 331 000
GDP: $2100 cap-1 yr-1
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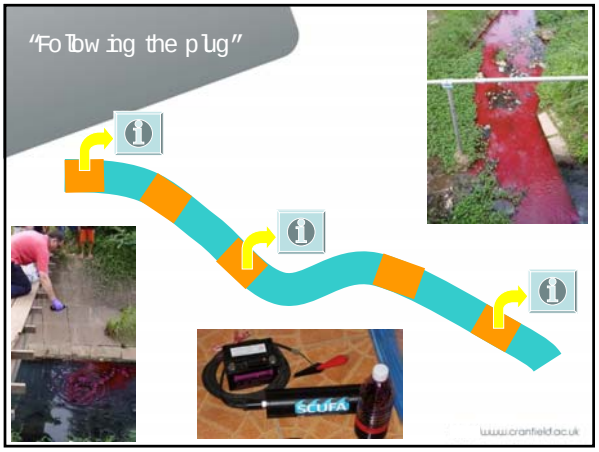
Vientiane


"Following the plug"
SCUFA
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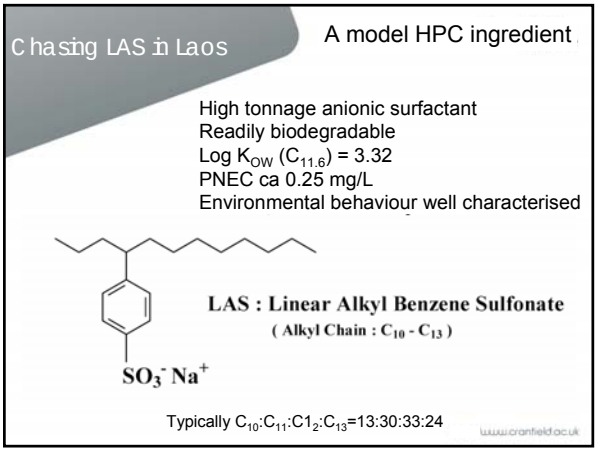
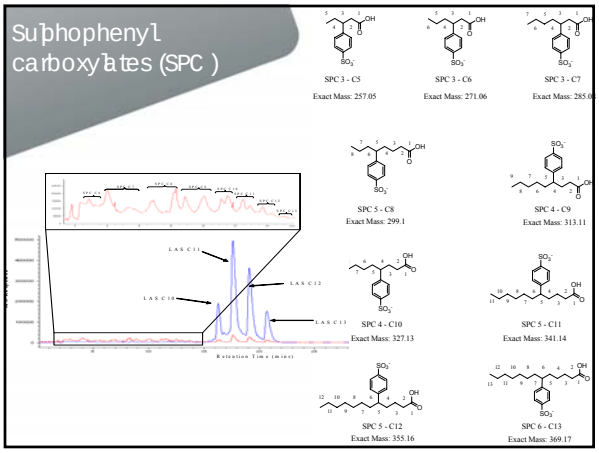
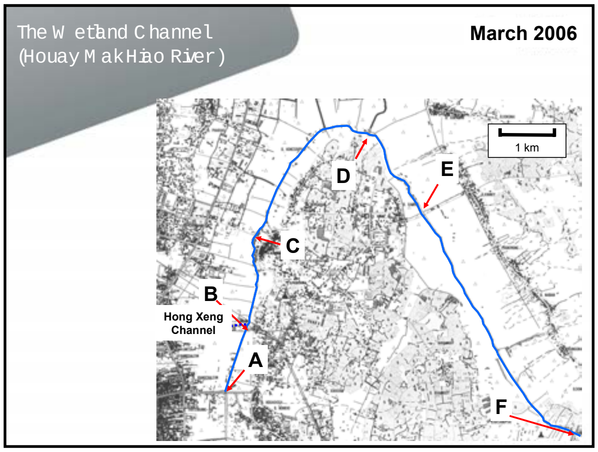

Chasing LAS in Laos
A model HPC ingredient
High tonnage anionic surfactant
Readily biodegradable
Log KOW (C11.6) = 3.32
PNEC ca 0.25 mg/L
Environmental behaviour well characterised
LAS : Linear Alkyl Benzene Sulfonate
(Alkyl Chain : C10 - C13)
SO3- Na+
Typically C10:C11:C12:C13=13:30:33:24
www.cranfield.ac.uk


Sulphophenyl carboxylates (SPC)
SPC 3 - C5
Exact Mass: 257.05
SPC 3 - C6
Exact Mass: 271.06
SPC 3 - C7
SPC 5 - C8
Exact Mass: 299.1
SPC 4 - C9
Exact Mass: 313.11
SPC 4 - C10
Exact Mass: 327.13
SPC 5 - C11
Exact Mass: 341.14
SPC 5 - C12
Exact Mass: 355.16
SPC 6 - C13
Exact Mass: 369.17


WQ Analysis VTE-style
Cranfield UNIVERSITY


The Wetland Channel
(Houay Mak Hiao River)
March 2006
1 km
A
B
C
D
E
F
Hong Xeng Channel


A: Injection: That Luang Market
Cranfield University
(1)
(2)
(3)
(4)
(5)
(6)
www.cranfield.ac.uk


A: Injection: That Luang Market
Cranfield University
(1)
(2)
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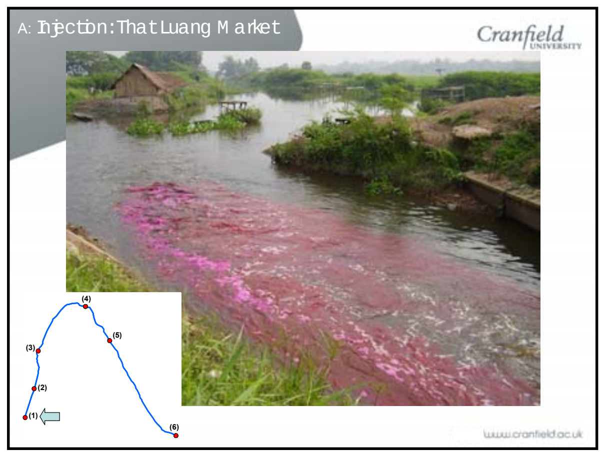
www.cranfield.ac.uk


A: Injection: That Luang Market
Cranfield University
(1)
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Cranfield University
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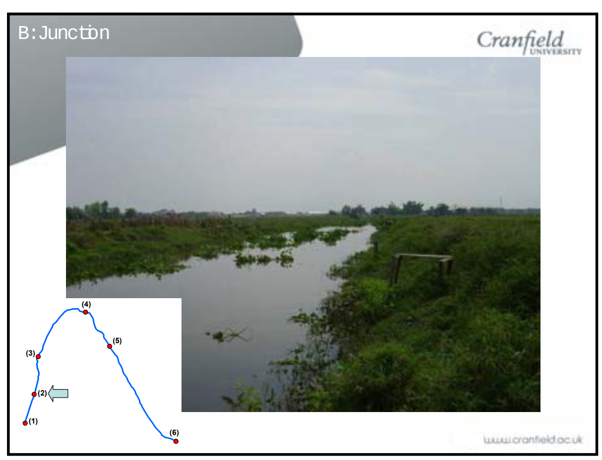
B: Junction
Cranfield University
(1)
(2)
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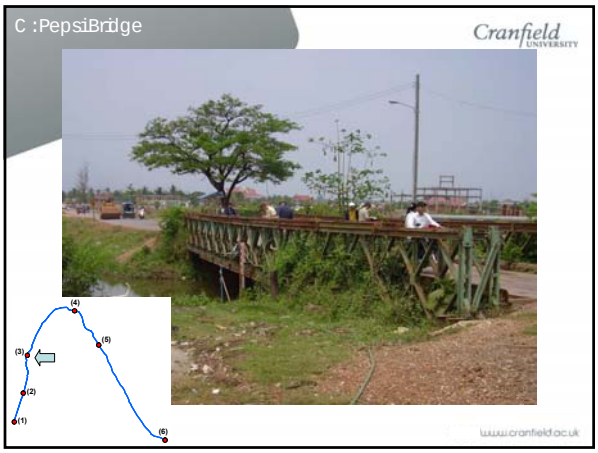
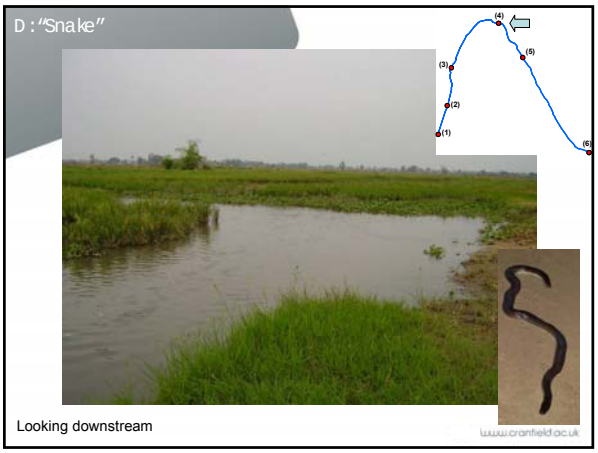
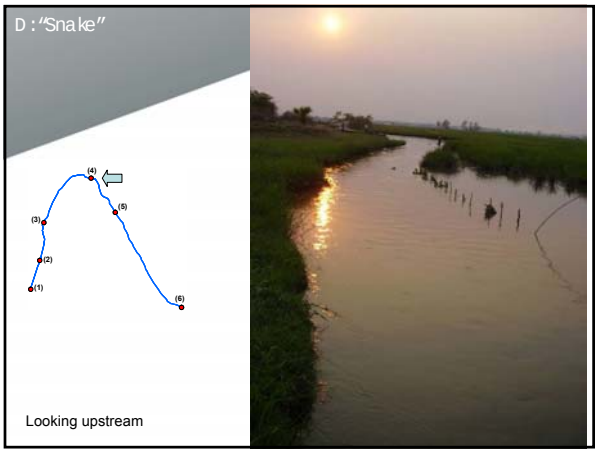
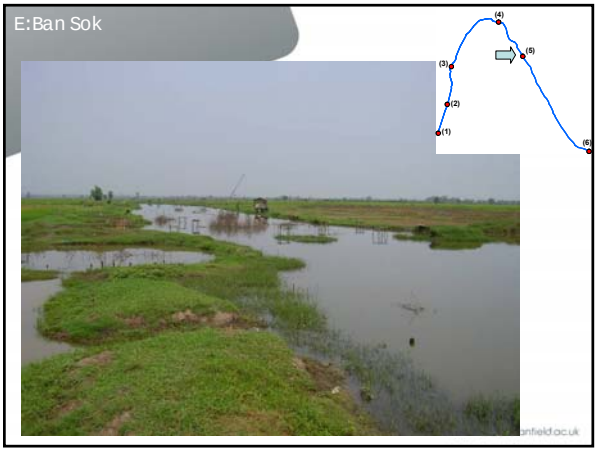
www.cranfield.ac.uk

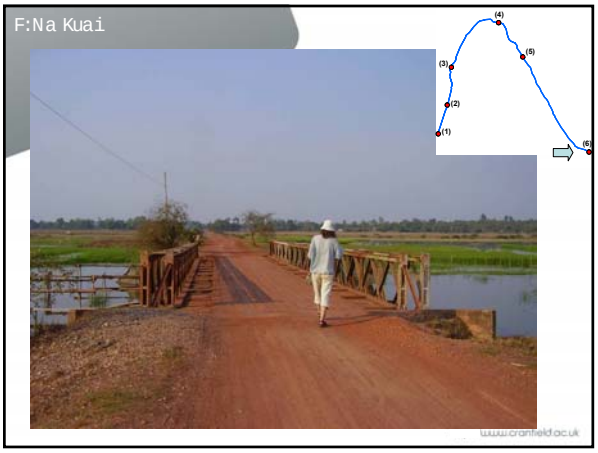

C :PepsiBridge
Cranfield
UNIVERSITY
www.cranfield.ac.uk


D :"Snake"
Looking downstream
www.cranfield.ac.uk


D :"Snake"
Looking upstream


E:Ban Sok


E:Ban Sok


F:Na Kuai
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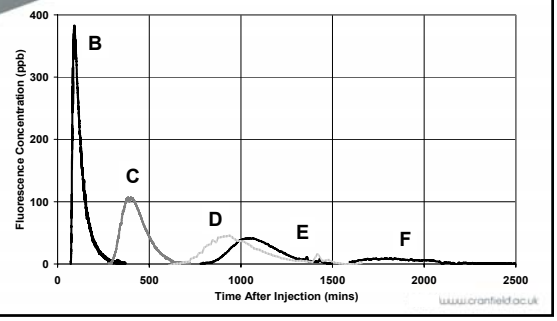
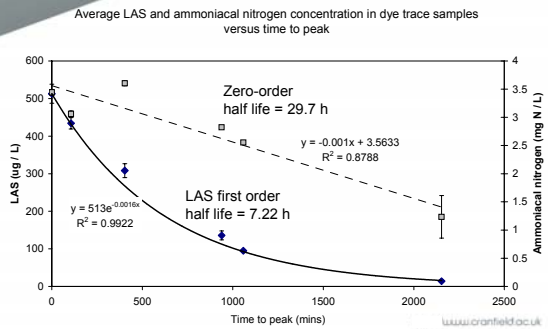
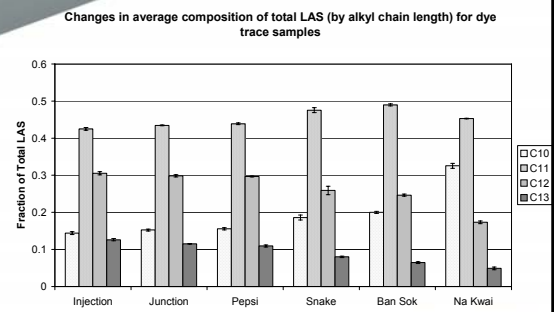
Dye Trace



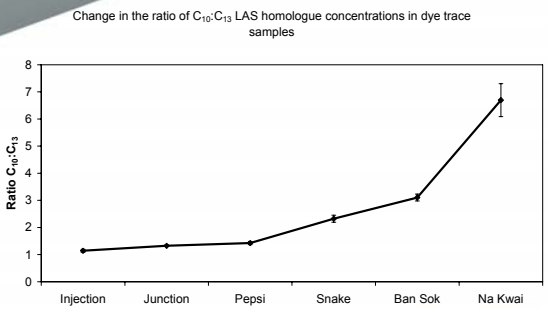
LAS and NH_4^+ (Dye Trace)



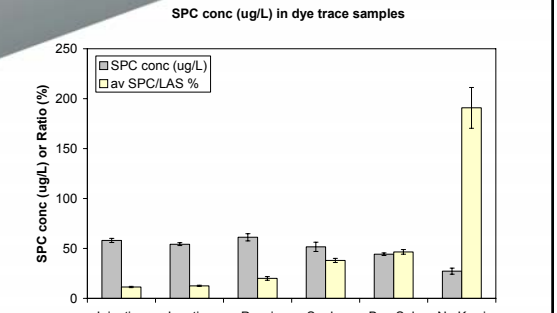
LAS homologue distribution



$C_{10}:C_{13}$ ratio



SPC concentrations



Conclusions

Concentrations of LAS are rapidly removed in the river channel draining Vientiane (and subjected to DD)

The ammonia story is complicated by N mineralisation (of autochthonous and exogenous organic matter), additional NH_4 emissions (e.g. by ducks) and uptake by plants

Results consistent with acceptable risk under the Impact Zone RA methodology

Need to confirm generality with other substances (readily and inherently biodegradable)


Thanks for Listening!
The behaviour of linear alkyl benzene sulphonate under direct discharge conditions in Vientiane, Lao PDR
Read all about it!
www.cranfield.ac.uk