WssTP

A vision for coordinated, integrated and innovative Water European Research Area

Mike Farrimond
Past President

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2 topics for today

- WssTP and our urban initiatives

- UKWIR's chemical investigation programme (CIP)

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Water, a key sector

- **Huge market:** 250 to 350 Billion € turnover /year (drinking and waste water)
- **Considerable assets:** > 3.5 M Km water distribution
  > 2.5 M Km sewers
- **Large social impact:** > 600,000 direct jobs in Europe
- **EU annual Investment:** **>€**33 Bn invested in water infrastructures

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Members


UCM
Norit
leading in purification
ANIMA
aquateam
BRØDRENE DAHL
Grontmij
Lonza
UIE
UKWIR
VEOLIA
ENVIRONNEMENT
UNIVERSITY OF SURREY
Brunel UNIVERSITY LONDON
UNIVERSITY OF EXETER
VTT
The James Hutton Institute
NIVA
Norsk institutt for vannforskning
UEX
cetaqua
Cranfield UNIVERSITY
CSTB
le futur en construction
ctm
CENTRE TECHNOLOGIC
DWF
Danish Water Forum
Deltares
TNO
vito
pool
AIDICO
INSTITUTO TECNOLÓGICO DE LA CONSTRUCCIÓN
ceit
Cemagref
Centre for Ecology & Hydrology
GEUS
HR Wallingford
IRSA CNR
International Water Association
JUANINUM RESEARCH
KWP
KOMPETENZ ZENTRUM Wasser Berlin
LEITAT
Technological Center
SINTEF
IVL
DHI
DVGW
EMH European Membrane House
n|w
fondazione AMGA
Atos
tecnalia
FederUtility
GRANDLYON
Norsk Vann
SIAAP
Svenskt Vatten
Vewin
ΕΠΙΣΕΥ ICCS
Aquafin
ÁGUAS DE PORTUGAL
Aeas
Canal de Isabel II
copa cogeca
DANVA
EUREAU
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WssTP, our mission

- Vision established in 2005
- ***"By 2030 the European water sector will be regarded as the global leader in the provision of sustainable water services."***
- WssTP was created to stimulate a **collaborative, innovative, visionary and integrated** RTD&I strategy for the European water sector.
  - Promote coordination and collaboration in RTD&I in the water sector
  - Shape the future priorities for research and innovation
  - Deliver a **common vision for water innovation**
  - Promote water in the political agenda
  - Address grand societal challenges of today and tomorrow

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Pilot programme 2: Sustainable water management inside and around large urban areas

Increasing urbanisation:

More than 50% of the population will live in urban areas.

Some issues:

- Rainfall management.
- Balancing water demand with environment.
- Asset management.
- Sludge.
- Alternative water resources.
- Water treatment.
- Leakages

Nicola Bazzuro, IRIDE Group, Italy

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Pilot programme 4: Sustainable water management for industry

All industries need to be more **efficient in the use of water.**

Implementation **cases:**

- Water fit for use.
- Closing water cycles.
- Reducing pollution (carbon impact) and water costs.
- Brines
- Complex waste water treatment
- SUSCHEM, ETP-SMR, ESTEP

Albert Jansen, TNO, Netherlands

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List of Publications - Reports

- **Coastal zones**
- Scientific Publication: Research and Technology Development Needs –
- **Urban areas**
- UTP1: Managing rain-related events and flooding in urban areas -
  UTP2: Asset management for sustainable urban water -
  UTP3: Supply Demand Balance & Public Participation –
- UTP4: Sustainable Sludge Management in Urban Areas -
- UTP5: Alternative Water Resources
- UTP6: Sensor – Creation of a Task Force,
- UTP7: Water Treatment - Report to be released
- UTP8: Pollution Control - Report to be released
- **Agriculture**
- UTP1: Irrigation Techniques – Report 12-10-1009
- UTP2: Water reuse – Report to be released
- UTP3: Nutrient Management – Report to be released
- **Manage Aquifer Recharge**
- State of the Arts and Research Needs – Report 18-09-2010
- **Climate Change**
- Incorporating Climate Challenge – Report 01-12-2010

Sensors and Monitoring, Water and Energy, Membrane Technologies for Water Applications, Millennium Development Goals, Brines, Leakages = *Report to be released*

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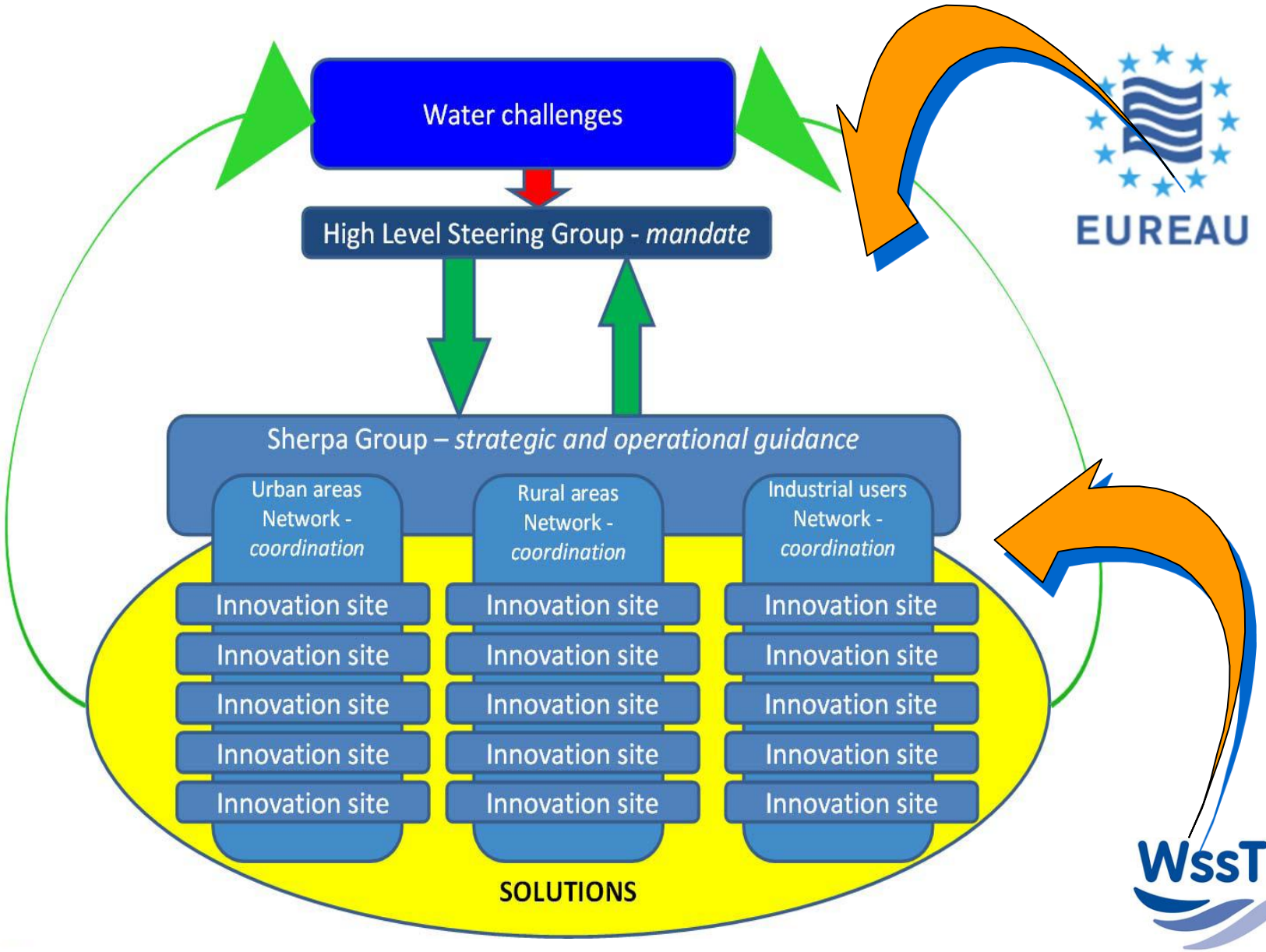
European Innovation Partnership on Water (STRUCTURE)



Chemicals Investigation Programme (CIP)

The overall aim of the CIP is to provide a better understanding of both the sources and prevalence of these substances, and their fate through existing and novel treatment processes.

C1. Extensive surveys of effluent quality at more than 160 treatment works;

C2. Detailed assessments of performance (removal efficiency) at [illegible] that represent [illegible] processes; and,

C3. Investigations [illegible] in 9 urban catchments

€32M

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nickel (dissolved)	2
lead (dissolved)	1.3
copper (dissolved)	1
zinc (dissolved)	10.5
cadmium (dissolved)	0.08
mercury (dissolved)	0.05 (0.07 as MAC)
aluminium (reactive)	50
diethylhexylphthalate	1.3
BDE28	0.0005 as sum of BDEs listed (0.000000049 as sum of BDEs listed)
BDE47	See above
BDE99	See above
BDE100	See above
BDE153	See above
BDE154	See above
nonylphenol 4-nonylphenol	0.3
tributyltin	0.0002
anthracene	0.1
fluoranthene	0.1(0.0063)
naphthalene	2.4 (2)
benzo(a)pyrene	0.05 (0.00017)
benzo(b)fluoranthene	0.03 (0.017 as MAC)
benzo(k)fluoranthene	0.03 (0.017 as MAC)
benzo(g,h,i)perylene	0.002 (0.0082 as MAC)

indeno(1,2,3-cd)pyrene	0.002 (-)
glyphosate	100
Aminomethyl phosphonic acid	80
triclosan	0.1
bentazone	430
bisphenol-A	0.1
mecoprop	6
EDTA	50
ibuprofen	0.01
propanolol	0.01
erythromycin	0.01
ofloxacin	0.01
oxytetracycline	0.01
fluoxetine	0.01
oestrone (E1)	0.003
17β oestradiol (E2)	0.001 (0.0004)
17α ethinyloestradiol (EE2)	0.0001(0.000035)
diclofenac	0.01 (0.1)

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CONCLUSION – there's a common theme

It's more complicated than you thought!

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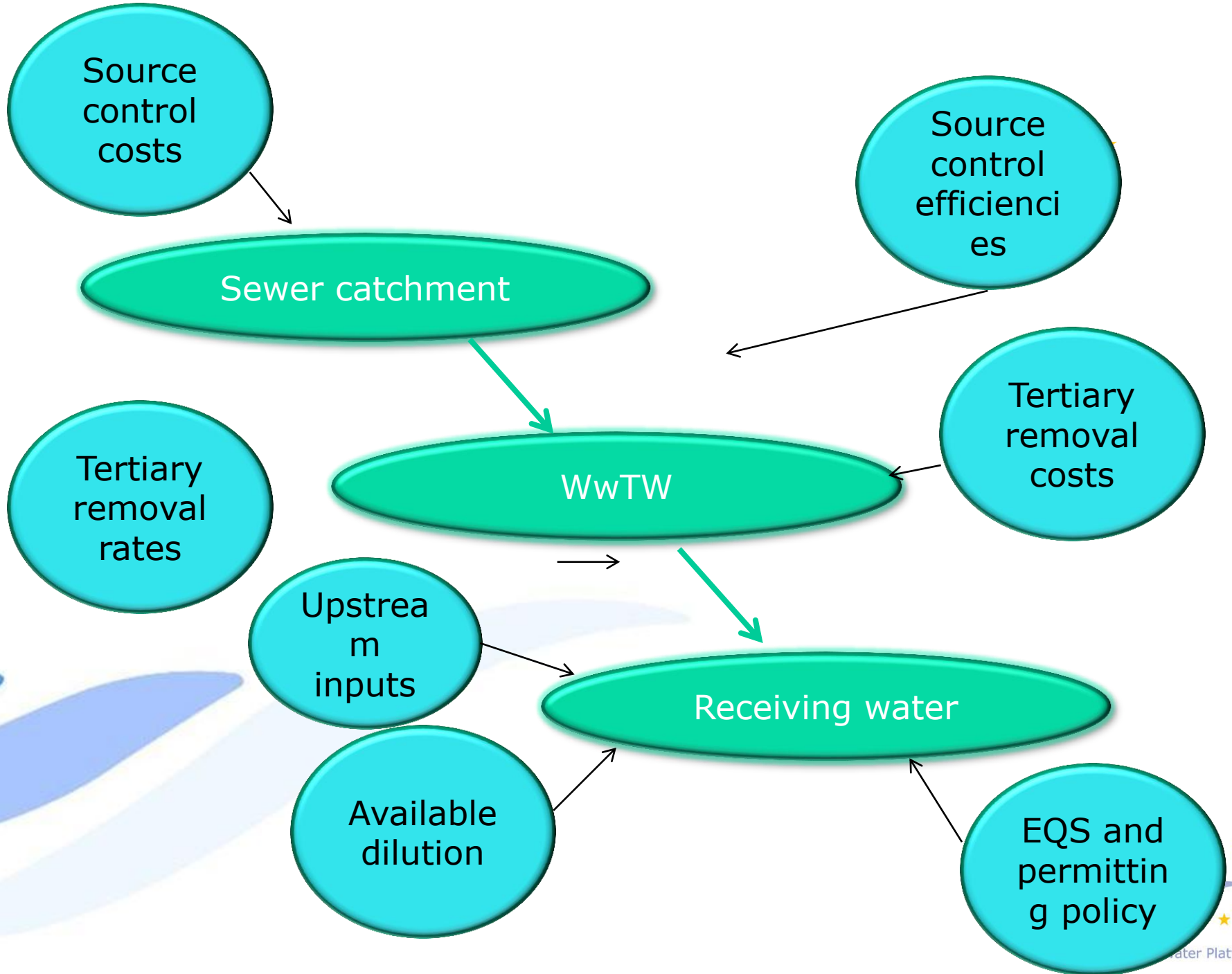
Source control costs
Source control efficiencies
Sewer catchment
Tertiary removal costs
Tertiary removal rates
WwTW
Upstream inputs
Receiving water
Available dilution
EQS and permitting policy

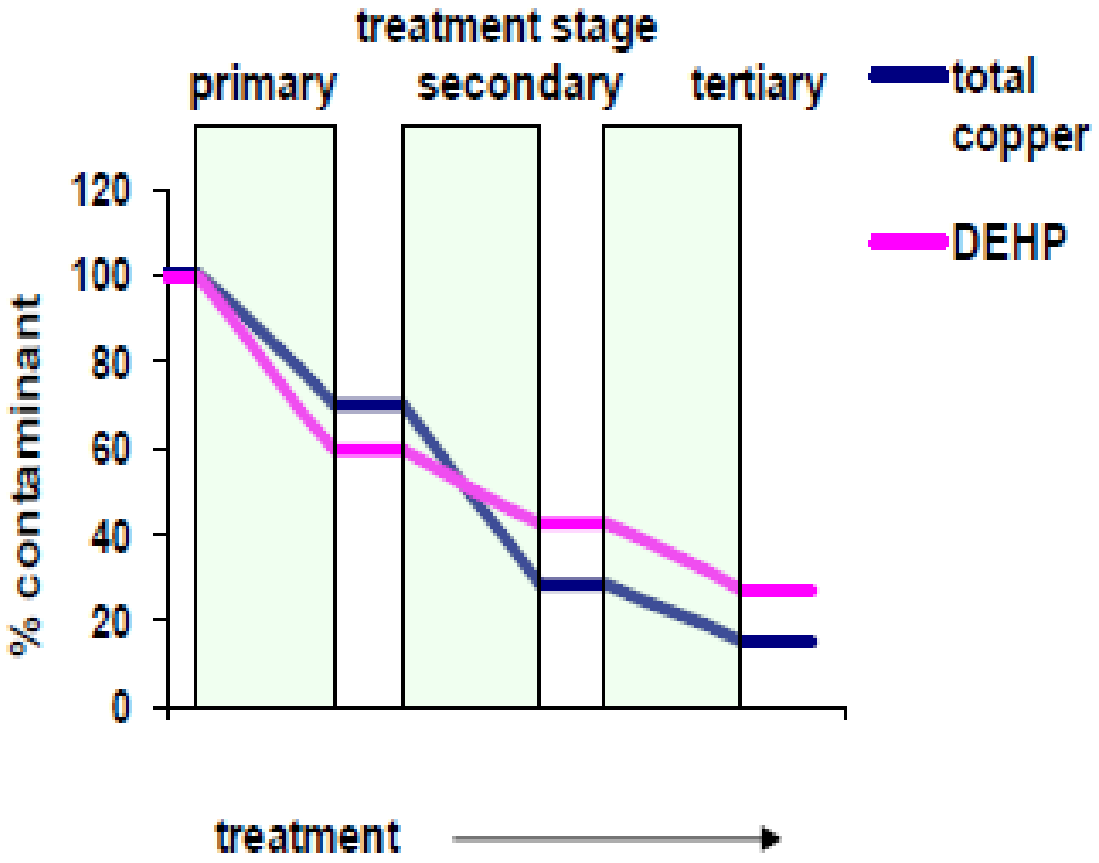

Figure 3 *Removal depends on substance and treatment type*

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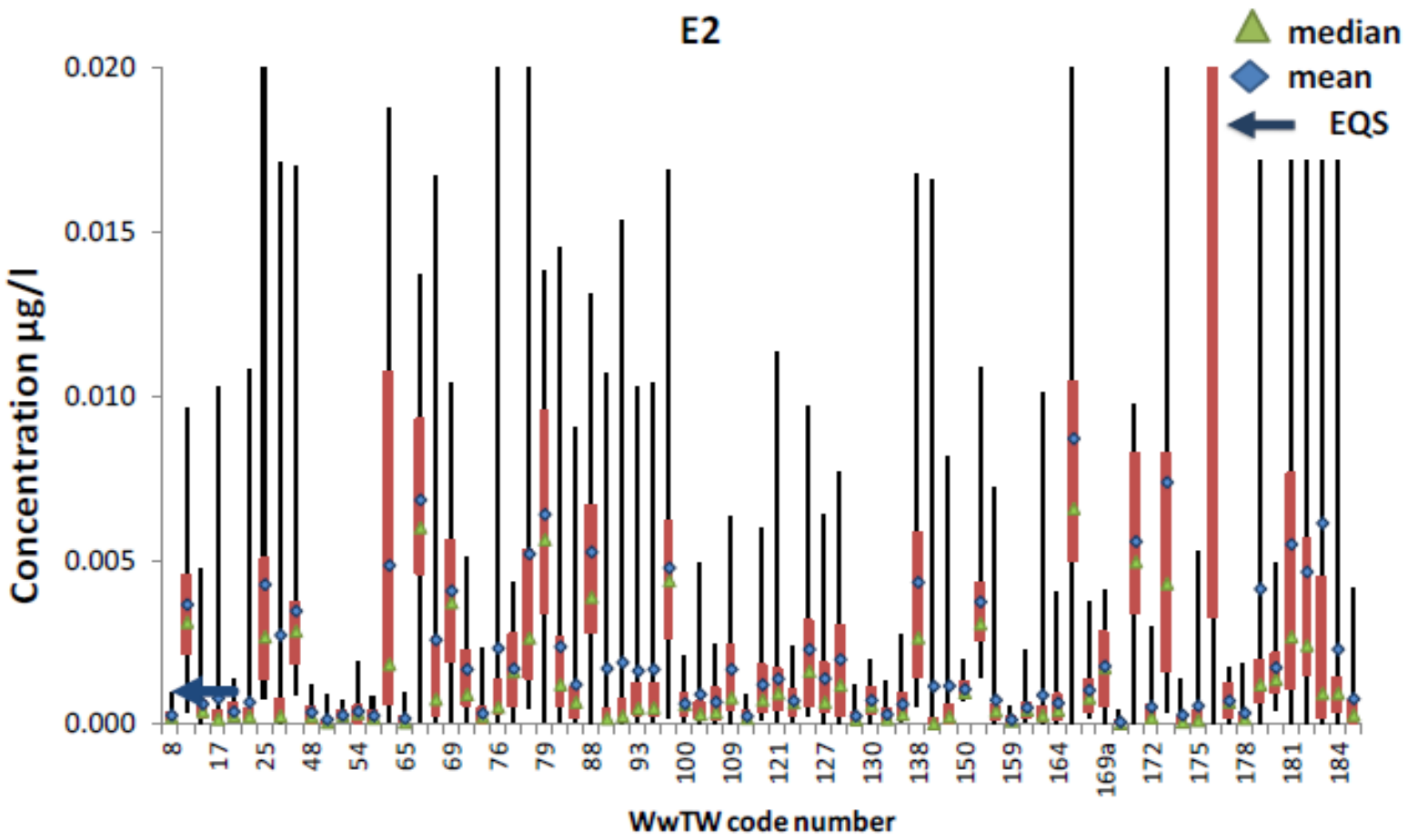


Figure 2 *Representation of average, typical range and extreme values for concentrations of the natural steroid oestradiol in sewage effluent for 76 treatment works*

Key to box and whisker plot

median

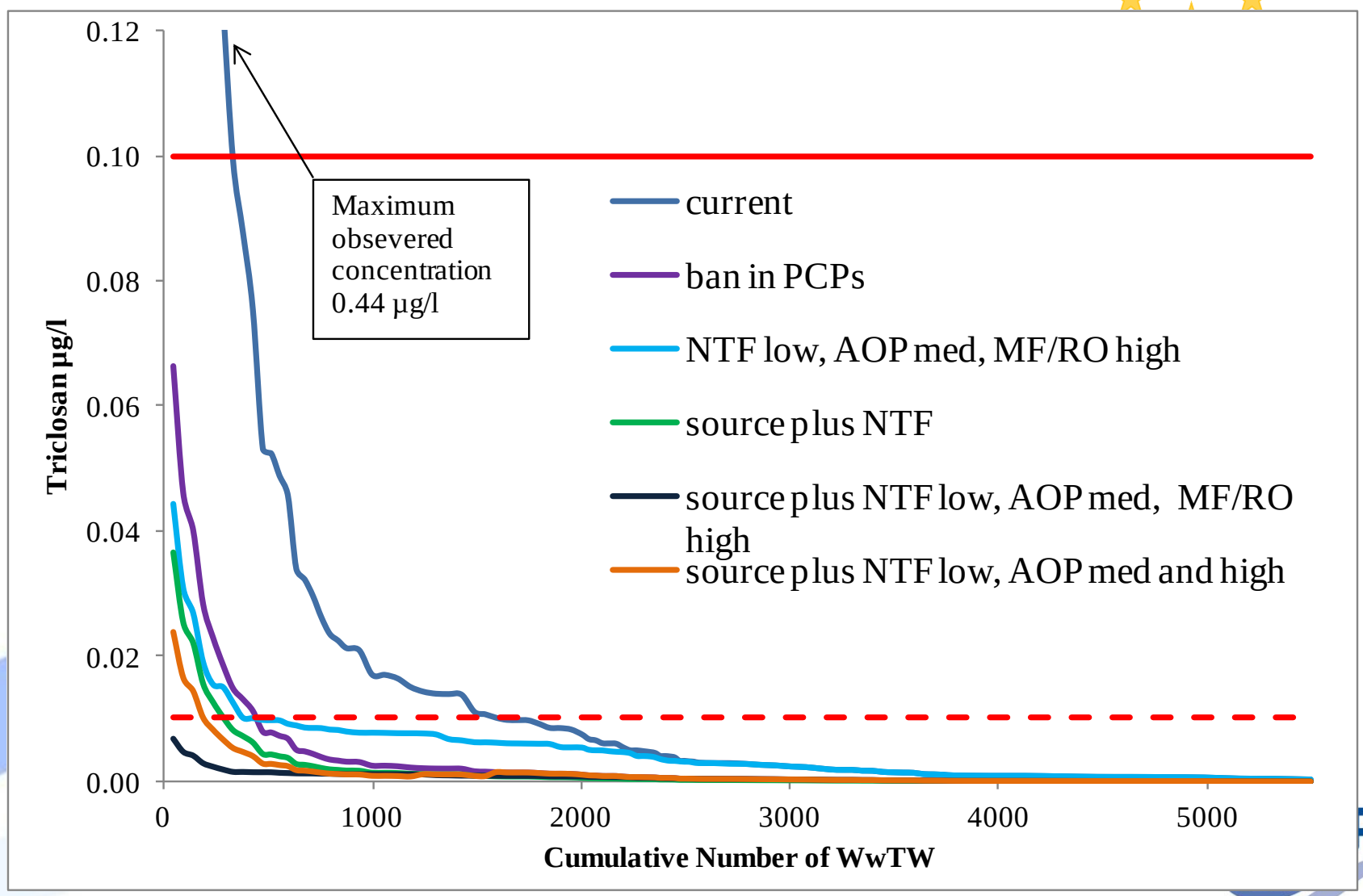
mean

PNEC

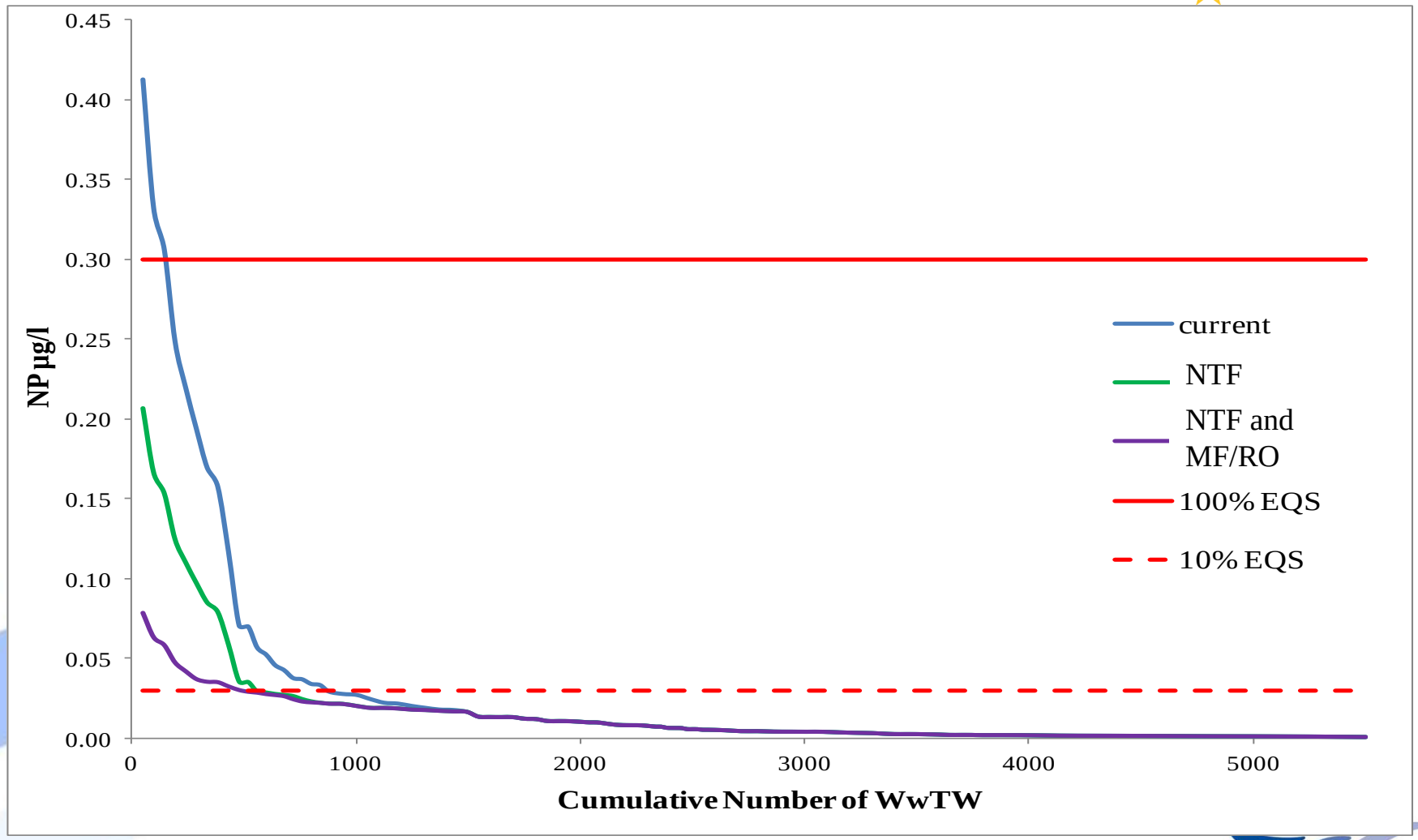
Brown "box" shows interquartile range

"Whiskers" show maximum and minimum values

Triclosan


0.12
0.10
0.08
0.06
0.04
0.02
0.00
Triclosan µg/l
0
1000
2000
3000
4000
5000
Cumulative Number of WwTW
Maximum obsevered concentration 0.44 µg/l
current
ban in PCPs
NTF low, AOP med, MF/RO high
source plus NTF
source plus NTF low, AOP med, MF/RO high
source plus NTF low, AOP med and high

Nonyl-phenols



Be prepared to change your mind

Industrial discharges are mainly responsible for pollution by trace contaminants

- WRONG – it's domestic!

Sewage works removals can readily be characterised according to "process type"

- WRONG – works are more diverse than this and not easily pigeonholed re performance – this has implications for viability of generic treatment models

Be prepared to change your mind

Sewage works probably won't remove trace contaminants very well

- WRONG - many WwTWs achieve substantial removals for many substances (though sometimes not enough)

Sewage works effluent quality is very variable

- PARTLY WRONG – WwTW effluents form a relatively homogeneous population within which there is some variation (that we now have characterised)

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Be prepared to change your mind

Hydrophobic trace contaminants will be associated with suspended solid matter

- WRONG – not necessarily – need to determine why….

Removal is a key metric in sewage works performance

- WRONG – no it's not. Key metric is effluent concentration …then upstream river conc. And available dilution

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Be prepared to change your mind

Associations between different substances are readily predictable on the basis of phys/chem data

- WRONG – they are not. The CIP has revealed unexpected associations that we have yet to explain. Expected links might not be as strong as imagined

A common theme

It’s more complicated than you thought!

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Substances of interest

- Tributyl Tin, (TBT), Brominated diphenyl ethers (BDEs), Polyaromatic hydrocarbons (PAHs), nonylphenol, diethyl hexyl phthalate (DEHP) and nickel (Water Framework Directive (WFD) Priority / Priority Hazardous Substances (PS/PHS))

- Triclosan, zinc and copper (WFD specific pollutants)

- 17alpha-ethinylestradiol (EE2), 17 beta-estradiol (E2), diclofenac and ibuprofen (Proposed PS Watch list)

An example - PAHs

- An NPV of at least £32bn is derived, with an operational $CO2_e$ emission of 839 ktonnes per annum where NTF or AOP are used

- Even with this level of investment there will still be in the region of 2000 WwTW that may contribute to a downstream breach of the EQS.

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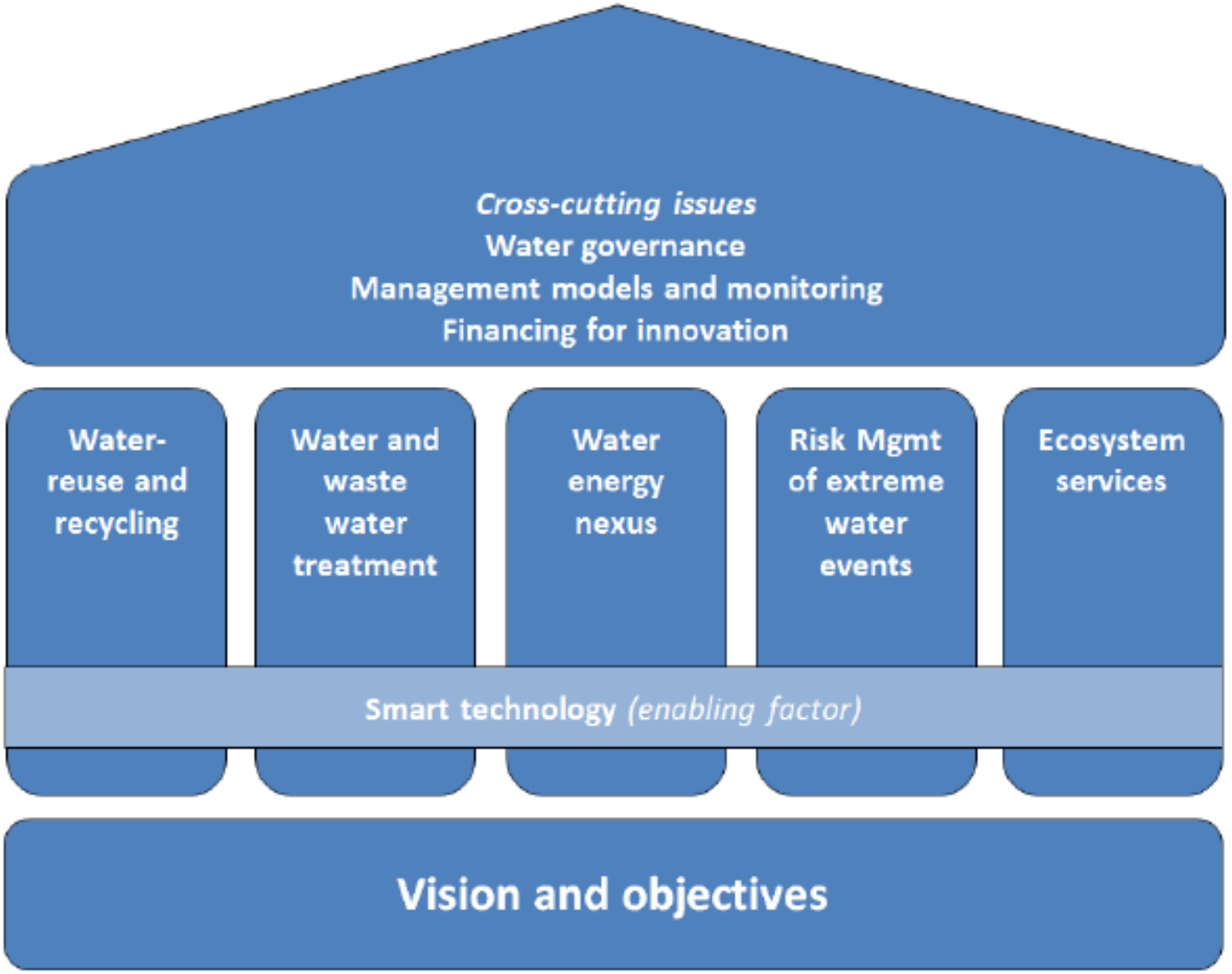
EIP – establish some BIG GOALS for RDI



Platform

Thank you for your attention

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