DELIVERING HEALTHY WATER

Building the Science-Policy Interface to Protect Bathing Water Quality

Workshop Three

University of Stirling

9th & 10th October 2012

NATURAL ENVIRONMENT RESEARCH COUNCIL

LANCASTER UNIVERSITY

UNIVERSITY OF STIRLING

PRIFYSGOL ABERYSTWYTH UNIVERSITY

Overarching aim

To ensure the managed flow of knowledge among researchers, policy makers, regulators and interested bodies with the aim of promoting long-term water security in bathing waters through shared understanding of the science evidence-base underpinning current and emerging microbial quantification techniques.

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Key to this process:

. . . .a series of workshops centred on emerging pressures and shifts in microbial quantification techniques for regulatory monitoring . . . . . .

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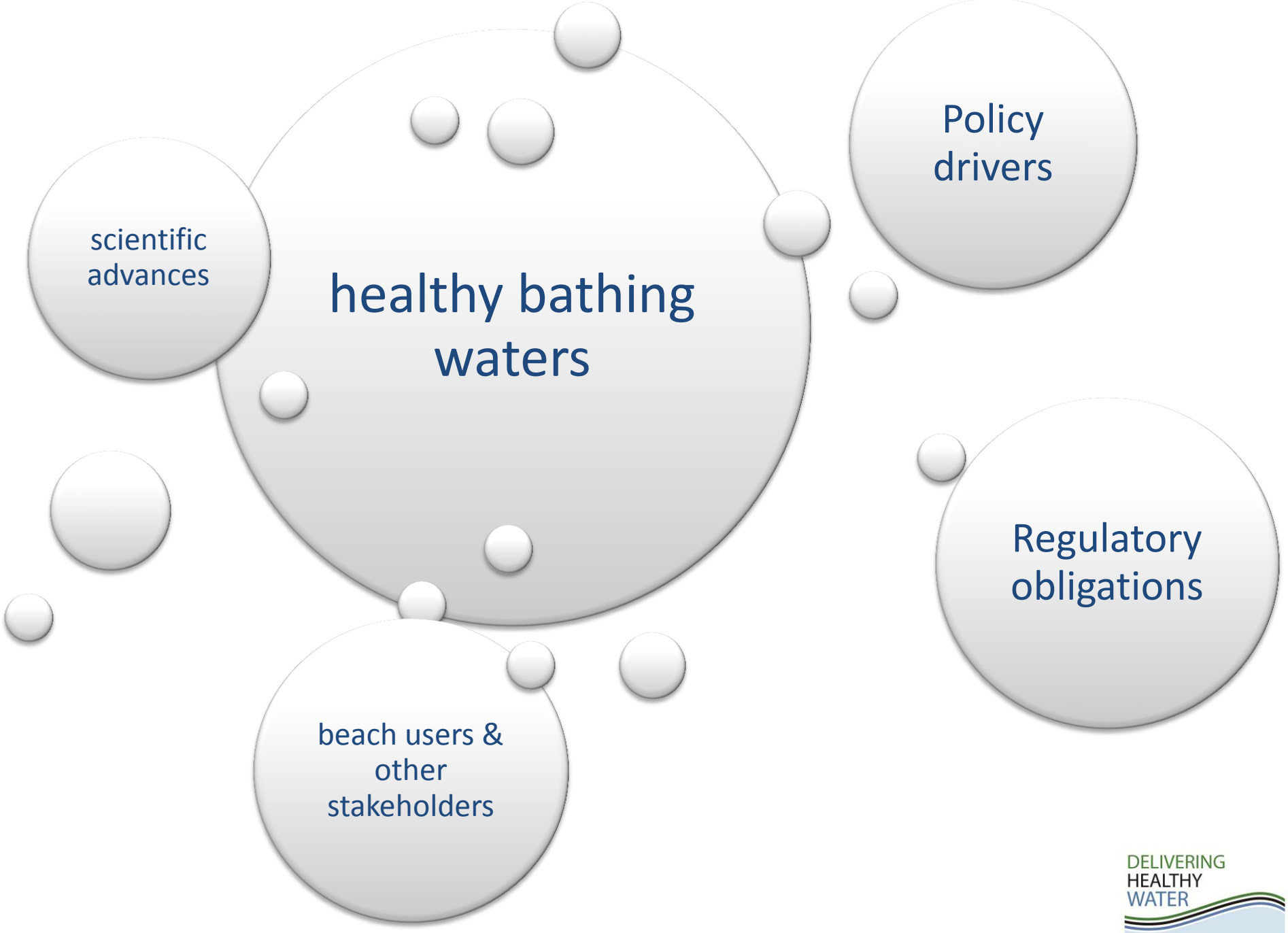

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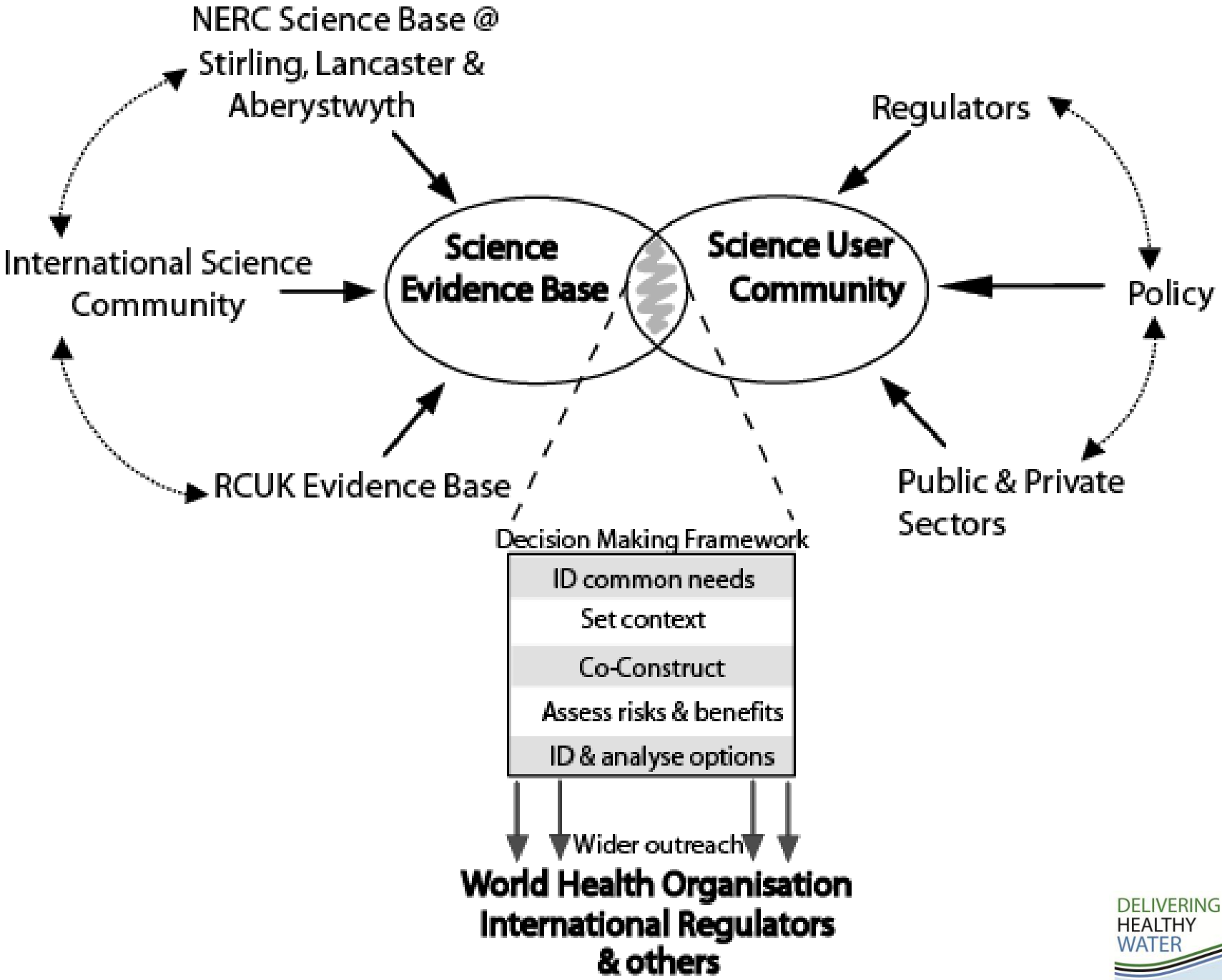

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Background

- More stringent standards
- A challenge for some designated BWs
- Parallel debates over suitability of methods adds extra layer of complexity

Image courtesy of Andy Cummins

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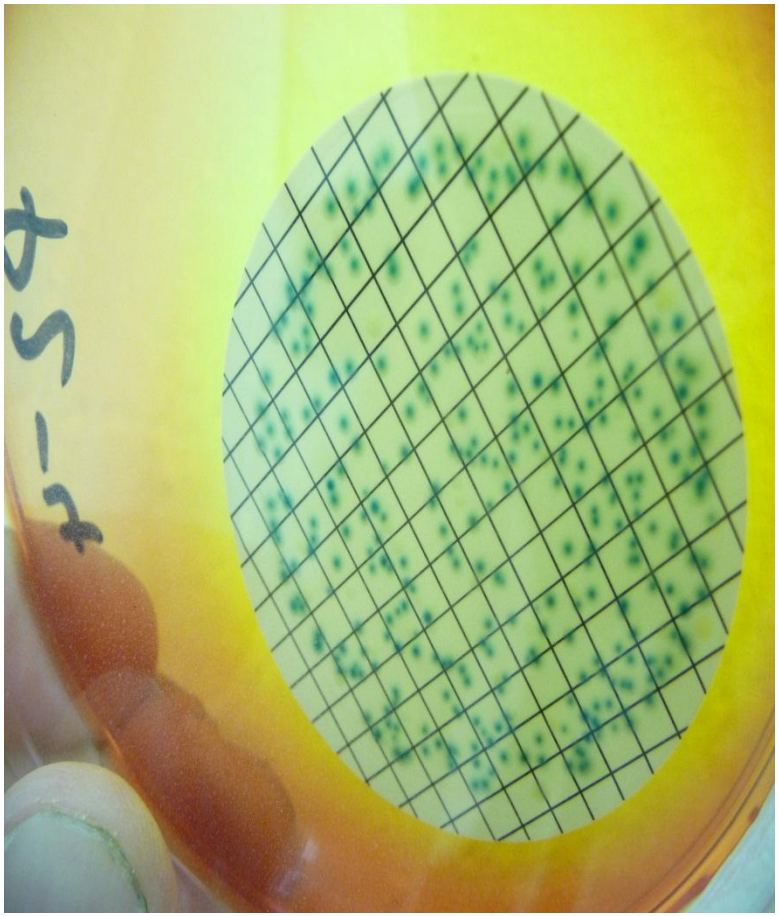
Rationale

- US has begun to consider molecular-based enumeration as alternative to ‘tried & tested’ culturing
- With emergence of new approaches come difficult decisions
- How best to translate technological innovation into up-to-date regulation?



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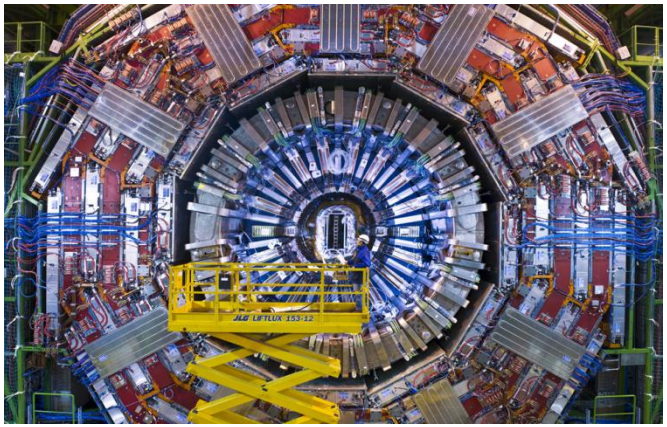
Key terminology

- FIO (Faecal Indicator Organism)
- Culture (plate counts) ~24 hr turn around time

- qPCR (more rapid)
- MST (Microbial Source Tracking)

In short ….

- Scientists can do some amazing stuff
- Advances in technology can be swift
- But who is it for?



International Workshops 1 and 2

UKWIR, London

March 2012

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Workshop contributors & participants

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SURFERS AGAINST SEWAGE

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Environment Agency

SEPA Scottish Environment Protection Agency

defra Department for Environment Food and Rural Affairs

PRIFYSGOL ABERYSTWYTH UNIVERSITY

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NORTH WYKE RESEARCH

ecehh European Centre for Environment and Human Health

Health Protection Agency

Cefas

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

USF UNIVERSITY OF SOUTH FLORIDA

National Institute for Public Health and the Environment
Ministry of Health, Welfare and Sport

Workshop 1

To identify & prioritise regulatory, policy and other stakeholder needs with respect to **evolving and emerging molecular technology for microbial parameter enumeration and tracking**.

To ensure the effective communication of these needs to the science provider community.

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Workshop 2

To evaluate how science providers can align with the needs identified in day 1 by the regulatory, policy and other stakeholder communities.

To identify limitations or areas of uncertainty that may hinder meeting those needs now or in the near future

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DELIVERING HEALTHY WATER

Delivering Healthy Water: building the science-policy interface to protect bathing water quality

Report from workshop 1
London, 27th and 28th March 2012.

Dissemination status
Unrestricted

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DELIVERING HEALTHY WATER

Delivering Healthy Water: building the science-policy interface to protect bathing water quality

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How realistic is the development of rapid testing in terms of the fit with regulatory needs?

- Could provide a more meaningful statement of risk
- Only useful if it used regularly –no point knowing in hours if only sampling once a week
- High costs for rapid testing
- Ideally delivered from a sampling van – test strips etc
- Little appetite for it in the UK

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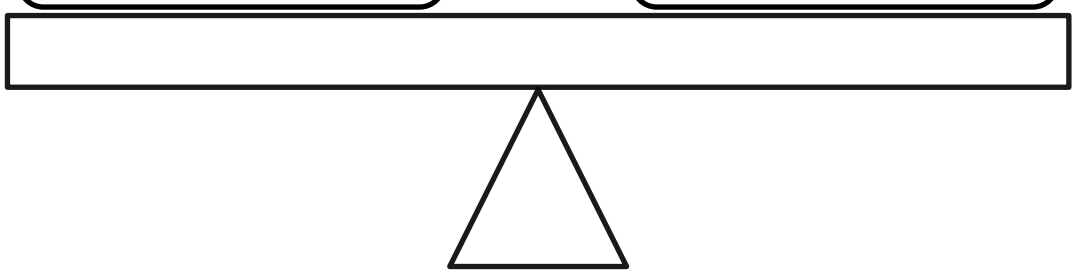
What are the costs and benefits of molecular technologies?

Costs	Benefits
Different methods – lack of standardisation	Use in MST & investigations
Training - Equipment, space	Speed & specificity
Communication- managing expectations	Flexibility – multiple targets
Dynamic field – changing techniques and equipment	Limitations of culture methods



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Workshop 3

To consider and explore the immediate and wider economic impacts related to potential shifts in future assessments of bathing water quality

To identify and prioritise future research needs linked to economic dimensions of the application of emerging technologies for bathing water assessment

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Explore the direct & indirect cost implications of technology change

- Valuing changes in environmental quality
- Principles of valuing risk reductions

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UNIVERSITY OF STIRLING

The James Hutton Institute

Newcastle University

KEEP SCOTLAND BEAUTIFUL

SAC

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

MILLS Public Policy

Previous reports of relevance

Department for the Environment, Food and Rural Affairs

Costing of the Revision
to the Bathing Water Directive:
Phase 3 Studies

Final Report

May 2002

eftec

Valuation of Benefits to England and Wales of a Revised Bathing Water Quality Directive and Other Beach Characteristics Using the Choice Experiment Methodology

Final report submitted to

Department for Environment, Food and Rural Affairs

by

Economics for the Environment Consultancy Ltd

25 June 2002

Immediate costs

- Implementing a new paradigm for regulatory monitoring
- Staff training costs and capital expenditure associated with more specialist microbiological methods
- Often the benefits of taking action are long term and difficult to estimate, but costs of taking action are more immediate

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Staff effort: UK

- ‘Not completely straightforward to answer’
- ‘There are a number of assumptions to reach a "typical" sample’
- ‘For costs, hope the ones which take longer are balanced by some shorter ones’
- ‘It is also assumed that we very rarely process single samples, therefore one analyst can process several samples in parallel. However, we charge on a single sample basis, therefore again, some we win on, some we lose on’

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City of Racine, Wisconsin

- Became the first entity nationally to demonstrate scientific defensibility and receive US EPA approval for the regulatory monitoring of bathing waters using qPCR (*E. coli* and enterococci).

- Aim one day to fully predict bathing water quality & confirm with the qPCR as a cost saving measure (it can cost as much as triple the culture-based method depending on the choice of test/platform).

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Capital and Consumable Costs

Culture(membrane filtration onto plated agar)

- Instrumentation
  - 6-place manifold, UV sterilizer, vacuum pump = $5442

- Consumables
  - Assuming 1 field sample analyzed
  - 4 QC samples
  - $17.00/sample
    - Amount would be less if QC cost distributed among multiple samples

qPCR (Enterococci by Taqman)

- Instrumentation
  - Range of prices, options, configurations
  - Thermocycler, qPCR workstations, specialized pipettes, centrifuges, segregated refrigerator and freezers
  - Average = $50,000

- Consumables
  - Assuming 1 field sample analyzed
    - Analyzed in duplicate
    - Includes Specimen Processing Controls
  - 3 QC samples
  - $54.30/sample
    - Amount would be less if QC cost distributed among multiple samples

Actual costs may vary from lab to lab; data courtesy of Julie Kinzelman

From WS2

- *'If you do qPCR there are a lot of controls ….. So, even if you automate the methods you've still got to have somebody to look over everything, you're still going to have expensive expendable re-agents …… and when you factor in the labour costs I'm just not sure if it's ever going to be as cheap as culture methods'.*

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Wider debates

Beaches are complex socio-ecological systems

Valuing coastal recreation linked to changes in water quality - the value of a day at the beach;

Valuing changes in health risk relating to bathing water quality;

The value of risk information.

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‘Testing the waters’

- Economic uncertainty?
- Horizon scanning opportunity

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Outputs from the 3rd workshop?

Content to form a briefing paper on emerging issues & gaps

Commentary-style manuscript focussing on pressing needs

Potential journal: Bulletin on the WHO; Marine Policy; Journal of Water & Health;

Molecular methods for enumeration of microbial compliance parameters in bathing waters: problem or solution?

Melanie van Niekerk[1], David M Oliver[1*], David Kay[2], Louise Heathwaite[3], Elaine Connolly[4], Andy Cummins[5], Ana Maria de Roda Husman[6], Ian Dunhill[7], Lora Fleming[8], Lidija Globevnik[9], Valerie J Harwood[10], Chris J Hodgson[11], David Lees[12], Calum McPhail[13], Gordon Nichols[14], Andreas Nocker[15], Jonathan Porter[16], Richard Quilliam[1], Amanna Rahman[17], Ciska Schets[6], Ted Thairs[18] and Tim Wade[19]

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19United States Environmental Protection Agency, National Health and Environmental Effects Research Laboratory, Research Triangle Park, North Carolina, USA

Working towards this: Workshop 3

<u>Platform to build on: Exchange of views, ideas and perspectives</u>

Alistair McVittie SAC	Sabina Shaikh University of Chicago	Dugald Tinch UoS	Research priorities & needs
Workshop Meal	Discussion throughout		Intro to Survey
Andy Vinten JHI	Sharyl Rabinovici Mills College	Julie Hewitt USEPA	Klaus Glenk SAC
	Nick Hanley UoS	Sue Chilton Newcastle University	