

# **Saving carbon, water and reputation**

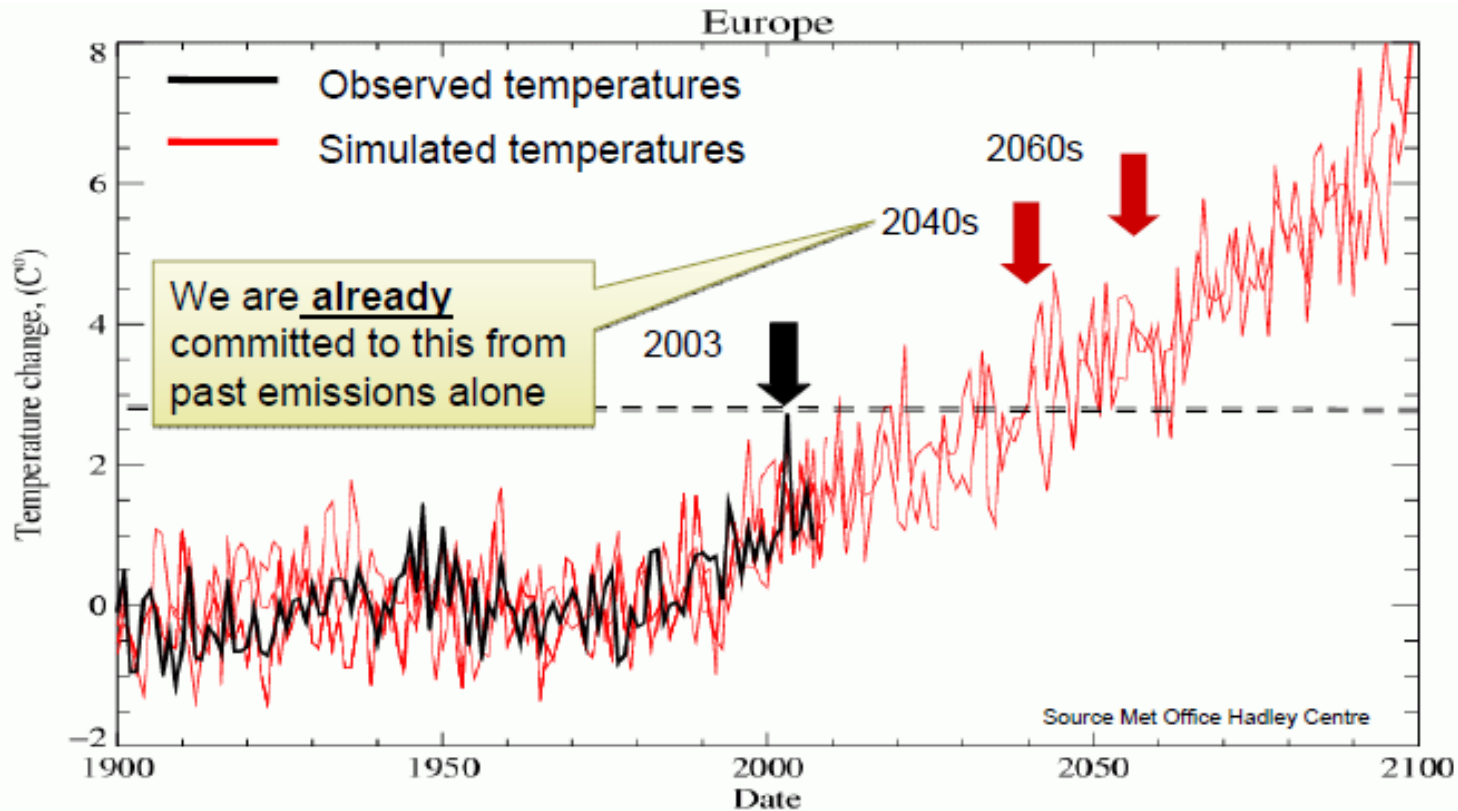
## **Case studies and research from the water sector**



**National  
Centre**  
for  
Environmental  
Toxicology

Mark Kowalski  
WRc plc

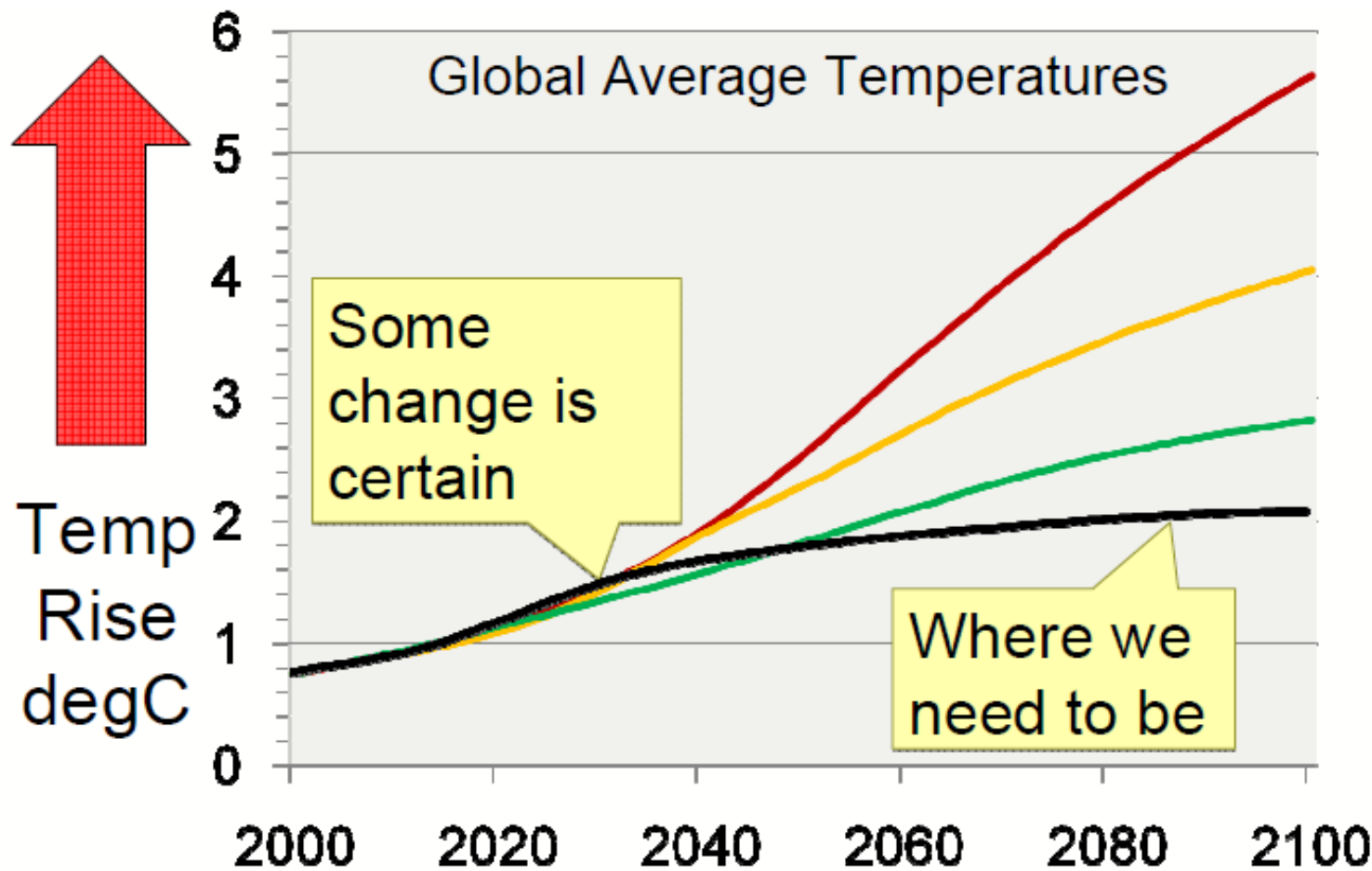
# Climate change? What climate change?



35 000 people died across Northern Europe in the August heatwave of 2003 – effective planning is essential

Acknowledgment: UKCIP

# Emissions scenarios and their projected impact on global temp



Acknowledgment: UKCIP

## Climate change/carbon mitigation

- Meet regulatory requirements
- Financial incentives
- Reduce operational costs

## Climate change/carbon adaptation

- Meet legislative requirements
- Assess and manage risk and impacts

# Meet regulatory requirements



- Report CO<sub>2</sub>e to CRC Energy Efficiency Scheme → Environment Agency
- Report GHG emissions → Ofwat
- Meet Meet WQ legislative requirements
  - Water Framework Directive
  - Urban Waste Water Treatment Directive
  - Bathing Waters Directive
  - Shellfish Directive
  - ...

# Drivers for Climate Change Mitigation: Financial incentives



*e.g. Landfill Directive, Renewable Obligations (RO),  
Renewable Heat Incentive (RHI), Feed-in Tariffs (FIT)*

- Recover energy from waste / waste minimisation and reuse (Waste Mgmt cos, LAs, WaSCs)
  - Anaerobic digestion
  - Co-digestion – suitable feedstocks ?
  - Organic waste reuse – agronomic benefit vs GHG emissions vs environmental pollution
- Offset electricity demand with on-site renewable generation (solar, wind, biomass, micro-hydro)
  - Cost-effective?
  - ROC or FIT?

# Reduce operational costs



- Improve pump efficiency
- Manage energy-intensive plant
- Building energy use
  - Energy efficiency/process auditing/benchmarking
  - Process modelling/optimisation
- Increase water efficiency; reduce leakage; manage seasonal demand
  - Balancing supply and demand
  - Microcomponent analysis and scenario forecasting
  - Active leakage control technology
- Footprinting of supply chain

# Meet legislative requirements



- Defra Adaptation Reporting Power (CC Act)
  - Develop and submit report to Defra by Jan 2011
- Flood and Water Management Act 2010
  - Local flood risk/coastal erosion risk assessments
  - Surface water management
    - Economic appraisal
  - Sustainable drainage
    - Expert advice on policy and policy implementation



- Flood risk management
  - Manage Sustainable Drainage Systems (SuDS)
  - Manage infiltration
  - Reduce sewer flooding incidents
    - Investigation of causes
    - Predicting where and how flooding might occur (blockages, hydraulic overload)
  - Manage Combined Sewer Overflows (CSOs) under abnormal weather conditions
    - Hydraulic / pollution modelling



- Asset resilience
  - Assess likely impacts on assets and resources and work up options for adaptation
    - Groundwater resource modelling
    - Environmental water quality modelling
    - Process modelling / scenario forecasting
- Security of supply
  - Improve network connectivity
    - Hydraulic modelling
  - Justify increase in winter storage
    - Supply-demand balance
    - Economic appraisal
  - Assess impact of climate-induced asset deterioration
    - Failure forecasting / deterioration modelling



- **The WRc Group**

- Innovative water & environmental consultancy
- Over 80 years experience working internationally
- Majority-owned by staff
- Works closely with its clients to improve the environment

- **Vision**

- Delivering results from research

- **People**

- 200 professional staff
- HQ in Swindon, Wiltshire
- Testing facilities in Oakdale, S Wales
- Offices & associated companies in UK and Europe

## Planning

- Asset Management
- Demand Management
- Sustainable Development
- Pollution Management
- River Basin Management
- Water Quality Monitoring
- Data Management

## Operations

- Water Treatment & Distribution
- Waste Water Treatment
- Sewer Operations
- Contaminated Land
- Waste Characterisation
- Leakage detection (Sahara™)
- Monitoring

WRc

## Regulation

- Policy & Legislation
- Performance Monitoring
- Standards & Best Practice
- National Centre for Environmental Toxicology
- Modern Regulation

## Research

- Collaborative Research Programme (Portfolio)
- Research Foresight Partnership
- Innovation
- Technology Development
- Product Testing, Field Trials & WRc Approved

# Clients



## Industrial, Agricultural & Others



MARKS &  
SPENCER



YorkshireWater



## Water Utilities



## Regulators & Policy Makers



European Environment Agency



A tyco International Ltd. Company



# Responsible environmental management in the water sector



- Climate change mitigation
  - Measure to manage
    - **Carbon accounting**
  - Reduce carbon footprint (  $\approx$  reducing energy costs)
    - Manage energy-intensive processes
    - **Reduce demand for water**
    - Increase renewable generation
- Climate change adaptation
  - **Surface water management**
  - **Sustainable drainage**
  - Improving asset resilience
- When the worst happens...
  - **National Centre for Environmental Toxicology**

# Carbon Accounting Workbook



- Initially developed for UK Water Industry Research (UKWIR) in 2004 in response to industry desire for common approach
- Regular updates - Version 4 (March 2010)
- Supports annual operational carbon reporting by UK Water Industry to Ofwat (mandatory) and Defra/DECC (voluntary)

Activity data

x

EF

x

GWP

=

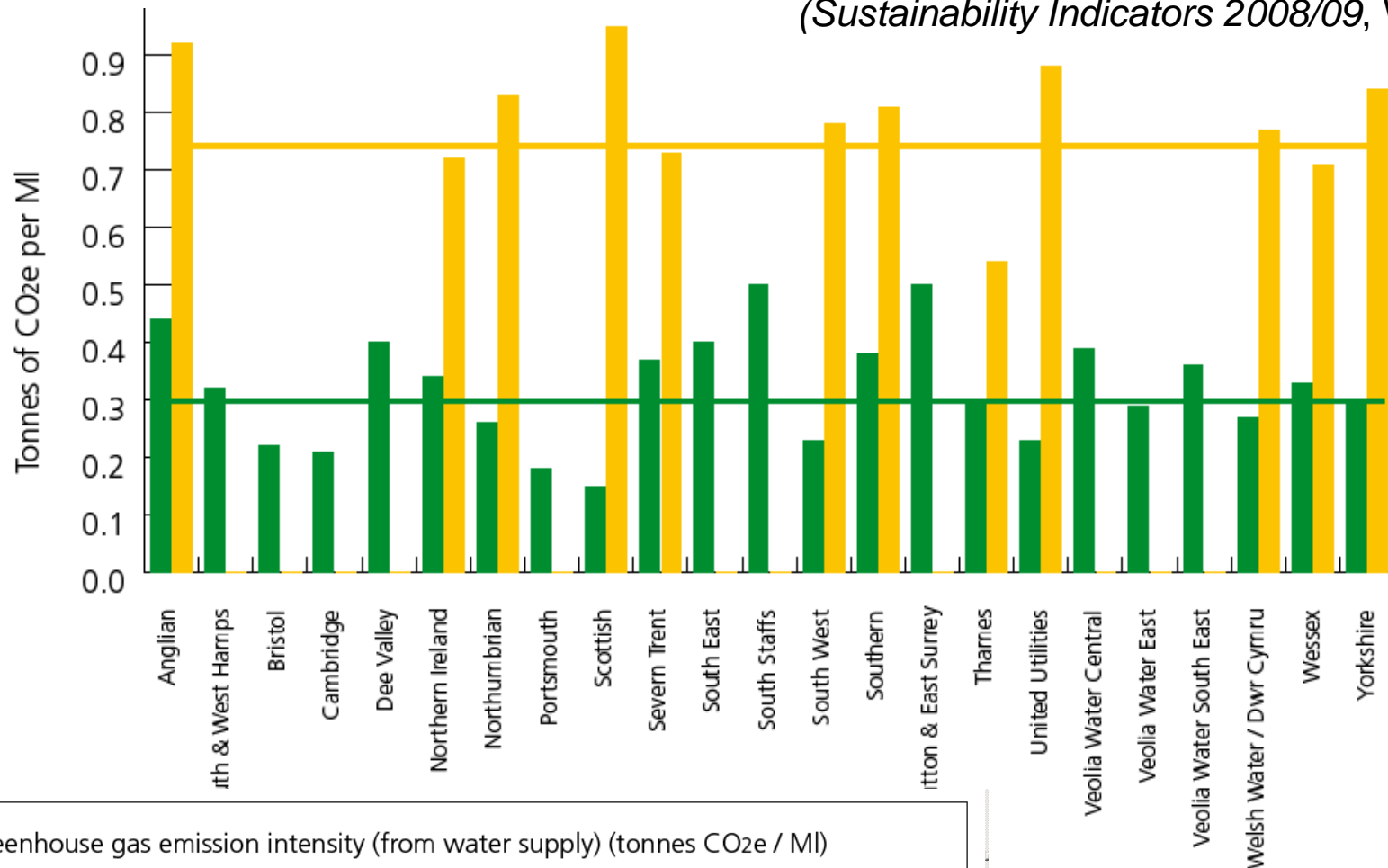
GHG emission

- Enables cross company comparisons

# GHG emissions from water supply and wastewater treatment

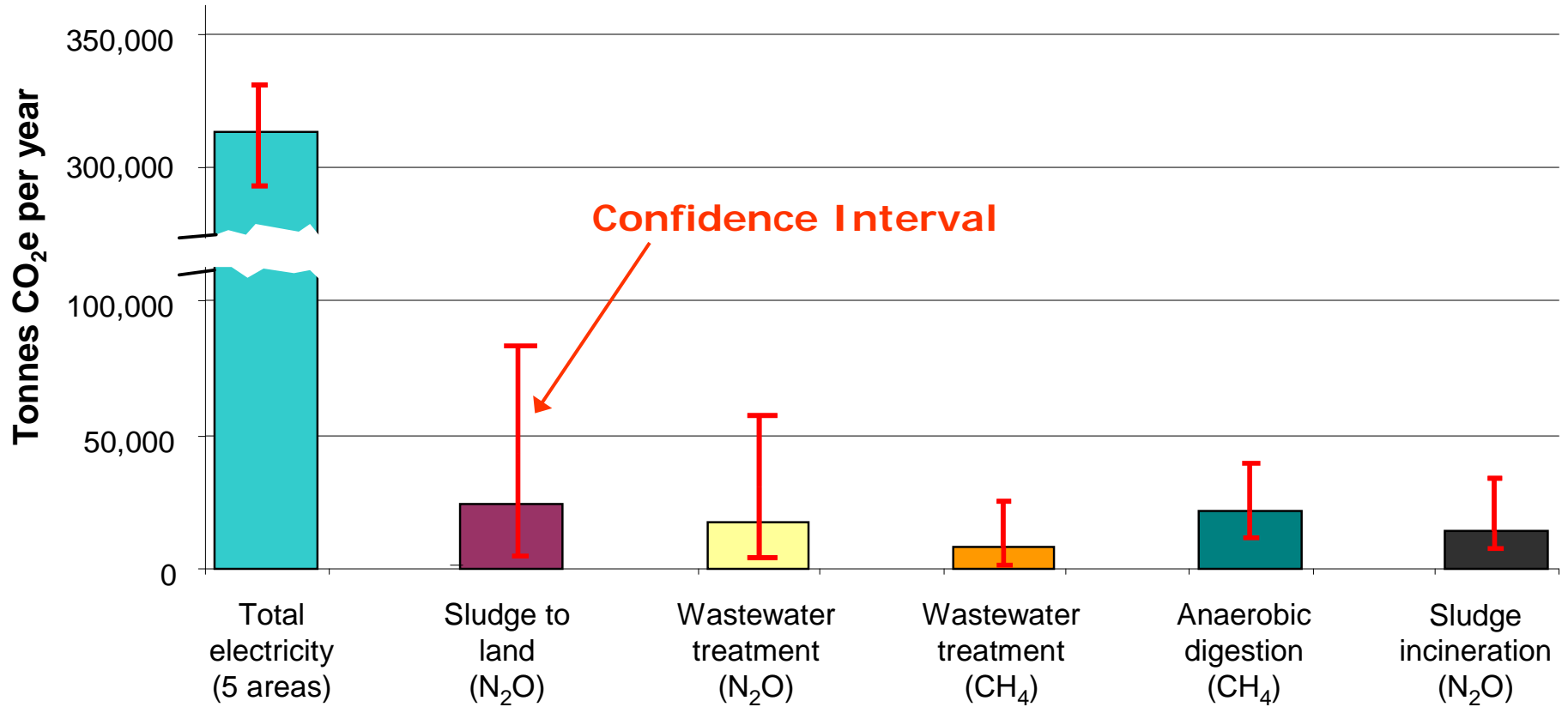


(Sustainability Indicators 2008/09, Water UK)

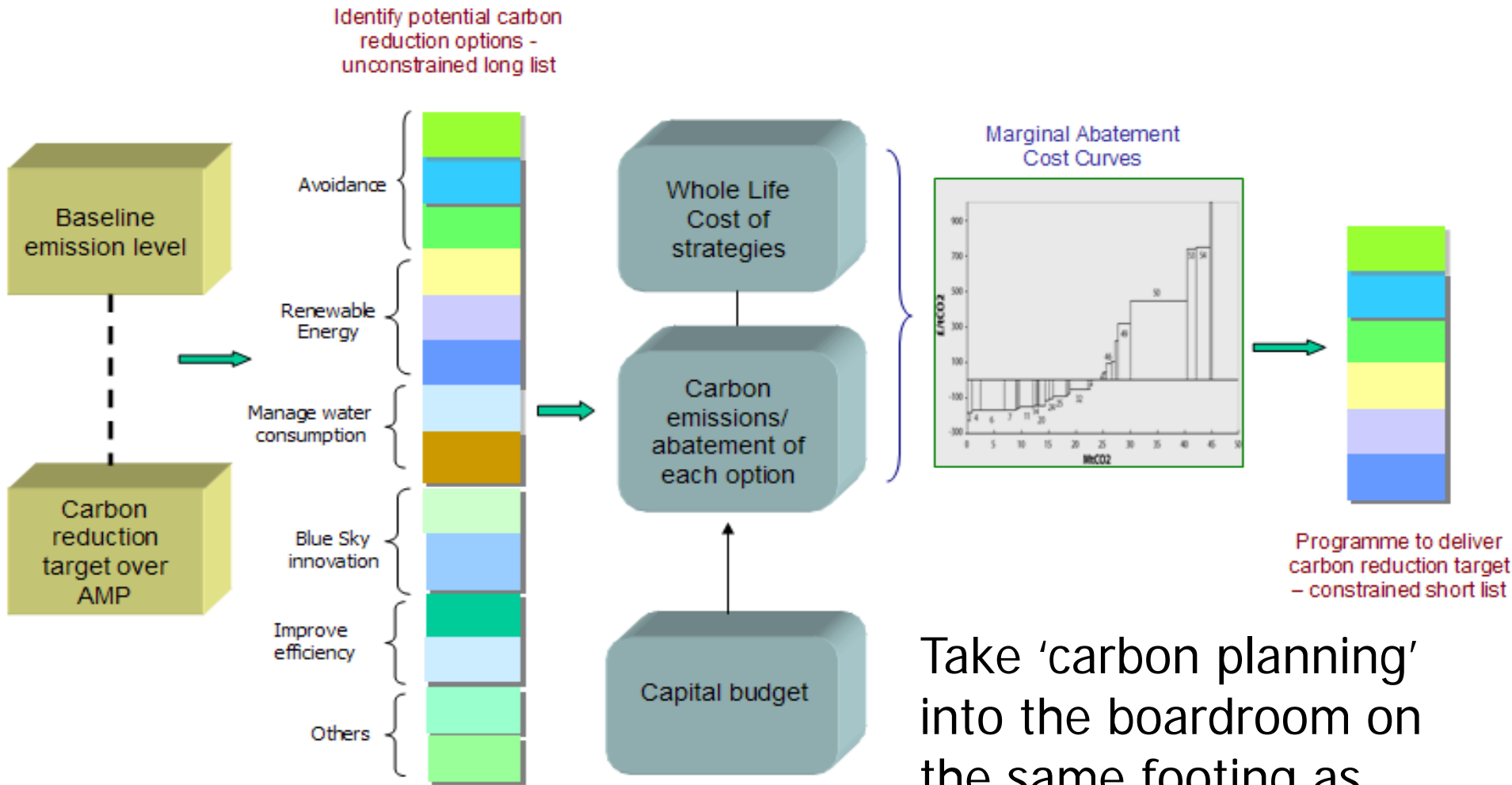


- Greenhouse gas emission intensity (from water supply) (tonnes CO<sub>2</sub>e / MI)
- Greenhouse gas emission intensity (from waste water treatment) (CO<sub>2</sub>e / MI)
- Average greenhouse gas emission intensity (from water supply) (CO<sub>2</sub>e / MI)
- Average greenhouse gas emission intensity (from waste water treatment) (CO<sub>2</sub>e / MI)

# Tackling uncertainty in emissions

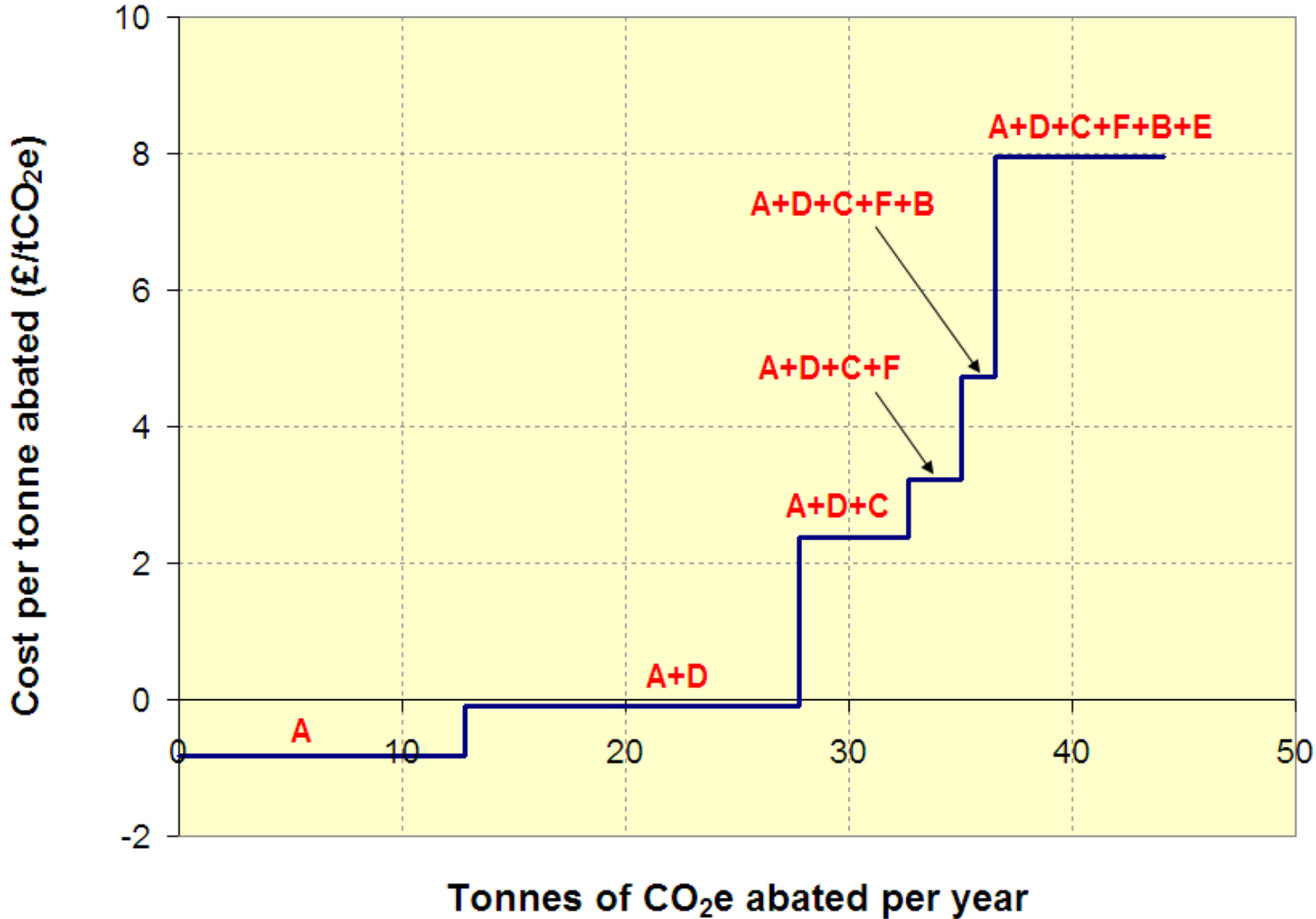


# Carbon abatement methodology



Take 'carbon planning' into the boardroom on the same footing as other aspects of project appraisal

# Marginal Abatement Cost Curves



# Carbon accounting benefits

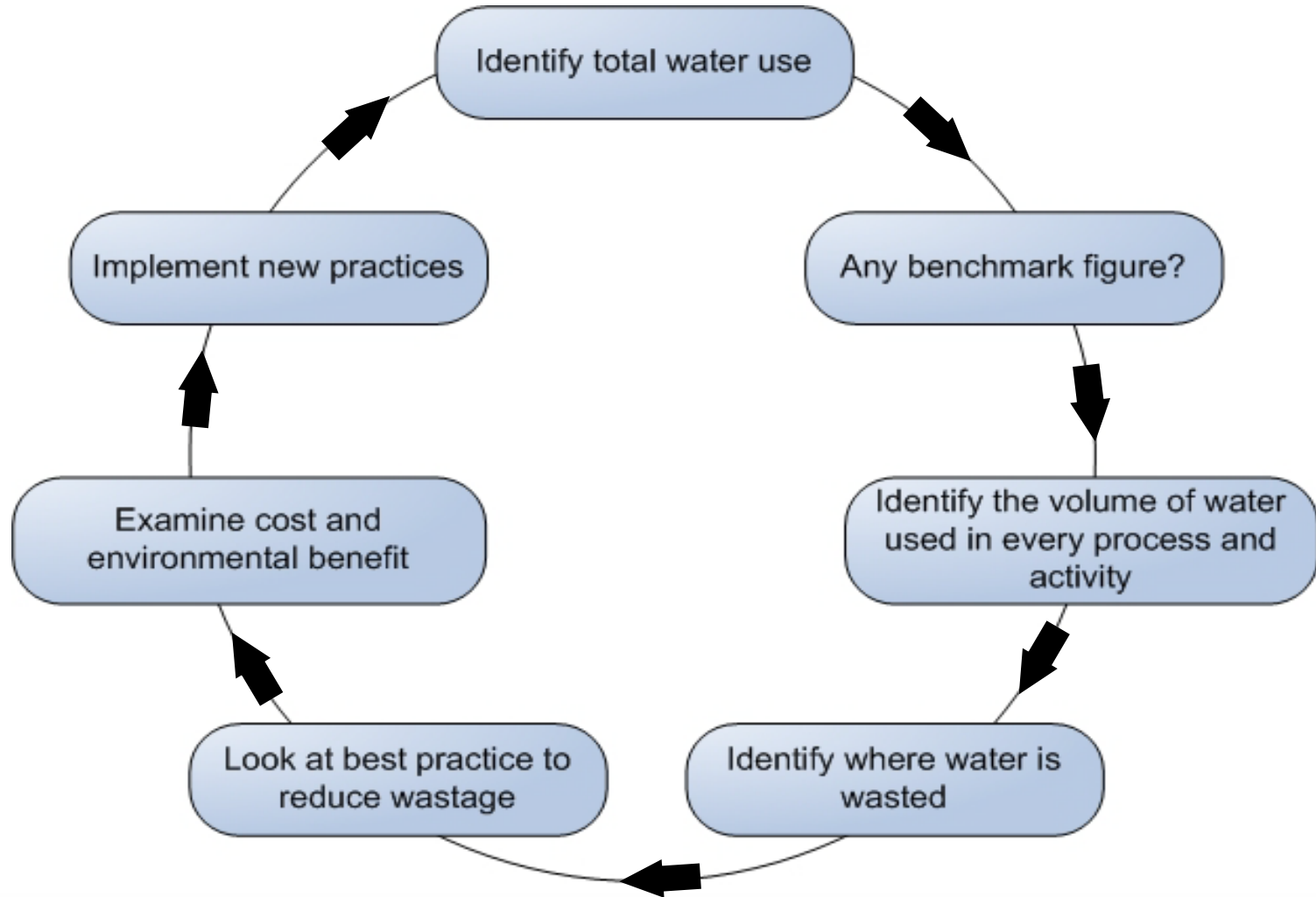


- Now have a standardised approach in the UK water sector
- Regular updates to ensure improved EFs and latest guidance
- Identifying and measuring emissions are the first steps to manage them
- Carbon impact of investments relevant in business planning
- Carbon reduction or environmental water quality?
- Reduced uncertainty to make robust investment decisions



- Water companies / EA: Microcomponent (end-use) monitoring of domestic water consumption (1999-present)
- ODPM (now CLG), Reducing water consumption in buildings (2005/6)
  - Benchmarked water consumption by building use type
  - Precursor to revision of Building Regulations Part G
- Defra Market Transformation Programme (2006-2008)
  - Collation of water-using product information and impact of policy scenarios (e.g. introduction of mandatory efficiency labelling)
- Water companies and EA (2009)
  - Efficacy of retrofitted water efficiency devices
- Strategic Forum for Construction (2009)
  - Best practice water use framework and methodology for improvement
- Waste & Resources Action Programme (WRAP) (2010)
  - Freshwater availability and use across the UK

# Good practice management cycle



# Hierarchy of approaches



- Eliminate water wastage on site
- Improve efficiency of water-using processes
- Offset consumption of mains water with alternative sources such as rainwater harvesting
- Hierarchical approach maximises the environmental benefit of water and carbon reduction



- Flood and Water Management Act 2010
  - National Flood and Coastal Erosion Risk Management Strategy (for EA)
  - National Sustainable Drainage Standards (for Defra)
  - Investigating
- Surface Water Management Planning
  - Pilot study to test Defra guidance (Warrington)
  - 70+ LAs now received funding from Defra to create bespoke plans
- Flooding from combined sewer systems
  - Investigating root causes of blockages and risk mapping
  - Hydraulic modelling to predict where hydraulic overload likely under various rainfall scenarios

# Environmental water quality



- Management contract for the delivery of research under the Water Framework Directive (for EU)
- Research into catchment-sensitive farming practice (for Defra)
- Modelling river and estuarine water quality
- Transport of pesticides, waste products and possible toxins to/from groundwater

When things go wrong...

**NCET**



- National Centre for Environmental Toxicology
- Established in 1995
- Independent, authoritative source of expertise and information
- Wide range of staff disciplines
- Diverse customer basis – WHO, DWI, UKWIR, environmental regulators, various industries
- Enquiry Service
- Toxicity Datasheets

When things go wrong...

# The NCET Enquiry Service



- **Pollution incidents:**
  - In emergencies, advise on the Suggested No Adverse Response Level (SNARL)
  - Advice on removal (water treatment)
  - Information on taste & odour
- 24 hour service to water industry and environmental regulators (e.g. EA , SEPA)
- On-call toxicologist during out of office hours:
  - mobile toxicity database!
- **Emergency response service:**
  - initial response within the hour, e.g. Buncefield oil depot incident
- Longer term response also available for non-emergencies (typically one week)

When things go wrong...

# Buncefield oil depot incident



- 6.01 am, 11 December 2005
- large plume of smoke – no toxicological concern
- fire fighters used foam containing PFOS, a **persistent bioaccumulative toxic compound (PBT)**
- EU restricted its use, significant worldwide monitoring occurred
- use of alternatives is encouraged, but little is known about their toxicity



# A final philosophical point



- Perhaps the best lessons learned and most meaningful action will always follow natural or human-induced disasters...
  - ...the meteorological drought of 1995 highlighted the inadequacy of some of our water distribution networks, and led to a massive industry programme to reduce leakage
  - ...contamination of waters around Buncefield with fire-fighting foams led to a extensive research programme into PFCs and the withdrawal of certain compounds from manufacturing
  - ...widespread UK flooding in recent years highlighted the vulnerability of our national critical infrastructure and led to, e.g.
    - Met Office/EA joint Flood Forecasting Centre,
    - Flood and Water Management Act 2010

## **Carbon and Climate Change Team:**

E-mail                    [carbon@wrcplc.co.uk](mailto:carbon@wrcplc.co.uk)  
Web:                      [www.wrcplc.co.uk](http://www.wrcplc.co.uk)  
Telephone:            +44 (0)1793 865 080



## **NCET enquiries:**

Telephone:            +44 (0)1793 865 000  
Fax:                     +44 (0)1793 865 001  
Email:                 [ncet@wrcplc.co.uk](mailto:ncet@wrcplc.co.uk)  
Web:                    [www.wrcplc.co.uk](http://www.wrcplc.co.uk)