



# Cutting Carbon While Growing Your Business

Carbon Academy  
4th of December

Institute of Physics  
London

# Housekeeping!



Emergencies



Questions after  
Each presentation



Please turn off your phone

# William Frederick Herschel KH, FRS.



- Born Frederick William Herschel on 15 November 1738 in Hanover.
- Died 25 August 1822 aged 83 in Slough, England.
- Nationality German; later British.
- Astronomy and music.
- Known for Discovery of Uranus, infrared radiation, deep sky surveys and first person to realise our solar system is moving through space.
- Constructed over 400 telescopes.
- Played the violin and harpsichord and later the organ. He composed numerous musical works, including 24 symphonies and many concertos, as well as church music.
- Despite his numerous important scientific discoveries, Herschel was not averse to wild speculation. In particular, he believed every planet was inhabited.



# Who are we today?

What is your role in your company?

- A) Facilities/Operations Director/ Manager
- B) Marketing/Sales Director/Manager
- C) Finance Director/Manager
- D) Sustainability/ Carbon Manager

**Why have I asked this?** Multiple Stakeholders for carbon & sustainability in an organisation.  
And the role is changing....

# Carbon Academy, 4<sup>th</sup> of December, Institute of Physics, London

## Cutting Carbon While Growing Your Business



### **09:00 – Introduction**

- Chris Chant, Director/Chairman, Carbon Footprint Ltd

### **09:10 - Challenge of reducing carbon emissions in London's transport**

- Helen Woolston, Transport for London

### **09:50 - Legislation update**

- Katie Elmer, Senior Sustainability Consultant, Carbon Footprint Ltd

### **10:10 - Carbon & Waste Management**

- Professor Ian Williams, University of Southampton

### **10:50 - Top 10 of Cutting Carbon while You Grow**

- John Buckley, MD, Carbon Footprint Ltd

### **11:05 - Closing Comments**

- Chris Chant, Director/Chairman, Carbon Footprint Ltd

### **11:20 - Close and further opportunity for networking and 1-2-1 discussions with our experts**

# Challenge of reducing carbon emissions in London's transport

Helen Woolston, Sustainability Coordinator  
Transport for London


# **Helen Woolston, TfL Sustainability Coordinator**



Helen Woolston has been Transport for London's Sustainability Coordinator for seven years. She is responsible for delivering a sustainability programme that includes ensuring it is in all key construction projects and business cases. She also coordinates reporting and delivery of climate change mitigation and adaptation programmes and directs a range of environmental management and communications initiatives.

Previously, Helen worked as Environmental Sustainability Manager for the London Borough of Sutton, as Head of Environment for the Engineering Employers' Federation and as Environmental Specialist at The BOC Group. She is a Full and Associate Membership assessor for the Institute of Environmental Management and Assessment.

Helen lives at the Bedzed eco village in Sutton and contributes to the Sustainable Hackbridge project as well as being a Trustee of a local furniture recycling charity, The Vine Project.



# Transport for London – Challenges of Reducing Carbon Emissions from a Growing Transport System

Helen Woolston, TfL Sustainability Coordinator

November 2013

Destination **Green** >





# Transport for London

## London Buses

- 8,500 buses travelling 483m km

## Walking

- 5.7m walk trips per day

## River services

- 2.2m

## London Underground

- 3.7m trips per day
- 1.2 bn passenger journeys a year

## Traffic management

Annual revenues = £4.5bn (£3.5bn from fares)

Annual operating expenditure = £6.4bn

£3.1m capex 2013

## Taxis

- 44,000 licensed hire vehicles

## DLR and London Overground

# Population and employment growth to 2031

Figure 14: Spatial distribution of population growth, 2007 to 2031



Figure 15: Spatial distribution of employment growth, 2007 to 2031



- Population increase from 7.6 million in 2007, by 1.25 million people, to 8.89 million in 2031.

- Employment up from 4.7 million by 750,000 jobs

- More travel:

- public transport use up by 22%
- total trips up by 16%

# CO<sub>2</sub> emissions from London's transport sector

**Figure 28:** Transport's contribution to London's CO<sub>2</sub> emissions

2008 London CO<sub>2</sub> emissions

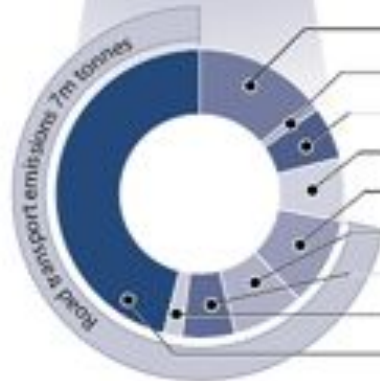
Total emissions 44.7m tonnes



Homes	35%
Workplaces	43%
Ground-based transport	22%

2008 London ground-based transport CO<sub>2</sub> emissions

Ground-based transport emissions 9.7m tonnes



Ground-based aviation*	14%
DLR, trams and shipping	1%
National Rail	6%
Underground	7%
HGVs	10%
LGVs	8%
Buses and coaches	6%
Taxis	2%
Cars, motorcycles and PHVs	46%

Source: London Energy and Greenhouse Gas Inventory, 2008 (LEGGI)

\* Including take-off and landing cycles to an altitude of 1,000 metres

# Mode Share

2006

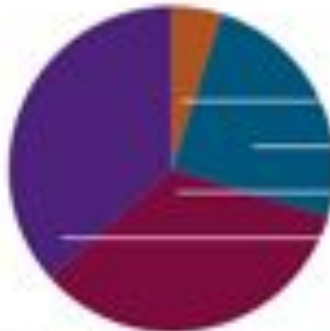


Cycling	2%
Walking	24%
Public transport	32%
Private motorised transport	43%

24 m  
trips  
per day

58%  
share

2031



Cycling	5%
Walking	25%
Public transport	34%
Private motorised transport	37%

27 m  
trips  
per day

64%  
share

Note: Do not add up to 100 due to rounding

Assuming no significant changes to land use changing apart from reversing the change in the Western Extension

Mayor's Transport Strategy proposed outcomes includes a six per cent increase in the mode share of walking, cycling and public transport by 2031

# Mayoral Strategies

**Air Quality**

**60%**

**Waste**

**Climate  
Change  
Mitigation and  
Energy**

**reduction in  
CO<sub>2</sub> in London  
by 2025**

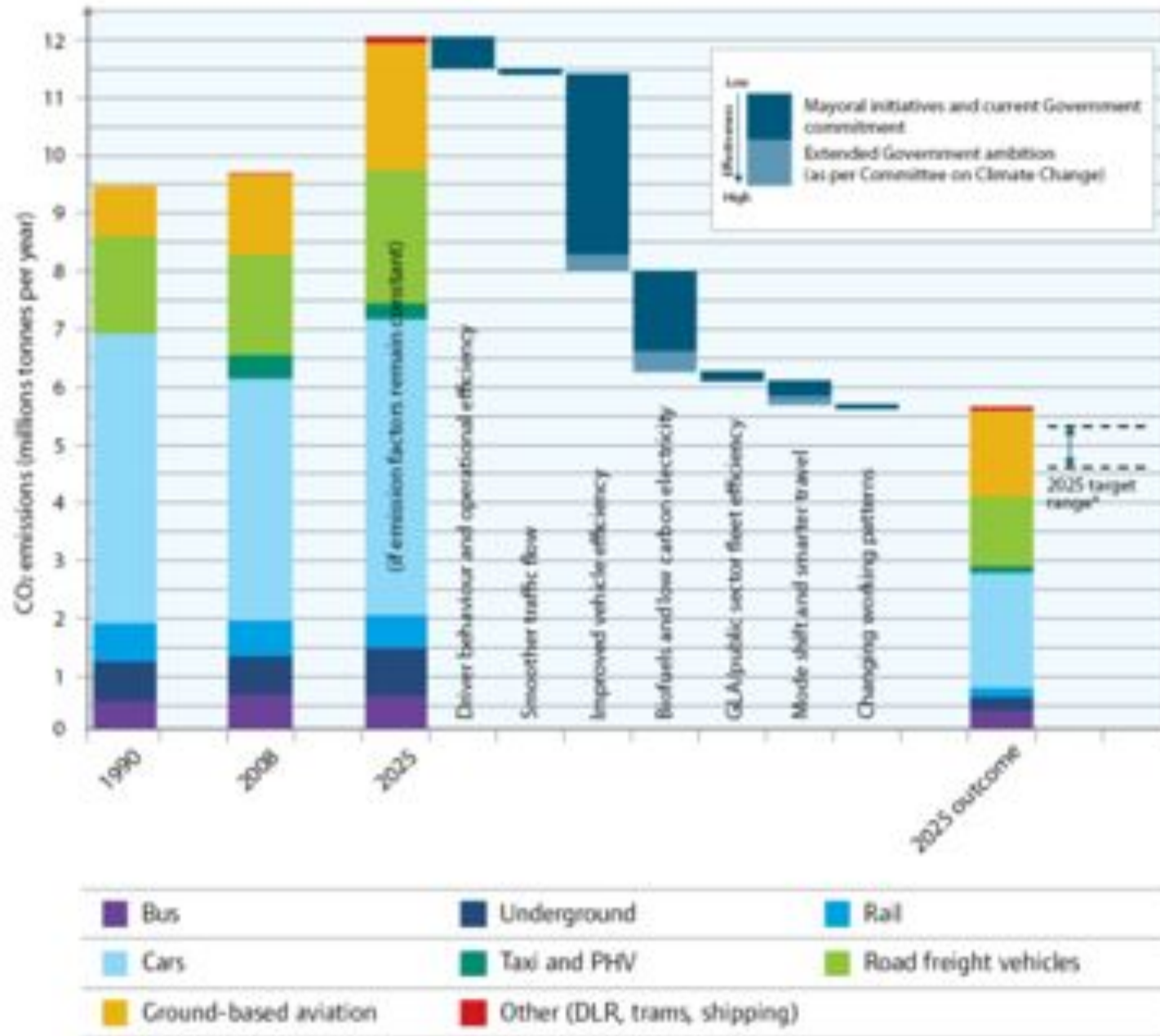
**Biodiversity**

**Adaptation**

**Noise**

**Water**

# Carbon dioxide emissions



# Mitigation efforts – reducing CO<sub>2</sub>

**Promoting carbon efficient mode choice**

**Improved operational efficiency**

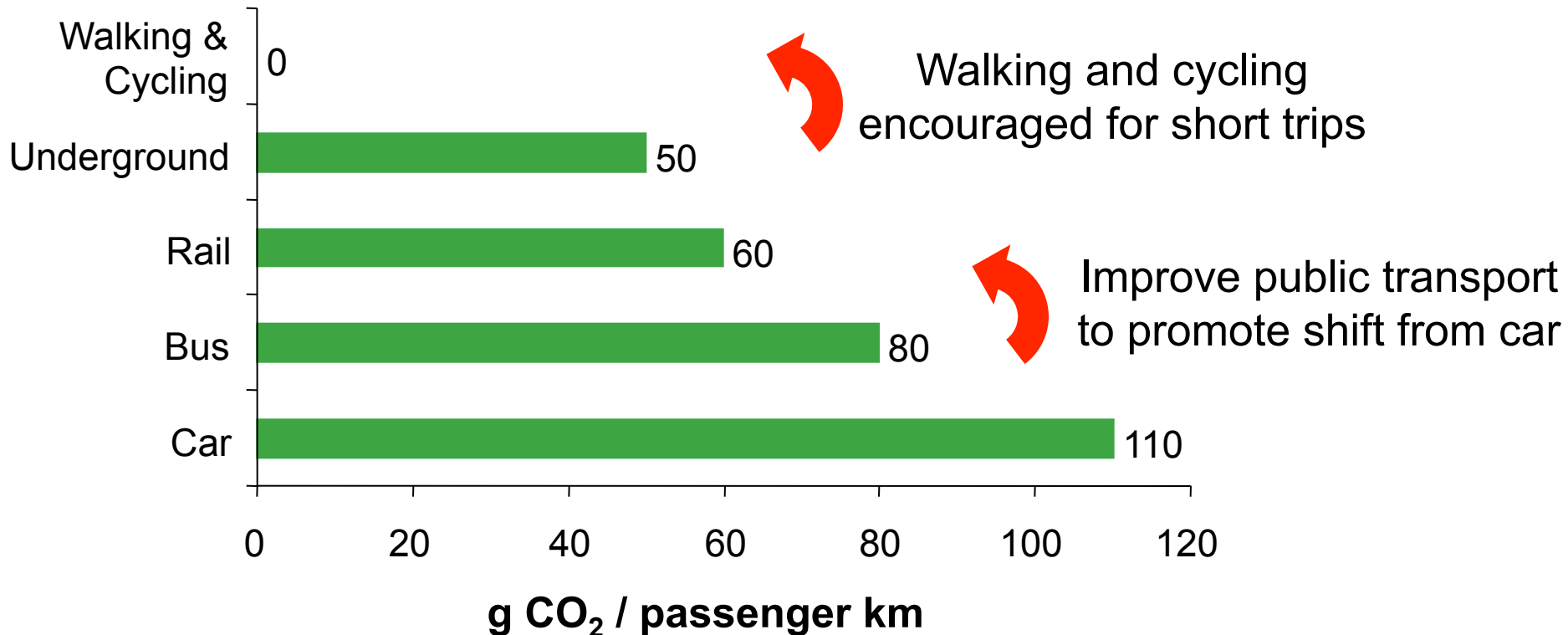
**Supporting the development of low C technologies**

**Getting our own house in order –  
staff education and sustainable buildings**



# Shifting demand to sustainable modes is critical

## Typical CO<sub>2</sub> emissions by mode





# TfL Energy Use

- *TfL are the largest electricity consumer in London and one of the Top 10 in the UK:*
- Some of the proposed improvements to the network will place greater demand for electricity
- Bus fleet generates half of TfL's CO<sub>2</sub> emissions

# Promoting Low Carbon Modes



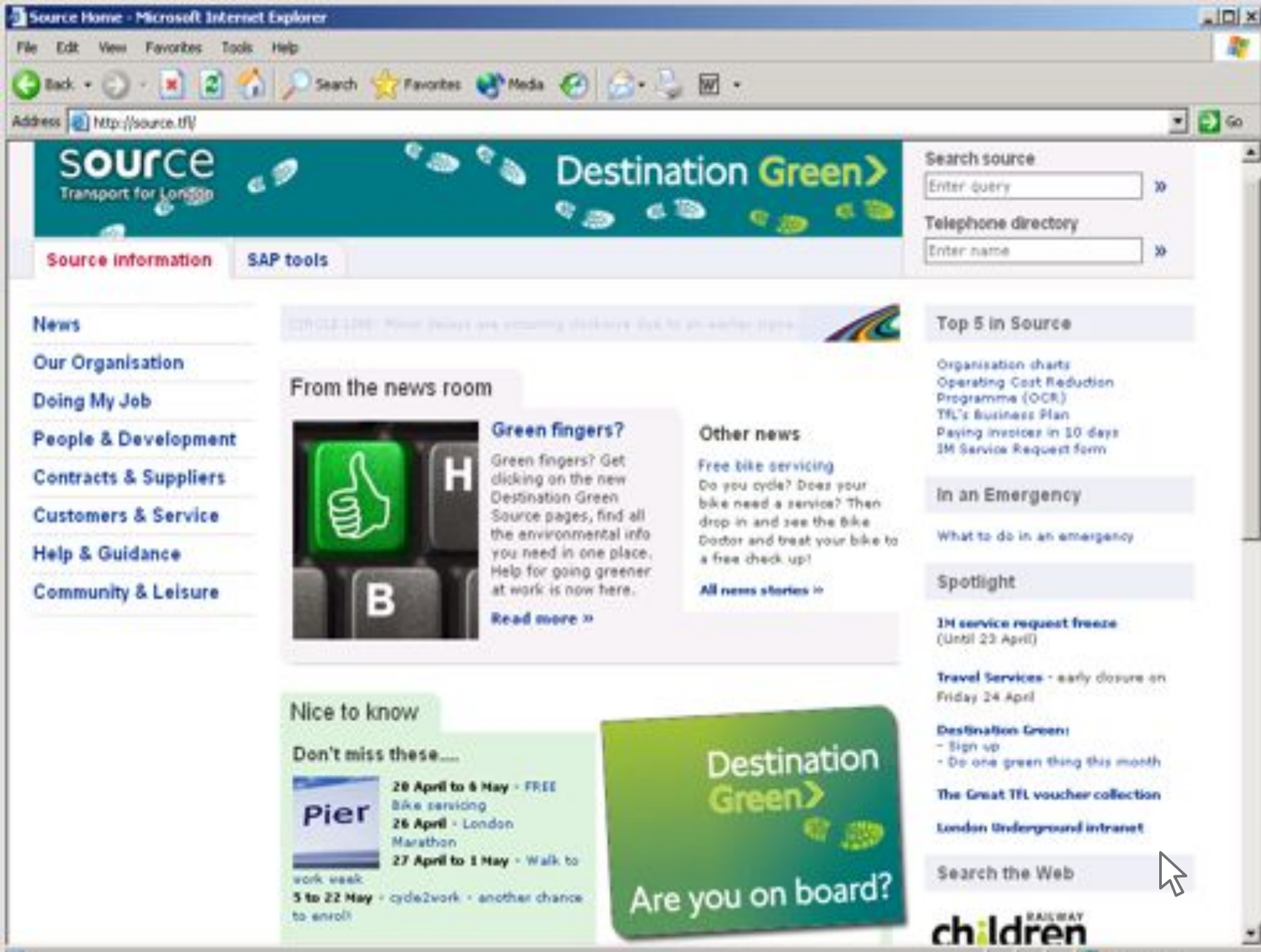
# Improved Operational Efficiency



# Low C Technologies







# Adaptation efforts



Simple interventions where possible:

- White painted roofs on buses
- Industrial-sized fans on the Tube

Tube cooling represents a major challenge:

- Groundwater cooling at Victoria station
- Air-conditioned sub-surface trains
- Testing systems for deep Tube lines



# Summary

- Progress on energy and emissions reduction made through:
  - mode shift
  - technological change / cleaner vehicles
  - targeted action – infrastructure, information and promotion
- But further work to be done
  - Not currently on course to meet CO<sub>2</sub> reduction target for transport
  - further action on local pollutants, particularly PM<sub>2.5</sub>
  - widespread challenges on CO<sub>2</sub> and NO<sub>2</sub>
  - measures at national and international level (eg scrappage)
  - efficacy of the tools eg Euro standards
  - how far can we go in behaviour change / demand-mgt?
  - Individual awareness & action: not just technical / government issue



# Transport for London Reducing Carbon Emissions from a Growing Transport System



# **Katie Elmer, Carbon Footprint Ltd**

## **Senior Sustainability Consultant**



Katie has spent over fourteen years as an environmental and sustainability consultant, working on behalf of both private and public sector clients, and leading multi-disciplinary teams.

Her experience is across a diverse number of areas within the field, including, designing and implementing Environmental Management Systems and Quality Assurance Systems (ISO 14001; EMAS; and ISO 9000 respectively); Environmental, Waste and Energy auditing; Sustainability Strategy; Sustainability and Environmental Policy Research; Green Skills Evaluations; Sustainable Master Planning and Energy Strategy; Many aspects of Environmental Planning, including: Environmental and Sustainability Training and Education; Environmental Impact Assessment (EIA); Sustainability Appraisal and Strategic Environmental Assessment (SA/SEA); and Stakeholder Engagement.

# Legislation and Standards Update

Katie Elmer  
Carbon Footprint Ltd



# What's being introduced or updated...

- **Legislation**

- Mandatory Greenhouse Gas (GHG) Reporting
- CRC Energy Efficiency Scheme Update
- ESOS - Mandatory Energy Audits

- **Standards**

- BSI's PAS 2060
- ISO 14001
- GRI 4

- **Best practice**

- Carbon Disclosure Project – increased supplier response



# Mandatory GHG Reporting

- Impacts
  - UK registered companies &
  - Listed on the major stock markets (LSE, European, NYSE, NASDAQ)
- Applicable from October 2013 For reporting years ending on or after 30 September 2013
- Report on at least Scope 1 & 2 emissions
- All 6 x GHG
- Emissions Reported in Directors Report section of the companies Annual Report
- To be review in 2015 – when it may be rolled out to all large companies



# Carbon Reduction Commitment Energy Efficiency Scheme



- Phase 2 starts in April 2014
  - Registration 4 November 2013 to 31 January 2014
  - £5,000 fine for not registering by the deadline, £500 per working day until it registers
  - Qualification year for phase 2 is 1 April 2012 and 31 March 2013
  - Qualification is 6000MWh through settled HHMs
  - energy supplied to CCA and EU ETS facilities is excluded
  - the landlord tenant rule has been amended to exclude construction leases
  - English State schools are out
  - First compliance year is 1 April 2014 – 13 March 2015



# Carbon Reduction Commitment (2)

- Simplifications
  - 2 fuels (gas and electricity) rather than 29
  - Only gas meters > 73,200kWh are included
  - Allowances surrendered until last working day of October (rather than July)
  - No Performance League Table (PLT)



# ESOS / Mandatory Energy Audits

- EU directive 2012/27/EU on Energy Efficiency – published November 2012
- ‘energy audits should be mandatory and regular for all large enterprises’ [as energy savings can be significant]’
- **Energy Savings Opportunity Scheme (ESOS)**
  - Mandatory for large Enterprises (not including public sector)
  - Voluntary for SMEs
  - Audit must be undertaken by Dec 2015
  - Then repeated at least every 4 years
  - Takes into account relevant standards such as ISO 50001 & 14001
  - Consultation ran from 10 July to 3 October 2013
  - Details of the Scheme due April 2014



# PAS 2060 revision

- Bsi's specification on Carbon Neutrality
- For organisations, products, services and events
- It covers:
  - Setting Boundaries
  - The calculation
  - Targeting carbon savings
  - Carbon offsetting projects
  - Communicating carbon neutrality
- Issued in 2010 – now going through its 3 year review cycle





# PAS 2060 Revision

- Draft currently out for peer review
- Review period end 22 Dec 2013
- Main changes:
  - Takes into account **historic** reductions up to **3 years before** the initial Carbon Neutral period
  - “Market friendly” declarations
  - Further guidance on application to **Events**
  - Transparency – improved awareness of the QES (**Qualifying Explanatory Statement**)
- PAS 2060:2013 due for release in Q1 2014

# ISO14001

ISO14001 – 15884 organisations had it in 2012 and that was an increase in 9% from 2011. Key changes:

- Align it with the Annex SL Structure (also being revised for other management systems- e.g 9000). Annex SL is on the ISO web site for Free
- To define the context of the organisation before defining the scope.
- Bigger focus on Protecting the Environment and the link to climate change
- Environmental Performance --> considers life cycle considerations



Certificate No. 538803

# ISO14001



- To be launched in early 2015 (so have about 18 months to prepare)
- 3yr transition period
- The mandate also requires the basic principles and existing requirements of ISO 14001:2004 be retained and improved



Certificate No. 538803

# Global Reporting Initiative 4 (GRI 4)

- Leading standard for Sustainability Reporting
- Used by over 4,000 organisations world wide
- Relevant to all organisations
- Covers 'three pillars'
  - Environmental
  - Social
  - Financial



# GRI 4 updates

- Changes cover:
  - Easier to understand guidelines
  - Eliminating ambiguities
  - Harmonise with other international standards (e.g. GHG Protocol and ISO14064)
  - Better guidance on identifying “Material” issues and emphasis on supply chain impact.
  - 2 Main areas of changes
    - Anti- corruption
    - GHG Emissions





# Carbon Disclosure Project (CDP)

- Popular voluntary carbon reporting programme
- Increased emphasis on supply chain emissions
- Non-CDP companies quizzed by their clients on their carbon management





# Any questions?

Katie Elmer

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Carbon Footprint Ltd offer a full range of consultancy services to help you reduce your carbon footprint and improve your businesses sustainability credentials





# Carbon & Waste Management

Professor Ian Williams,  
University of Southampton

# Ian Williams BSc PGCE PhD CChem MRSC MCIWM FHEA



Ian Williams is Professor of Applied Environmental Science at the University of Southampton where he is the Head of the Centre for Environmental Sciences. His work at Southampton is focused on waste issues. Current and recent waste-related projects include:

- Zerowaste in industrial networks;

- Carbon footprinting of cities, the waste and shipping industries, and higher education;

- Transport and logistics of WEEE collection and disposal;

- Bulky waste and furniture recycling/reuse;

- The development of waste strategies for local authorities in the UK;

- Improving resource use, business performance and environmental compliance in small- and medium-sized enterprises;

- Recycling behaviours in medium and high-density housing.

The background of the slide is a photograph of three industrial smokestacks at the bottom, emitting thick, dark smoke that rises into a sky filled with large, billowing clouds. The sky is lit with the warm, golden-orange light of a sunset or sunrise, creating a dramatic and somewhat ominous atmosphere.

# Carbon & Waste Management

A LECTURE BY IAN WILLIAMS

# Outline

- History of carbon footprinting and definitions
- Some thoughts on carbon footprinting
- Carbon & waste management
- Conclusions

# Origin

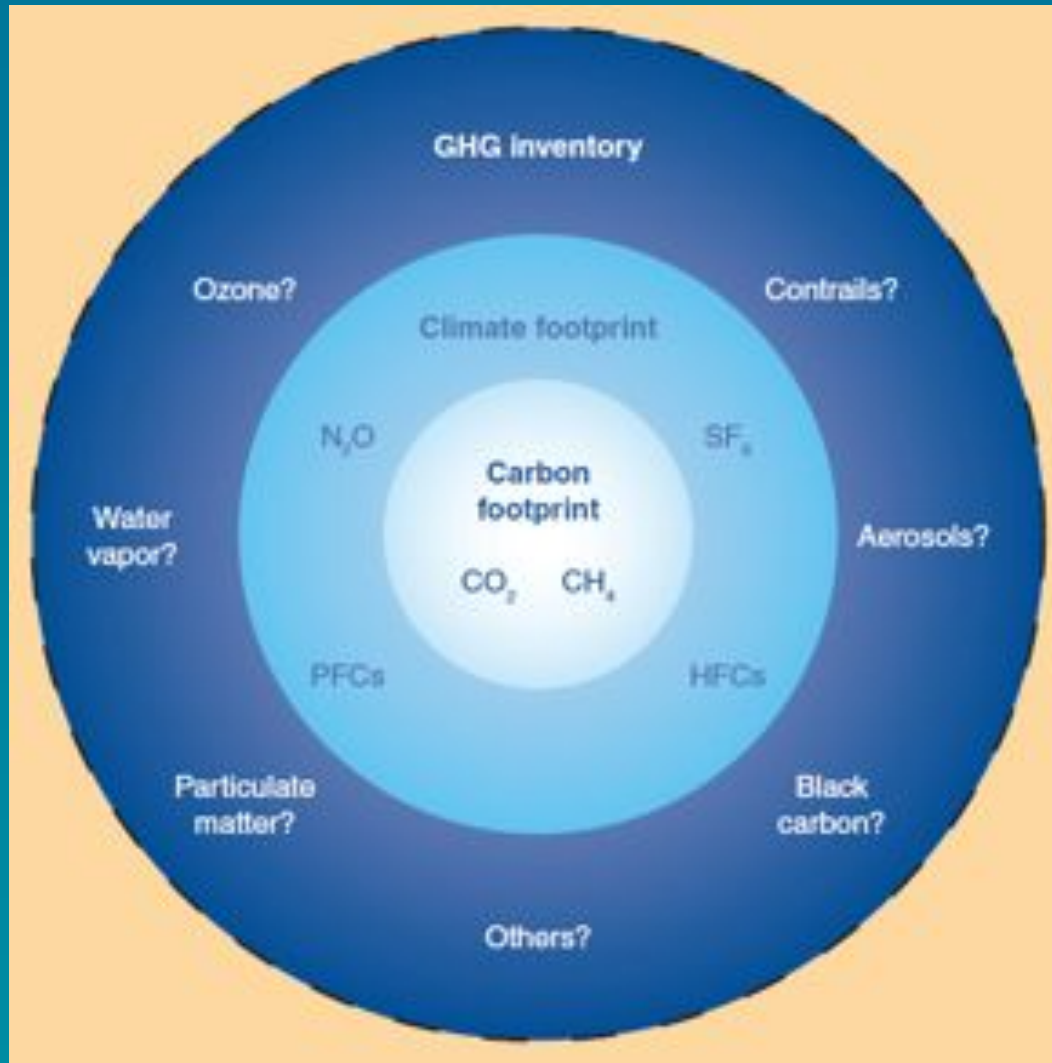
- Mid '90s: interest in measuring human environmental impact
- Ecological Footprint: “A methodology for estimating the area of the Earth’s surface needed to provide all necessary resources to, and process waste and pollution from, a given population, organization or activity”
- Problem: different definitions in circulation

# Carbon Footprint

*“A measure of the total amount of  $\text{CO}_2$  and  $\text{CH}_4$  emissions of a defined population, system or activity, considering all relevant sources, sinks and storage within the spatial and temporal boundary of the population, system or activity of interest. Calculated as  $\text{CO}_2$  equivalents using the relevant 100-year global warming potential”*

Wright et al (2011)

# Climate Footprint + GHG Inventory



Wright *et al* (2012)



1. Emissions source identification



2. Boundary setting



3. Select emission calculation method



4. Collect data



5. Calculating Scope 1 and 2 emissions



6. Capturing Scope 3 emissions

# Emissions scopes

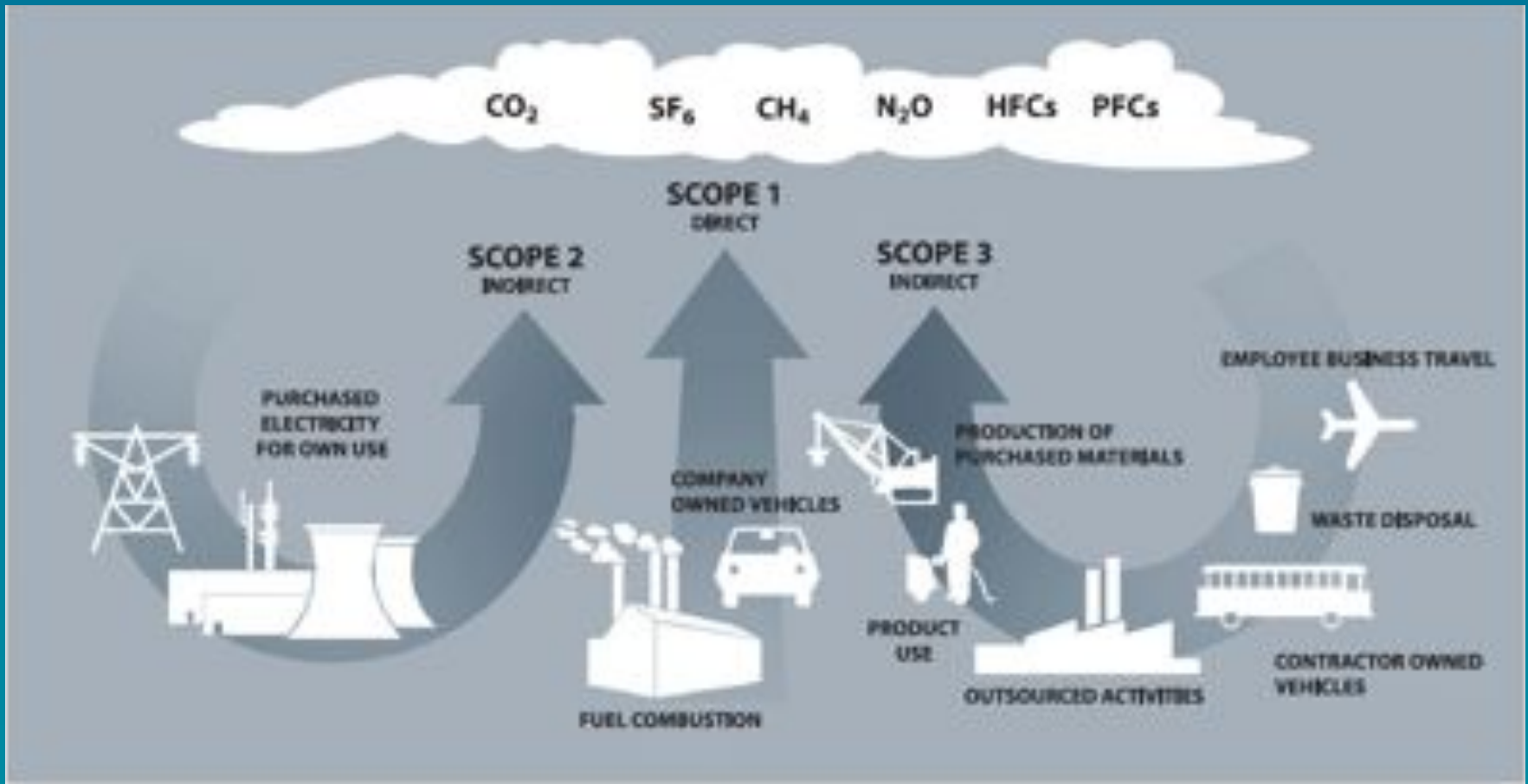


Image: World Resources Institute & World Business Council for Sustainable Development (2005) *Greenhouse Gas Protocol for Project Accounting*, WRI, USA

# Boundary Setting

- Cost-benefit of data collection
- System boundaries
- Geographic boundaries
- Temporal boundaries

# Who is responsible?

- Production-based responsibility allocation



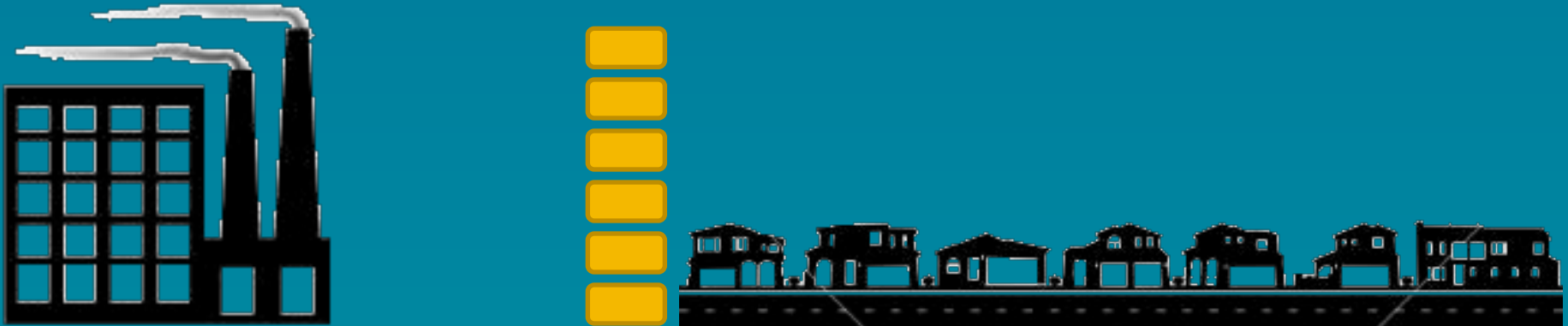
# Who is responsible?

- Consumption-based responsibility allocation



# Who is responsible?

- Shared responsibility



# Emission Calculation Methods



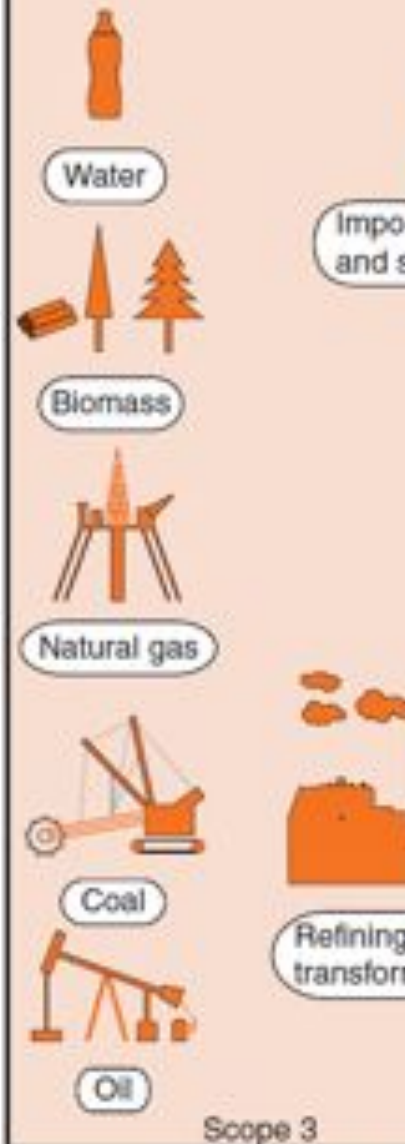


**PAS 2070:2013**Specification for the assessment  
of greenhouse gas emissions of a city

Direct plus supply chain and consumption-based methodologies

SUPPORTED BY  
MAYOR OF LONDON

bsi.



Upstream processes

ts



Downstream processes

City processes

# C Management and Waste

- Waste management sector under increasing pressure to measure, report + manage C emissions
- GHG emissions from WM sector ~3% of UK total; ~89% sector's contribution from CH<sub>4</sub> emissions
- Impacts of WM activities could be reduced by:
  - i) generation of energy from waste
  - ii) recovery of materials

Challenge is to maximize resource efficiency whilst simultaneously reducing C emissions

# C Footprinting Waste: Drivers

- International, European and national government agreements and commitments to reduce national emissions
  - Kyoto Protocol: reduce UK emissions of GHGs by 12.5% by 2008–2012, relative to 1990 emissions
  - Climate Change Act: reduce national GHG emissions by at least 80% by 2050, relative to 1990 emissions
- Initiatives: Climate Change Agreements, CC Levy EU ETS
- CRC Energy Efficiency Scheme
  - Aim to drive energy efficiency improvements in private and public sectors
  - Mandatory for organizations that consume  $\geq 6000$  MWh of half-hourly metered electricity per year
- Voluntary reporting - CSR

# Rare metals in a mobile phone



ITO Coated  
LCD glass  
(In, Sn, Sr, Zr)

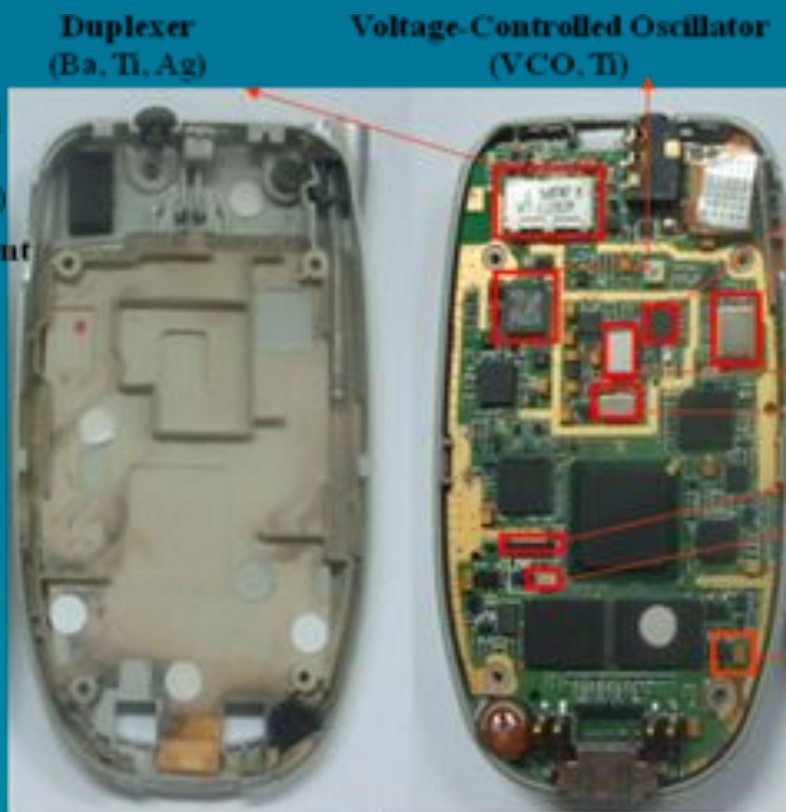
LED element  
(Al, Ga)

< Mobile >



< Battery >

Li battery  
Anode (Li, Co, Mn, Ni)  
Cathode (Li, Ti, Sn, Si)  
Cap (Al)



Duplexer  
(Ba, Ti, Ag)

Voltage-Controlled Oscillator  
(VCO, Ti)

SAW Filter  
(Al, Si, Li, Ti)

Pulse Locked Loop  
(PLL, Ba, Ti)

Band Pass Filter  
(BPF, Ba, Ti, Ag)

Temperature Compensated  
Crystal Oscillator  
(TCXO, Ba, Ti, Ag)

Silicon (Si)

Resonator  
(Ba, Ti)

Chip Resistance  
(Al, Zr, Ru)

Chip Inductor  
(Ni, Fe, Zn)

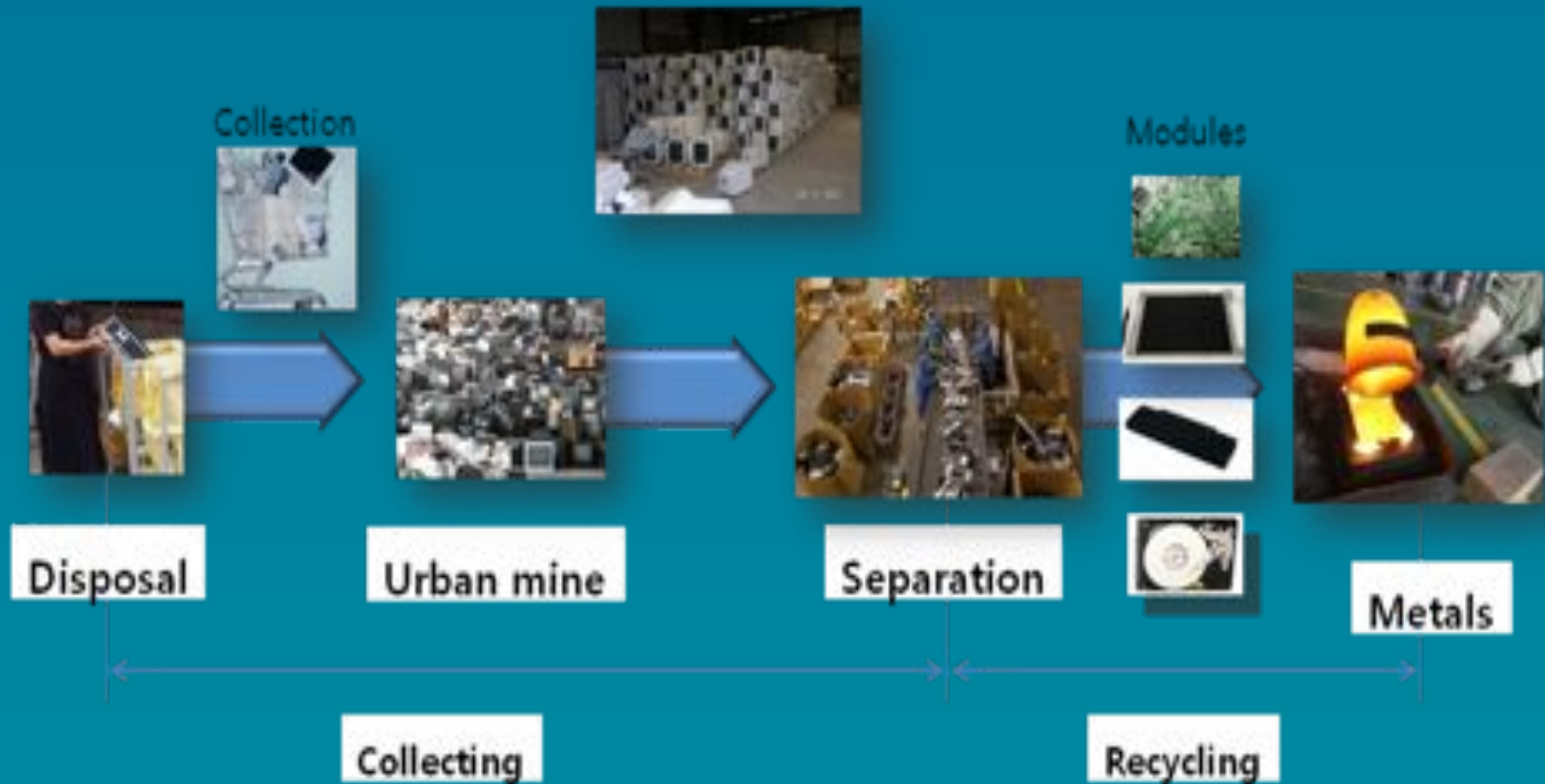
Chip Condenser  
(Ba, Ti, Ta, Cu, Ni)

Chip Varistor  
(Zn, Sr, Ag)

Chip Thermistor  
(Mn, Fe, Al, Co, Ni, Ag)

< Main Board >

# Urban Mining





# Cleaning with a new low carbon technology



**November 10, 2011:**

Awarded the 2011 Brian Mercer award for Innovation by the Royal Society



## **Southampton device**

2 litres/minute

100 W

Few or no additives

No aerosol production

Little (or no) run-off  
(device usually runs in mode to recirculate water)

Simple to scale up

## **Pressure washer**

20 litres/minute

2 kW

Many additives

Much contaminated aerosol

20 litres/min of contaminated run-off

Difficult to scale up to arrays of nozzles

# C Footprinting Waste: Key Aspects

- Temporal boundary selection
- GHG selection
- Choice of GWP reference
- Emissions factors
- Biogenic carbon & carbon sequestration
- System boundary selection
- Scope 3 emissions
- Double counting
- Avoided emissions
- Reporting
- Verification
- SMEs



# Carbon Footprints – Waste Sector

Table 1. Comparison of different accounting/reporting mechanisms for UK waste management companies.

Accounting/ reporting aspect	GHG Protocol	EpE Protocol	PAS 2050 [53]	ISO 14064 Series	Carbon Trust Standard	DEFRA Guidelines	LCA (EASEWASTE) <sup>†</sup>
GHG included	Six Kyoto gases <sup>‡</sup>	CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	As listed in AR4 (2007) Table 2.14	Six Kyoto gases <sup>‡</sup>	Six Kyoto gases <sup>‡</sup>	Six Kyoto gases <sup>‡</sup>	User defined
CO <sub>2</sub> <sub>fossil</sub>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CO <sub>2</sub> <sub>biogenic</sub>	Reported separately	Reported separately	Yes	Reported separately	Reported separately	Reported separately	Yes
GWP CO <sub>2</sub> <sub>biogenic</sub>	0	0	1	0	0	0	0
C <sub>biogenic</sub> sequestration	ND	ND	Yes	ND	ND	ND	Yes
GWP reference	SAR (1995)	SAR (1995)	AR4 (2007)	SAR (1995)	SAR (1995)	SAR (1995)	AR4 (2007)
GWP <sub>100</sub> CH <sub>4</sub>	21	21	25	21	21	21	25
GWP time horizon (years)	100	100	100	100	100	100	User defined (usually 100)
Waste management sector specific	No	Yes	No	No	No	No	Yes
Time boundaries	1 year	1 year	1 year	1 year	1 year	1 year	User defined (usually 1 year)

This table summarizes key aspects and differences between the different procedures but it should be observed that it is by definition an oversimplification of each procedure.

<sup>†</sup>A variety of different life cycle assessment tools are available (e.g., WRATE, ORWARE and WISARD) and most parameters are user defined, meaning that there is no single way of undertaking life cycle assessment. For the purposes of this comparison, the life cycle assessment model EASEWASTE was used, as it is an example of a waste-specific tool.

<sup>‡</sup>Kyoto gases: CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, perfluorocarbons and sulfur hexafluoride.

AR4: IPCC Fourth Assessment Report; DEFRA: Department for Environment, Food and Rural Affairs; EpE: Entreprises pour l'Environnement; GWP: Global warming potential; LCA: Life cycle assessment; ND: Not defined; SAR: IPCC Second Assessment Report.

Adapted from [14].

# Waste Sector companies are not meeting the basic requirements for C footprinting reporting

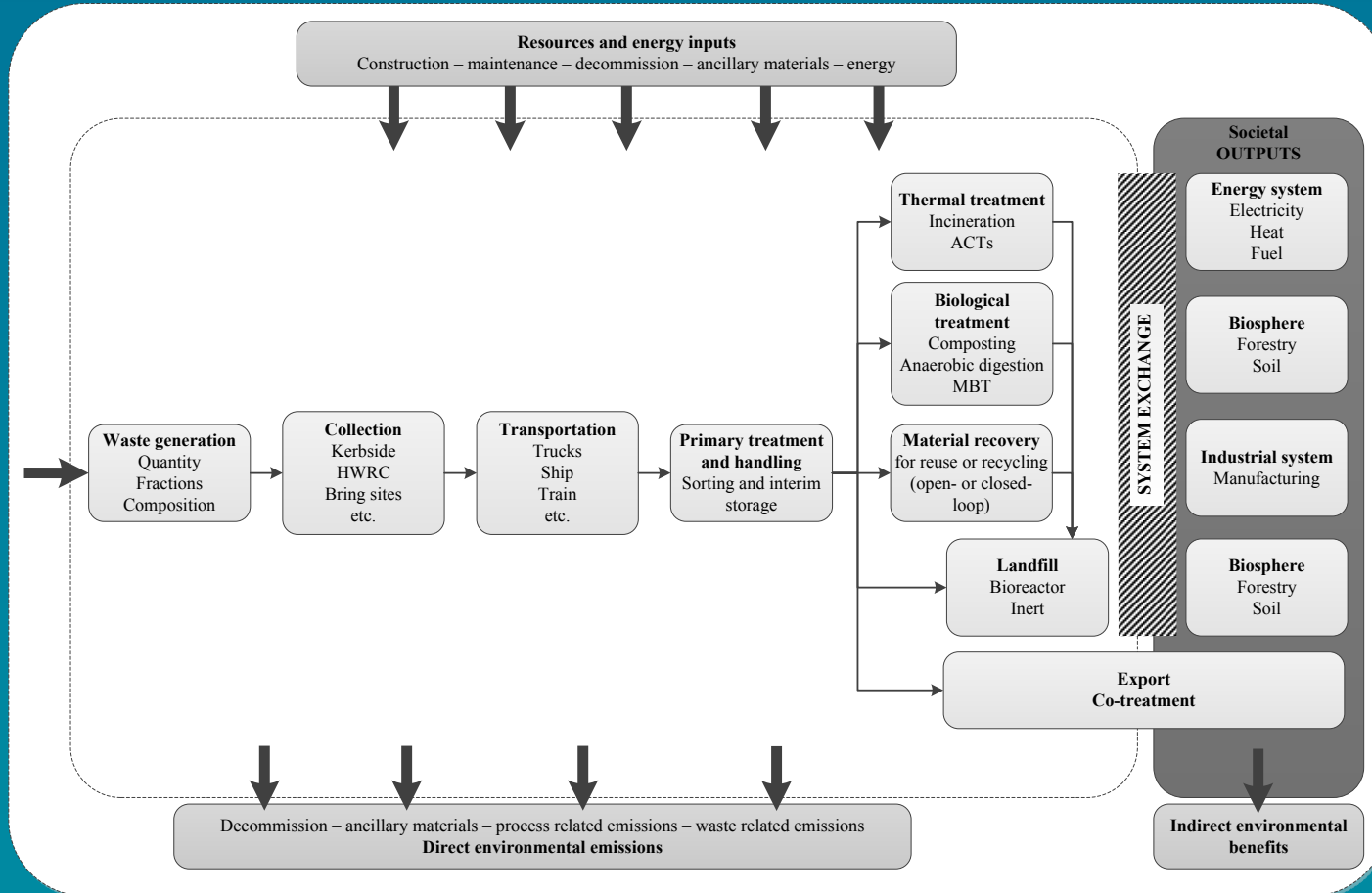
Table 5. Required information according to the GHG Protocol Corporate Standard and, for each of the seven largest UK waste management companies, whether their carbon footprint reports include specified information.

Company	Total (gross) Scope 1 and 2 emissions	Emissions data independently for each Scope	Emissions data for each GHG included (metric tonnes and tonnes of CO <sub>2</sub> e)	Selected base line year emissions data	Explanation of any historic emission adjustments	Emissions data for CO <sub>2</sub> biogenic	Carbon footprint calculation methodology used	Details of any exclusions from the calculation
Biffa Group Ltd	✓			✓				
Cory Environmental Ltd	✓			✓			✓	
Shanks Group Plc	✓	✓		✓				✓
Sita UK Ltd	✓			✓				
Veolia Environmental Services (UK) Plc	✓	✓		✓			✓	
Viridor Waste Management Ltd								
Waste Recycling Group Ltd	✓	✓	✓	✓	✓	✓	✓	

# Assisting national and regional decision-making in MSW management: application of a novel carbon footprint method

David Turner, Ian Williams & Simon Kemp

# System complexity



Generic MSW management system.  
Source: adapted from Gentil *et al.*, 2010

# Case Study: Wales



- Population: 3.064 million
- Predominantly rural
- ~1.5 Mt MSW generated p/a
  - ~50% landfilled (2011/12)
- WG accorded certain executive and legislative powers

*Image source: Wikimedia Commons*

# *One Wales: One Planet*

- Future Generations (Wales) Bill
- *Climate Change Strategy for Wales*



*One Wales: One Planet*

- 0.21% (0.66 Mt CO<sub>2</sub>e) annual reduction in GHG emissions from waste management until 2050
- UK Climate Change Act 2008
  - 80% reduction in GHG emissions by 2050
- *Towards Zero Waste & Municipal Sector Plan*

# Purpose of study

- National study carried out in partnership with the WGGA
- Research aim:  
*to quantitatively evaluate and critically analyse the carbon footprint of Wales' existing MSW management system & that of alternative MSW management strategies, both now and into the future*
- Purpose: inform policy & assist in strategic decision-making
- Outputs must be **practical & comprehensible**

# WasteDataFlow

- Web-based municipal waste data reporting system offering
- “Streamlined and transparent” access to performance data
- Started in April 2004
- Developed around a core set of questions
- Question 100:
  - ‘Tree’ structure: traces movements of waste from collection, through treatments to final destination
  - Facility type, name & addresses reported



# EASETECH



- Developed at DTU, Denmark

## Advantages

Flexible & adjustable

Detailed but not too complex

Transparent and documented

User-friendly

## Disadvantages

LCI database geographical correlation

Requires training

Results reported only as net value

Beta-version

# Waste composition: proximate analysis

Waste category	Moisture (% ww)	VM (% ww)	Fix-C (% ww)	Ash (% ww)	Reference
Paper	13.0			27.7	Eisted and Christensen, 2011
Paper		77.35	20.37	2.28	Guo et al., 2001
Paper	6.9	78	9.1	6.0	Igoni et al., 2007
Paper	10.2				Zhao et al., 2009
Other paper	27.45			9.68	Department of the Environment, 1994a, b
Waste paper	6.51	76.31	11.15	6.03	Islam et al., 2005
Office paper	8.75	80.12		18.89	Riber et al., 2009
Office paper	8.75	72.36		18.89	EASETECH, 2013
Other clean paper	7.36	81.15		16.11	Riber et al., 2009
Other clean paper	7.37	76.53		16.11	EASETECH, 2013
Dirty paper	24.47	69.26		6.72	Riber et al., 2009
Dirty paper	24.47	68.81		6.72	EASETECH, 2013
Paper - mixed	10.24	75.94	8.44	5.38	Kaiser, 1966
Paper (mixed)	6.0			6.0	Zsigalova et al., 2009
Glossy paper	6.50	61.15	6.42	25.93	Heikkinen et al., 2004
Glossy paper		67.30	4.70	28.0–42.7	Sarum et al., 2001a

# Waste composition: data quality

- Data sources assessed in relation to the ‘quality scoring matrix’ (Weidema and Wesnæs, 1996)

Reference	Reliability	Completeness	Temporal correlation	Geographical correlation	Technological correlation	Mean data quality score
Department of the Environment, 1994a, b	3	5	5	1	-	3.5
Kaiser, 1966	1	3	5	3	-	3
Riber et al., 2009	3	1	1	3	-	2
EASETECH, 2013	1	1	1	3	-	1.5
Heikkinen et al., 2004	1	1	3	3	-	2
Zhao et al., 2009	2	5	2	5	-	3.5
Eisted and Christensen, 2011	1	1	1	3	-	1.5
Ryu et al., 2007a	1	2	2	2	-	1.75

# Research progress

- Initial application: Cardiff
- Next step: upscale to Wales
- Then, scenario design and development
  - Stakeholder engagement
- Outcomes:
  - Dissemination of results to stakeholders
  - Policy & strategic decision-making support
  - Applications beyond Wales?

# Conclusions – Carbon and Waste

- Poor waste management is a significant business cost and lost opportunity (in selling resources: “waste”)
  - UK government: British businesses could secure £50bn of resource efficiency savings via better waste management
  - £18bn achievable via low/no cost measures with payback of under a year
- Businesses should be including waste element within their carbon footprint calculations
  - Waste: ~5% of global C emissions + ~50% of CH<sub>4</sub> emissions
  - Recycling 1 tonne paper/cardboard will avoid 1.4 tonnes of CO<sub>2</sub>e cf landfill + 0.62 tonnes of CO<sub>2</sub>e cf incineration
  - Landfill tax soon to be £80 per tonne

# Conclusions – Carbon and Waste

- First step is to understand your waste streams
- Not just about reducing amount of waste – about moving your waste streams up through the waste hierarchy
- Good waste management is a key element of being a sustainable business
  - Look at example of “big business” (Tesco)
  - Commercial advantages of “seen to be green”
- New Waste Standards Emerging
- (Data gaps need filling
- Method improvements needed)

# Carbon & Waste Management

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Carbon Academy Workshop, Cutting Carbon while Growing your Business

Carbon Footprint Ltd, 4 December 2013, Portland Place, London

# **John Buckley, Carbon Footprint Ltd**

## **Managing Director**



John founded Carbon Footprint Ltd in 2005, and has managed the strategy and growth of the company since then.

Prior to building Carbon Footprint Ltd, he spent 14 years in the space business. One of his highlights was being a project manager for the build and launch of two disaster monitoring satellites.





# Top **10** Techniques for Cutting Carbon and Cost While Growing Your Business

John Buckley  
Managing Director  
Carbon Footprint Ltd

# Why focus on carbon management while you grow?



- Legislation
- Sales tender demands
- Market differentiation
- Increased brand reputation with stakeholders
- Reduce risks of bad PR
- Attract investors
- Cost reductions and boost in profits



# **The top 10 techniques to cut carbon while you grow...**

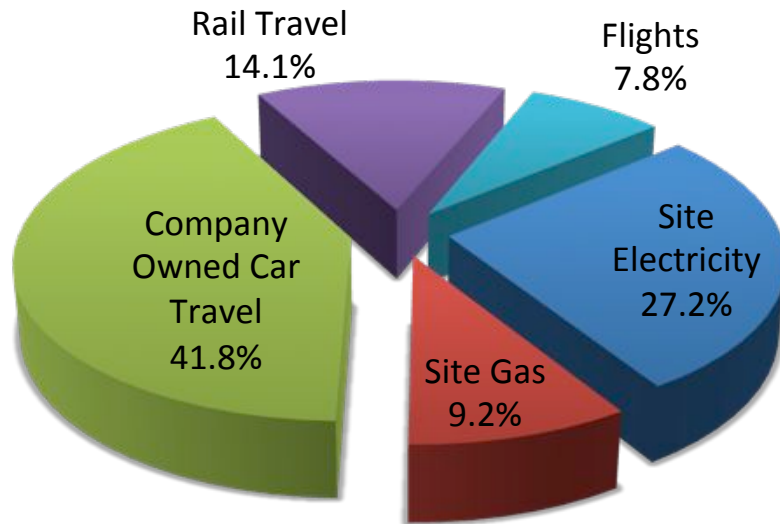
# 1. Get Board Level Buy-In Now



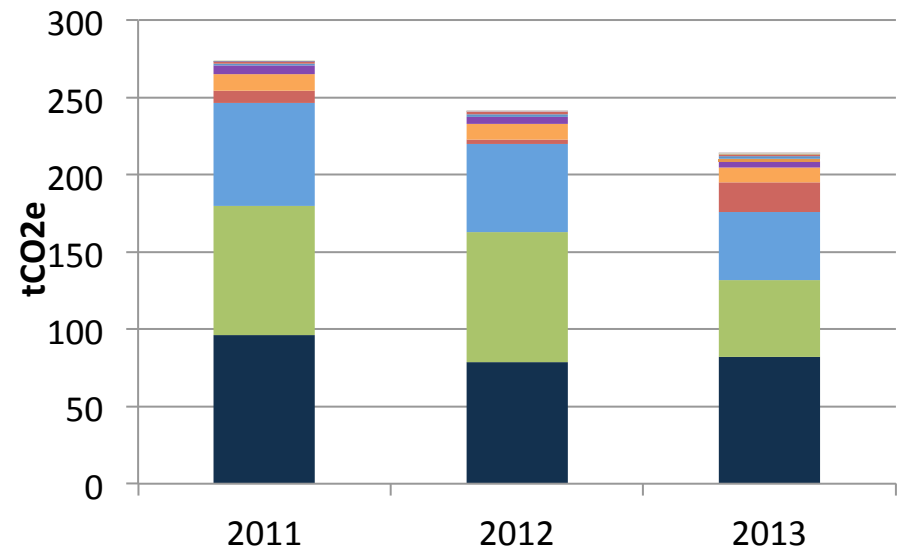
## 2. Set up robust process to assess and track your emissions and key indicators



Breakdown of Carbon Footprint



Total tCO<sub>2</sub>e 2011 - 2013



# 3. Define realistic targets and goals



## 4. Generate ideas of *projects* rather than ad-hoc actions to meet targets



# 5. Produce a Carbon Management Plan

Action	Who	When	Footprint Element	Costs	Annual Cost Savings	Pay back period	Annual Carbon Savings
Change T8 lights to T5 in Building 1	Bob Smith	Mar 2014	Building 1 Electricity	£5,000	£2,500	2 years	20tCO <sub>2</sub> e
Investigate options for route planning systems	Jill Black	Dec 2013	Delivery Vehicles	1 day	-	-	-
Implement route planning	Jill Black	March 2013	Delivery Vehicles	£1000 TBC	£4000 TBC	2.5 years TBC	10tCO <sub>2</sub> e



## 6. Proper project management



## 7. Choose Low Carbon New Buildings/ refits



# 8. Consider whether carbon offsetting has a role to play



## 9. Communicate with customers and stakeholders – build the story over time in a way they understand and care about...



# 10. Measure, track & report your ROI



# 10 Steps to Success

1. Get **Board Level Buy-in** Now
2. Set up Robust Process to assess / **track your emissions** & KPIs
3. Define achievable **suitable targets and goals**, linked to the goals of the business
4. Generate **ideas of projects** rather than ad hoc actions to meet your targets
5. Produce a **Carbon Management Plan**
6. Proper **Project management**
7. Choose **low carbon new buildings/retrofits**
8. Consider if **carbon offsetting** has a role
9. **Communicate** with customers and stakeholders
10. Measure, track, **report your Return on Investment**





# Any questions?

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Carbon Footprint Ltd offer a full range of consultancy services to help you reduce your carbon footprint and improve your businesses sustainability credentials

# Cutting Carbon While Growing Your Business



- Governments (despite short term political expediency) are committed to reducing carbon intensity
- Blue chip pioneers now impacting supply chain
- Waste – increasingly significant footprint & cost
- Cutting *your* carbon emissions:-
  - Measurement - scope and frequency
  - Capital Investments - treat “cutting carbon” as integral not additional
  - Communication - both internal and external stakeholders
  - ROI - Ensuring *your* business remains Sustainable

***How will you keep your carbon low while you grow?***