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The UK's Persistent Organics Pollutants multimedia emission inventory: an overview

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Outline

- Framework and obligations
- The POPs inventory and the UK government
- Creating the UK POPs multimedia emission inventory
- Dataflow and quality control
- Emission estimates
- Continuous improvements/updates of the inventory
- Other POPs covered by the Stockholm Convention
- Further development



Framework and obligations

- UNEP Stockholm Convention
- The Aarhus Convention, which is part of the UN ECE Convention on Long Range Transboundary Air Pollution (CLR-TAP)
- EC (850/2004) POPs regulation

Annex A (Elimination)

- Aldrin
- Chlordane
- Dieldrin
- Endrin
- Heptachlor
- Hexachlorobenzene (HCB)
- Mirex
- Toxaphene
- Polychlorinated biphenyls (PCBs)
- Pentachlorobenzene (PeCB)
- α -hexachlorocyclohexane (α -HCH)
- β -hexachlorocyclohexane (β -HCH)
- Lindane (γ -HCH)
- Chlordecone
- Hexabromobiphenyl
- Hexabromodiphenyl ether and heptabromodiphenyl ether (C-octaBDE)
- Tetrabromodiphenyl ether and pentabromodiphenyl ether (C-pentaDBE)
- Endosulfan
- Hexabromocyclododecane (HBCD)

Annex B (Restriction)

- DDT
- Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF)

Annex C (Unintentional)

- PCBs (including Dioxin-Like PCBs)
- Dioxins (PCDDs)
- Furans (PCDFs)
- Hexachlorobenzene (HCB)
- Pentachlorobenzene (PeCB)

Framework and obligations



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Second Round of Party Reports - Google Chrome

chm.pops.int/Countries/NationalReports/SecondRoundofPartyReports/tabid/1315/Default.aspx

STOCKHOLM CONVENTION
 Protecting human health and the environment from persistent organic pollutants

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Reporting

- Overview and Mandate
- Decisions
- National Reports
- Electronic Reporting System
- Guidance

Second round of Party reports

Parties that have submitted their National Reports pursuant to Article 15 of the Convention

Reports

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Parties that have submitted their National Reports pursuant to article 15 of the Convention
 (you can sort the list below by Party's name or submission date by clicking on the corresponding column header)

PARTY	SUBMISSION DATE	SUBMITTING OFFICER	REPORT
United Kingdom of Great Britain and Northern Ireland	29/10/2010	Melanie JOHNSTON Department for Environment, Food and Rural Affairs	

The emission inventory

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Emission inventories to air, land and water for ten new Persistent Organic Pollutants

An update to the 2011 report on nine new POPs

Report for DEFRA

Ricardo-AEA/R/ED57722002
Issue Number 1 (Draft)
Date 24/10/2013

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POPs Multi-Media inventory Tables of Change report 2014



Report for DEFRA

Ricardo-AEA/R/ED57722001_TOG
Issue Number 1
Date 03/04/2013

Aether

978-0-9573549-1-3

UK Greenhouse Gas Inventory, 1990 to 2011

Annual Report for Submission under the Framework Convention on Climate Change

Main authors Webb N, Broomfield M, Cardenas L, MacCarthy J, Murrells T, Pang Y, Passant N, Thistlethwaite G, Thomson A

With contributions from Gillespie S, Goodwin J, Hallsworth S, Hobson M, Manning A, Martinez C, Matthews R, Misselbrook T, Salisbury E, Venfield H, Walker C

April 2013

This work forms part of the Climate, Energy, Science and Analysis Research Programme of the Department of Energy and Climate Change.

The emission inventory

The UK's POPs Multimedia Emission Inventory covers substances listed in Annex C only, for the period 1990 – 2012:

- PCBs (including Dioxin-Like PCBs)
- Dioxins (PCDDs)/Furans (PCDFs)
- Hexachlorobenzene (HCB)
- Pentachlorobenzene (PeCB)

Emission = Activity × Emission Factor

- Activity rates
 - values in unit per year of product manufactured (e.g., steel, sinter, cement, pulp, compost, *etc.*) or feed material processed (e.g., municipal waste, hazardous waste, coal, diesel fuel, bodies cremated, *etc.*), or annual quantities of material released (e.g., m³ of flue gas, litres of wastewater, kilograms or tons of sludge generated, *etc.*)
- Emission factors (EFs)
 - values for the quantity of POPs, released to each vector per unit of activity (e.g., µg per ton of material produced, per ton of fuel burned, *etc.*)

Data sources

The NAEI team draws upon datasets from many hundreds of UK organisations, integrating activity data and available emissions and emission factor data.

Data sources

Potential sources of information on **activity rates** include the following:

- National statistics;
- National energy balance;
- Regional economic activity records including national production and import/export data;
- International statistics such as EUROSTAT, OECD, FAO, World Bank etc.
- Local operating and permitting records of industrial facilities;
- Industry association data;
- Historical production and industry data;
- Other release inventories such as the inventory of criteria pollutants and or greenhouse gases;
- Questionnaires;
- Pollution Release and Transfer Registers (PRTRs).

Data sources

Emission factors are chosen in way that they represent 'typical' or 'averaged' process conditions — they tend to be technology independent. Main sources of information are:

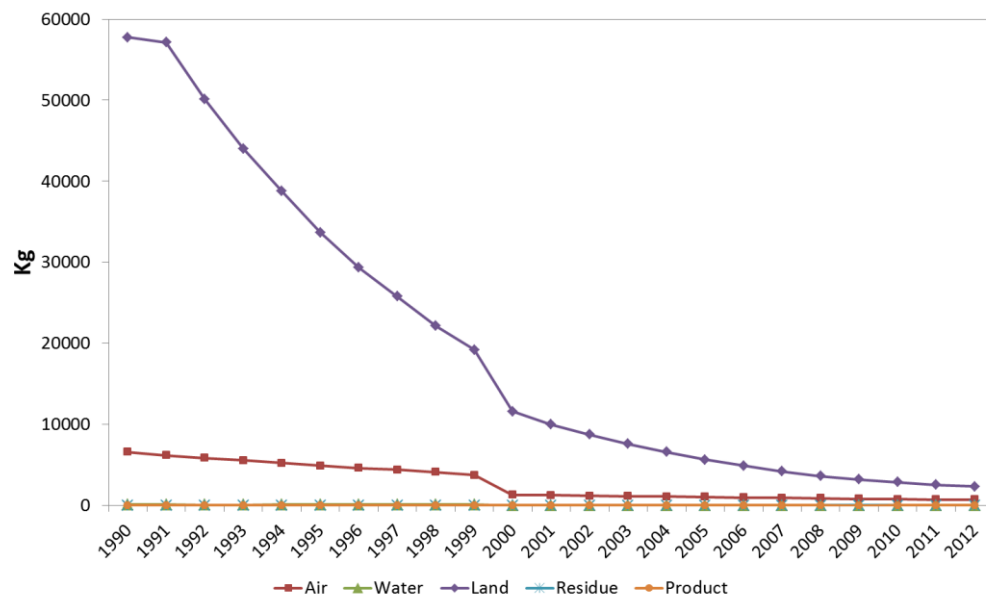
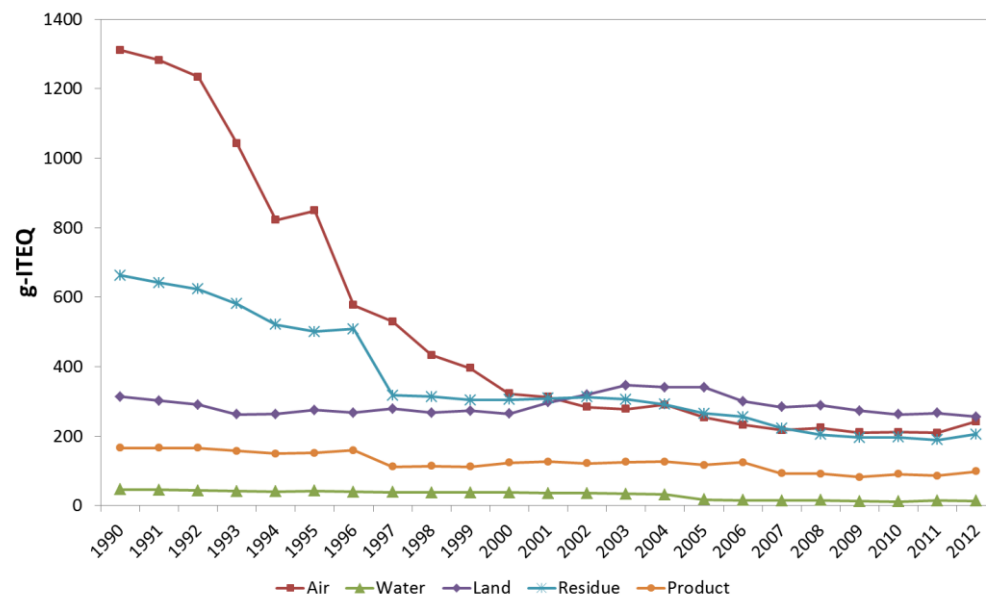
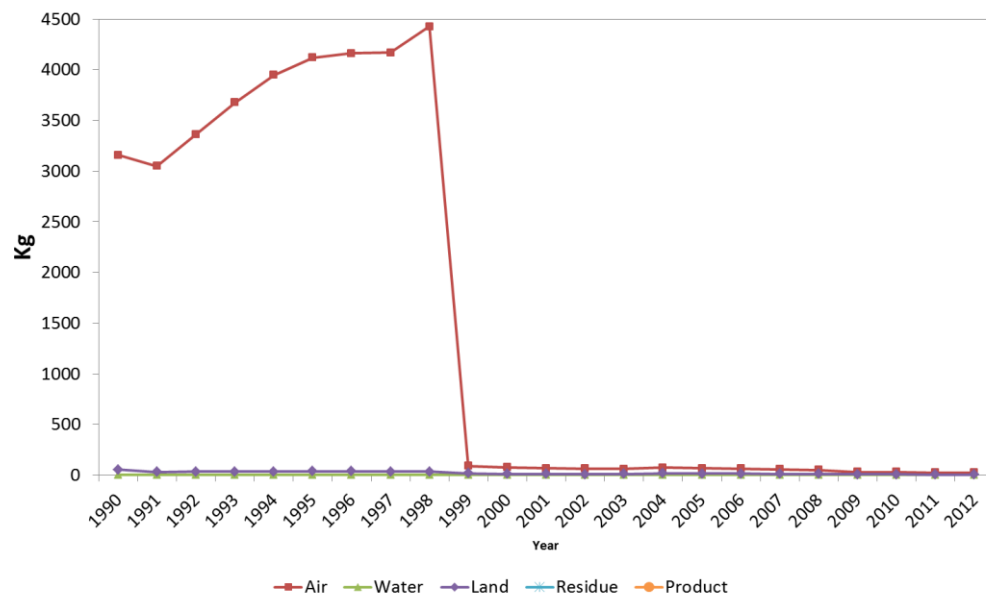
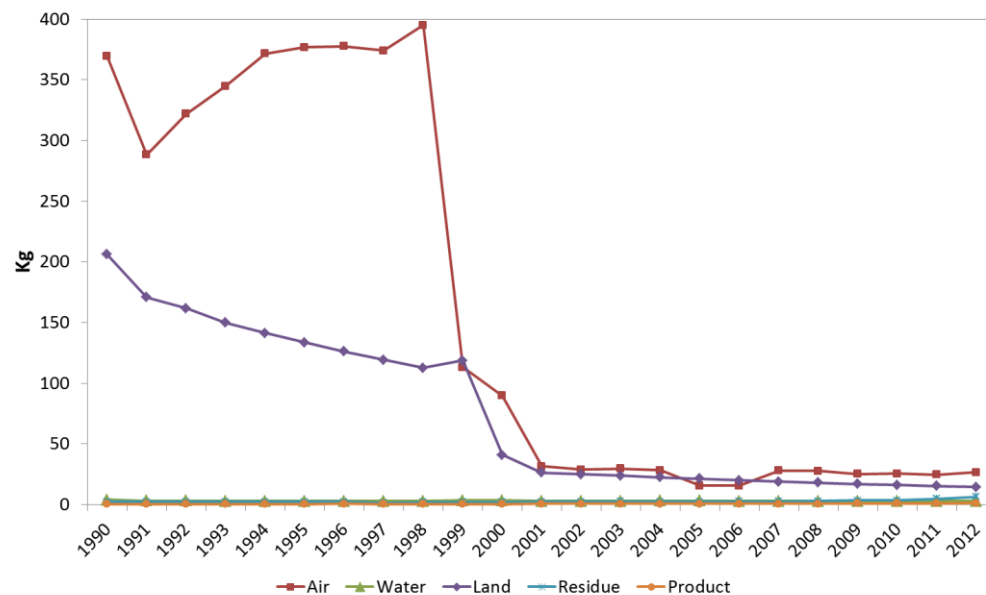
- UNEP Toolkit – 2013;
- EMEP/EEA Air Pollutant Emission Inventory Guidebook – 2013;
- USEPA AP-42;
- IPCC Guidebooks;
- Academic literature;
- Pollution Inventory
 - the operator of a business that requires an environmental permit have to report annual pollution releases of certain substances to air, controlled waters and land, and off-site transfers in wastewater and waste.
- Industry/trade associations:
 - e.g. UK petroleum industry association (UKPIA) and Tata Steel provide additional information regarding EFs pertinent to specific fuels and processes.
- The UK PRTR (Pollutant Release and Transfer Register);
- The Environment Agency Hazardous waste database.

Results for 2012 inventory

- Total UK emission estimates:
 - Air
 - Water
 - Land (i.e. assumed to be uncontrolled release)
 - Residue (i.e. assumed to be controlled release to land – landfill)
 - Product (i.e. recycled materials put back into products)

2012 compilation

PCDDs/Fs		DL PCBs		PCBs		HCB		PeCB	
g-ITEQ		g-WHO-TEQ		Kg		Kg		Kg	
Air	242	Air	187	Air	727	Air	25	Air	27
Water	14	Water	0	Water	0	Water	3	Water	3
Land	256	Land	34	Land	2348	Land	5	Land	14
Residue	205	Residue	0.4	Residue	26	Residue	0	Residue	6
Product	98	Product	0.4	Product	20	Product	0	Product	1.3

PCBs 2012 compilation**PCDDs/Fs 2012 compilation****HCB 2012 compilation****PeCB 2012 compilation**

Changes to this year's cycle (2012)

2011 compilation

PCDDs/Fs		DL PCBs		PCBs		HCB		PeCB	
g-ITEQ		g-WHO-TEQ		Kg		Kg		Kg	
Air	181	Air	185	Air	778	Air	25	Air	35
Water	27	Water	0	Water	0	Water	2	Water	3
Land	282	Land	38	Land	2574	Land	6	Land	229
Residue	184	Residue	2	Residue	28	Residue	0	Residue	5
Product	86	Product	0.7	Product	22	Product	0	Product	1.0

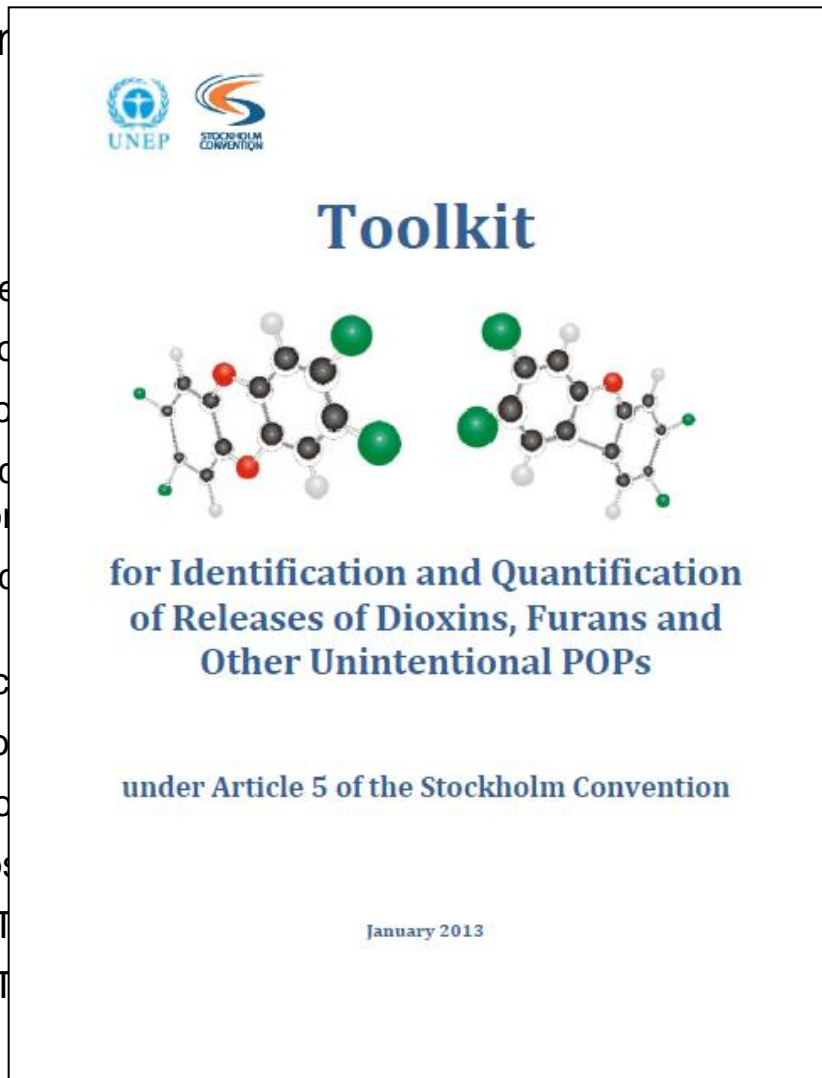
2012 compilation

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Improvement Programme – Dioxins/Furans

- New approach to dioxin

- 2b Coke Production
- 2d Copper Production
- 2i Magnesium Production
- 6b Open Burning of Waste
- 7a Wastewater Effluent from
- 7b Elemental Chlorine Production
- 7c EDC/VCM/PVC Production
- 7c EDC/VCM/PVC Production (Emulsion PVC-only)
- 7e TiCl₄ and TiO₂ Production
- 7e Caprolactam Production
- 7f Petroleum Refining (process)
- 9a Landfills, Waste Dumps
- 9b Sewage and Sewage Treatment
- 9b Sewage and Sewage Treatment
- 9c Open Water Dumping



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tanium electrodes)

EDC, EDC/VCM and

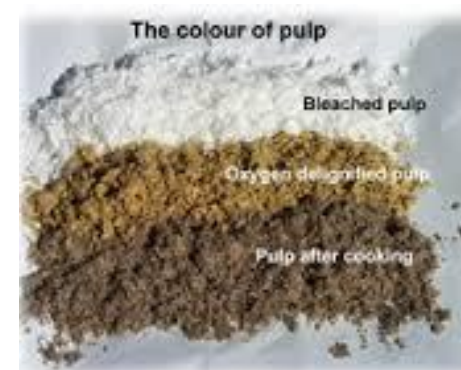
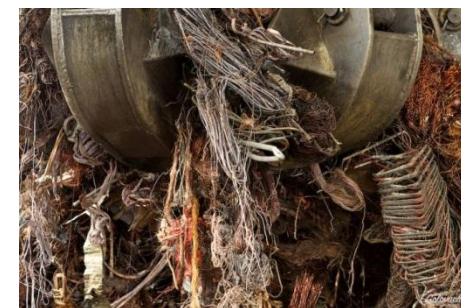
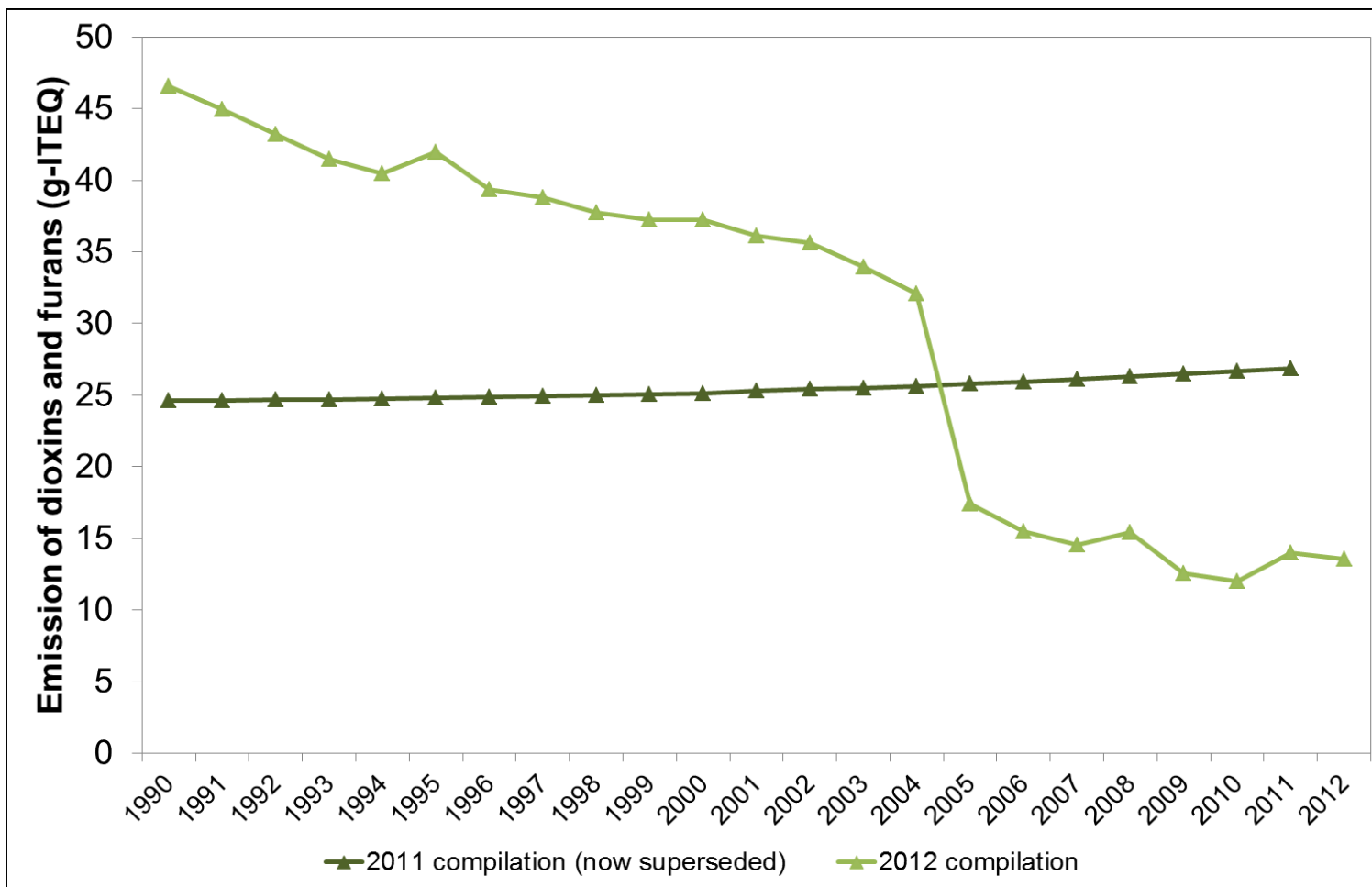
Suspension, Dispersion or

Improvement Programme – Dioxins/Furans

- New approach to dioxin emissions from industry – new guidance. Key sources:
 - 2b Coke Production
 - 2d Copper Production
 - 2i Magnesium Production (using MgO/C thermal treatment in Cl₂ - comprehensive pollution control)
 - 6b Open Burning of Waste and Accidental Fires (Construction/Demolition)
 - 7a Wastewater Effluent from Pulp and Paper Production and Pulp Sludges
 - 7b Elemental Chlorine Production (2. Chlorine/chlor-alkali production using titanium electrodes)
 - 7c EDC/VCM/PVC Production: Releases to Water via Wastewater Effluent (EDC, EDC/VCM and EDC/VCM/PVC production from sites with oxychlorination reactors)
 - 7c EDC/VCM/PVC Production: Releases to Water via Wastewater Effluent (Suspension, Dispersion or Emulsion PVC-only)
 - 7e TiCl₄ and TiO₂ Production via the Chloride Process
 - 7e Caprolactam Production
 - 7f Petroleum Refining (production processes)
 - 9a Landfills, Waste Dumps and Landfill Mining
 - 9b Sewage and Sewage Treatment (no sludge removal)
 - 9b Sewage and Sewage Treatment (with sludge removal)
 - 9c Open Water Dumping

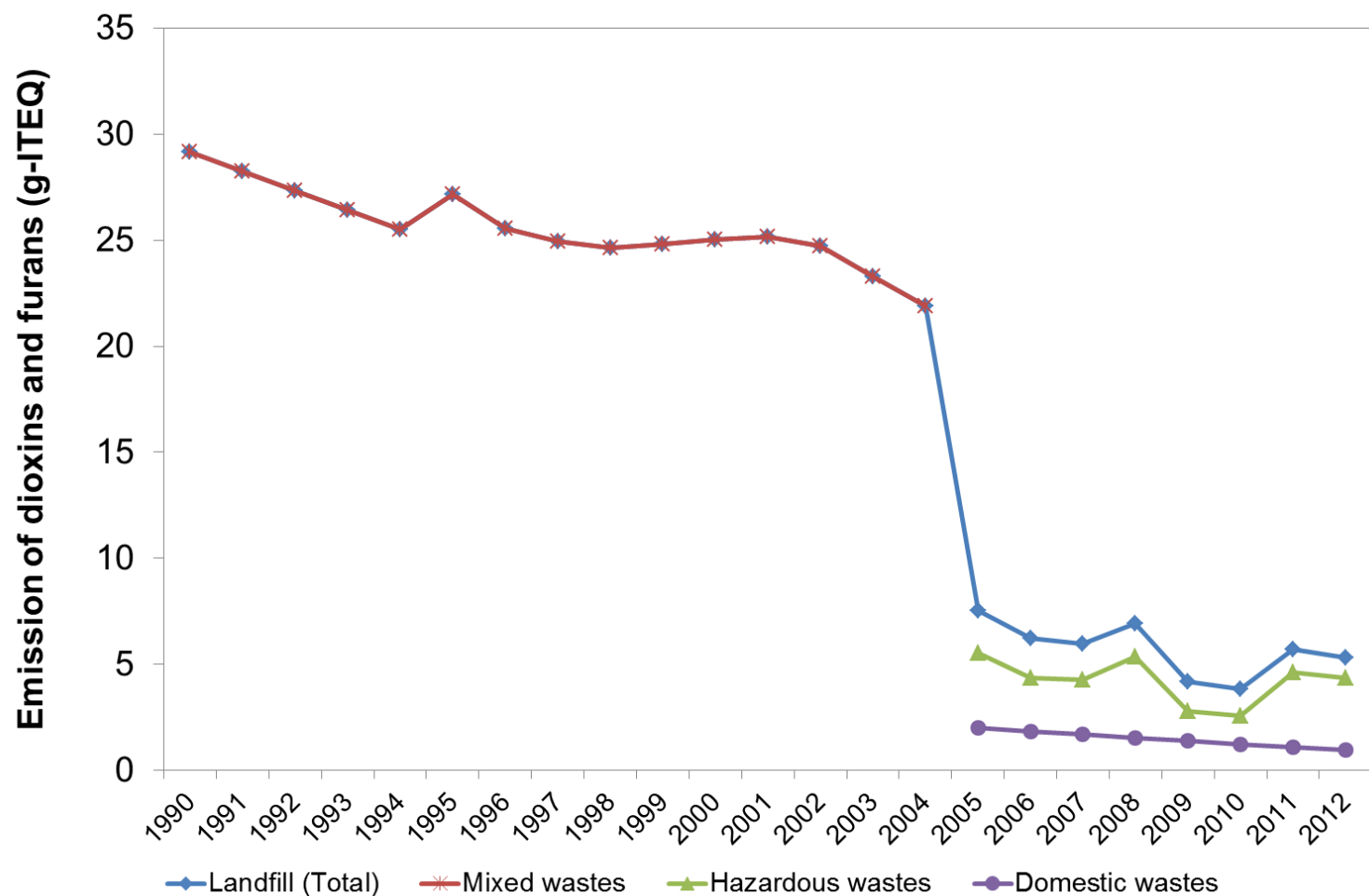
PCDDs/Fs emission to water

Comparison of dioxins and furans annual total water emissions in the 2011 and 2012 inventory cycles



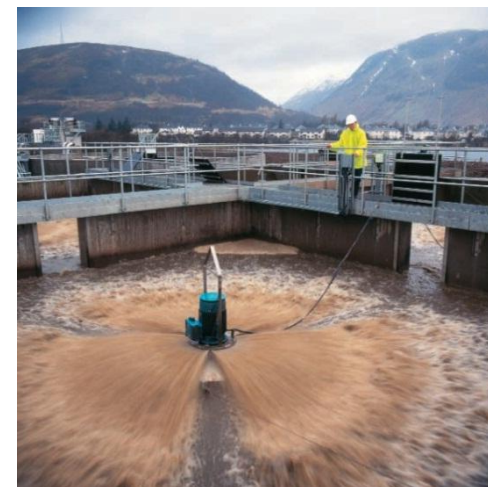
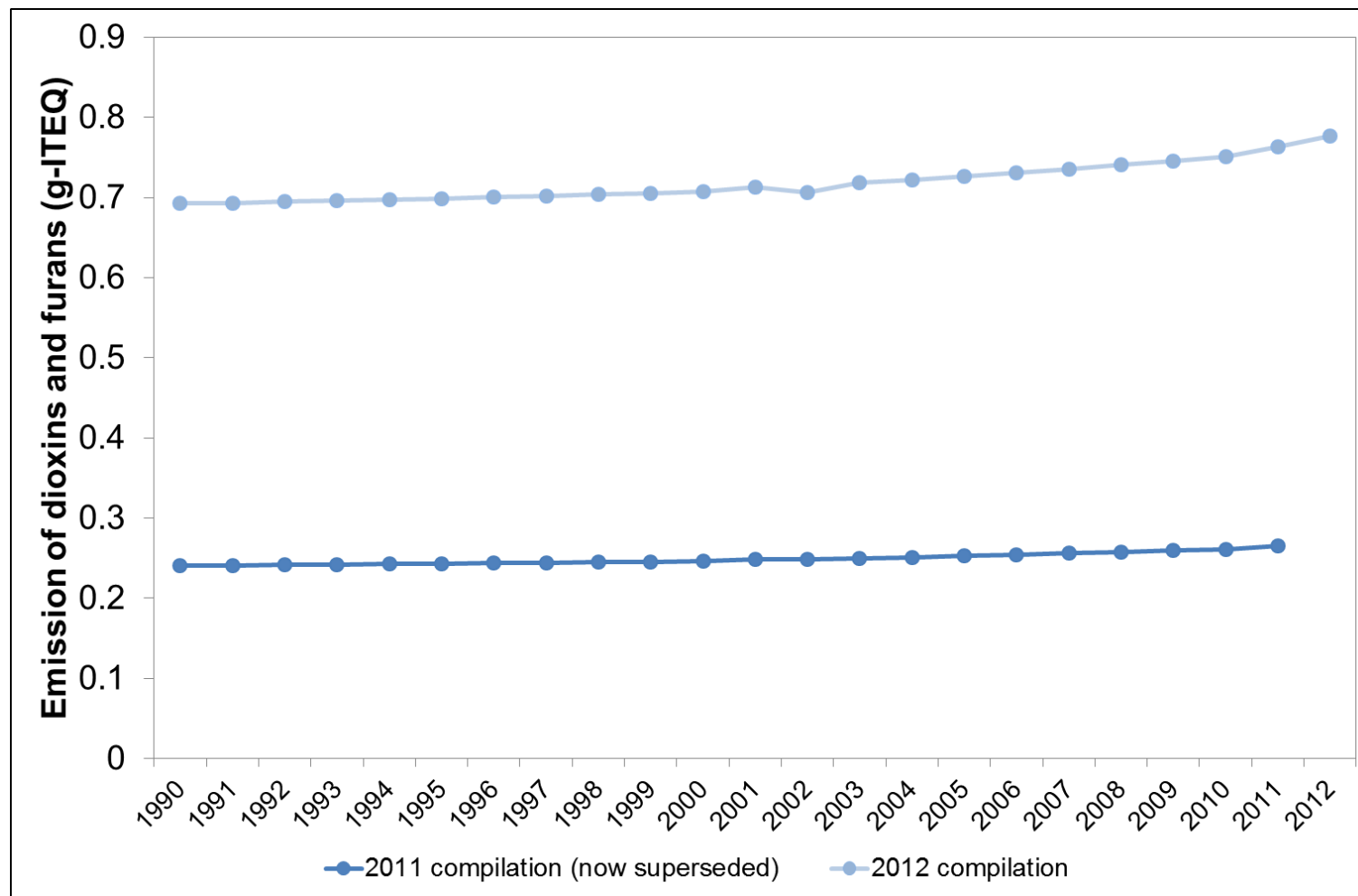
PCDDs/Fs emission to water – Landfill

Sharp decline in 2005: introduction of the Hazardous Waste Regulations



PCDDs/Fs emission to water – Wastewater

Emissions have been updated retrospectively using new estimated activity data and EF



Improvement Programme – PeCB

Activity reduced to reflect recent research on the:

- Accidental fires
- Open burning of mixed waste (Agricultural waste)

Improvement Programme – PeCB Land

Comparison PeCB annual total land emissions in the 2011 and 2012 cycles

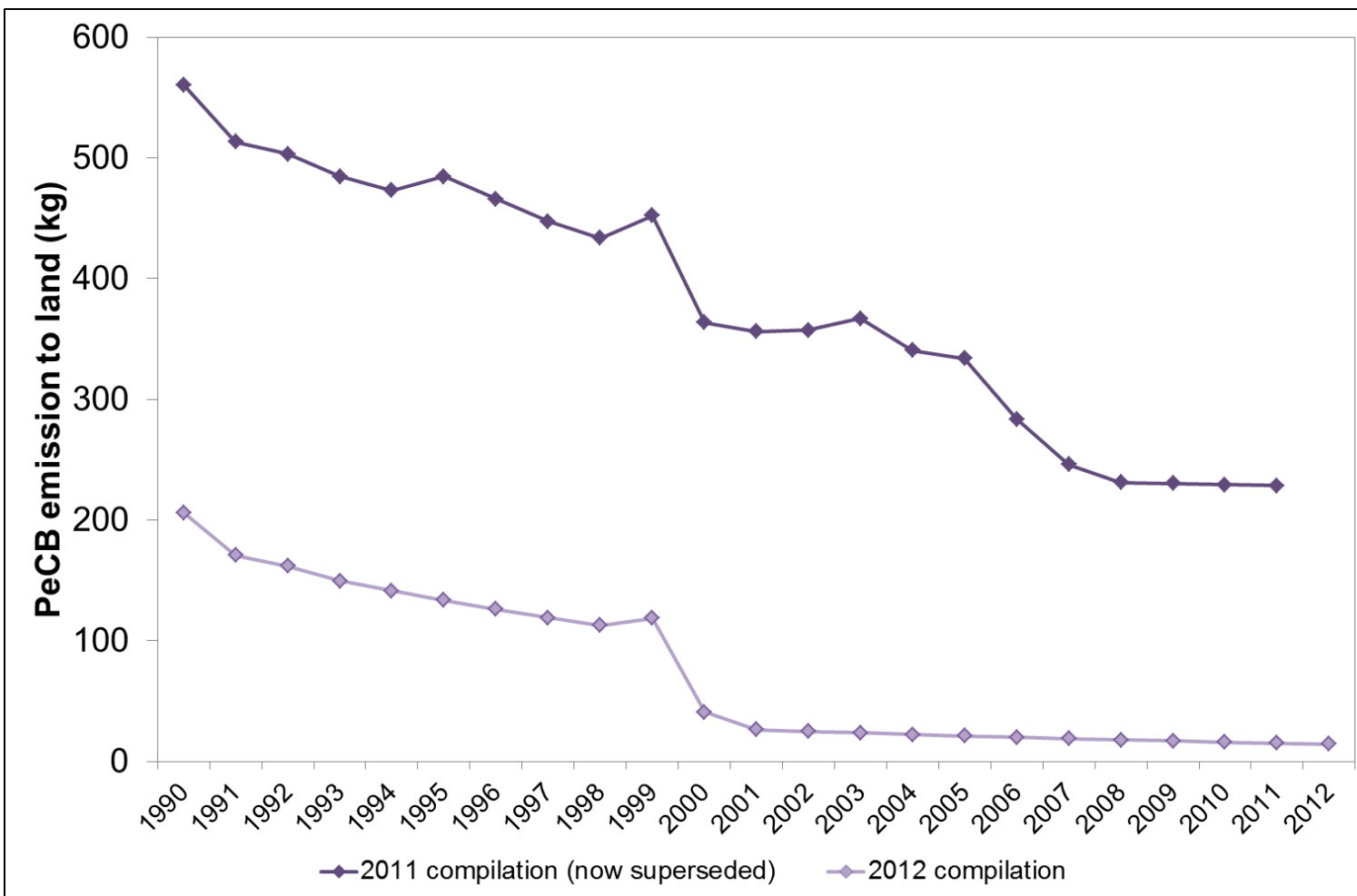
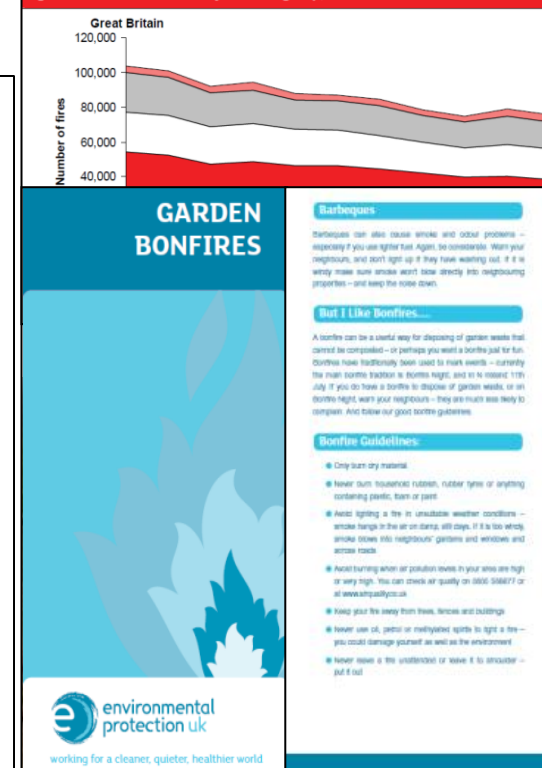


Figure 1.2: Accidental fires by location group, 2000/01-2010/11



Other POPs

Other POPs covered by the Stockholm Convention Emission estimates for 2011

POP	Air 2011	Land 2011	Water 2011	Residue 2011	Product 2011	Estimated uncertainty
Chlordecone	(Assumed to be zero emissions to all media)					N/A
Alpha HCH	7.4 tonnes to all media			no data	0 Kg	Factor of 3
Beta HCH	2.7 tonnes to all media			no data	0 Kg	Factor of 3
Lindane	2110 kg	20 kg	0 kg	60 kg	90 kg	Factor of 2
Tetra and PentaBDE	3700 kg	490 kg	1390 kg	92,000 kg		Factor of 5
Hexa and HeptaBDE	232 kg	31 kg	89 kg	5900 kg		Factor of 5
HBB	1.1 kg	no data	<1 gram	50 kg	no data	Factor of 5
PFOS	0 kg	2 kg	840 kg	NE	no data	Land: Factor of 3 Water: $\pm 40\%$
PeCB	34 kg	229 kg	3 kg	5 Kg	0 Kg	Air: $\pm 25\%$ Land & Residue: $\pm 50\%$ Water: factor of 2 Residues: Factor of 3
Endosulfan	(Assumed to be zero emissions to all media)					N/A

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Further development



- New information:
 - Flame retardants in soft furnishings and sewage sludge (University of Birmingham)
 - PFOS in rivers Aire and Calder in North Yorkshire (Lancaster University)
 - PDBEs in WWTP (Lancaster University)

- Ideas for improvement/development:
 - HBCDs
 - DecaBDE
 - PFOS

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