Environmental chemistry at the Greenpeace Research Laboratories:

some recent case-studies

David Santillo & Iryna Labunska
Greenpeace Research Laboratories
School of Biosciences, University of Exeter

- Science and Greenpeace - background to the Greenpeace Research Laboratories

- Case studies of environmental analysis – workplace and environmental contamination from manufacture & recycling of e-waste

Greenpeace Research Laboratories

- Established in 1986 within Queen Mary College, University of London
- Moved to University of Exeter in 1992
- Affiliated with School of Biosciences
- Recent relocation to Innovations Centre

“to provide scientific advice and analytical support to Greenpeace campaigns and offices world-wide, over a range of disciplines”

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↘ World Websites:

Argentina
Australia
Austria
Belgium
Brazil
Canada
Chile
China
Czech Republic
Denmark
Fiji

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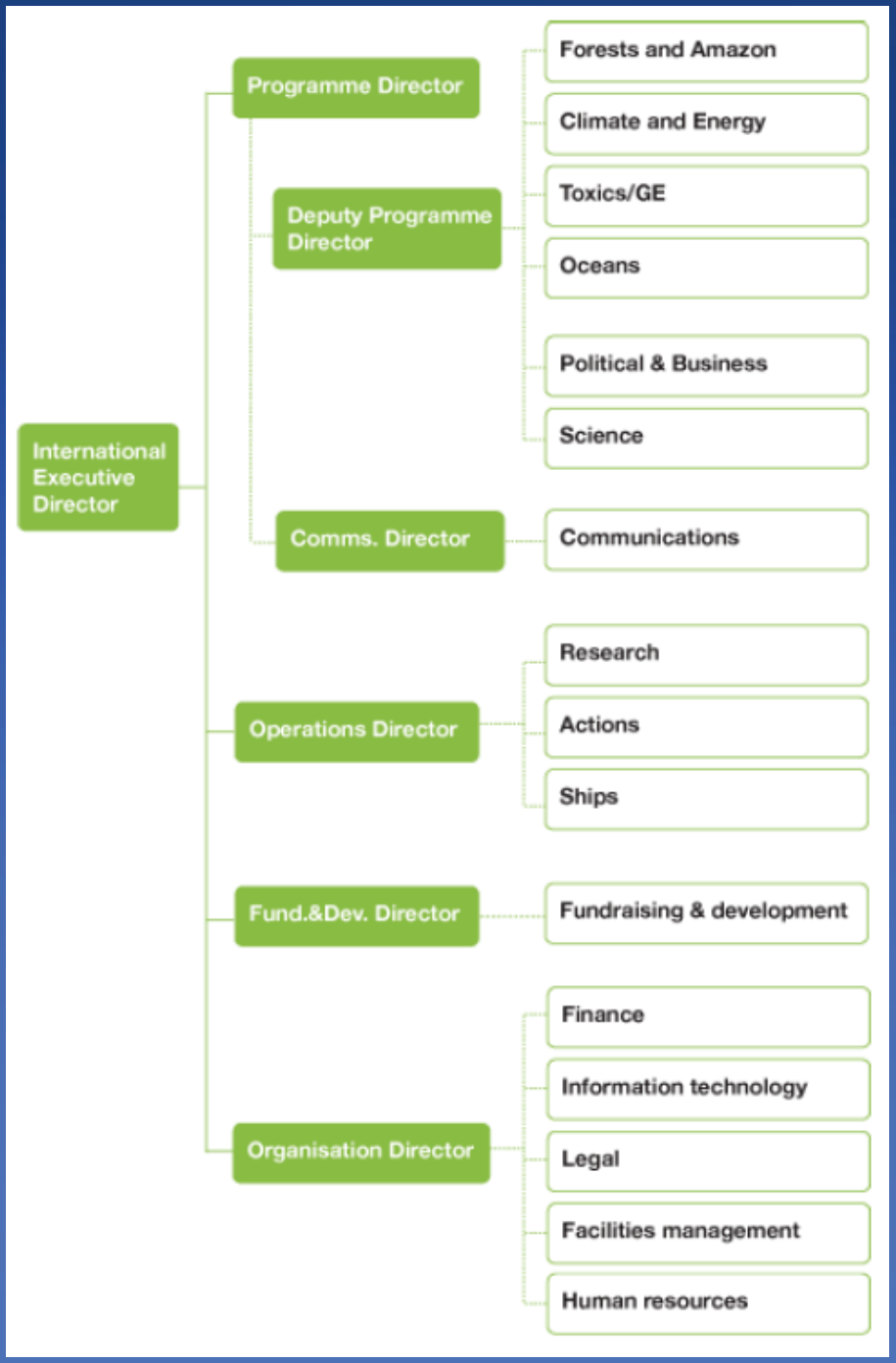
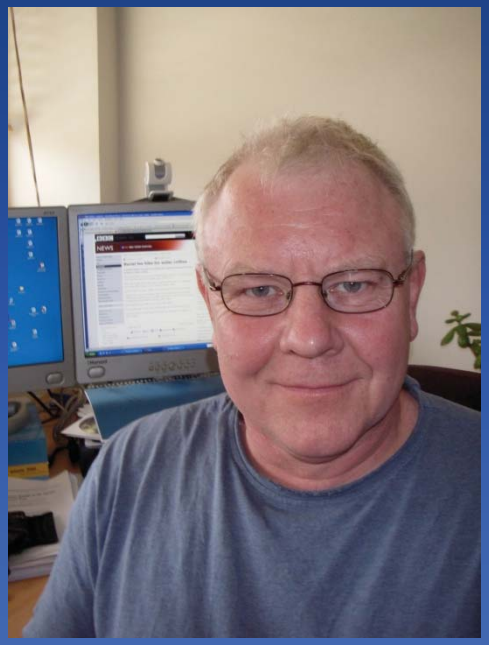
Greenpeace ‘core values’

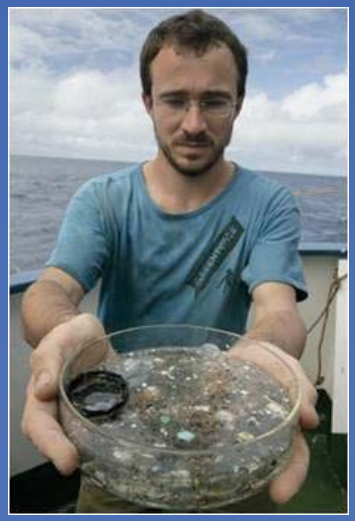
- ‘Bear witness' to environmental destruction
- Non-violent confrontation
- No permanent allies or adversaries
- Financial independence
- Seek solutions/promote informed debate about society's environmental choices.

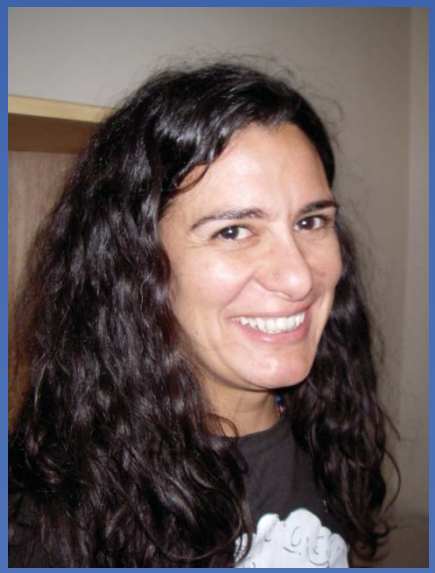
Structure of Greenpeace International



Who are we?







What do we do?

- Design and execution of analytical programmes and communication of results to decision-makers, the media and public
- Providing advice regarding scientific aspects of Greenpeace's work
- Providing technical support to facilitate rapid response to incidents and accidents
- Preparation of technical reports and scientific reviews, and informing Greenpeace of new developments in science

What do we do?

- Review and quality control of scientific projects, reports, press releases, etc.
- Representation of Greenpeace at international level, including at scientific symposia, environmental treaties and conventions
- Publication of research papers in scientific journals
- Ongoing development of Greenpeace policies and long-term directions through continued scientific awareness, research and development

www.greenpeace.to

Research collaborations

Cefas

eurofins

SCOTTISH ASSOCIATION for MARINE SCIENCE

LGC
Setting standards in analytical science

UNIVERSITET STOCKHOLMS

WAGENINGEN UR
For quality of life

SAHFOS
Sir Alister Hardy Foundation for Ocean Science

The CPR survey - monitoring the health of the oceans since 1931

Focus of analytical research

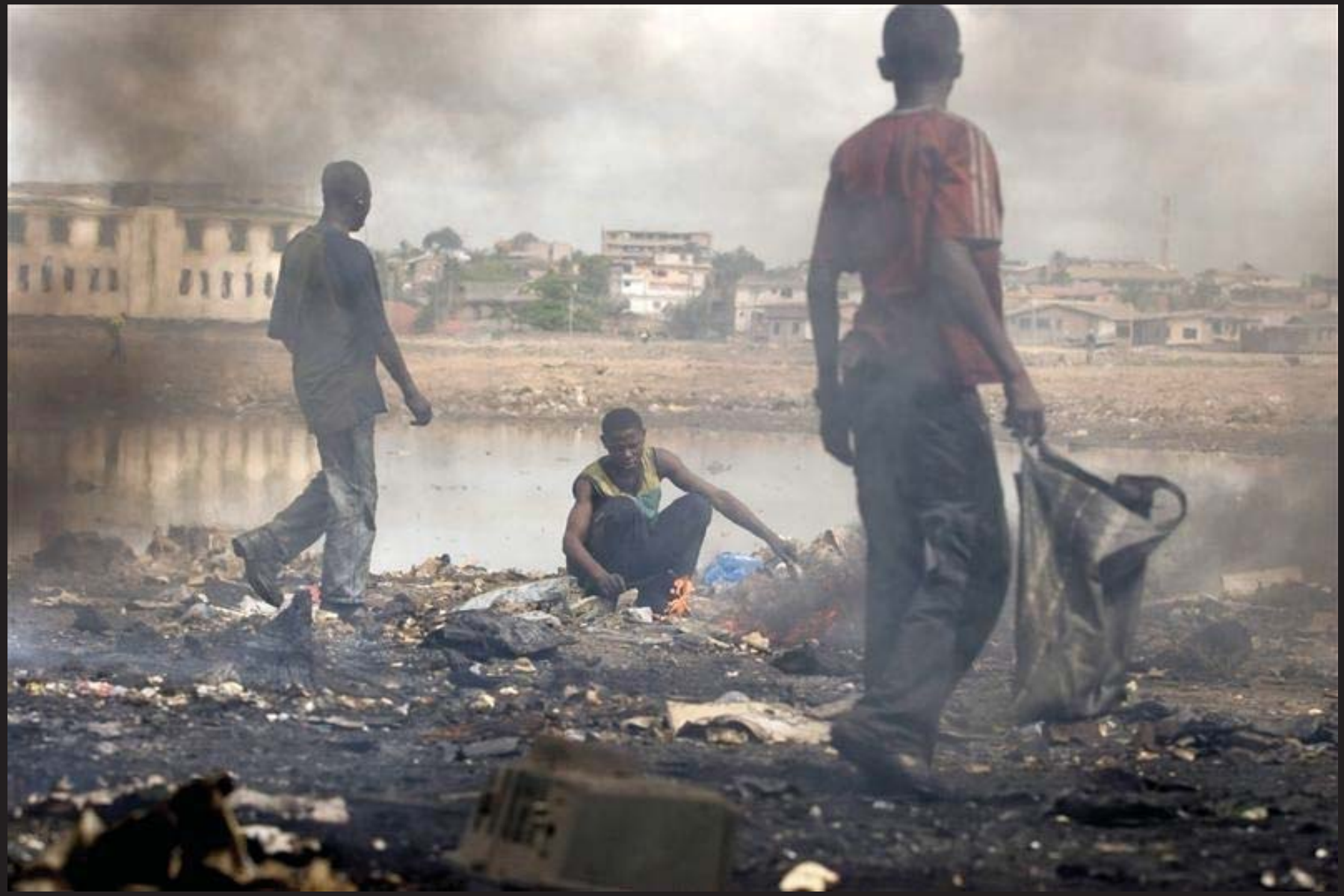
- documentation of environmental contamination with metals and persistent organic pollutants arising from industrial sources
- particular emphasis on the quality and complexity of industrial wastes
- increasing focus on rapidly industrialising economies in Asia and South America.


‘e-waste’ – the world’s
fastest growing waste stream

India

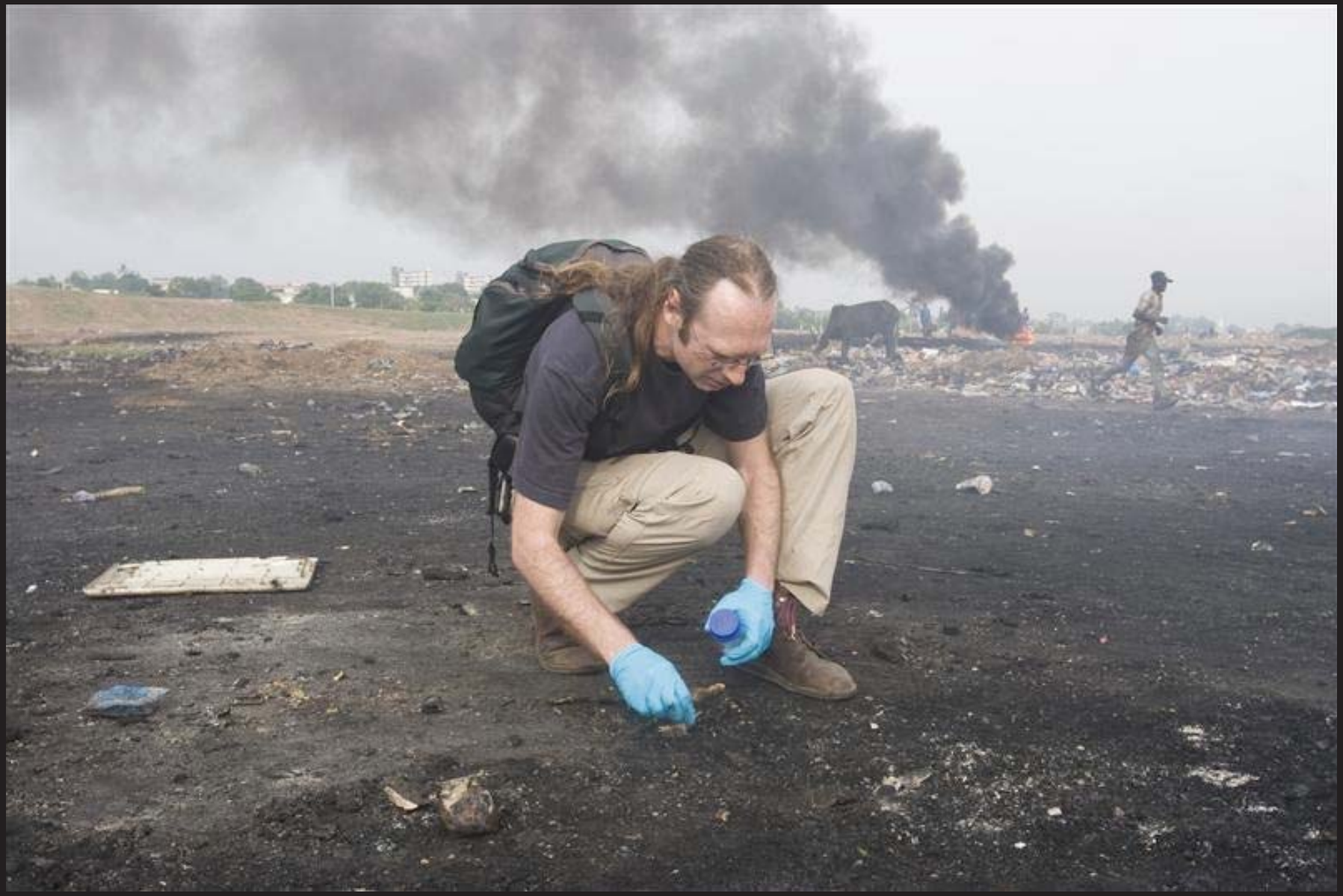

China


Ghana




China

Ghana



Case studies of environmental analysis – workplace and environmental contamination from manufacture & recycling of e-waste

Iryna Labunska

Greenpeace projects on electronics 2005-2008

- Recycling of electronic wastes in China and India: workplace and environmental contamination – 2005
- Cutting edge contamination: A study of environmental pollution during the manufacture of electronic products (China, Thailand, Philippines and Mexico) – 2006-2007
- Russian Refuse: PBDEs and other contaminants arising from production, recycling and disposal of electrical and electronic equipment in St-Petersburg area, Russia – 2007-2008
- Chemical contamination at e-waste recycling and disposal sites in Accra and Korforidua, Ghana - 2008

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E-waste recycling in China and India

- Separation, processing and recycling of plastics
- Manual separation of products
- Removal and collection of solder using heating
- Acidic extraction of metals from complex mixtures
- Burning of wastes to remove combustible plastics and isolate metals
- Glass recovery from cathode ray tubes (CRTs)

E-waste recycling in Russia and Ghana

- Manual separation of products to isolate metals
- Burning of wastes to remove combustible plastics and isolate metals

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Electrical and electronic goods production sectors

- Printed wiring board (PWB) manufacture– China, Thailand, Russia
- Semiconductor chip manufacture – Philippines, Mexico, Russia
- Computer components assembly – Mexico
- Electrical engineering – Russia

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Organic compounds resulting from manufacture and recycling of electronic goods (part 1)

Compounds	E-production		E-waste	
	Water samples (36)	Solid samples (18)	Water samples (7)	Solid samples (64)
Flame retardants				
Tetrabromobisphenol A (TBBPA)	**2**	**-**	**-**	**-**
Polybrominated diphenyl ethers (PBDEs)	**7**	**18**	**2**	**24**
Triphenyl phosphate & derivatives	**1**	**-**	**3**	**3**
Mirex (or Dechlorane)	**-**	**-**	**-**	**10**
Insulators & capacitors additives				
Polychlorinated biphenyls (PCBs)	**-**	**2**	**-**	**20**
Polychlorinated benzenes	**6**	**5**	**4**	**25**
Polychlorinated naphthalenes (PCN)	**-**	**-**	**-**	**6**
Photolithography related compounds				
Diphenylmethanone and derivatives	**4**	**1**	**-**	**-**
Diphenylethanone and derivatives	**4**	**-**	**-**	**-**
Quantacure ITX	**5**	**2**	**-**	**-**

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Organic compounds resulting from manufacture and recycling of electronic goods (part 2)

Compounds	E-production		E-waste	
	Water samples (36)	Solid samples (18)	Water samples (10)	Solid samples (64)
Antioxidants				
Nonylphenol	**1**	**-**	**-**	**4**
Plasticizers				
Phthalate esters	**9**	**-**	**9**	**10**
Silicon dioxide film production intermediates				
Decamethylcyclopentasiloxane	**-**	**2**	**-**	**13**
Octamethylcyclotetrasiloxane	**-**	**1**	**-**	**13**
Solvents				
Chlorinated methanes, ethanes and ethenes	**18**	**n/a**	**2**	**n/a**

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Levels of 2,3,7,8-substituted polychlorinated dibenzo-p-dioxins and furans (PCDD/Fs) in three samples collected from e-waste burning/disposal sites in China and Ghana, expressed as toxicity equivalent value (TEQs) in pg/g.

	PCDD/Fs (pg/g TEQ)		
Congeners	**China**	**Ghana 1**	**Ghana 2**
2378-PCDDs	366	10	359
2378-PCDFs	309	21	629
TOTAL 2378-PCDD/Fs	675	31	988

China - sample consisted of mixtures of ash, partially burned small electronic components and partially burned plastic fragments; collected from dumpsite in Longmen village

Ghana 1 - sample consisted of mixtures of ash and soil; collected from burning only site (no disposal) at Agbogbloshie Scrap Market in Accra which situated alongside the Densu River

Ghana 2 – sediment sample from a lagoon adjacent to disposal and burning areas, Agbogbloshie Scrap Market in Accra

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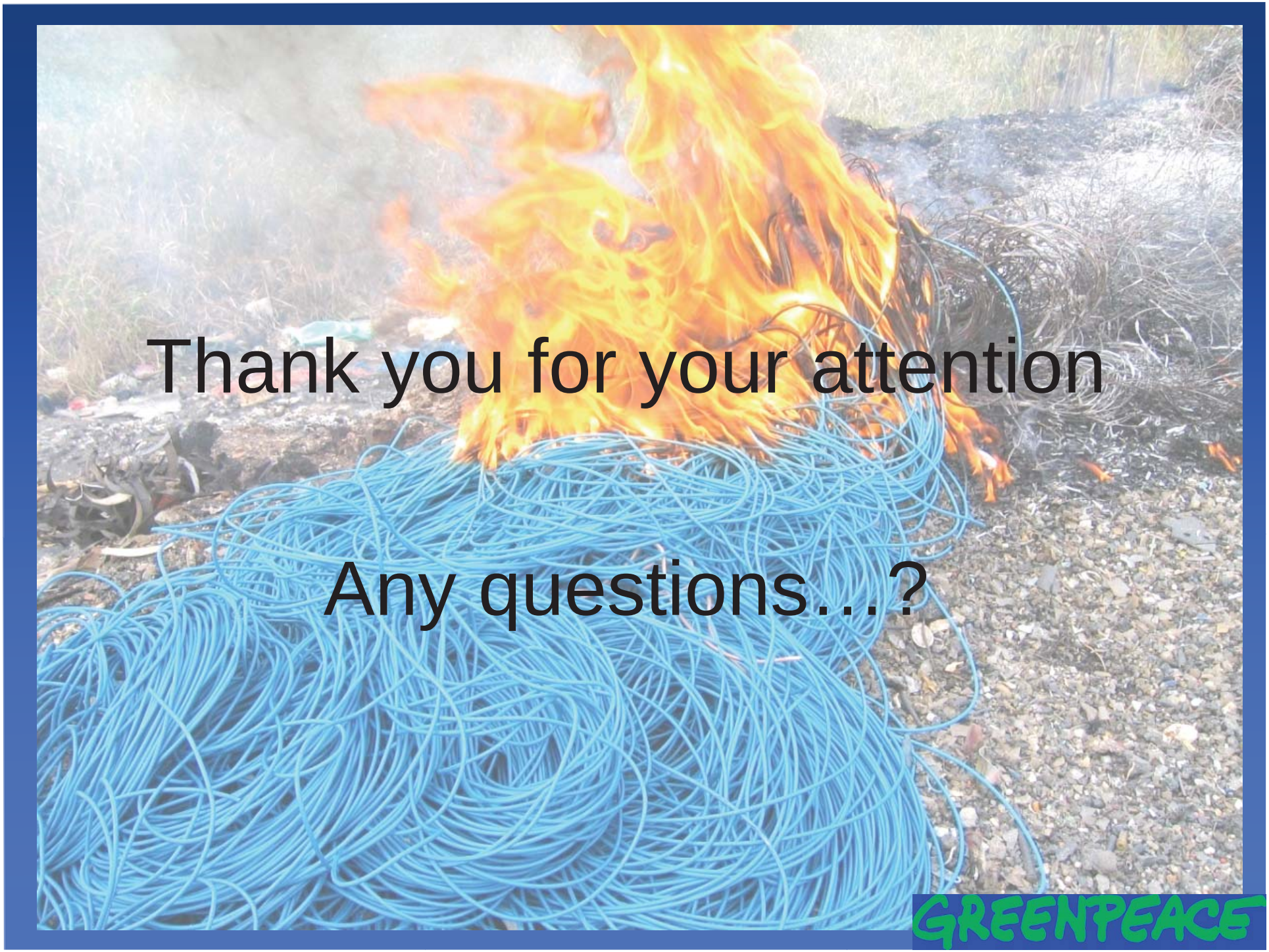
Thank you for your attention
Any questions…?
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