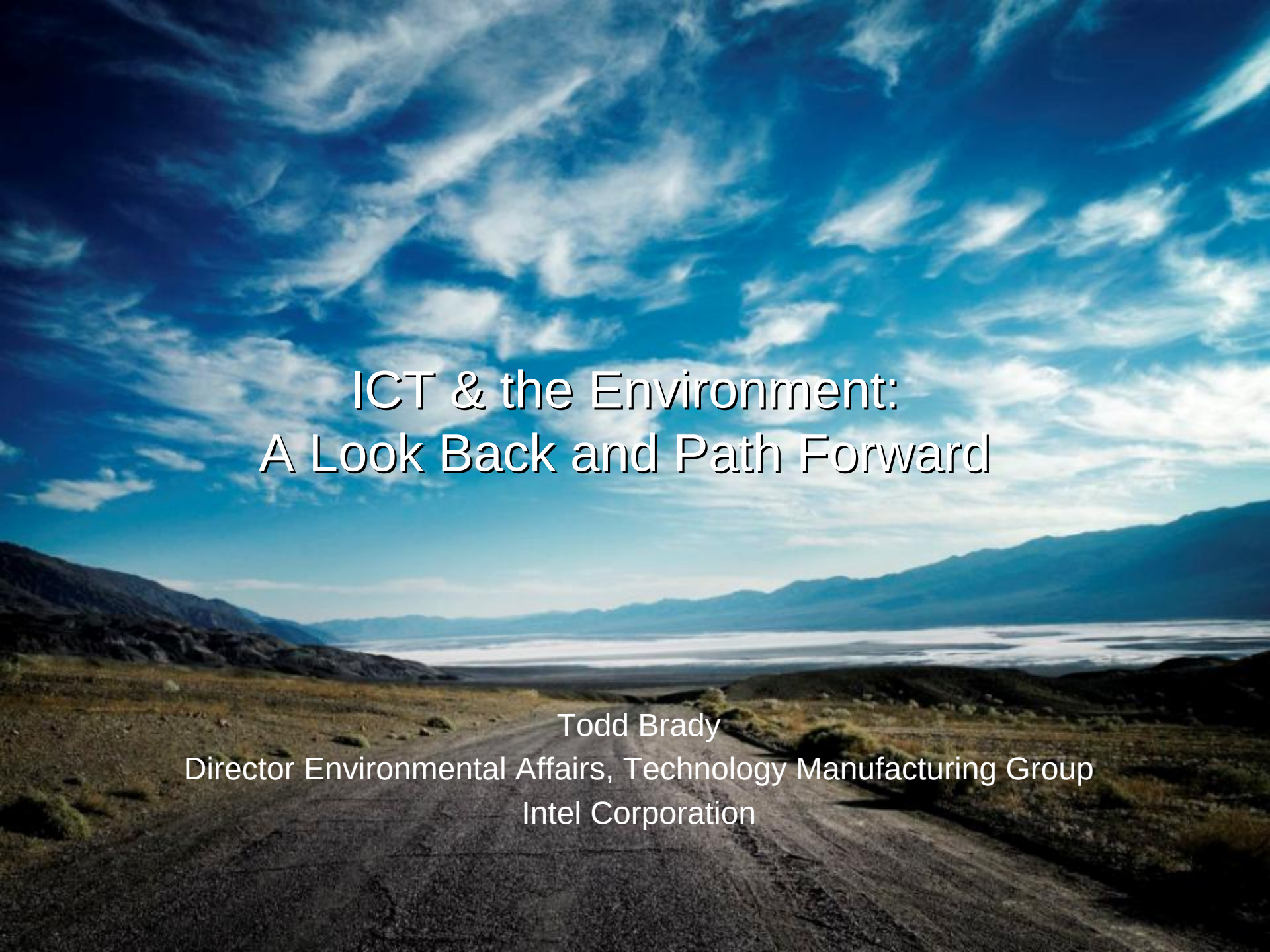


ICT & the Environment: A Look Back and Path Forward

Todd Brady
Director Environmental Affairs, Technology Manufacturing Group
Intel Corporation

Reducing Environmental Impact

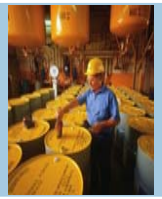
Air Pollution

Global Warming Gases

Energy

Water

Chemicals



Logistics & Transport

Wastewater

Chemical Waste

Solid Waste

Reducing Environmental Impact

Intel wins the California Clean Air Award for outstanding leadership

Intel pledges to reduce global GHG emissions by 30% per production unit

CLIMATE LEADERS
U.S. Environmental Protection Agency

Intel Ireland certified to IS393 Energy Management Systems Standard

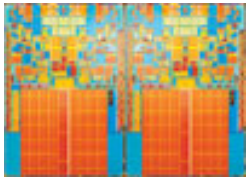
Intel pursues LEED certification for fabrication plants and buildings

Packaging reductions of 16-40% decreased number of shipments and fuel consumed

Intel's Ocotillo Campus wins EPA Water Efficiency Leader Award

Over 3 million gallons of water is reclaimed each year using special collection systems

Intel's newest 45nm processors to go lead free and halogen free



Intel, regulators and neighbors join together to reduce waste and increase recycling

Project XL

Solid waste and consumer recycling initiatives reduce E-waste

intel

Intel's Public Environmental Goals

Reduce absolute global-warming gas footprint by 20% by 2012 from 2007 levels.
Reduce energy consumption per chip 5% per year from 2007 through 2012.
Achieve engineering and design milestones to ensure that Intel products keep the energy-efficiency lead in the market for our next two product generations.
Reduce water use per chip[1] by 2012 from 2007 levels.
Reduce generation of chemical waste per chip by 10% by 2012 from 2007 levels.
Recycle 80% of chemical and solid waste generated per year.

1 Assuming a typical chip size of approximately 1cm2. (Chips vary in size depending on the specific product.)

Intel's Environmental Focus

Sustainable Operations

Products & Technology

Industry Initiatives

A look back: Lead-free

- Environmental policy approach is to ban use of lead
  - Well documented toxicity issues and correlation with selected uses (e.g. paints, leaded gasoline) but not electronics.

- RoHS compliance cost estimated at $32B (Technology Forecasters 2008)

What did we achieve with the investment?

Lead Emissions by Product in EU15 (2000)

Products	Pb Prod.	Product Use				Waste Treat.	
	Air	Air	Water	Sediment	Soil	Air	Soil
Batteries	0.21					0.03	0.02
Lead Sheet	0.04				0.89	0.01	0.01
Water Pipes			0.28				
Other Extrudes	0.01						
Pigments	0.04					0.04	0.31
Ammunition	0.01				8.80		
Alloys	0.01					0.01	0.01
Cable	0.01				0.10		
Petrol	0.01	0.15					
Miscellaneous	0.01			0.03		0.02	0.01
TOTALS:	**0.35**	**0.15**	**0.28**	**0.03**	**9.79**	**0.12**	**0.36**

Source: "Risks to Health and the Environment Related to the Use of Lead in Products", A. Tukker for DG ENTR, September 20

Data in Kilotonnes/year

Lead-free ICT Environmental Impacts

- Reduced EU lead emissions by 10-30 tonnes/yr (0.1-0.3% of total).
- Positive impact on worldwide lead emissions.

Cost per pound of lead removed from environment:

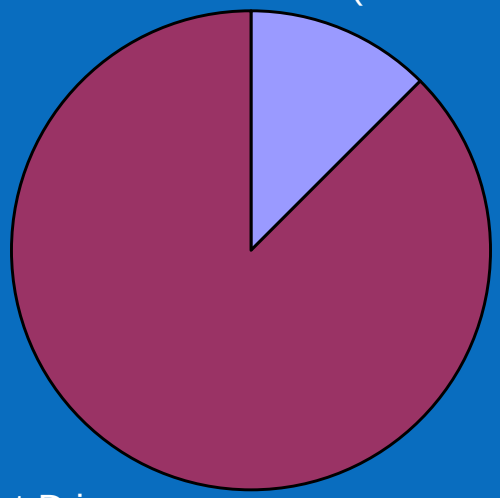
- Assume EU only reductions: ~$500K-1.5M/lb
- Assume worldwide reductions: ~$100K-300K/lb

Price of carbon (Sept 19 – EU trading system):

- $35.46/tonne or ~$0.016/lb

Lead Reduction in PCs – Regulation vs. Market

Cost ~ $Billions



Cost ~ $0; Lead reductions ~10X

Market-driven conversion of desktop PCs to notebook PCs and CRT to LCD monitors has far surpassed impacts of RoHS at no additional cost

Assumptions:

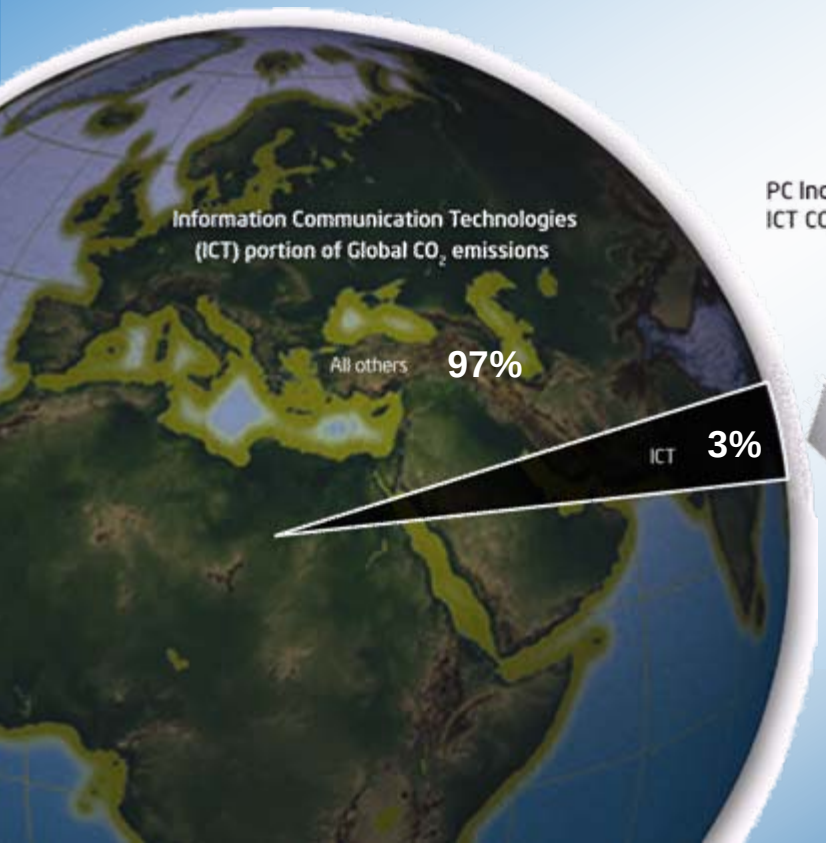
- **36.5 million PCs sold in Western Europe in 2006**
  - **21.9 million Desktop**
  - **14.6 million Notebooks**
- **LCDs used in 50% of desktops**
- **100 g of lead per PC**
- **1 kg of lead per CRT monitor**

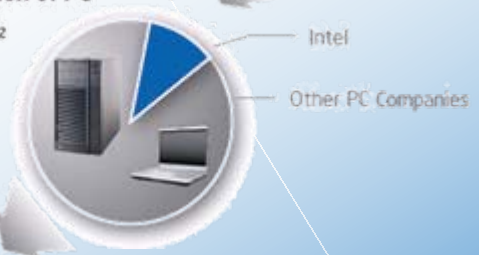
Summary of Key ICT LCAs

Year	Author	Focus	High Impact Stages	High Impact Components
1997	Masafumi Tekawa (NEC)	Desktop and Notebook PC	•Use •Production	Display Main Board
2004	Seungdo Kim (Samsung)	Computer Monitor	•Use •Production	Cathode Ray Tube Printed Circuit Board
2004	EPIC-ICT (Motorola, Philips, Dell)	Desktop PC	•Use •Production	Display Motherboard
1999	Scheller, H. Hoffman, W.F., III (Motorola)	Pager	•Material Extraction •Use •Production	Precious Metals
2005	Pranshu Singhal, Project Mgr IPP (Nokia Corp)	Mobile Phone	•Use •Production	PWBs: Raw Material Acquisition and Manufacture

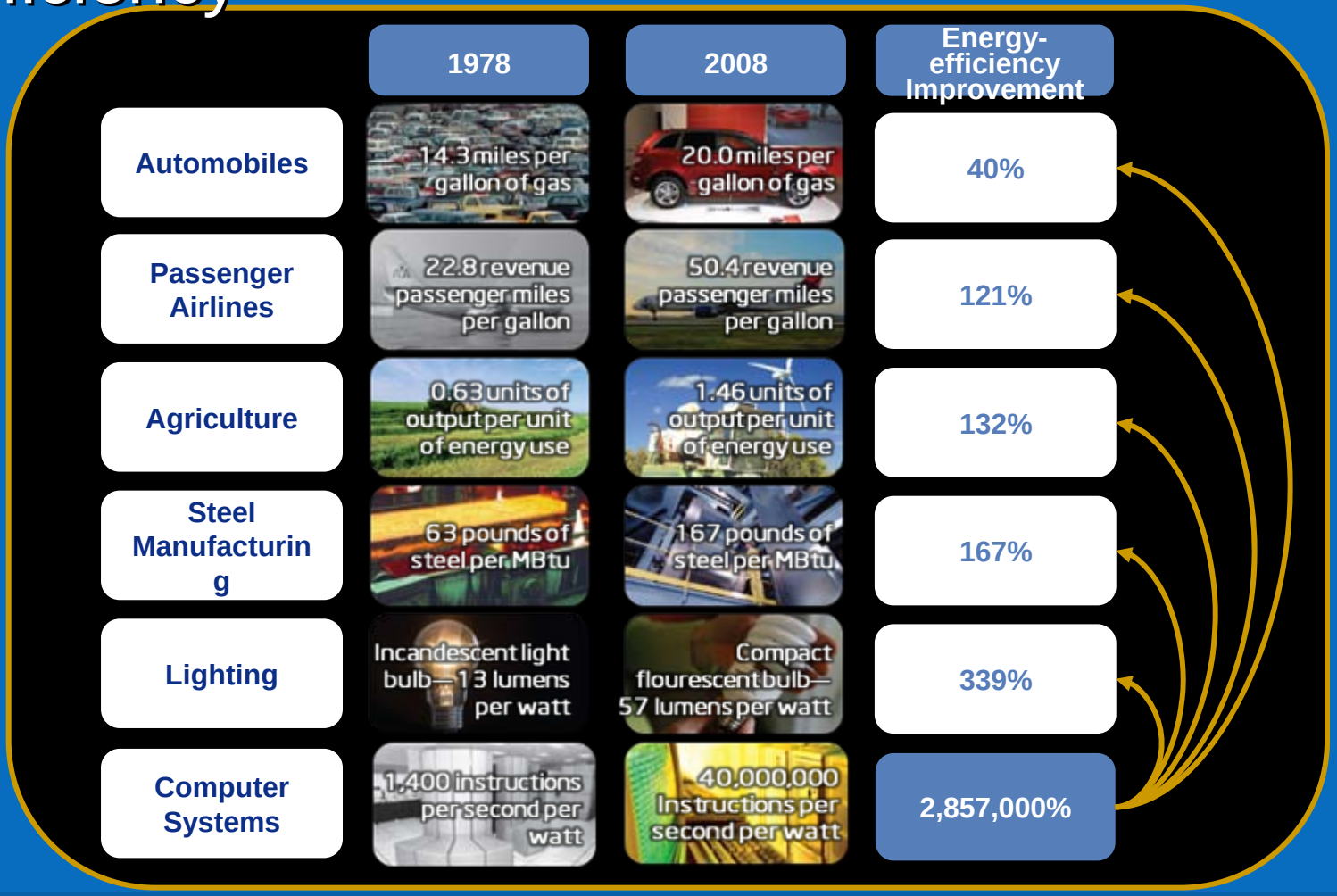
Lead, halogens and e-waste
are not primary environmental impacts

Glimpse at the "Use phase"
Intel & ICT Carbon Footprint as a Portion of Global Emissions





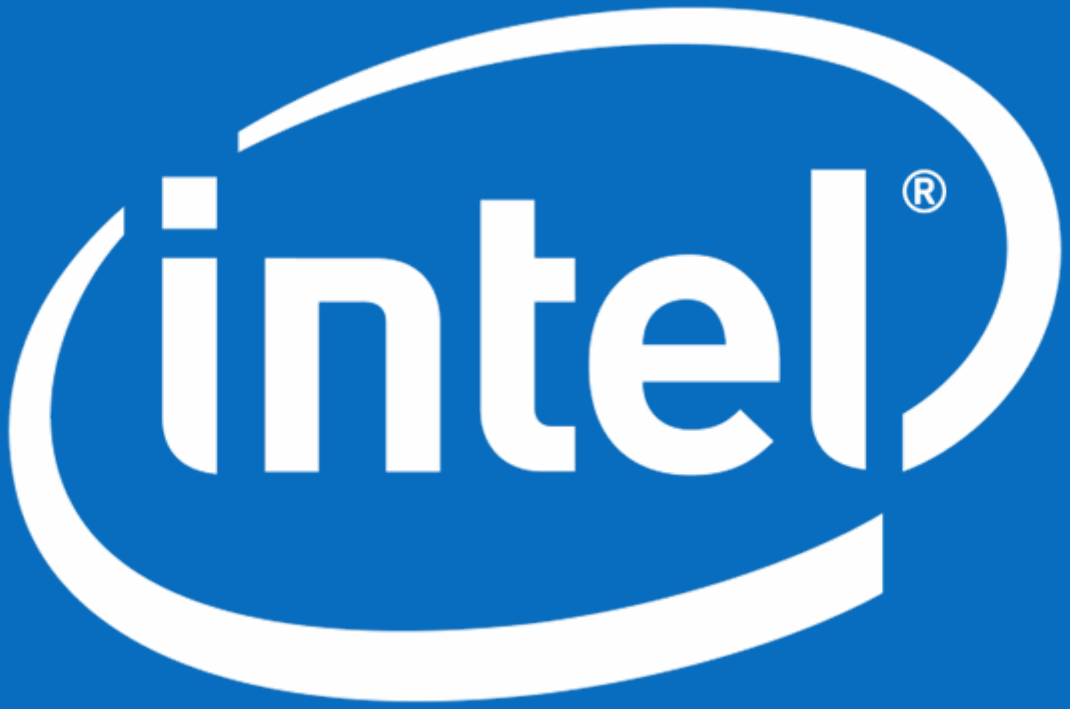
Greater Role of ICT in Enabling Energy Efficiency



Source: "A Smarter Shade of Green," ACEEE Report for the Technology CEO Council, 2008.

Together We Can

- Enable the right environmental policy
- Identify primary environmental impacts and proactively reduce our impact
- Maximize the potential of ICT to contribute to global environmental efficiency
- Utilize iNEMI roadmap exercise toward a path forward


intel


intel