

BFRs – From Source to Lake

Miriam Diamond

Matthew Robson, Lisa Melymuk,
Susie Csiszar

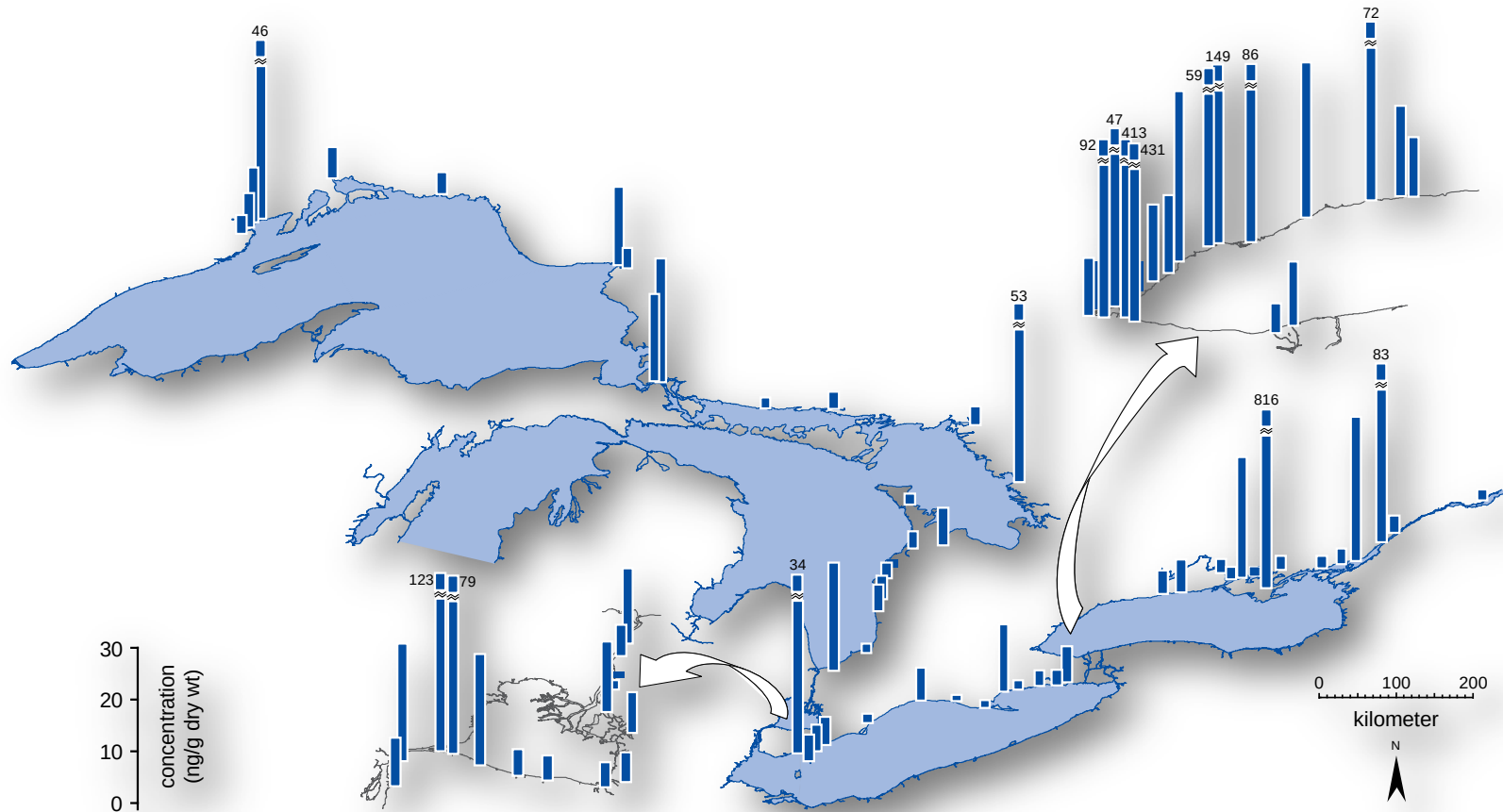
University of Toronto

Paul Helm

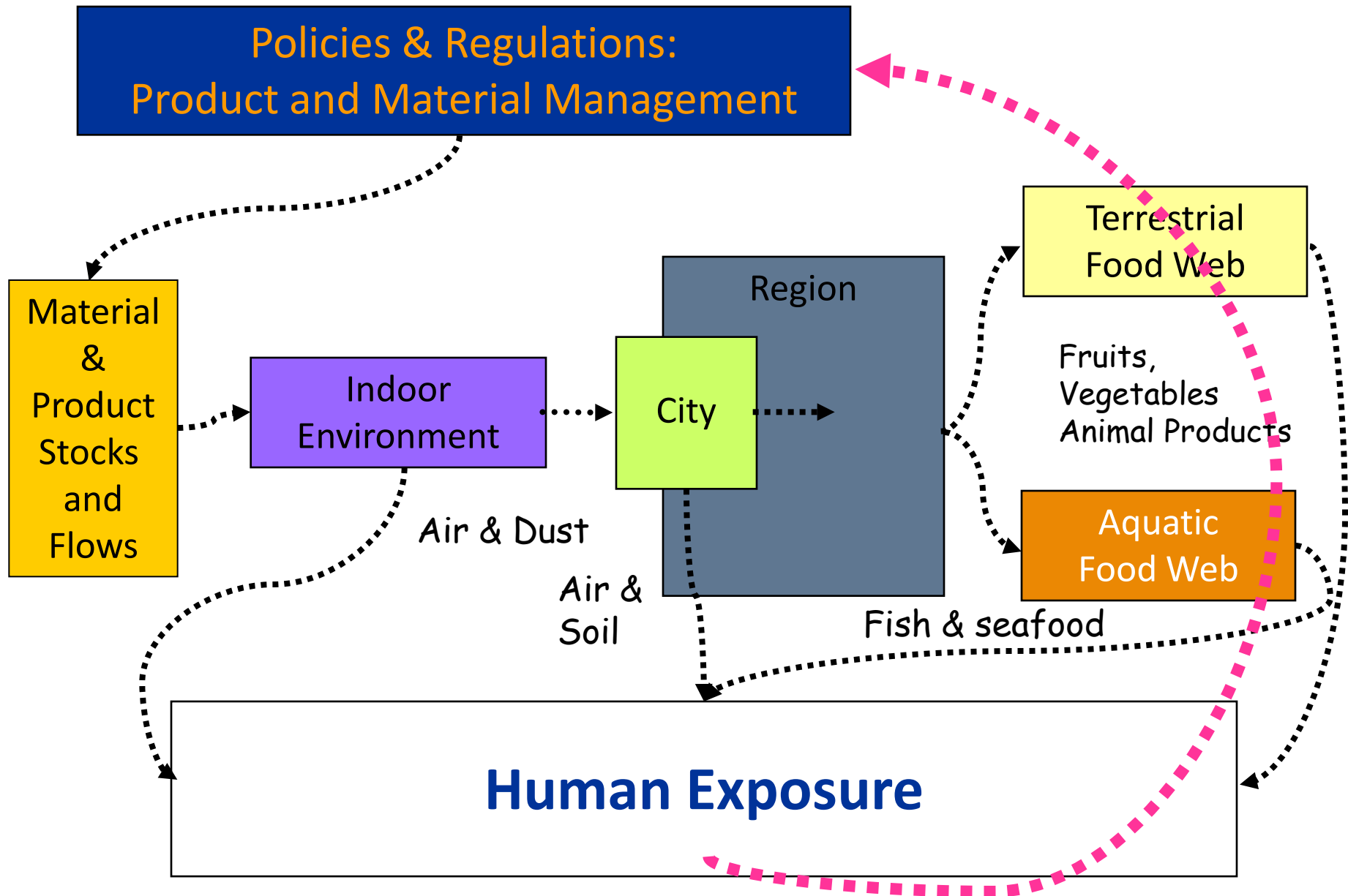
Ontario Ministry of Environment

PBDEs in Great Lakes Tributary Sediments

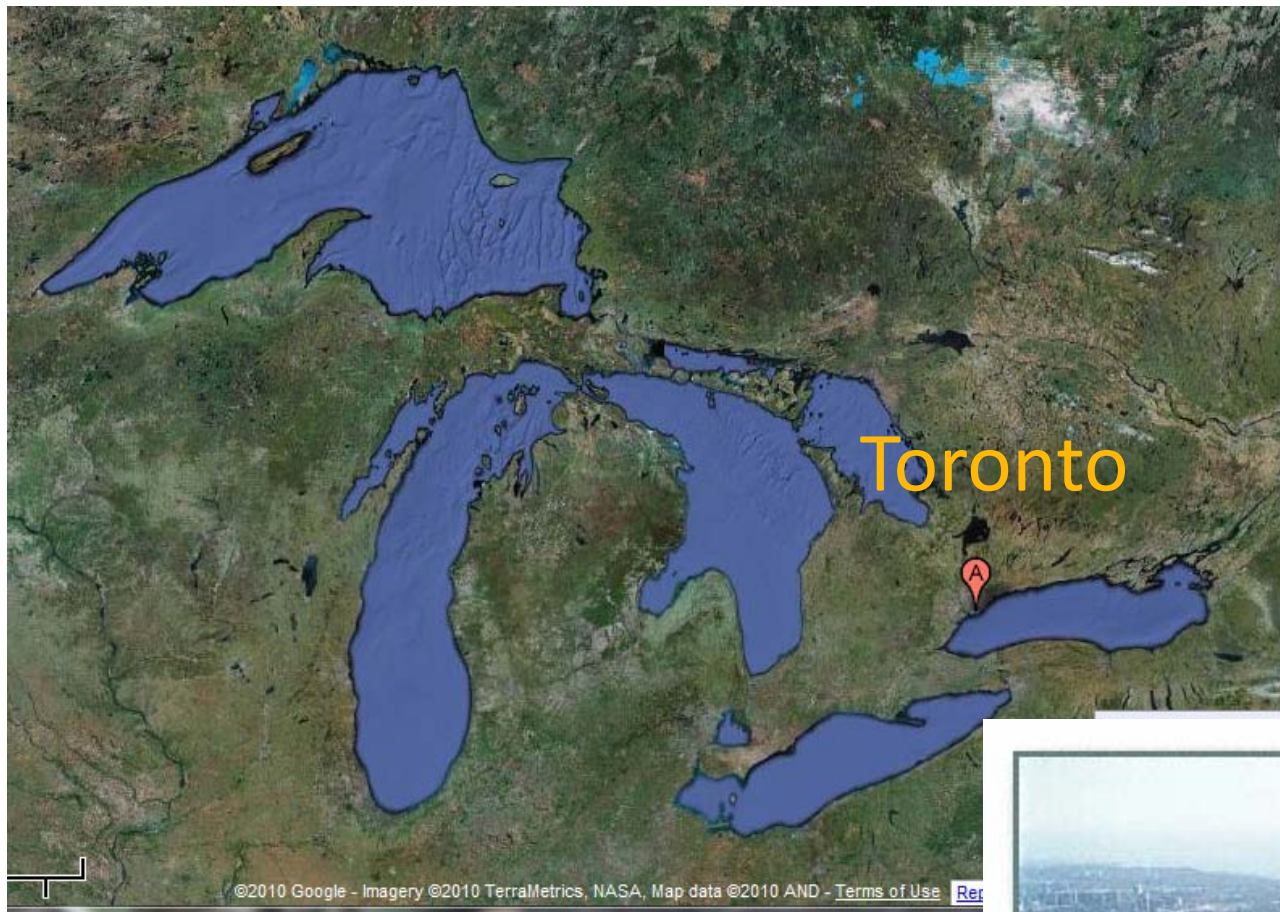
Source: Environment Canada and Ontario Ministry of the Environment



Acknowledgement: Chris Marvin, Environ Canada & Paul Helm, Ont Min of Environ

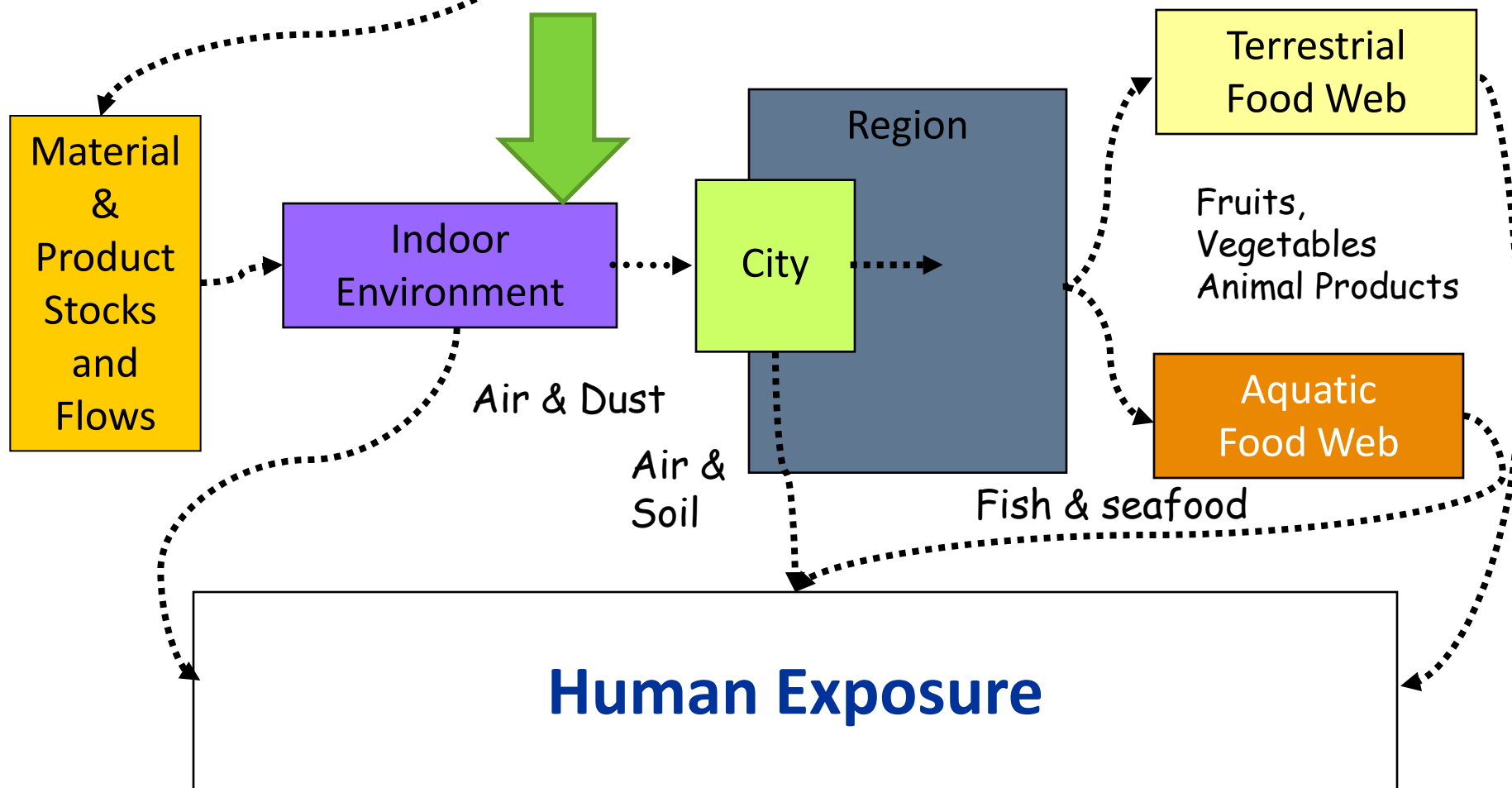


Diamond & Harrad. 2009. The chemicals that will not go away: implications for human exposure to reservoirs of POPs. *Persistent Organic Pollutants: Current Issues and Future Challenges*. S.J. Harrad Chichester, UK, Wiley.



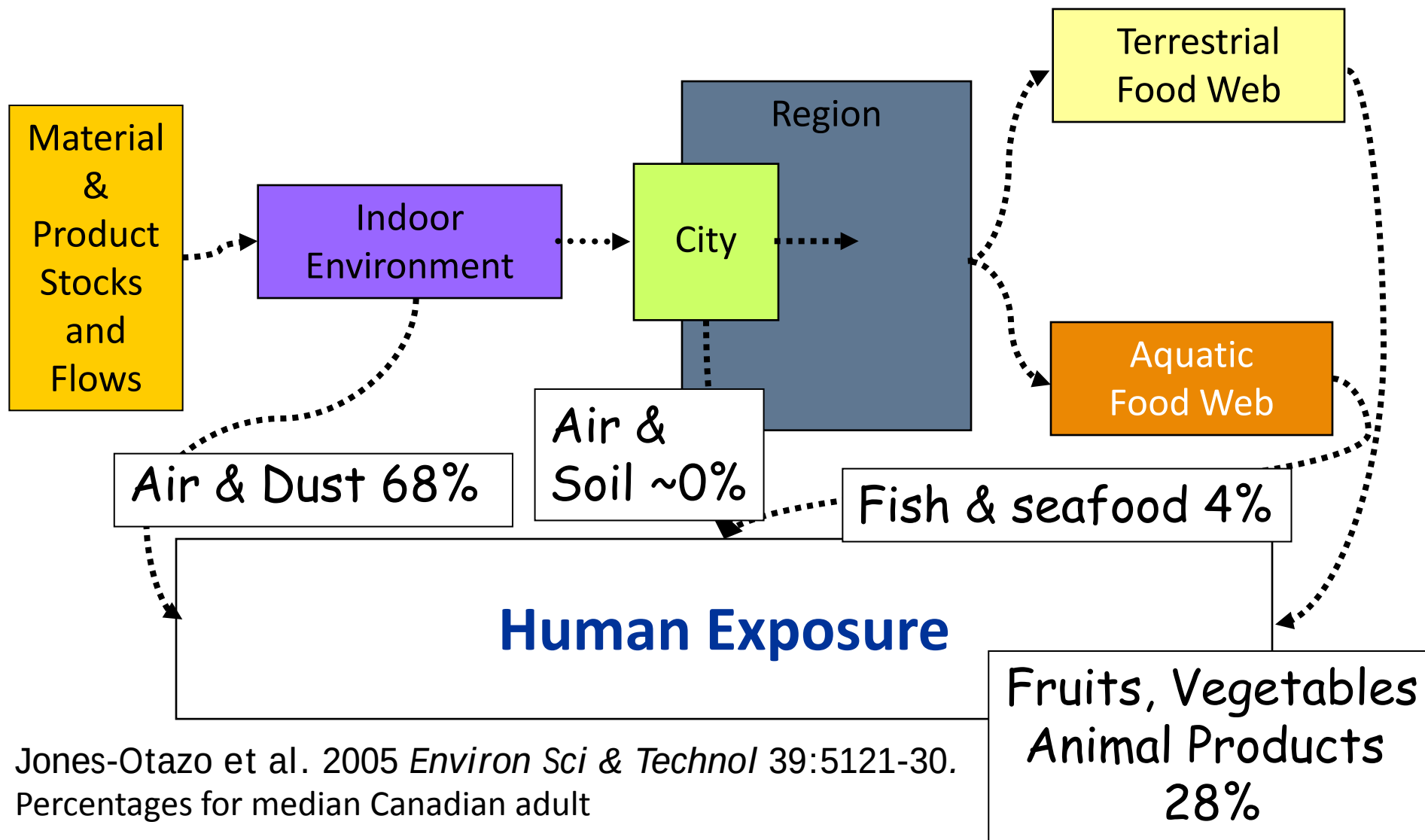
http://www.photography-plus.com/images/Toronto/DowntownToronto090702_96%20copy.jpg

Policies & Regulations: Product and Material Management

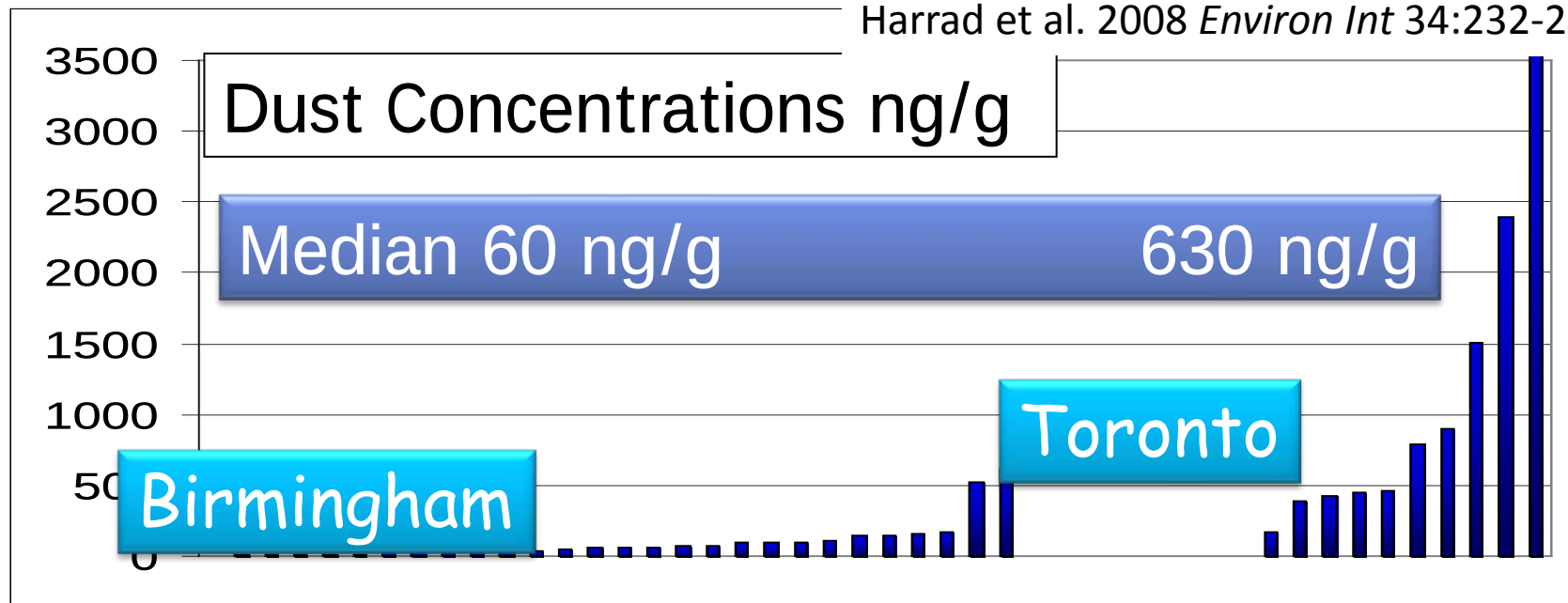


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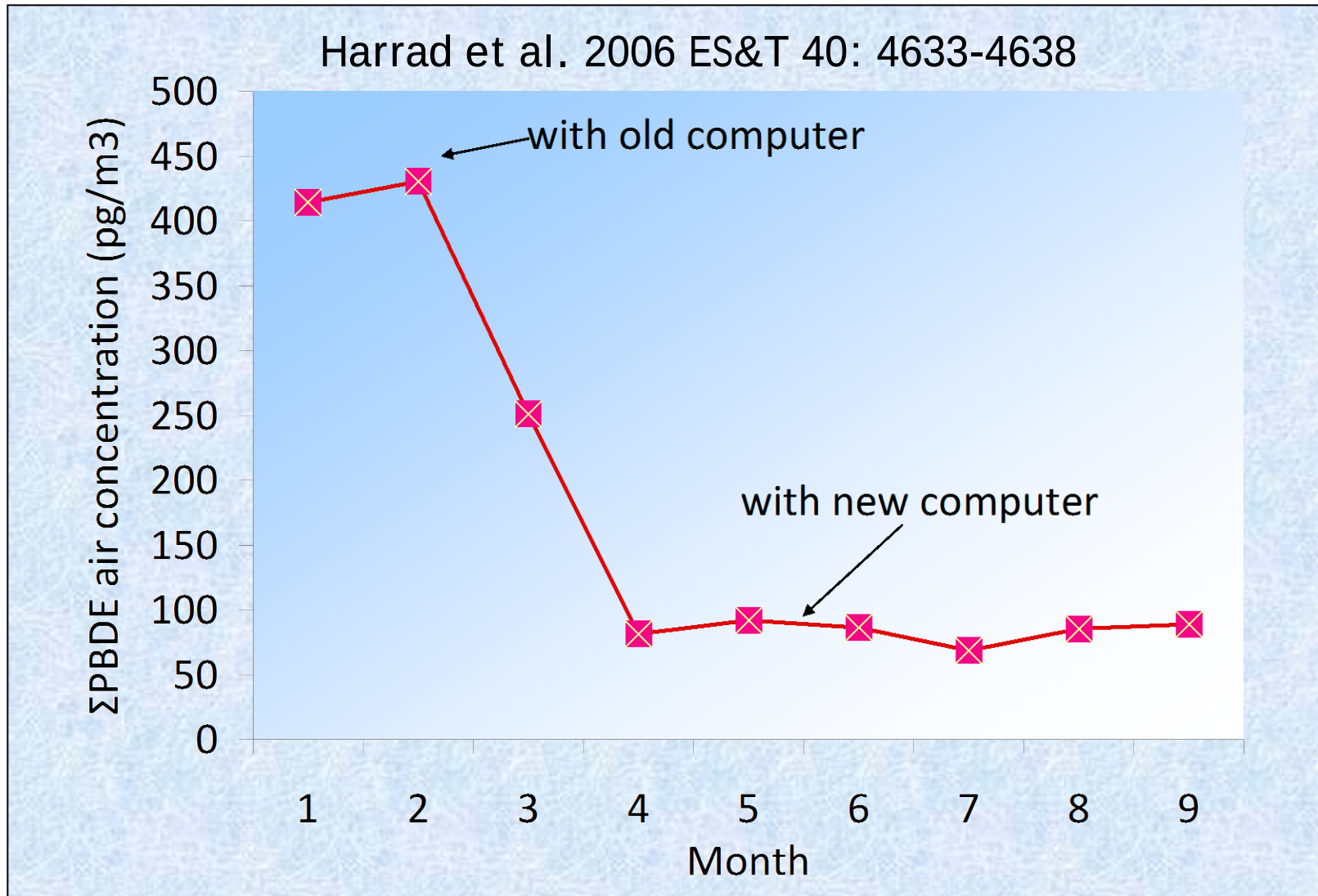
P₇BDEs







PBDE Air Concentrations in Stuart's Office



What are indoor emissions?

Stuart Harrad's Office

Harrad, et al., 2006, ES&T. 40, 4633-4638

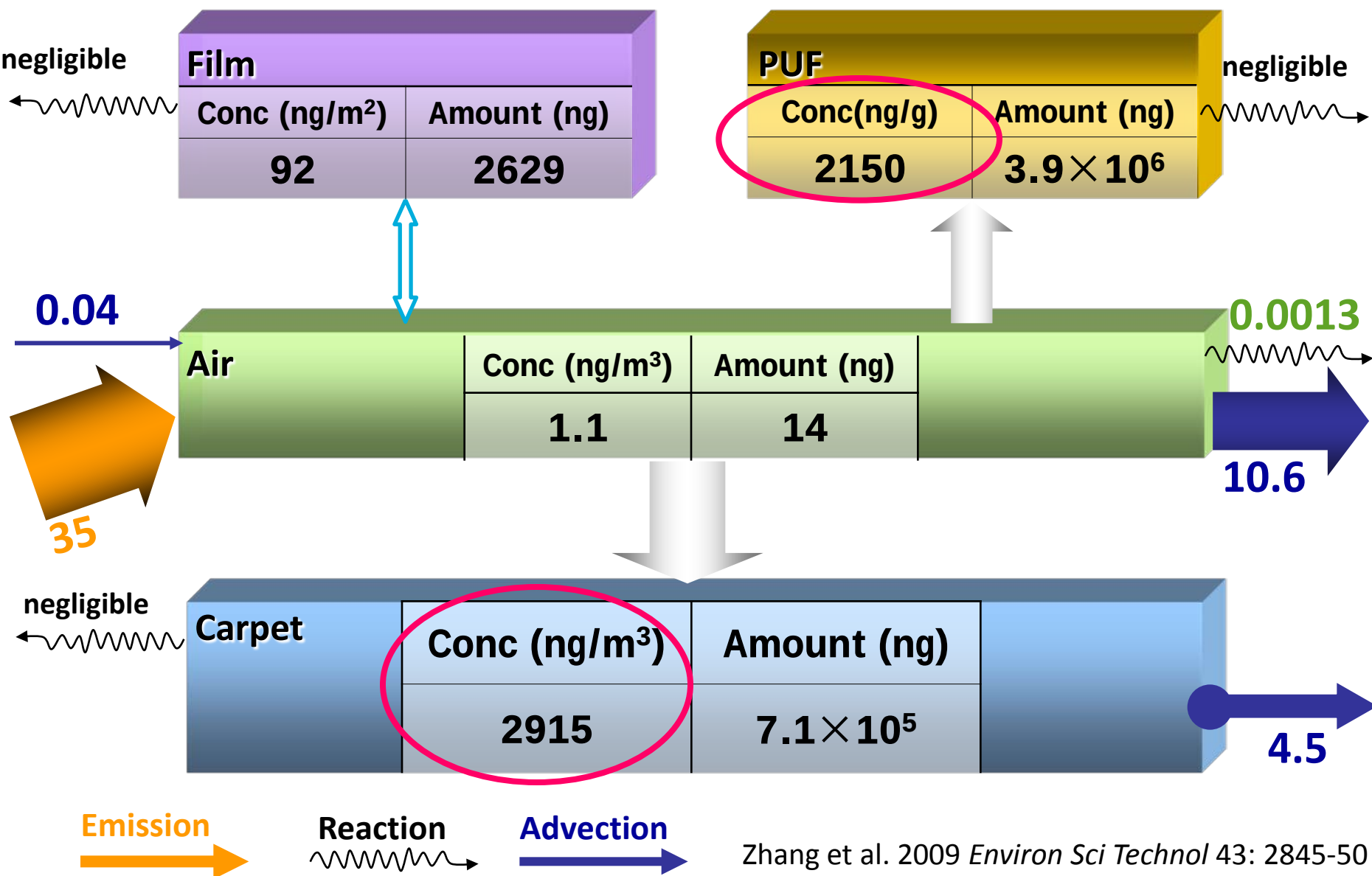


Measured:

$$C_{\text{puf}} = \begin{matrix} 2184\text{ng/g} \\ 47.2\mu\text{g/m}^3 \end{matrix}$$

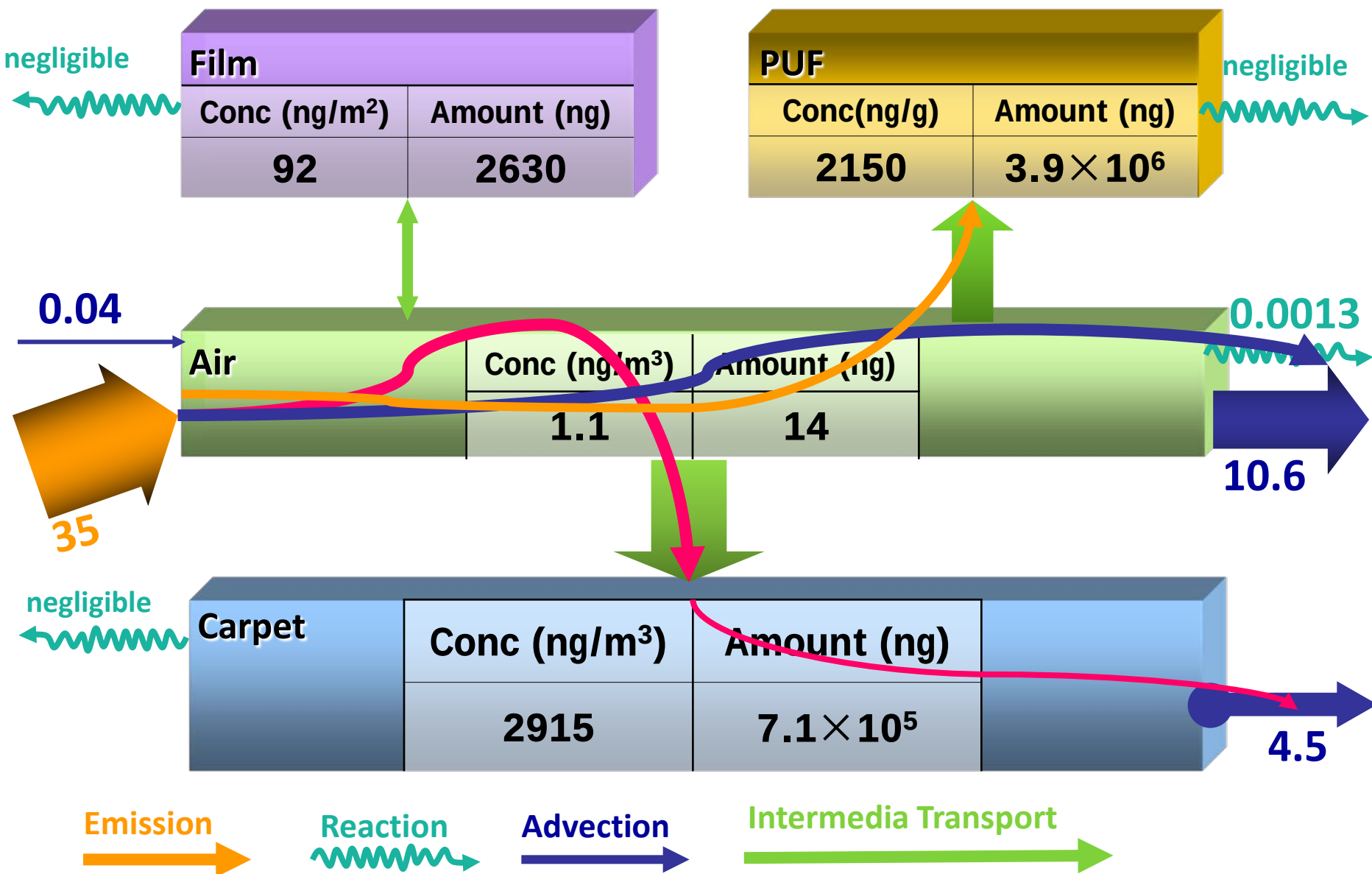
$$C_{\text{carpet}} = \begin{matrix} 148\text{ng/g} \\ 42000\mu\text{g/m}^3 \end{matrix}$$

Indoor Fate of P₇BDEs – old computer



Indoor Fate of P₇BDEs – old computer

Zhang et al. 2009 *Environ Sci Technol* 43: 2845-50

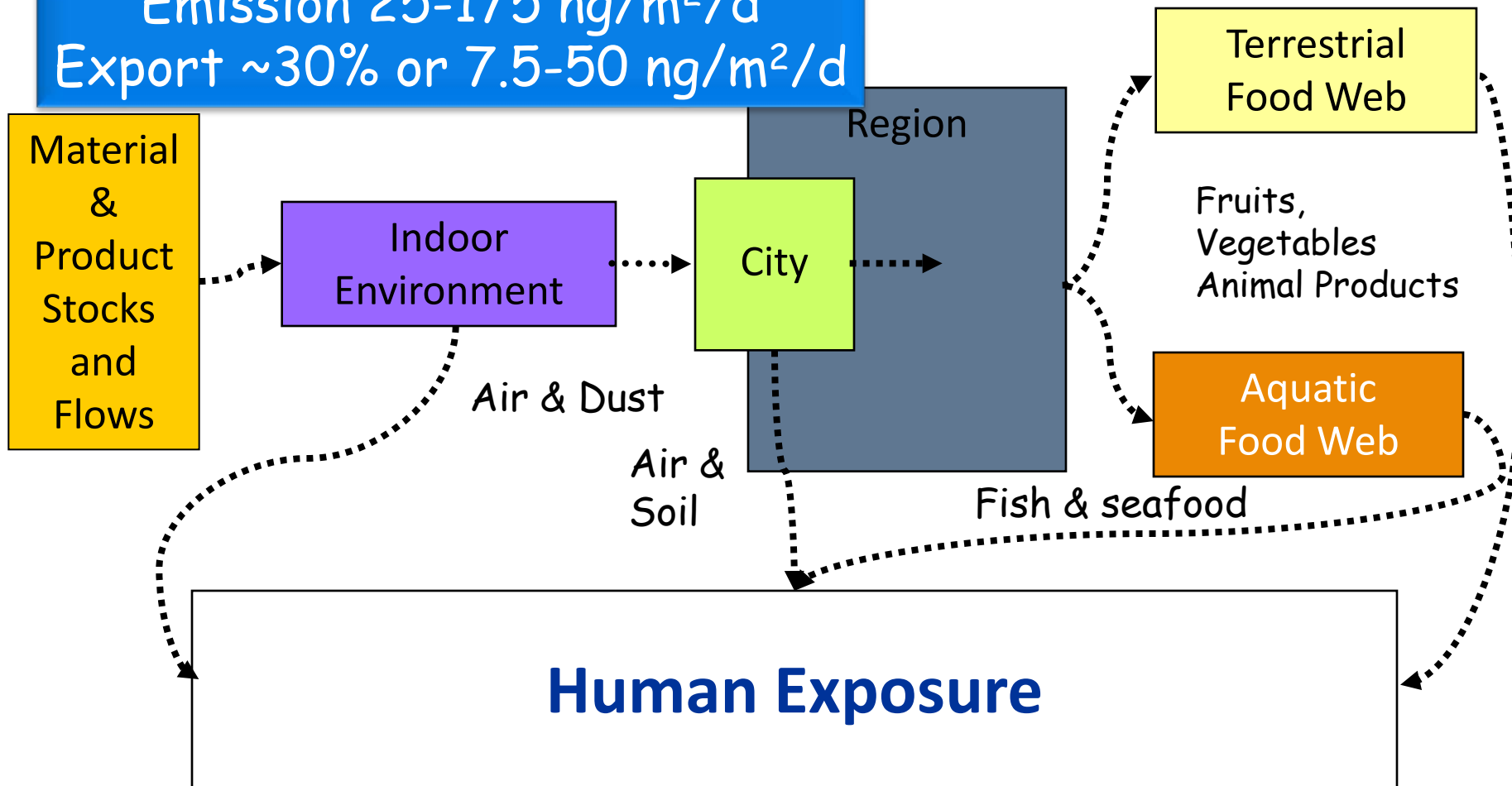


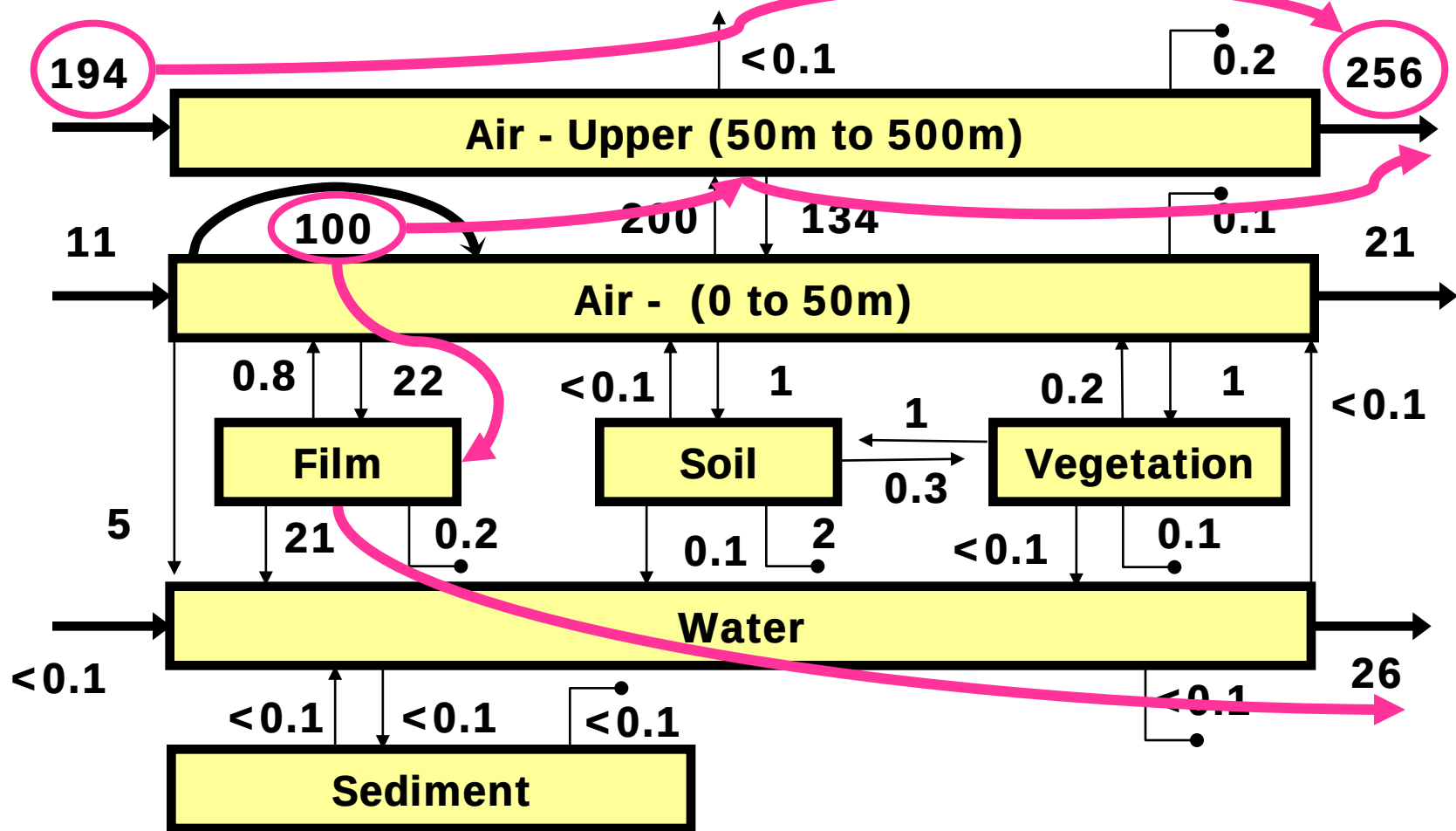
Chemical	Indoor Emission (ug/m ² d)	Chemical Mass (mg)	Residence Time (y)	Annual Release (%)
BPA	1.2-2.5	240	76	1.3
BBP	0.4-13.3	22	27	4
DEHP	4.3-7.7	17000	1175	0.1
PCB	0.8	600	800	0.1
PBDE	0.03-0.2	4.6		0.001

P₇BDEs

Emission 200-800 ng/m²/d
Export 80% or 170-760 ng/m²/d

Emission 25-175 ng/m²/d
Export ~30% or 7.5-50 ng/m²/d

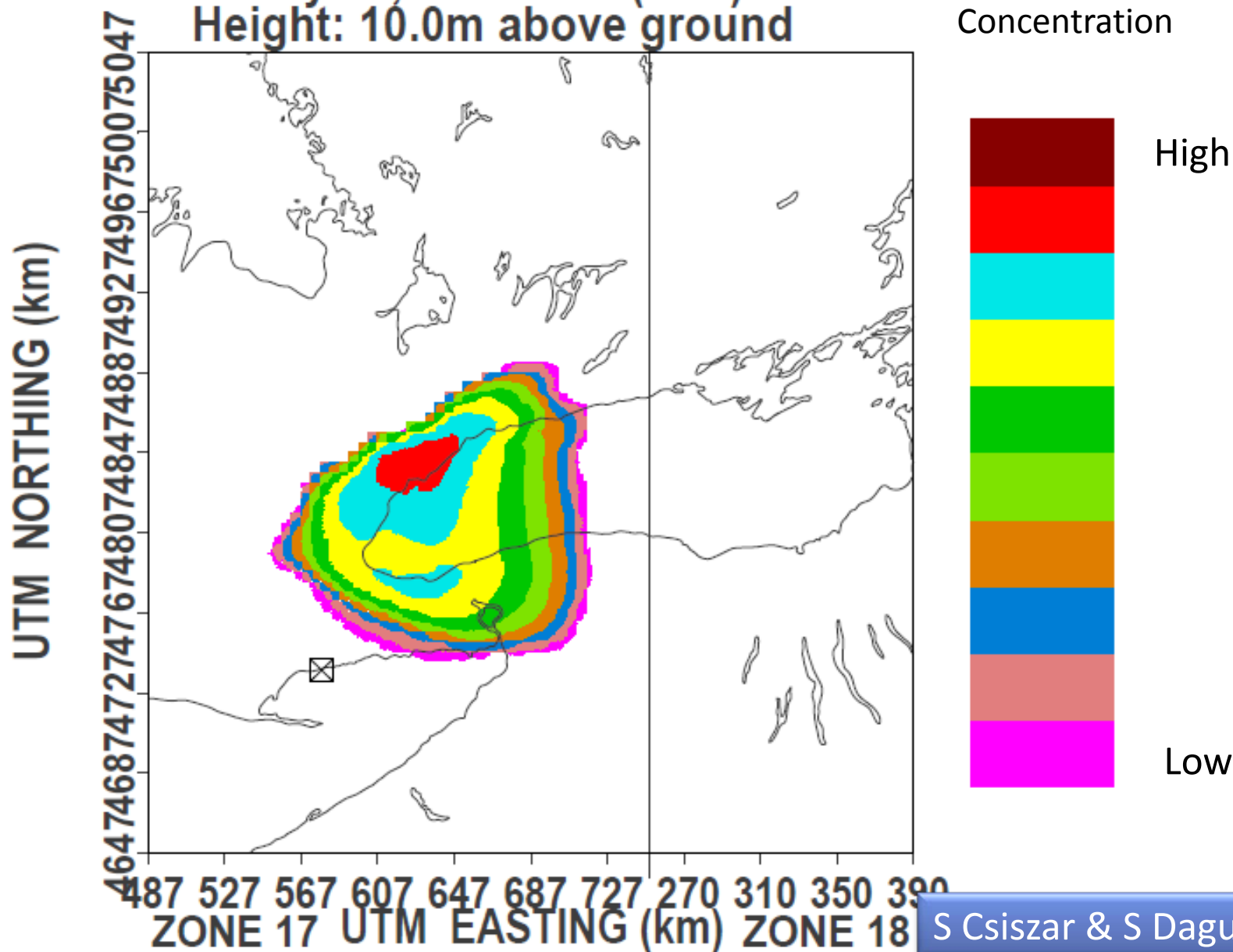




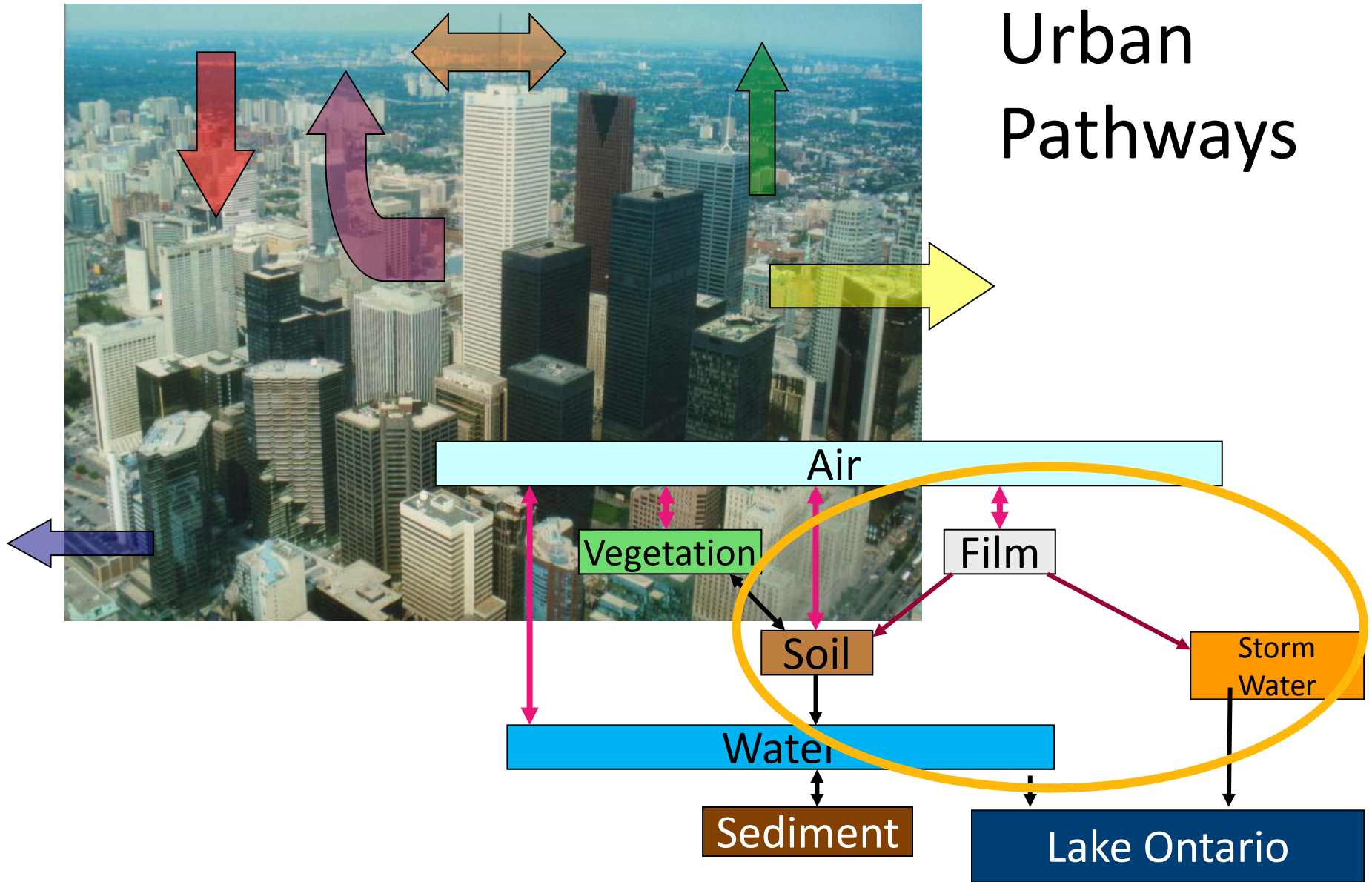
PBDEs

BLFMAPS

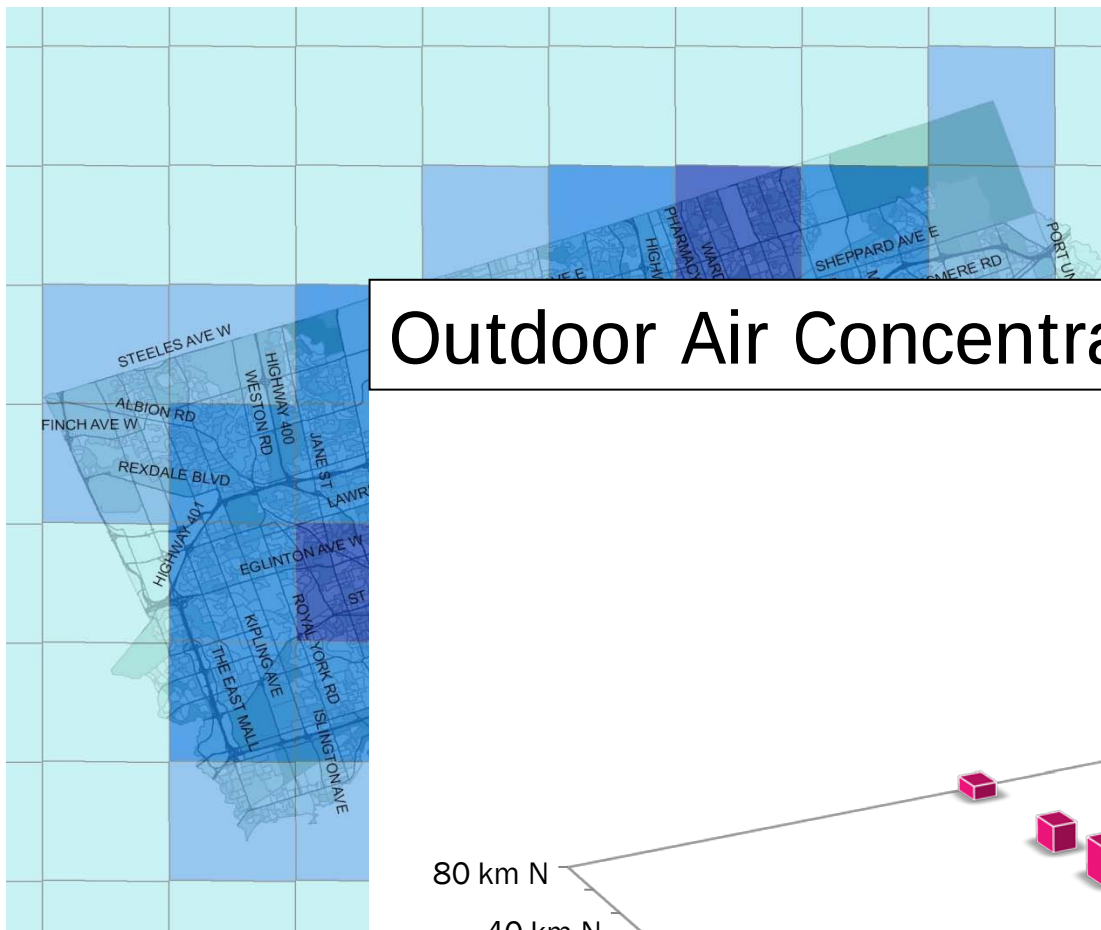
Hourly Averaged Concentration
May 09, 2008 00:00 (LST)
Height: 10.0m above ground



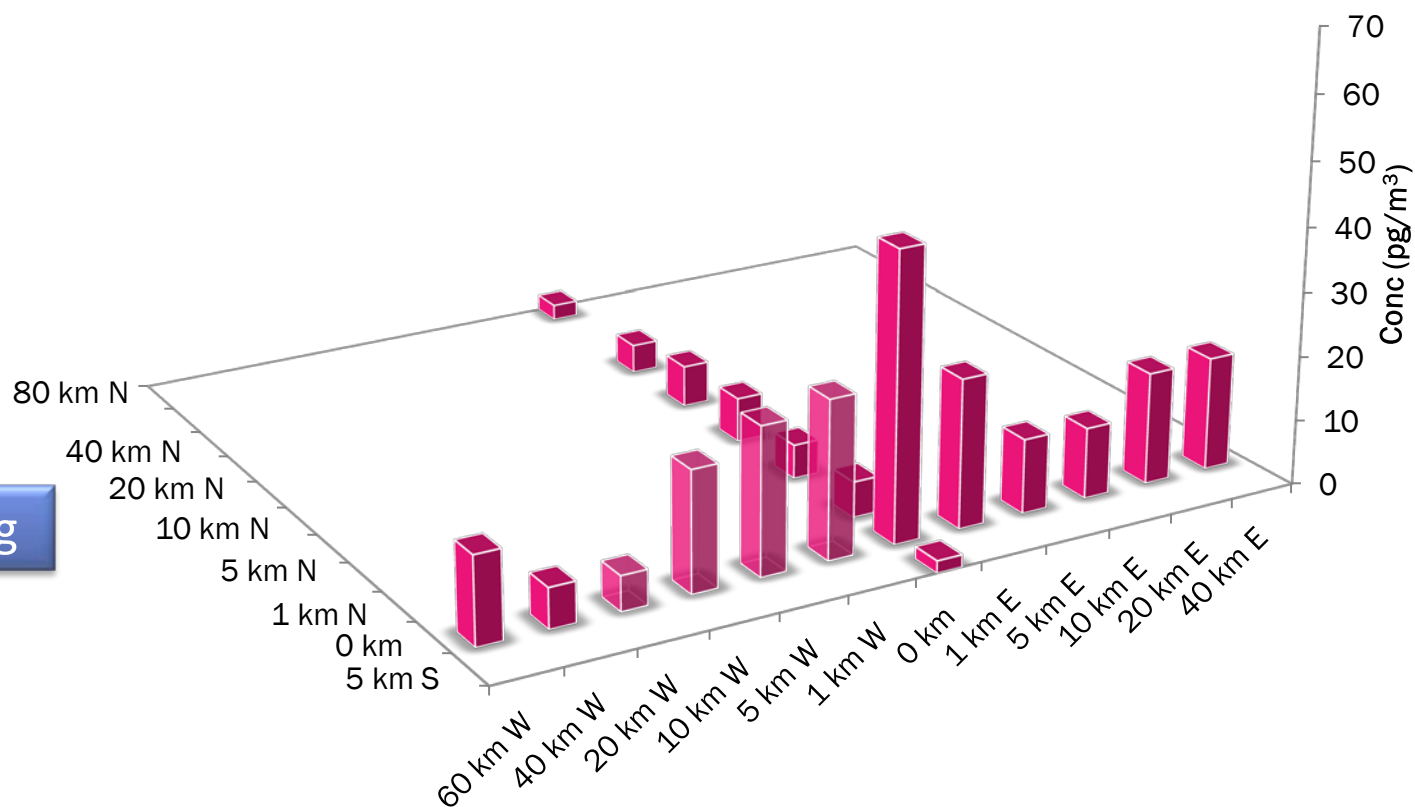
Urban Pathways







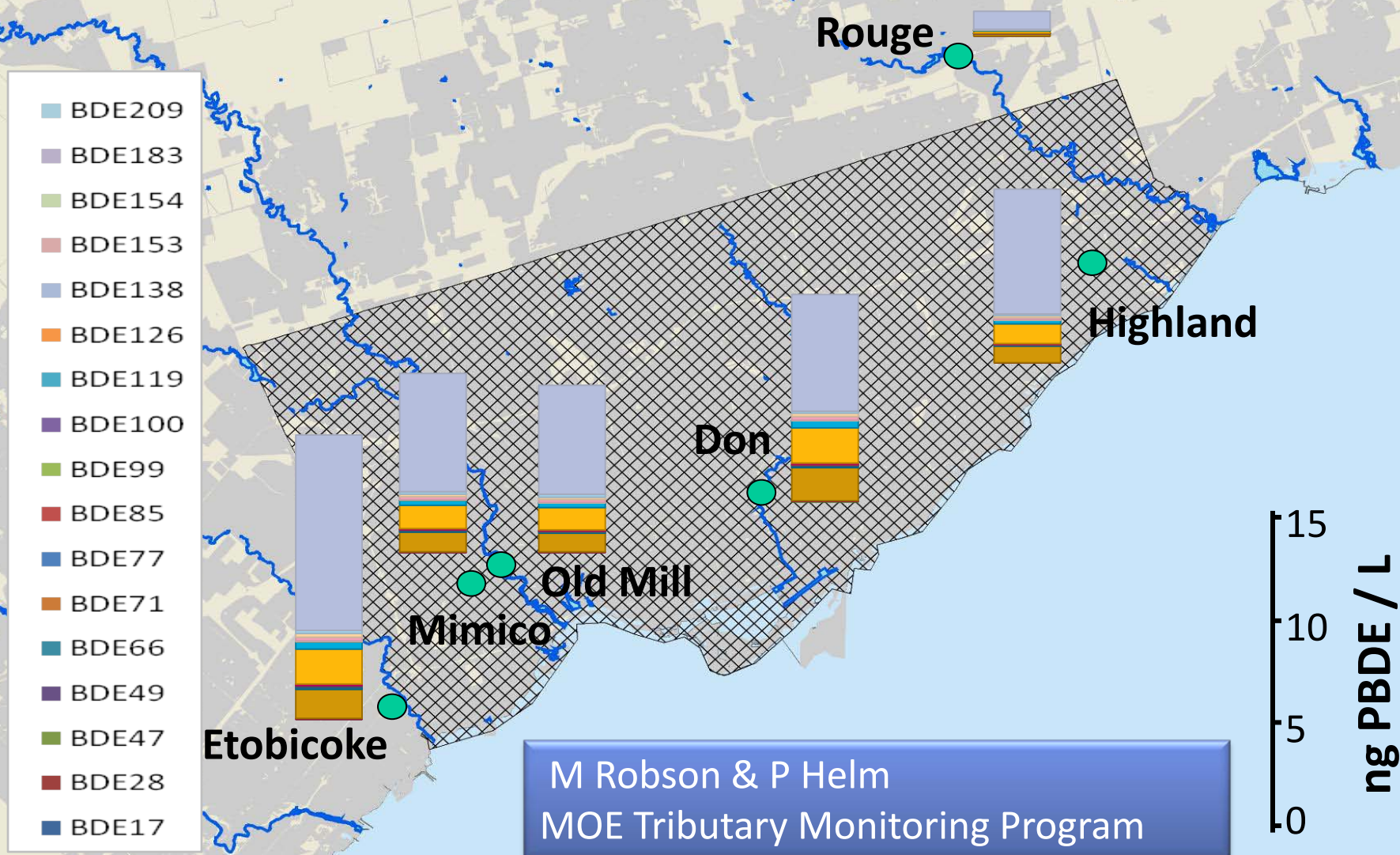
Outdoor Air Concentrations pg/m^3



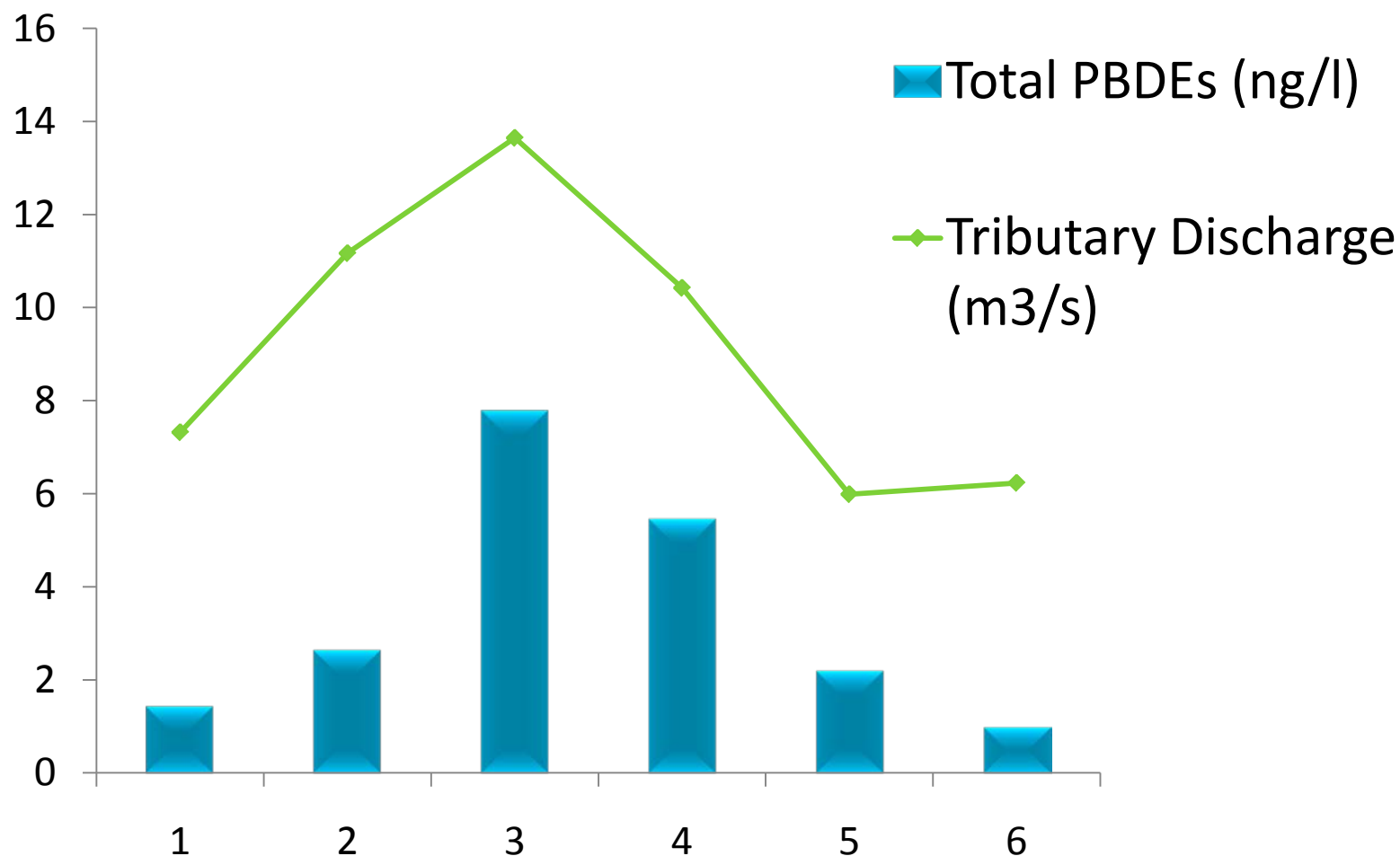
A Giang, V Cheung

L Melymuk

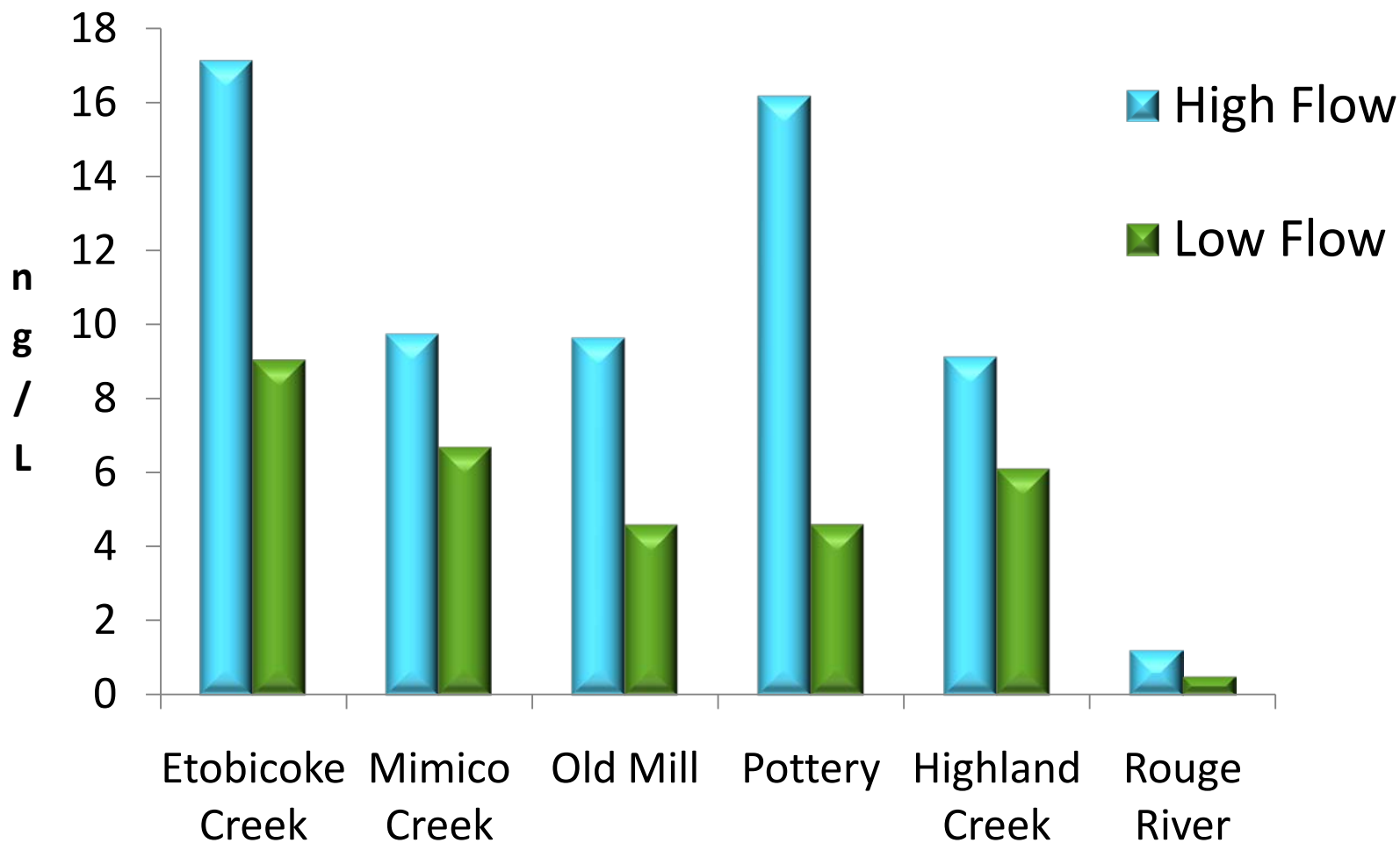
PBDE Concentrations in Tributaries



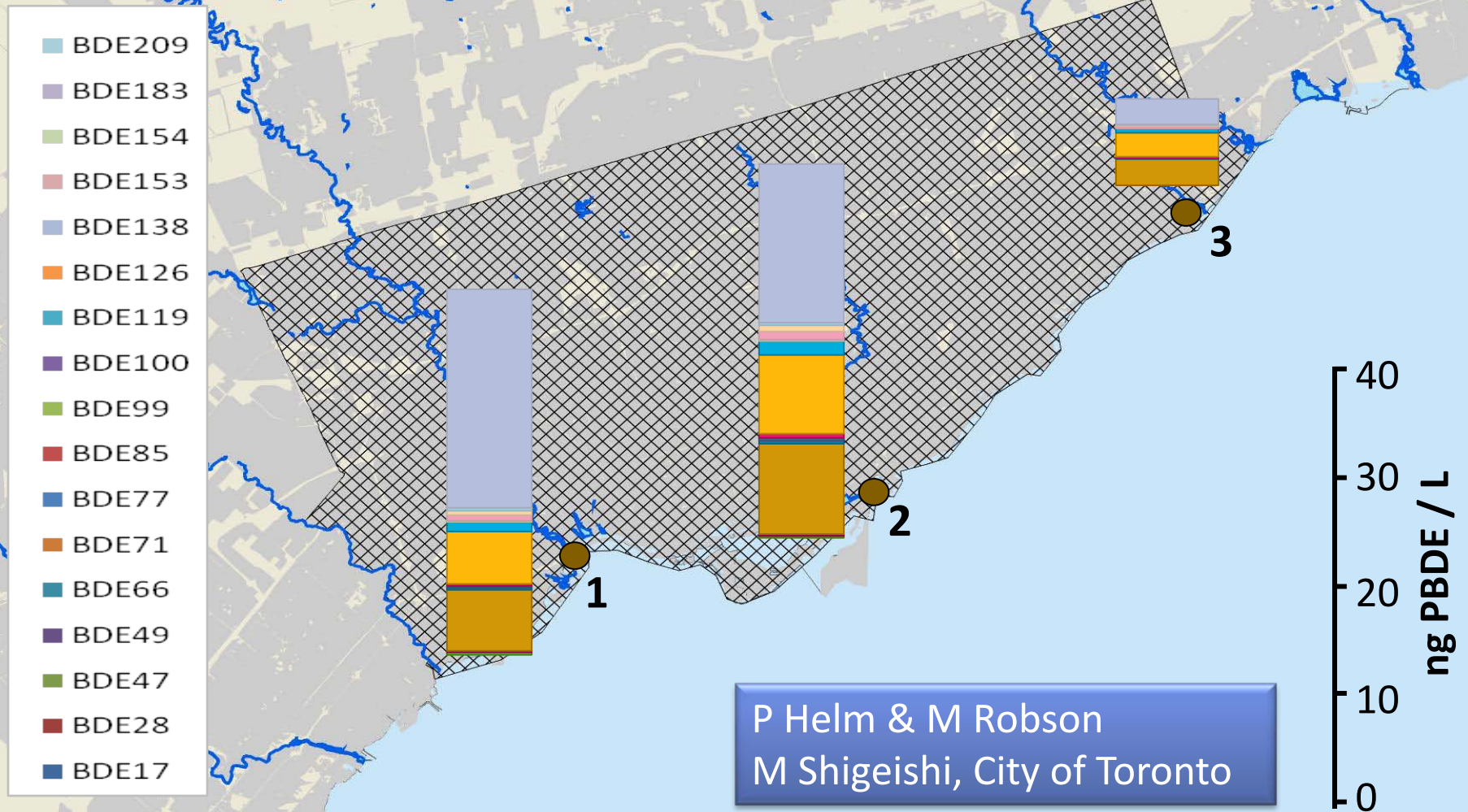
Σ PBDE Conc during high flow event



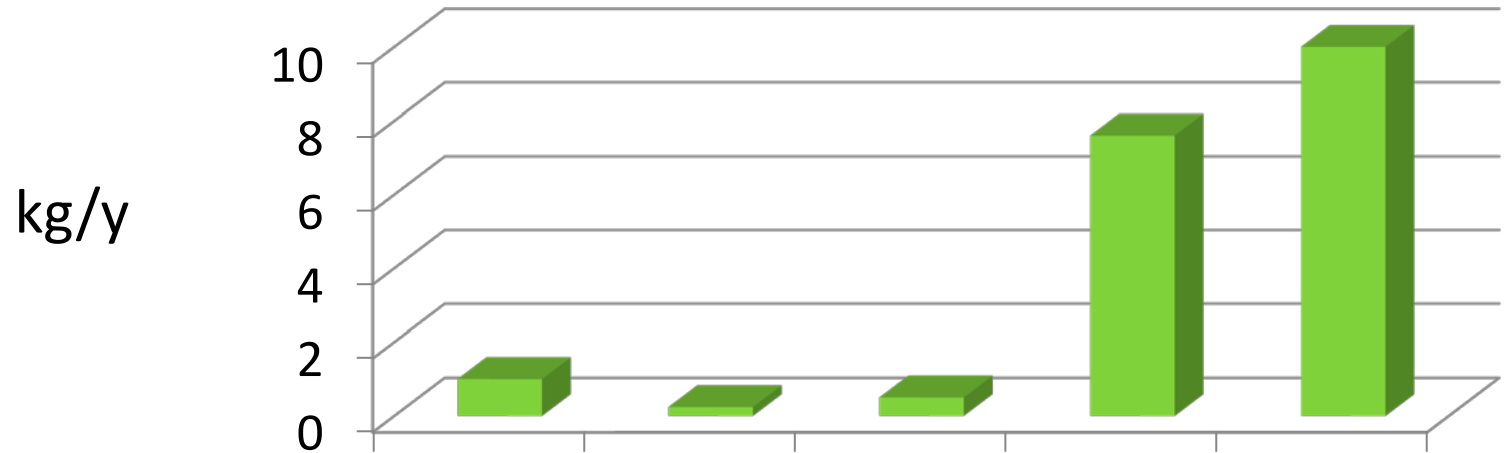
Average Total PBDE Conc (ng/L) in Tributaries during High & Low Flows



PBDE Concentrations in Wastewater Treatment Plant Effluent



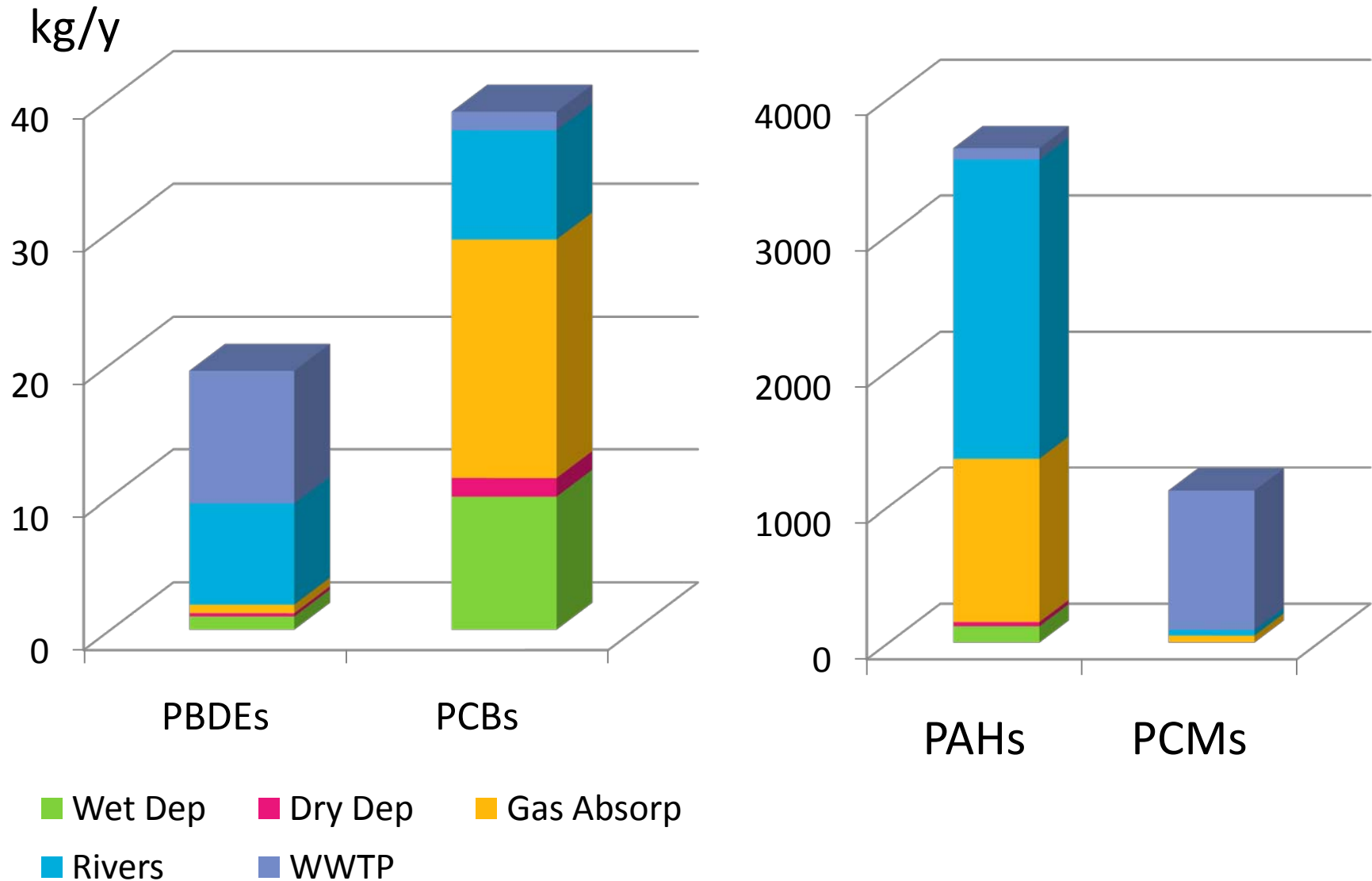
PBDE Annual Loadings to Lake Ontario



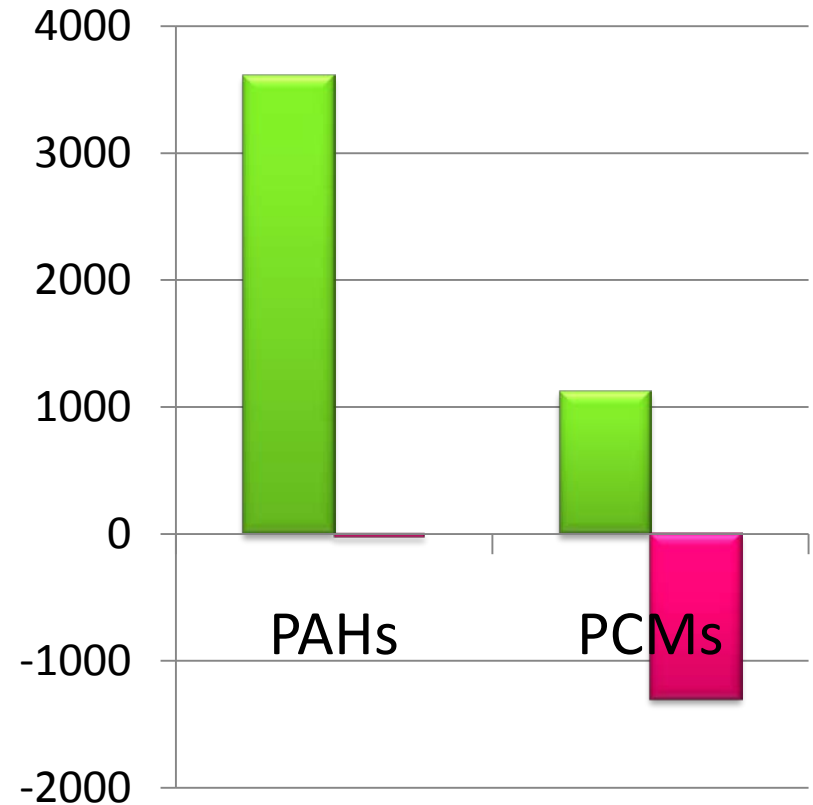
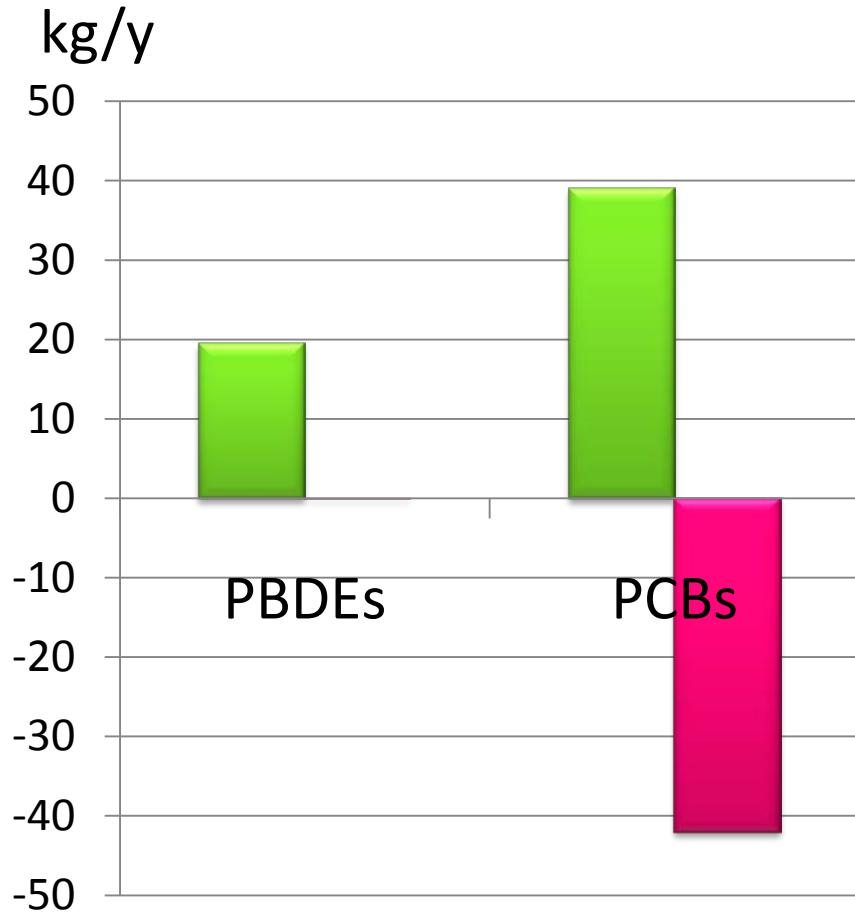
Rivers

WWTP

Comparison of Loadings to Lake Ontario

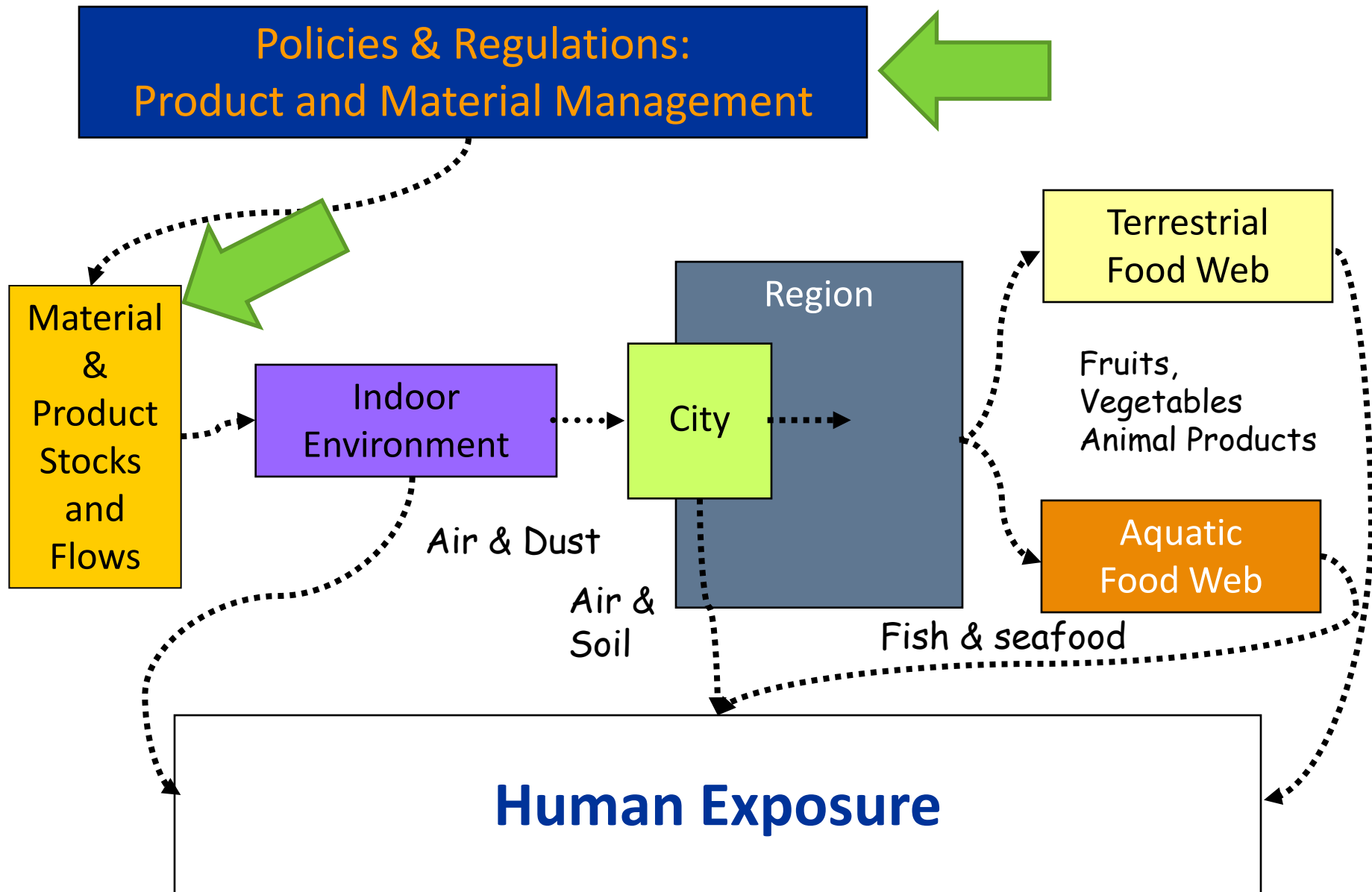


Net Loadings to Lake Ontario



■ Total Loadings

■ Volatilization



Diamond & Harrad. 2009. The chemicals that will not go away: implications for human exposure to reservoirs of POPs. *Persistent Organic Pollutants: Current Issues and Future Challenges*. S.J. Harrad Chichester, UK, Wiley.

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get a \$1

February 27, 2008 1:54 PM PST

Cell phone sales hit 1 billion mark

by Marguerite Reardon

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Sales of cell phones skyrocketed to more than 1 billion in 2007, according to data released Wednesday from market research firm Gartner.

More than 1.15 billion mobile phones were sold worldwide in 2007, a 16 percent increase from the 990.9 million phones sold in 2006, the firm said.

The developing world helped boost sales significantly. And in the developed world, sales of new cell phones was drive by consumers looking for replacement phones with tons of features.

http://news.cnet.com/8301-10784_3-9881022-7.html

Social Risk Migration

Alcock & Busby 2006 *Risk Analysis* 26: 369-381.

Busby et al. 2008 *Environ Sci & Policy* 12: 297-308

Annual Growth Rates

- Plastics 2.5%
- Electronics & electrical goods 4.3%
- Global population 1%



Acknowledgements

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Matt Robson

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Jennifer Sawyer

Susie Csiszar

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- Great Lakes Commission
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- Ontario Min of Environment
- Environment Canada

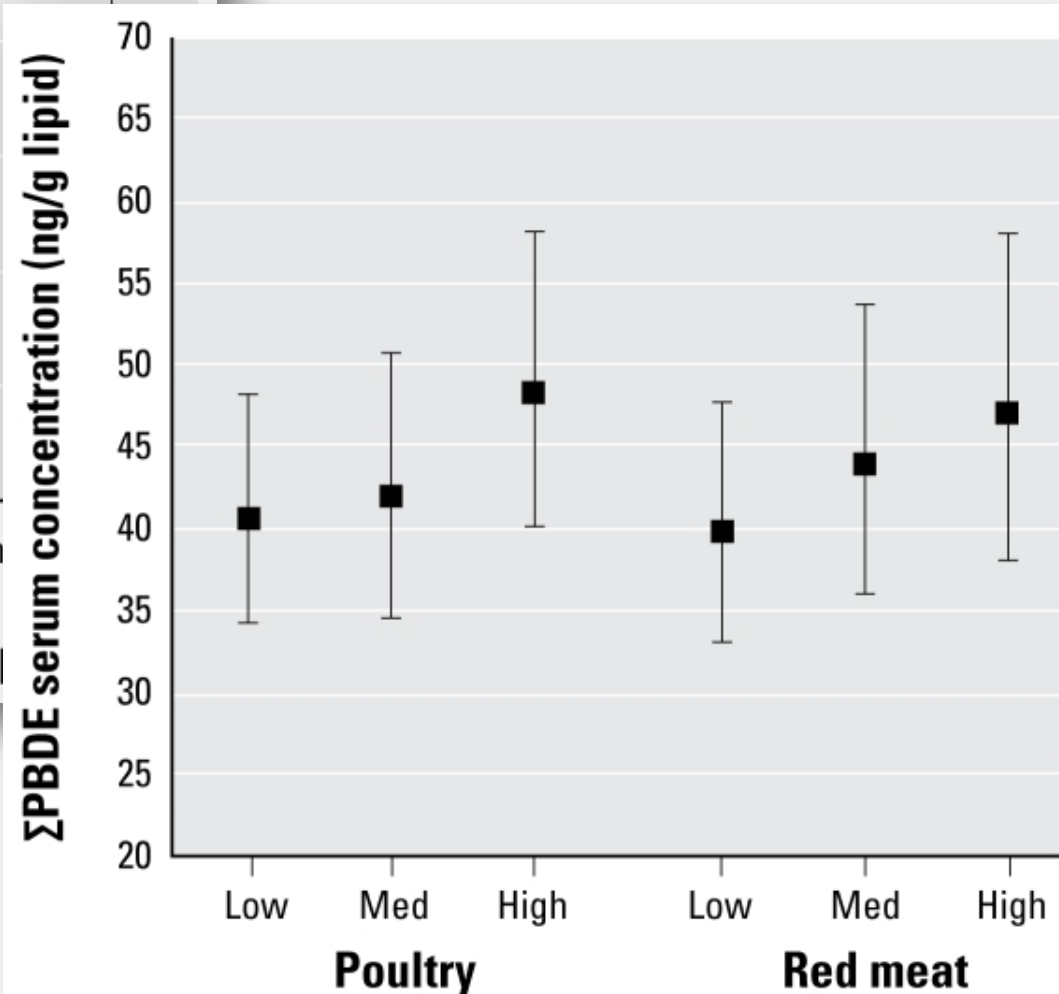
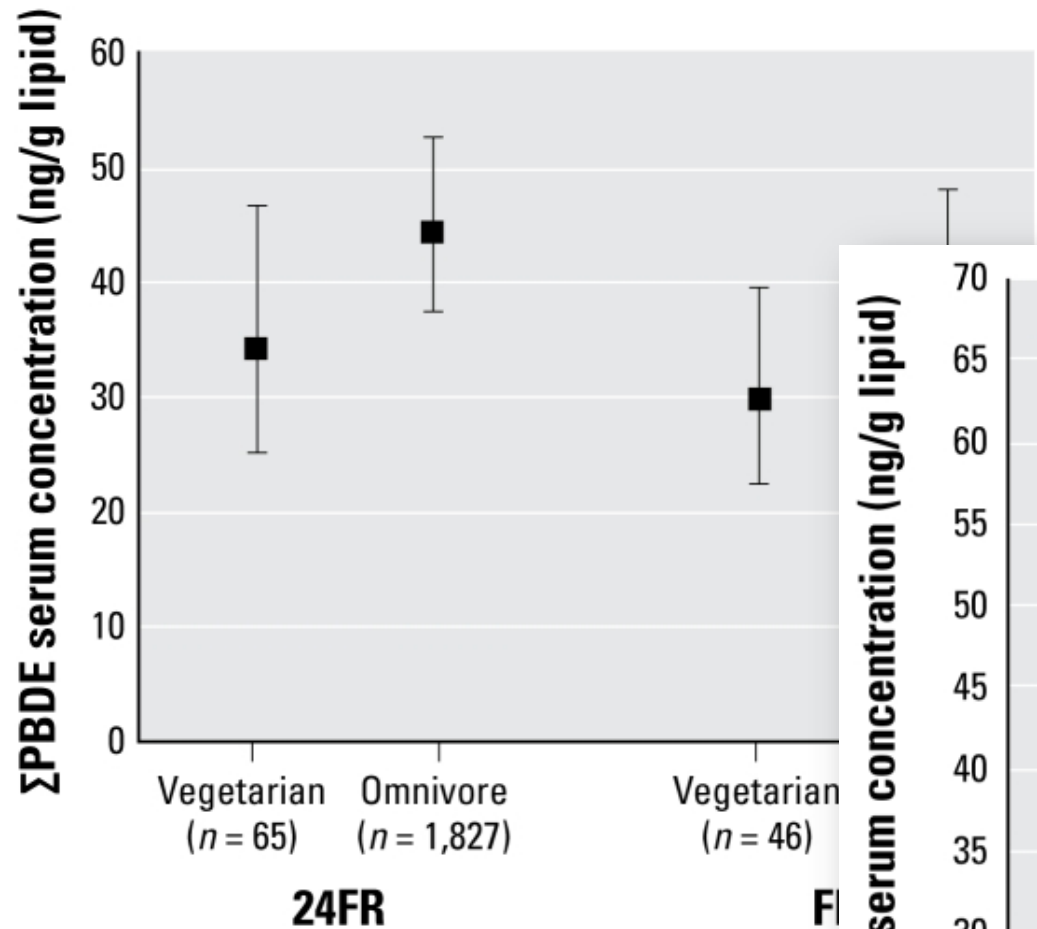
Acknowledgements

Stuart Harrad, Univ of Birmingham

Sean Backus, Liisa Jantunen,
Environ Canada

Beth Gilbert, D Super, MOE
M Shigeishi City of Toronto

Or is Diet More Important?



Fraser, Webster & McClean. 2009. Diet Contributes Significantly to the Body Burden of PBDEs in the General U.S. Population. Environ Health Persp 117:1520-1525.