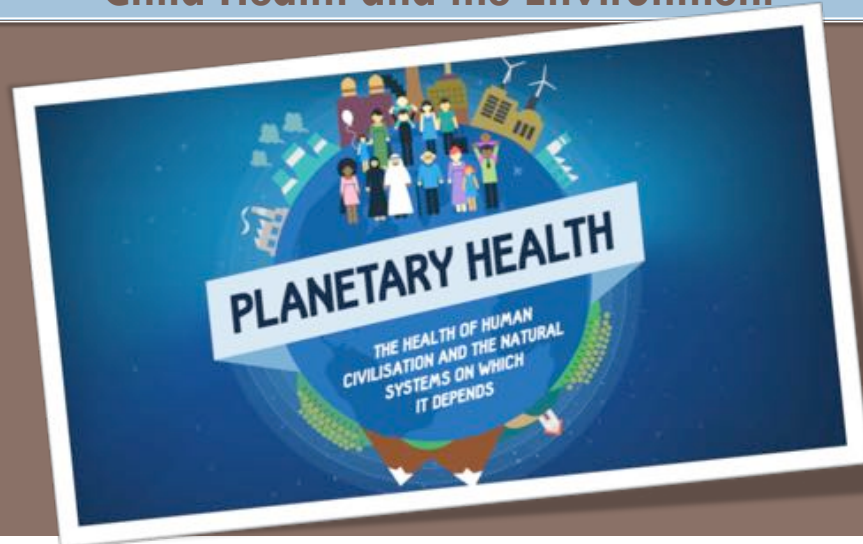


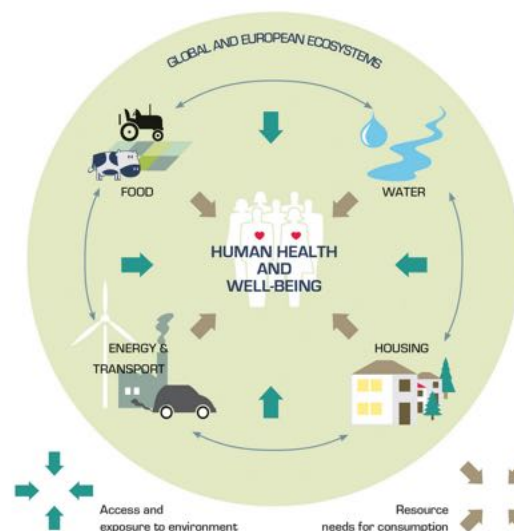
## Child Health and the Environment



Paivi Abernethy PhD MRes MSc  
Royal Roads University

## It is all connected

2



European Environment Agency: <https://www.eea.europa.eu/media/infographics/how-are-the-environment-and/view>

Health Promotion International, Vol. 26 No. S2  
doi:10.1093/heapro/dar064

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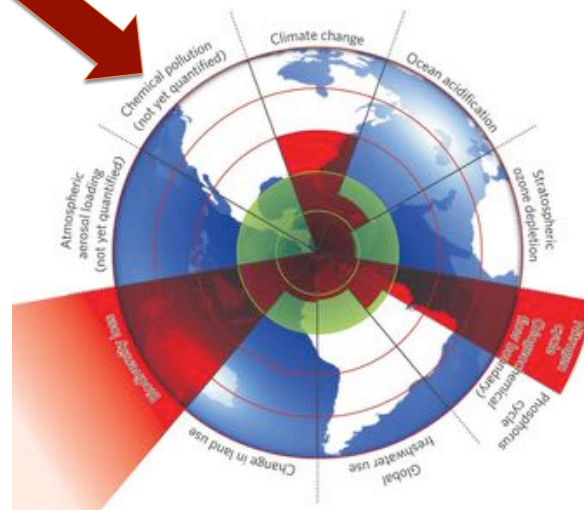
## Agenda

**It's the environment, stupid! Declining ecosystem health is THE threat to health in the 21st century**

By Trevor Hancock

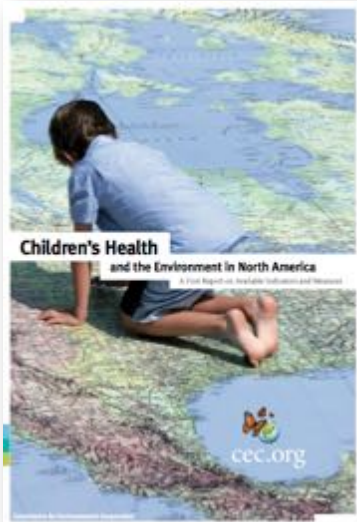


## Planetary boundaries – biophysical

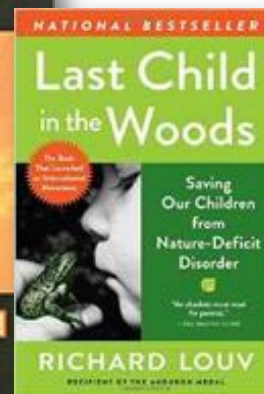


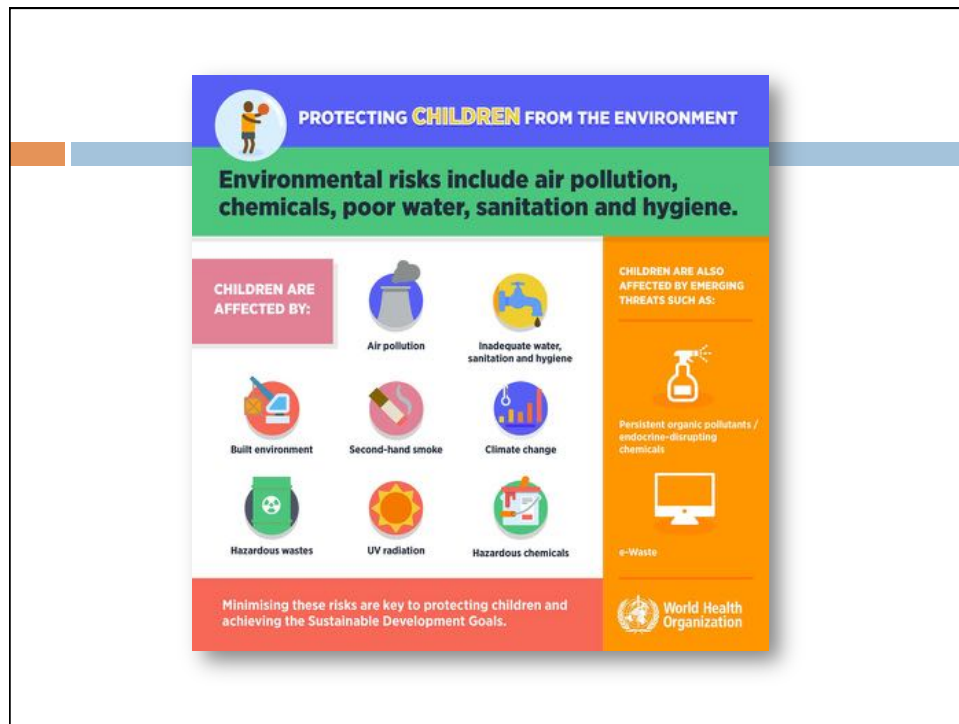
## Child health & the environment

5



6







## Human 'boundaries'

– psychosocial ↔ biophysical

9

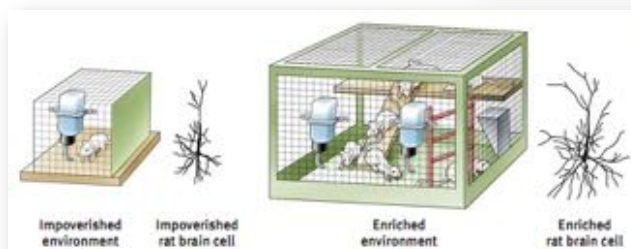


## Benefits of social interaction and stimuli

### Environmental Enrichment Reverses Cognitive and Molecular Deficits Induced by Developmental Lead Exposure

Tomás R. Guilarte, PhD, Christopher D. Toscano, MS, Jennifer L. McGlothlin, MS, and Shelley A. Weaver, PhD

Ann Neurol 2003;53:50–56



## Benefits of nature

11

### Environment and Behavior

Home Browse Submit Paper About

**Coping with add**  
*The Surprising Connection to Green Play Settings*  
 Andrea Faber Taylor Frances E. Kuo William C. Sullivan  
 First Published January 1, 2001

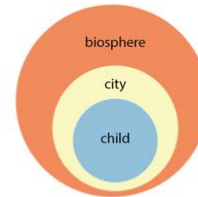
**Kids active in nature** at preschool better at  
 (134 preschools over 4 yrs):

- ☐ Distinguish living from lifeless entities
- ☐ Empathetic for non-human life forms
- ☐ Concerned for environmental degradation
- ☐ Perceive the harmful effects of environmental pollution
- ☐ Recognize the role of ecological resources for the production of everyday objects

Giusti, M., Barthel, S., & Marcus, L. (2014). Nature Routines and Affinity with the Biosphere: A Case Study of Preschool Children in Stockholm. *Children Youth and Environments*, 24(3), 16-42.

### Nature Routines of Children as Leverage Point for Sustainable Social-Ecological Urbanism

Connecting childhood and biosphere to design sustainable  
civilizations in the human habitat



Matteo Giusti

Licentiate thesis in Sustainability Science  
 Stockholm Resilience Centre  
 Stockholm University  
 May 2016



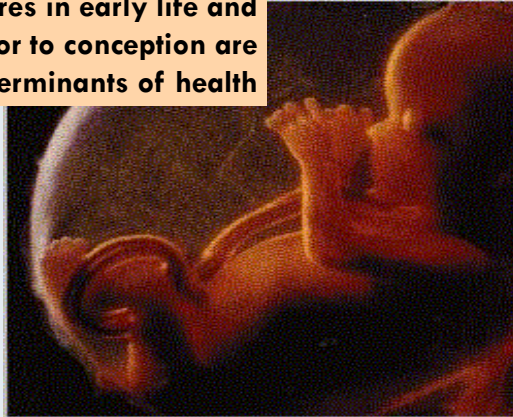
## Children's environmental health (as people see it)

12

1. Quality of physical environment (especially lack of pollution)
2. Access to natural environment
3. Mental well-being related to independent exploration in nature
4. Skills for interacting with nature in a healthy manner
5. The way in which children see environment and health
6. Understanding what healthy and sustainable community means
7. Healthy built environment
8. Healthy future

Government's focus on toxic compounds reflects the **"technical part of kids being exposed to bad things in the environment"** but it excludes the **"healing power of the environment or environment as a playground"**. (Participant)

Exposures in early life and  
prior to conception are  
key determinants of health



13

Why are children more vulnerable?

## Chemical Experiment?

***“We are conducting a vast toxicological  
experiment in which our children and our  
children’s children are the experimental subjects.”***

Dr. Herbert Needleman,  
Pediatrician and Psychiatrist,  
University of Pittsburgh



[www.healthyenvironmentforkids.ca](http://www.healthyenvironmentforkids.ca)

## Why Are Children More at Risk?



There are unique differences that make children more vulnerable than adults to environmental contaminants:

- Developmental differences
- Behavioural differences
- Greater exposure
- Greater uptake of contaminants
- Longer “shelf-life”

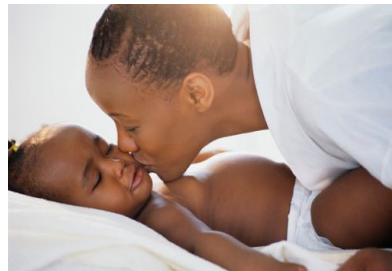
[www.healthyenvironmentforkids.ca](http://www.healthyenvironmentforkids.ca)

## Some children are more vulnerable than others

- Genetic differences
- Socioeconomic differences
- Cultural differences

***Genetics loads the gun, but environment pulls the trigger.***

– Judith Stern, University of California, Davis



[www.healthyenvironmentforkids.ca](http://www.healthyenvironmentforkids.ca)



## What is Risk?

Risk is composed of two parts:

$$\text{Risk} = \text{Toxicity} \times \text{Exposure}$$



Critical aspects:

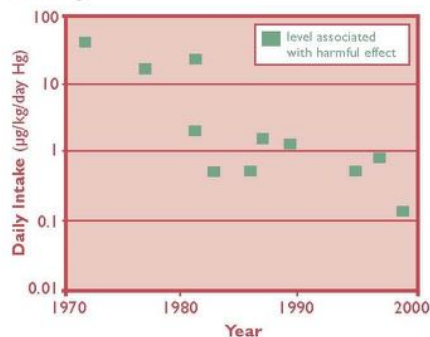
- Strength of the chemical compound
- Mode of action
- Timing (Windows of vulnerability)
- Dose

[www.healthyenvironmentforkids.ca](http://www.healthyenvironmentforkids.ca)

## What is Toxicity?

"The dose makes the poison"  
- Paracelsus 1493-1541

Figure 15: Declining Threshold of Harm for Mercury



Source: Schettler, T. et al. 2000.

**INCOMPLETE!** The more we look, the lower the dose at which we find an effect at (eg. lead, mercury).

[www.healthyenvironmentforkids.ca](http://www.healthyenvironmentforkids.ca)

## Endocrine disrupting chemicals (EDCs)

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### □ Interfere with hormone regulated processes that:

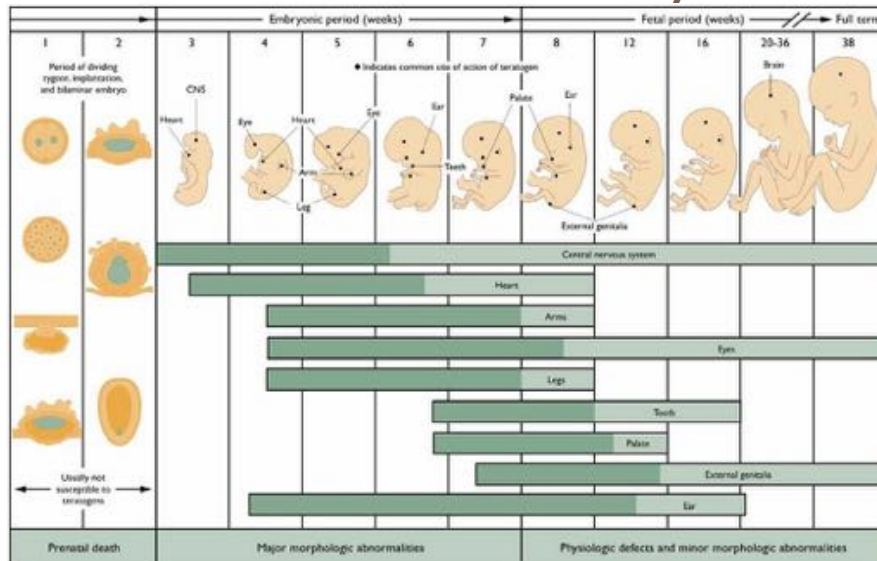
- ✓ Regulate, i.e. growth, brain development, reproduction
- ✓ Coordinate production, use & storage of energy
- ✓ Maintain homeostasis - nutrition, metabolism, excretion, & salt/water balance
- ✓ React to stimuli from outside the body
- ✓ Send chemical messages to direct cell functions

#### Dirty dozen EDCs:

1. Dioxin
2. Bisphenol A
3. Atrazine
4. Phthalates
5. Perchlorate
6. Fire retardants
7. Lead
8. Arsenic
9. Mercury
10. Perfluorinated compounds (PFCs)
11. Organophosphate pesticides
12. Glycol ethers

<http://www.ewg.org/research/dirty-dozen-list-endocrine-disruptors>

## Critical Windows of Vulnerability

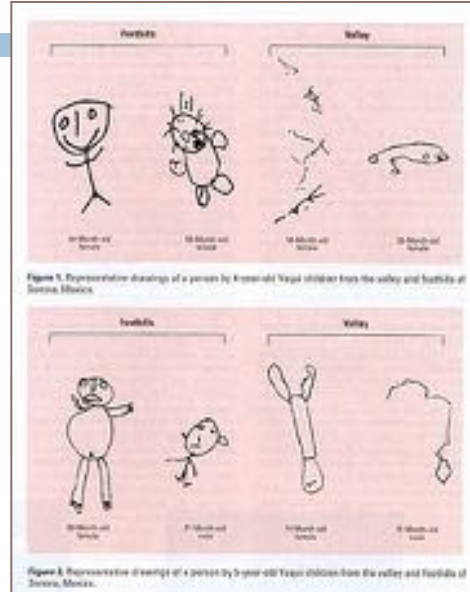


(Figure originally from Moore & Persaud, 1973)

## Impacts of endocrine disruptors

- Some pesticides can damage the growing brain

Reproduced with permission  
Guillette E et al, 1998 *Environmental Health Perspectives*



## Developmental origins of health and disease

22

### The Dutch Hunger Winter and the developmental origins of health and disease

Laura C. Schulz<sup>1</sup>  
Department of Obstetrics, Gynecology and Women's Health, University of Missouri, Columbia, MO 65211


PNAS | September 28, 2010 | vol. 107 | no. 39 | 16757-16758

#### Epigenetic changes

**Morbidity:** asthma, allergies, learning disabilities, autism, ADHD, cancers, diabetes 2, obesity, other metabolic disorders, Parkinson's disease, Alzheimer's disease, cardiovascular diseases, etc.



	
<p>23</p>	<p>How is this relevant to One Planet Region?</p>

<p>24</p> 	<p>NEWS 24 Aug 2016   TheTyee.ca</p> <h2>Dirty Water and Good Intentions: The Murky Case for Victoria Sewage Treatment</h2> <p>Scientific argument for \$1-billion project is far from watertight.</p> <p><b>“130 million litres of sewage Victoria dumps into the ocean each day”</b></p>
---	--

## Our limited understanding of what we are doing

*“According to the EPA, **362 contaminants** have been identified in the Great Lakes system, only about a third (1/3) of which have been evaluated for their effects on wildlife and human health.”*

Scott Fields (2005): Great Lakes: Resource at Risk  
*Environmental Health Perspectives* 113(3): A164-A173

## Sufficient waste water treatment? (What do we need and for what purpose?)

26

*Water Qual. Res. J. Canada, 2004 • Volume 39, No. 1, 57–63*  
Copyright © 2004, CAWQ

### Occurrence of Endocrine-Disrupting Chemicals in Sewage and Sludge Samples in Toronto, Canada

Hing-Biu Lee,



Environmental Pollution

Volume 157, Issue 3, March 2009, Pages 786–791



### The occurrence of illicit and therapeutic pharmaceuticals in wastewater effluent and surface waters in Nebraska

Shannon L. Bartelt-Hunt<sup>a</sup>, Daniel D. Snow<sup>b</sup>, Teyona Damon<sup>b</sup>, Johnette Shockley<sup>a</sup>, Kyle Hoagland<sup>c</sup>



## Problems for fish (& your drinking water?)

27

### Assessment of Feminization of Male Fish in English Rivers by the Environment Agency of England and Wales

**Melanie Y. Gross-Sorokin, Stephen D. Roast, and Geoffrey C. Brighty**

Ecosystems and Human Health, Science Group, Environment Agency, Wallingford, Oxfordshire, United Kingdom

Environmental Health Perspectives • VOLUME 114 | SUPPLEMENT 1 | April 2006

### Intersex Prevalent in Black Bass Inhabiting National Wildlife Refuges in Northeast

Release Date: DECEMBER 17, 2015

Eighty five percent of male smallmouth bass and 27 percent of male largemouth bass tested in waters in or near 19 National Wildlife Refuges in the Northeast U.S. were intersex, according to a new study by U.S. Geological Survey and U.S. Fish and Wildlife Service researchers.

#### Contacts

Department of the Interior,  
U.S. Geological Survey  
Office of Communications and  
Publishing  
12201 Sunrise Valley Drive

Iwanowicz et al. (2016). Evidence of estrogenic endocrine disruption in smallmouth and largemouth bass inhabiting Northeast US national wildlife refuge waters: A reconnaissance study. *Ecotoxicology and environmental safety*, 124, 50-59.

## Problems for fish (& your drinking water?)

28

≡ TIME



**Ecocentric**

All things green, from conservation to Capitol Hill

WILDLIFE

### Canada's Transsexual Fish

By Jeffrey Kluger | July 29, 2010

f Share Like 12 Tweet G+ 0 in Share Pin it Read Later

It just got harder to be a fish—at least a Canadian fish. Or at least a Canadian fish looking for a mate. That's because more and more of the boys keep turning into girls. As with so many other things, it's humans who are to blame.

Email Print

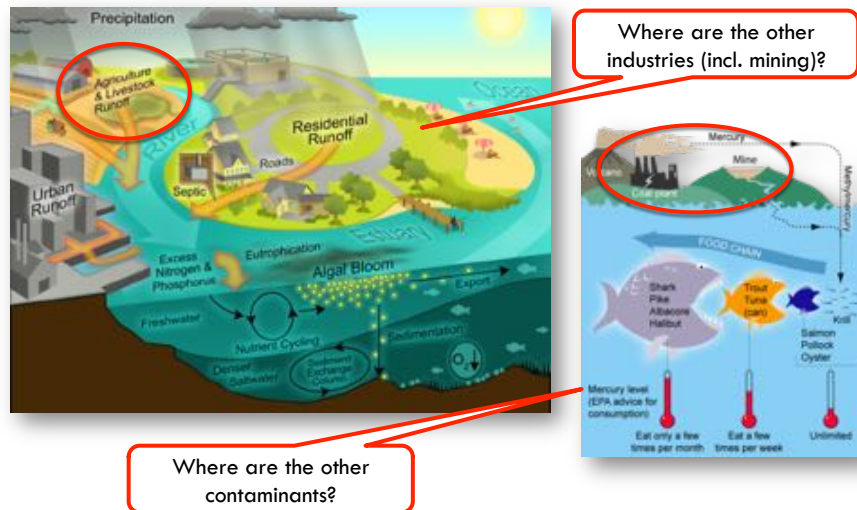
+ Share

Follow @TIME

The human household environment is awash in chemicals—preservatives, plastics, drugs, cosmetics and more. A lot of those chemicals contain hormones or so-called endocrine disrupters, and many of those gender-manipulating substances wind up getting washed down drains or flushed down toilets and into streams, rivers and other waterways. Numerous studies over the years have shown that this can have an impact on the sexual development of fish, amphibians and other aquatic life, but a new Canadian report in *Environmental Toxicology and Chemistry* has turned up some especially striking findings.

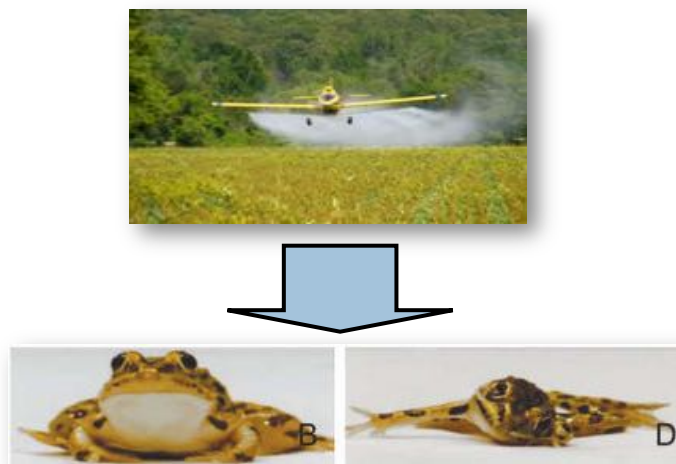
## Water pollution & food – silo A & B

29



## Agriculture runoff: Pesticides

30



Hayes et al. (2006). Pesticide mixtures, endocrine disruption, and amphibian declines: are we underestimating the impact? *Environmental health perspectives*, 114, 40.

## Agriculture runoff: Pesticides

31

### Atrazine and other s-triazine herbicides in lakes and in rain in Switzerland

Hans Rudolf Buser

*Environ. Sci. Technol.*, 1990, 24 (7), pp 1049–1058

DOI: 10.1021/es00077a016

Publication Date: July 1990

### "Atrazine in public water supplies and risk of ovarian cancer among postmenopausal women in the Iowa Women's Health Study."

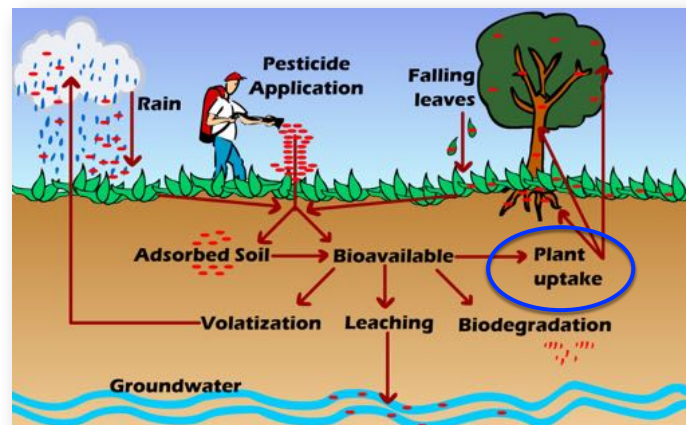
Inoue-Choi et al 2016 in Occupational and Environmental Medicine

### "Agricultural compounds in water and birth defects."

Brender & Weyer 2016 in Current environmental health reports, 3(2), 144-152.

## Water pollution, food & health

32



## Prerequisites for health

(Ottawa Charter for Health Promotion 1986)

□ The fundamental conditions and resources for health are:

- ✓ peace,
- ✓ shelter,
- ✓ education,
- ✓ food,
- ✓ income,
- ✓ a stable ecosystem\*,
- ✓ sustainable resources,
- ✓ social justice and equity.



□ **Improvement in health requires a secure foundation in these basic prerequisites.**

\*=healthy ecosystem



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Solutions

Why local collaboration matters

## Complexity, 'wicked problems' & local solutions

35



## The gaps in our knowledge - silos

36

- Pollution often context-specific (hotspots) - yet knowledge remains 'siloed', especially in local & regional contexts
- Solutions 'hidden' within organizations
- No institutionalized mechanisms in place at the local level to facilitate cross-sectoral knowledge sharing





## Interconnected solutions

37

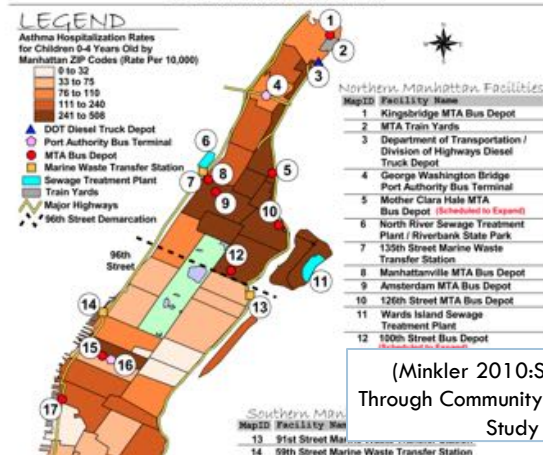
### Socio-Ecological Model



## Making a difference LOCALLY & more

38

### Polluting Facilities & Asthma Hospitalizations For Children 0-4 Years Old in Manhattan in 1996



(Minkler 2010:S83 in "Linking Science and Policy Through Community-Based Participatory Research to Study and Address Health Disparities")

## Making a difference LOCALLY & more

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### Coalitions

WE ACT partners with organizations locally and nationally to achieve our environmental justice goals and build a movement for a more sustainable, equitable world. To learn more about the key coalitions with which we are currently involved, click on the links below.

- [The Campaign for New York's Future](#)
- [Just Transition Alliance](#)
- [Faith Leaders for Environmental Justice](#)
- [NYS Transportation Equity Alliance](#)
- [Environmental Justice Climate Change Initiative](#)
- [The JustGreen Partnership](#)

**Public transit & bike lanes** for reduced pollution & increased physical activity

**Community gardens** for healthy food, food security, skill building & social networks

**Green industries & energy production:** for less pollution, improved livelihoods, etc.



**Urban mixed use & green spaces** for physical activity, mental health, social networks, counteracting pollution, etc.

**CSA** for local livelihoods & healthier food

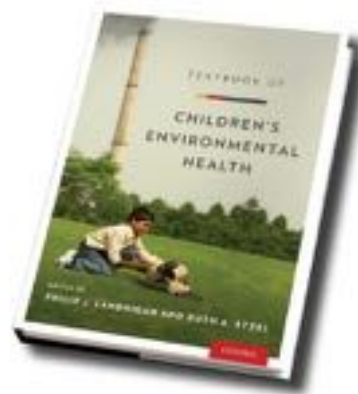
**Healthy building design (materials) & architecture (beauty & functionality)** for reduced pollution and increased mental health

**Community ownership & empowerment**

## We need one another's knowledge & skills

41

- Know the problems but do not let them paralyze you
- We already know what the direction is – let's work together
- Could children's environmental health help the bridging?



## Healthy sustainable cities, community capacity building & local solutions

42



"Many communities and individuals today face a complex range of social, environmental and economic challenges. From climate change and resource depletion to growing financial disparities and declining public health, we know what these challenges are, but often they can seem too big to solve.

However, there is a common underlying factor in these challenges that we can begin to address, right in our own homes, buildings, streets and neighbourhoods: **We can build greater social connectedness, connection to place, and sense of community and belonging that many of us yearn for so deeply.**" (p.2)

<http://bchealthycommunities.ca/>

## Healthy sustainable cities, community capacity building & local solutions

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**How do you see children's environmental health relate to**

- **your life?**
- **your work?**
- **One Planet Region Victoria Conversations?**

<http://bchealthycommunities.ca/>



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Thank you

## Chinese government acknowledges it – how about us?

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### Govt targets land pollution to ensure food security

By Wu Jiao (China Daily)  
Updated: 2008-08-20 07:29

Comments(0) Print Mail

The Ministry of Environmental Protection is strengthening measures to hold polluting companies accountable for land pollution amid increasing public health hazards triggered by soil pollution.



Villager Yang Xiaogang looks out at corn fields that have been submerged allegedly by polluted water from a nearby paper mill in Xiangfen, Shanxi Province, in this file photo. [China Daily]

## Promoting Healthy and Sustainable Food Systems

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- CRFAIR
  - ✓ Focus on livelihoods of local farmers;  
<http://www.crfair.ca>
- LifeCycles Project
  - ✓ Focus on helping people to grow their own food and have better access to fresh local foods in the city;  
<http://lifecyclesproject.ca/>
- Capital Regional District (CRD) Regional Food & Agriculture Strategy (2016)
  - ✓ Local government strategy;  
<http://www.crd.bc.ca/project/food-agriculture>





## Promoting Healthy and Sustainable Food Systems

47

- “water management issues (stormwater pollution, infiltrating rain, flooding, well and aquifer management and climate change)”
- - could **children’s environmental health** make this stronger & more appealing?

✓ Local government strategy;  
<http://www.crd.bc.ca/project/food-agriculture>



## Contact information

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