

# A holistic perspective on children's environmental health challenges in the region

**Paul Jagals**

**Professor and Specialist Practitioner of Environmental Health**

- Children's Environmental Health Programme, University of Queensland [p.jagals@uq.edu.au](mailto:p.jagals@uq.edu.au)
- Director of Environment4health [p.jagals@environment4health.org](mailto:p.jagals@environment4health.org)

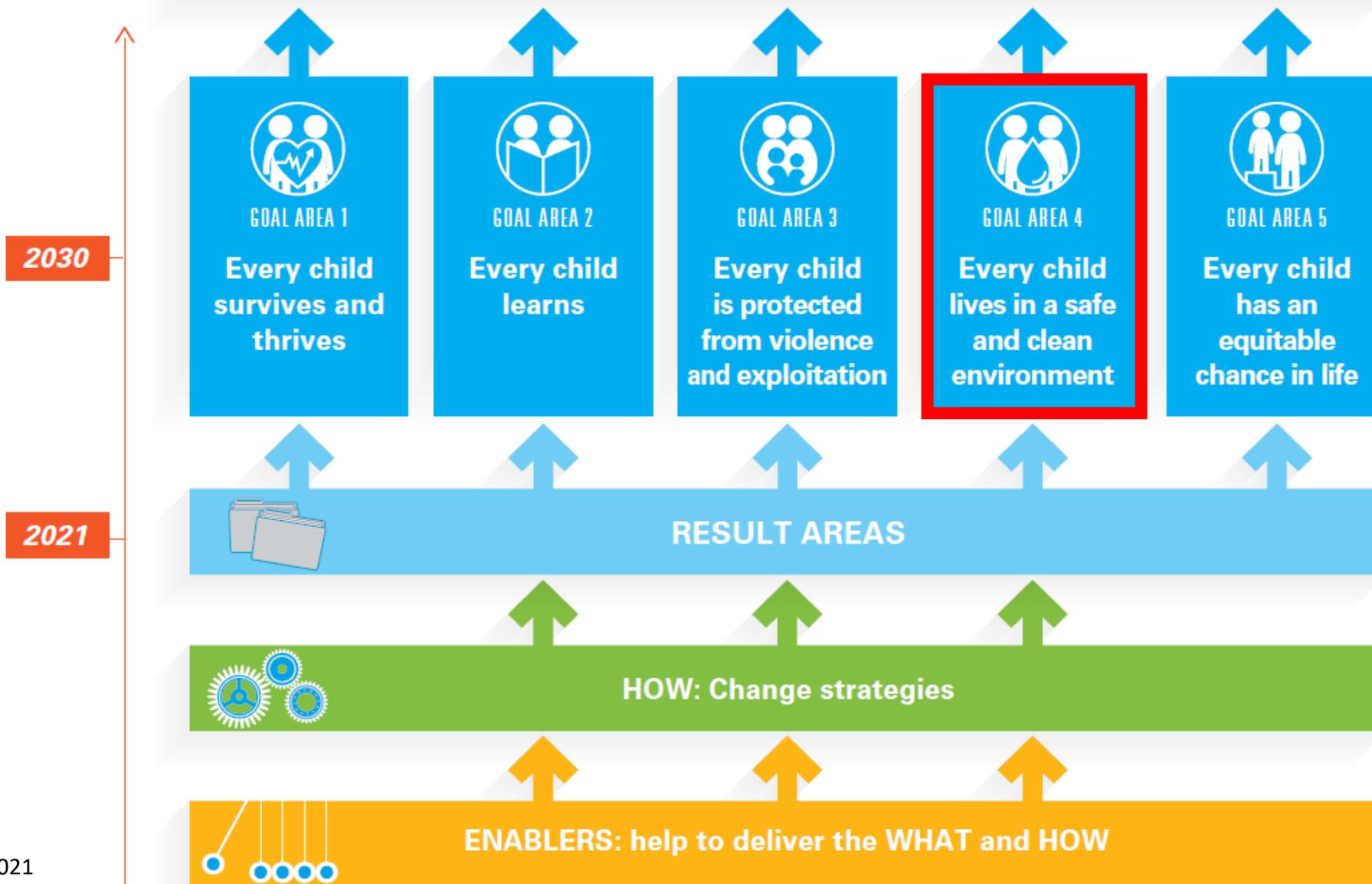
**Advancing Children's Right to a Healthy Environment**

**East Asia and the Pacific Region**

**22-23 October 2019, Bogor, Indonesia**



Realizing the rights of **every child**, especially the most disadvantaged



# Let us understand.....

*Inheriting a  
sustainable  
world?*

Atlas on children's  
health and the  
environment

- Our world
- Environmental Health
- The World of a Child
  - Environment
  - Health
- Children's Environmental Health: Challenges and Opportunities



Land and Water

Anthropogenic Settings



Biters and  
Vectors



Living with  
Animals



Infectious  
Disease



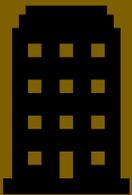
Natural Allergens  
and Toxins



Living with our environment

Land and Water

Anthropogenic Settings



Energy



Water



Goods



Food

Living with our environment

Land and Water

Anthropogenic Settings

Energy



Water

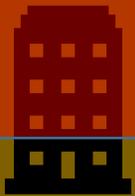
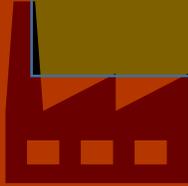


Goods



Living with our things

Waste



Resources  
in

# First let us define *Environmental Health*

- Public Health discipline
  - Measure, understand and manage exposures to environmental hazards
  - Healthy environments for healthy people
- Academic discipline
  - Research and teach how exposures to environmental hazards affect our health
- Practice
  - Ensure hazardous environments are prevented / mitigated
  - And healthy environments are promoted and sustained

# The ultimate goal of Children's Environmental Health

- Protect Children's Health
- (to sustain support for them achieving their highest potential)
  - Reducing bad exposures to unhealthy environments
  - Protecting and promoting healthy environments
  - Where they live, play, learn and work
  - During foetal stage, childhood as well as across the entire human life span

# The World of a Child

- Complex Matrix of Environments
- Unique and Different Exposures
- Dynamic Developmental Physiology
- Live longer- express diseases over longer latency period
- Politically powerless
- Their health more definitively linked to their environments
  - And their interaction with these environments

## Sources:

- Landrigan PJ and Etzel RA. 2014. Children's Environmental Health. Oxford University Press
- World Health Organization. 2017. Inheriting a sustainable world? Atlas on children's health and the environment. Geneva.
- Hubal et al 2014: Identifying important life stages for monitoring and assessing risks from exposures to environmental contaminants: Results of a World Health Organization review
- World Health Organization. 2017. Don't pollute my future! The impact of the environment on children's health. Geneva.
- [www.who.int/features/factfiles/children\\_environmental\\_health/en/](http://www.who.int/features/factfiles/children_environmental_health/en/)
- <http://www.who.int/ceh/capacity/trainpackage/en/>



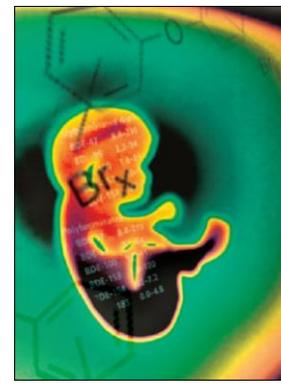
# For a child we must consider 'Environment' very comprehensively

- Children's environments are complex - many layers
- Environments themselves change over time
- Many interactions with multiple environments at different life stages
- Influences of the human genome and epi-genome
- Interactions between their environmental health, poverty, and social injustice

# Unique and Different Exposures

- Unique exposure pathways
- Exploratory behaviours (leading to exposures)
- Stature and living zones, microenvironments
- Children do not understand danger

- Unique exposure pathways
  - Many chemicals cross the placenta and breastfeeding
    - Lead, mercury, polychlorinated biphenyls (PCBs)...
    - Substances of abuse: alcohol, methadone
  - Some physical factors may affect the fetus directly
    - Ionizing radiation, heat



- Exploratory behaviours (leading to exposures)
- Hand-to-mouth, object-to-mouth
- Non-nutritive ingestion



- Stature and living zones, microenvironments
- Location – lower to the ground
- High body-mass to volume / surface ratio

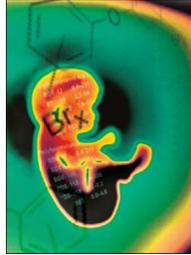
- Children do not understand danger
  - Pre-ambulatory children cannot avoid danger
  - Pre-adolescents / adolescents have cognitive immaturity and thus "risk-taking" behaviours

# Environments

- More than one environment actually
- Spaces / places where children live, develop, learn, play and work
- Contains the settings and agents that are hazardous
- Carriers that transmit hazard through exposure pathways

# Children's Environments (Settings)

- Intra-uterine



- Home



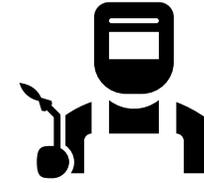
- Home-away-from-home (Day care)



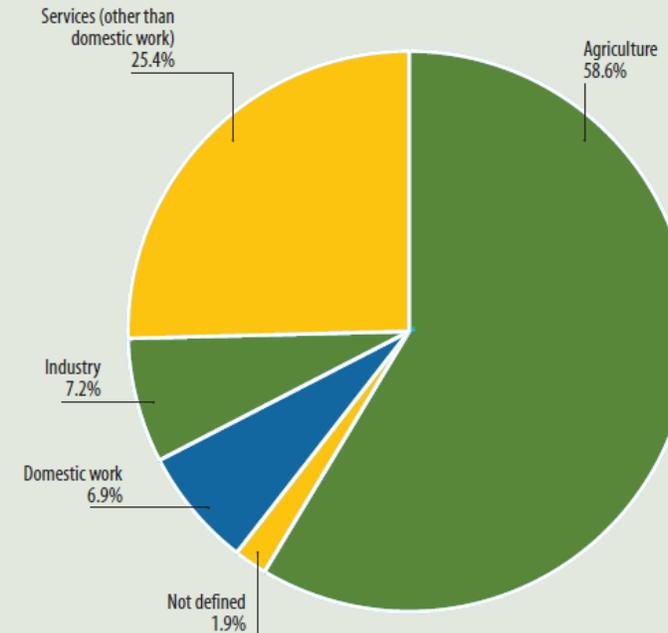
- School



- Workplace



Sectoral distribution of children in child labour, 5–17 years age group, 2012



# Children's Environments (Settings)

- Play place



- Hangouts



- Recreation



- Nature



# Environmental risk factors

- Settings:
  - Lack of physical activity
  - The built environment
  - Local and global environments – climate change, disasters, conflicts
- Environmental health risks such as:
  - Air pollution
  - Lack of water and inadequate sanitation
  - Malnutrition
  - Disease vectors
  - Chemical and electronic hazardous waste
  - Injuries
  - Radiation
  - Endocrine Disrupting Chemicals in everyday use

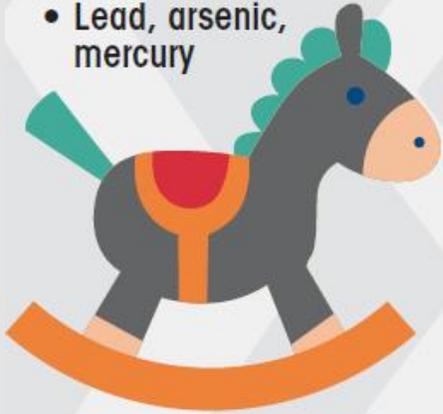
# Safe as houses: Risks to children of inadequate housing



# Examples of hazardous chemicals that can be found in everyday items

## Toys

- Lead, arsenic, mercury



## Computers

- Flame retardants: polybrominated diphenyl ethers (PBDEs), chromium, cadmium, mercury, lead



## Food



## Cleaning products

- Organic solvents
- disinfectants



## Carpet/furniture

- PBDEs, formaldehyde, fungicides



## Clothing

- PBDEs
- hazardous dye ingredients e.g. chromium VI



## PVC shoes, raincoat

- Plasticisers: phthalates, alkylphenols, formaldehyde, chlorinated phenols, fungicides



## Cosmetics:

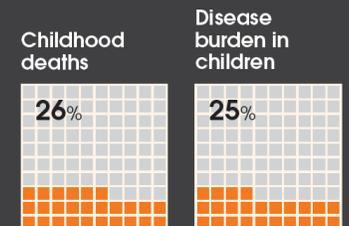
- Lead
- mercury



# What is a 'Healthy Environment' for a child?

*'..A geographical space / a condition / a state of mind where the interactions between children and all their environments do not cause disease, injury and / or disability'*

**Reducing environmental risks could prevent  
a quarter of childhood deaths and disease**

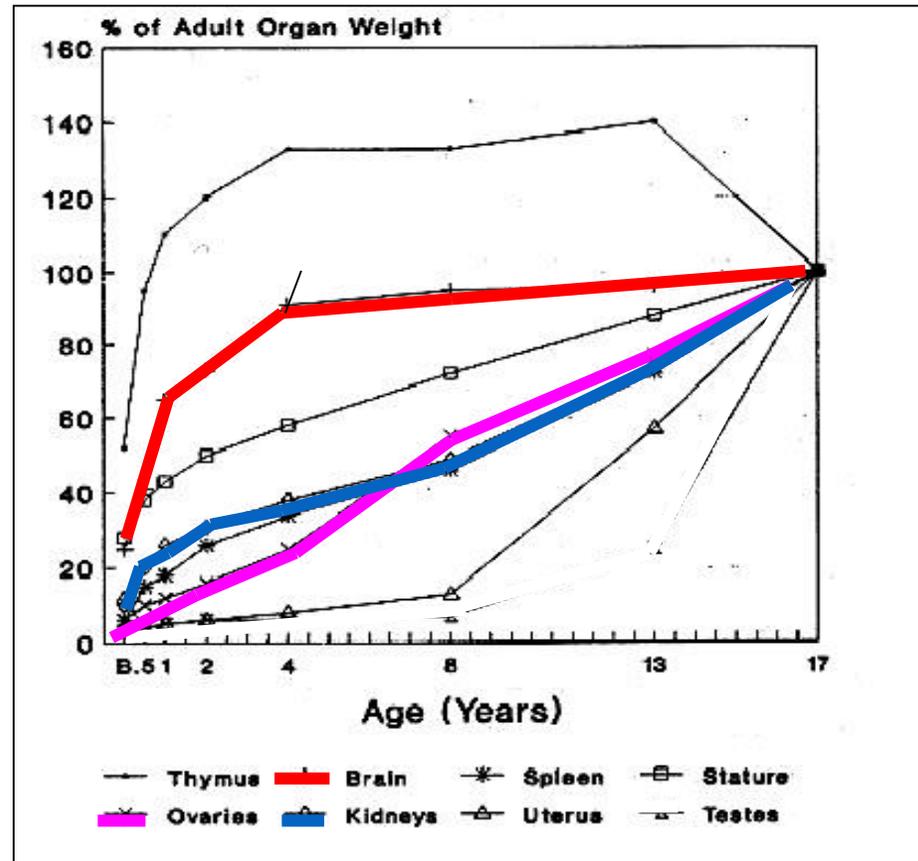


# Dynamic Developmental Physiology

- Children have growing bodies
- Xenobiotics handled differently by an immature body

- Critical windows of development - very vulnerable
  - Their vital organs are still forming and rapidly developing
  - When?
    - During pregnancy
    - In early childhood
- Use more calories, water and oxygen per kg of body weight
- Absorption of substances into the body much greater
- Their bodily detoxification processes not yet developed
- Elimination of wastes from their bodies slower – especially at a very young age

# Windows of Development: Birth to Adolescence



*Altman eds, FASEB, 1962*

- **Vital organ growth**
  - Brain
  - Lungs
  - Kidneys
  - Reproductive organs
- **Physiological function**
  - Central nervous system
  - Immune system
  - Endocrine system

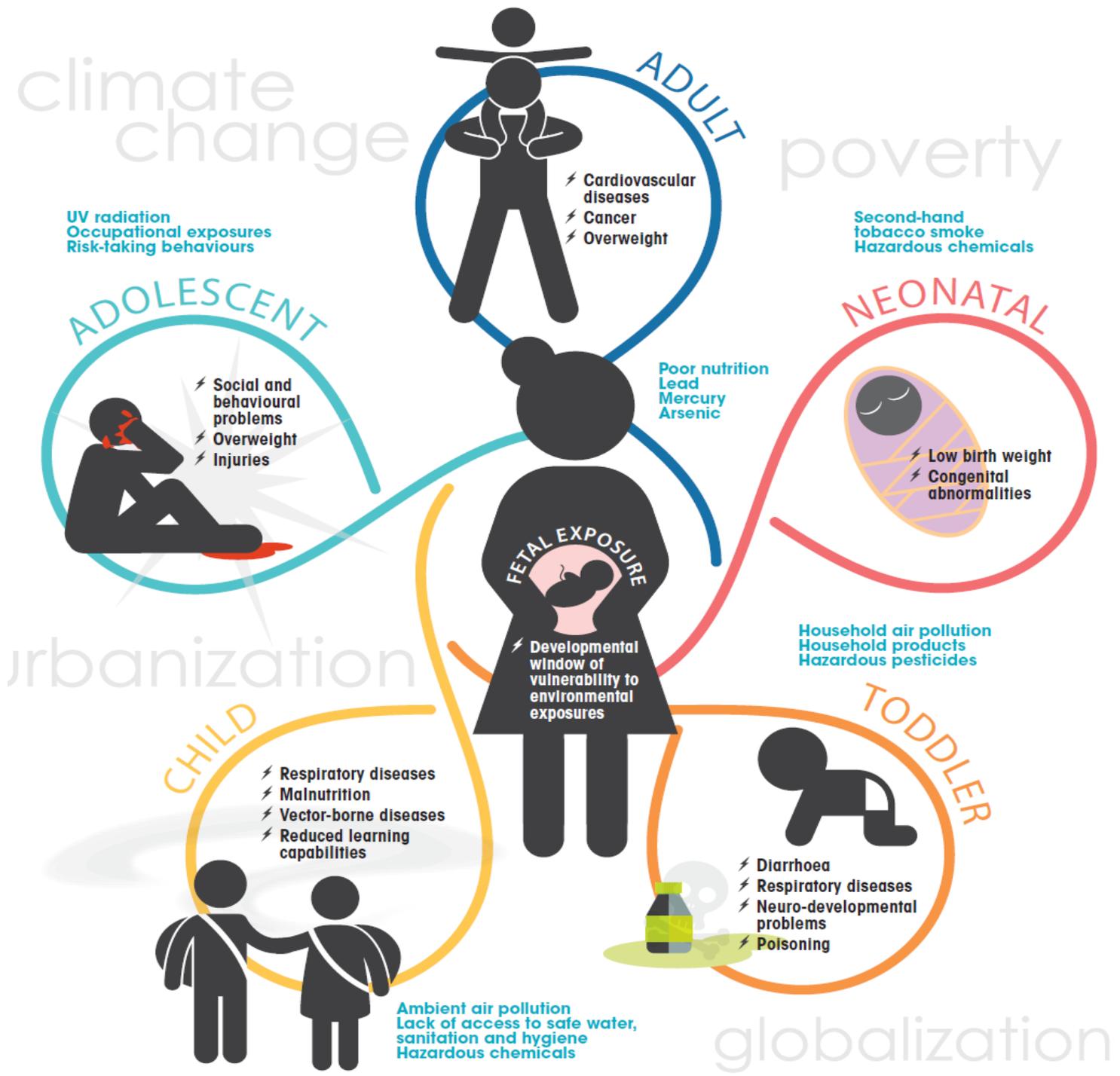
Not only do the organs grow, but their function also matures and modifies at different life stages, until the end of adolescence

# Children's Environmental Health

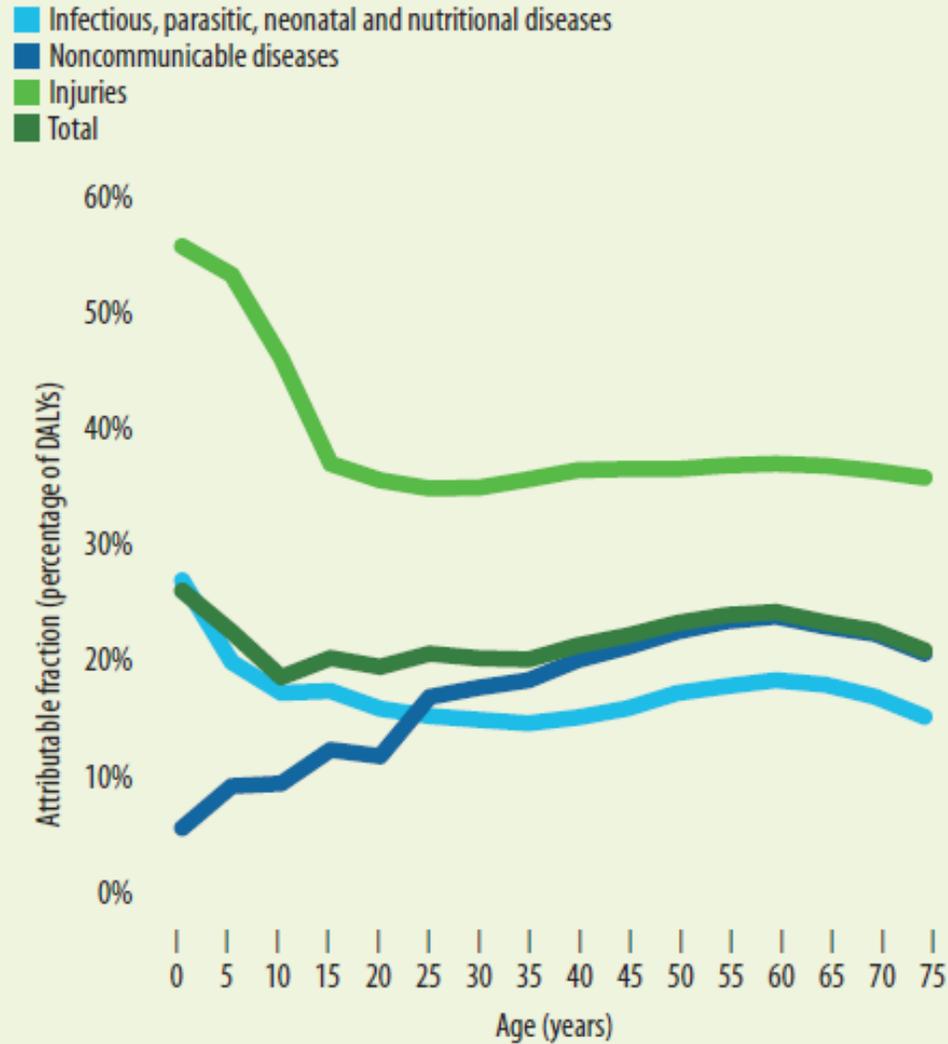
Challenges and Solutions

# Health

It's the ideal measure of how we are doing environmentally

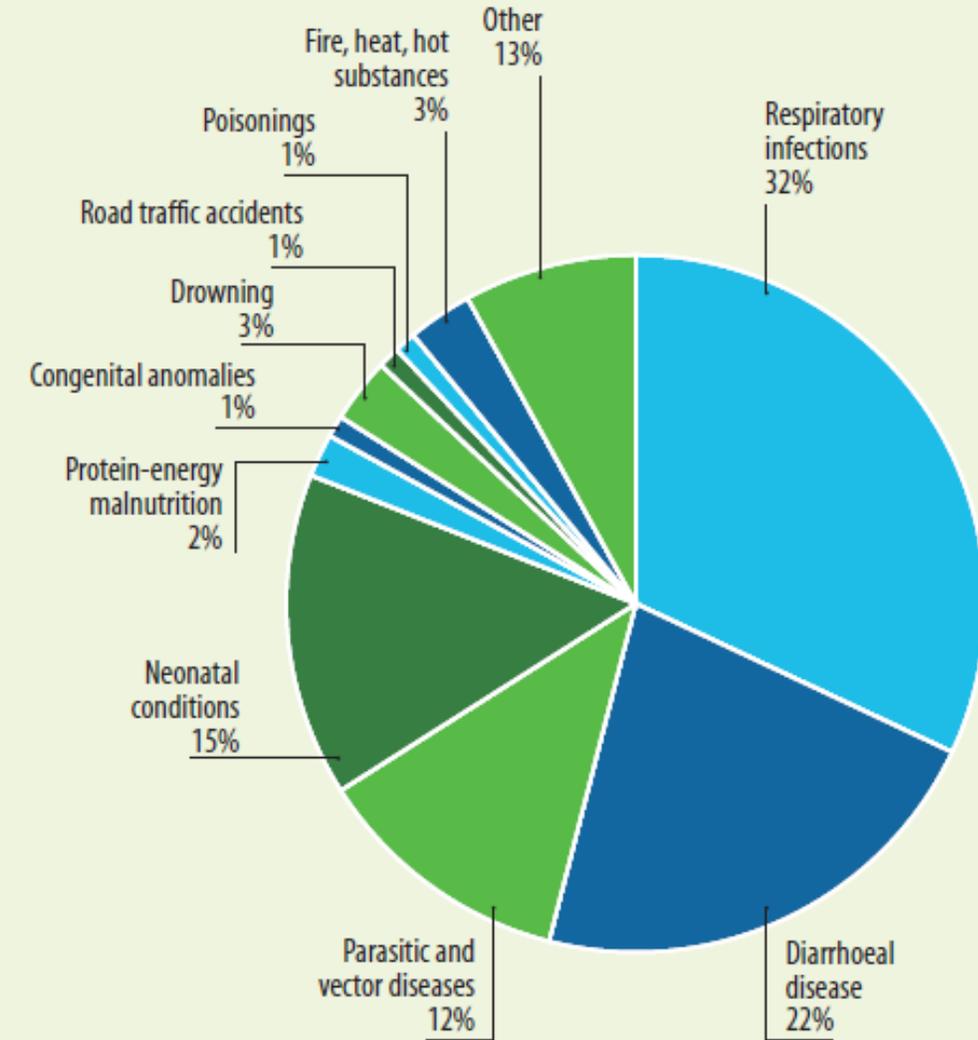


## Environmental fraction of global burden of disease (in DALYs), by age and disease group, 2012



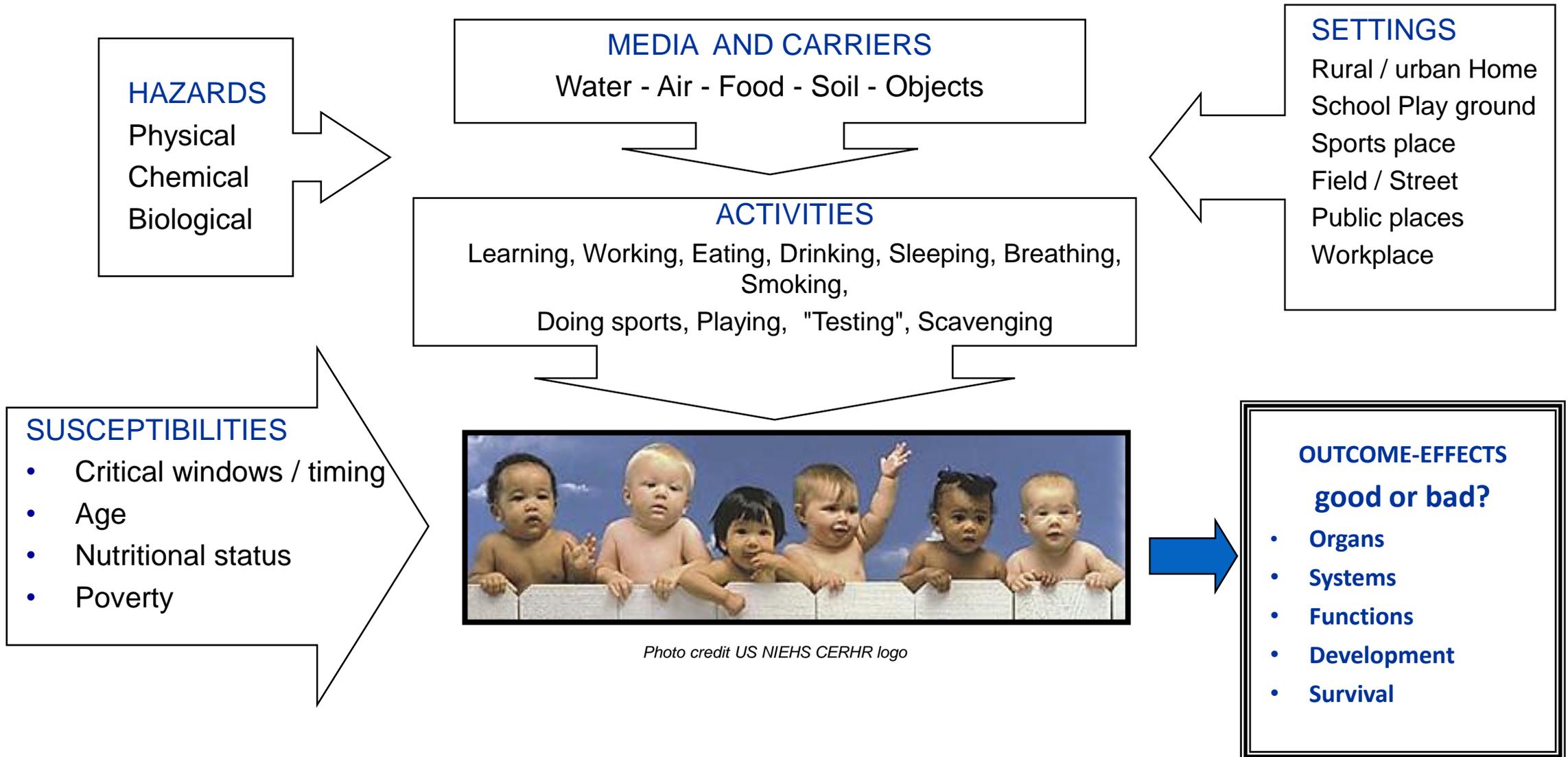
Note: Data from evidence-based assessment and expert opinion.

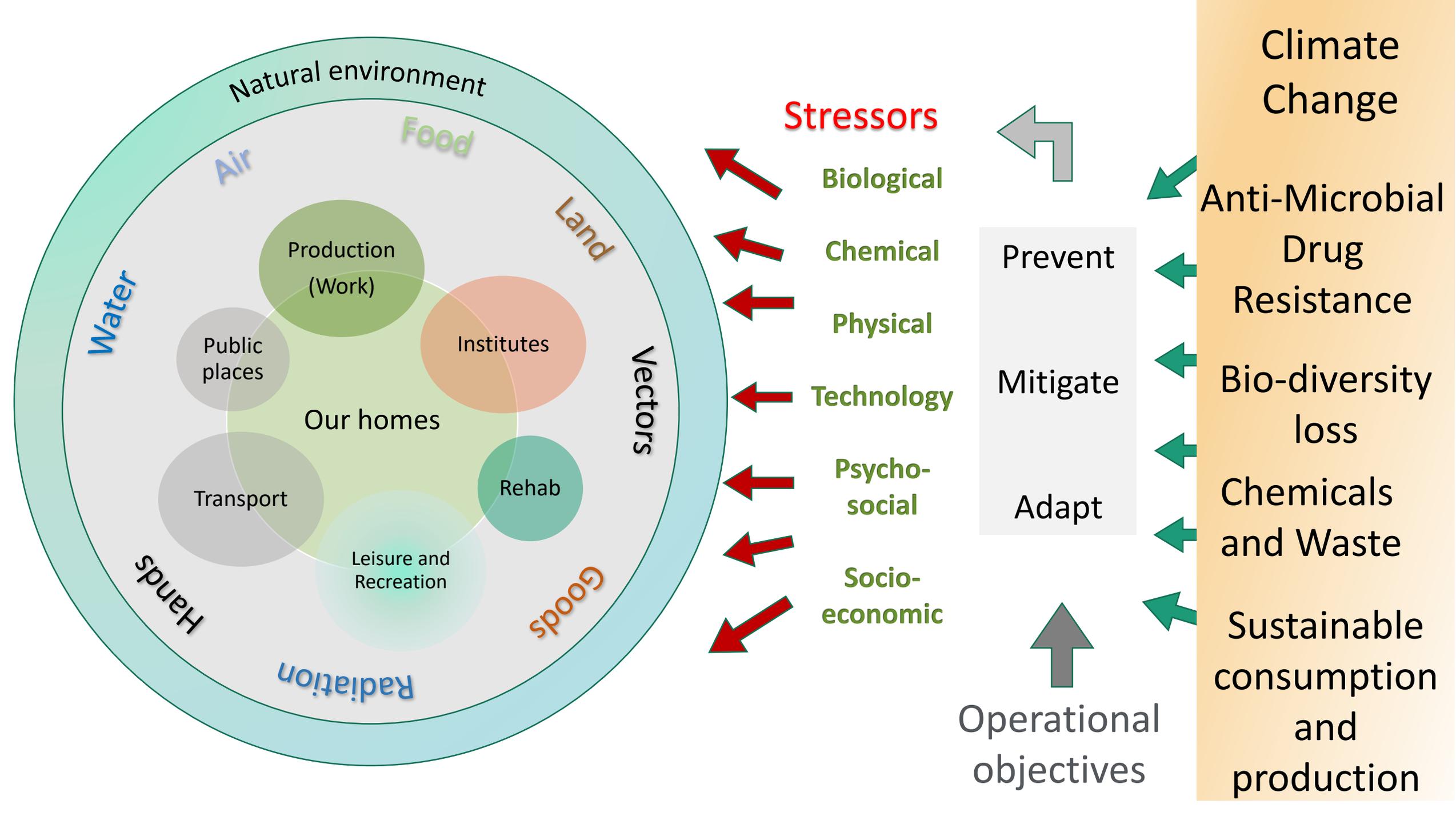
## Main diseases contributing to the environmental burden of disease for children under five years, 2012



Diseases with the largest environmental contribution in children under five years of age include lower respiratory infections, diarrhoea, neonatal conditions, malaria and protein-energy malnutrition, as well as injuries.

# Complex environments of Children and adolescents





Natural environment

Stressors

Climate Change

Water

Air

Food

Land

Production (Work)

Public places

Institutes

Vectors

Our homes

Transport

Rehab

Leisure and Recreation

Hands

Goods

Radiation

Biological

Chemical

Physical

Technology

Psycho-social

Socio-economic

Prevent

Mitigate

Adapt

Operational objectives

Anti-Microbial Drug Resistance

Bio-diversity loss

Chemicals and Waste

Sustainable consumption and production

## Environmental interventions for improving child health

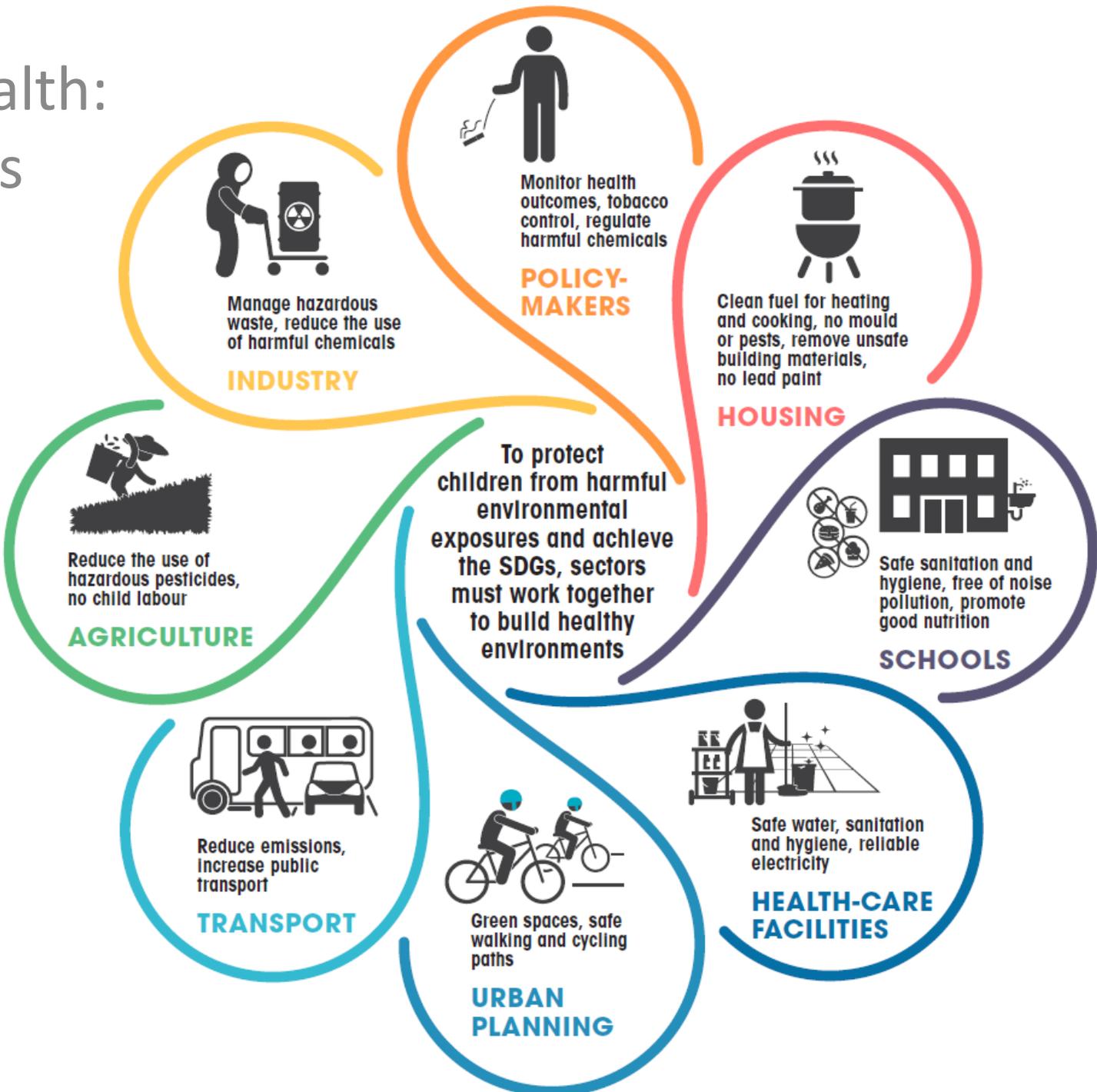
The main areas of environmental intervention for improving child health include ensuring clean air inside and outside households, adequate water, sanitation and hygiene (including in birth settings), protection of pregnant women from second-hand tobacco smoke, and safe built environments (at household and community levels).

### Key environmental intervention areas for main childhood diseases and injuries

Diseases and injuries	Main environmental intervention areas
<b>Respiratory infections</b>	<ul style="list-style-type: none"><li>• Household and ambient air pollution, second-hand tobacco smoke</li><li>• Housing</li></ul>
<b>Diarrhoeal diseases</b>	<ul style="list-style-type: none"><li>• Water, sanitation and hygiene</li><li>• Climate change</li></ul>
<b>Parasitic and vector diseases</b>	<ul style="list-style-type: none"><li>• Environmental management and modification</li><li>• Water, sanitation and hygiene</li><li>• Housing</li></ul>
<b>Neonatal and nutritional conditions</b>	<ul style="list-style-type: none"><li>• Household air pollution</li><li>• Maternal exposure to second-hand tobacco smoke</li><li>• Water, sanitation and hygiene (including in birth settings)</li></ul>
<b>Injuries (drowning, road traffic accidents, poisonings, burns)</b>	<ul style="list-style-type: none"><li>• Road design, land-use planning</li><li>• Safe handling, labelling and storage of chemicals</li><li>• Safety of cooking, lighting and heating equipment, use of flammable materials in the home</li><li>• Safety of water environments, public awareness, regulations</li></ul>
<b>Cancers</b>	<ul style="list-style-type: none"><li>• Household air pollution, exposure to second-hand tobacco smoke, ionizing and UV radiation, chemicals</li></ul>
<b>Asthma</b>	<ul style="list-style-type: none"><li>• Air pollution, second-hand tobacco smoke, indoor pollution from dampness and mould</li></ul>
<b>Congenital anomalies</b>	<ul style="list-style-type: none"><li>• Exposure of pregnant women to second-hand tobacco smoke, certain chemicals</li></ul>

# Children's Environmental Health: Challenges and Opportunities

# Local Solutions?



# Child Injury – the specialisation that gives us a good matrix for practice

Key approaches	Traffic	Drowning	Burns	Falls	Poisoning
<b>Legislation, regulations and enforcement</b>	Speed limits; comprehensive drink-driving laws; child restraints	Four-sided pool fencing	Hot water tap temperature legislation; smoke alarms	Playground equipment standards	Labelling and packaging requirements; restrictions on sales of hazardous products to consumers
<b>Product modification</b>	Vehicle-front modification; child restraint systems	Personal flotation devices	Non-tip lanterns and candle holders	Baby walker modification; safety glass	Medication packaging; child resistant closures
<b>Environmental modification</b>	Child-friendly infrastructure; safer routes to school; safer play spaces	Barriers, such as well coverings and fencing	Separation of cooking from living area	Window guards on tall buildings; roof railings, non-climbable banisters	Safe storage of potentially harmful substances
<b>Education and skills development</b>	Helmet wearing; using child restraints	Swimming training and supervision	First aid – “cool the burn”	Supportive home visitation to identify fall hazards	Immediate first aid
<b>Emergency medical care</b>	Child-sized equipment; child-friendly environment	Immediate resuscitation	Burns centres	Appropriate paediatric acute care	Poisons centres



Don't  
pollute  
my future



尚中泽  
Felix Shang  
10岁  
10 years old

保护环境,拯救生命!!!

Protect the nature, save the future!!!