

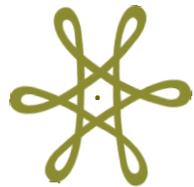
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# Digital Health Ecosystems: Gaps and Challenges in Developing Countries

Peter Drury, PhD

6<sup>th</sup> June 2019

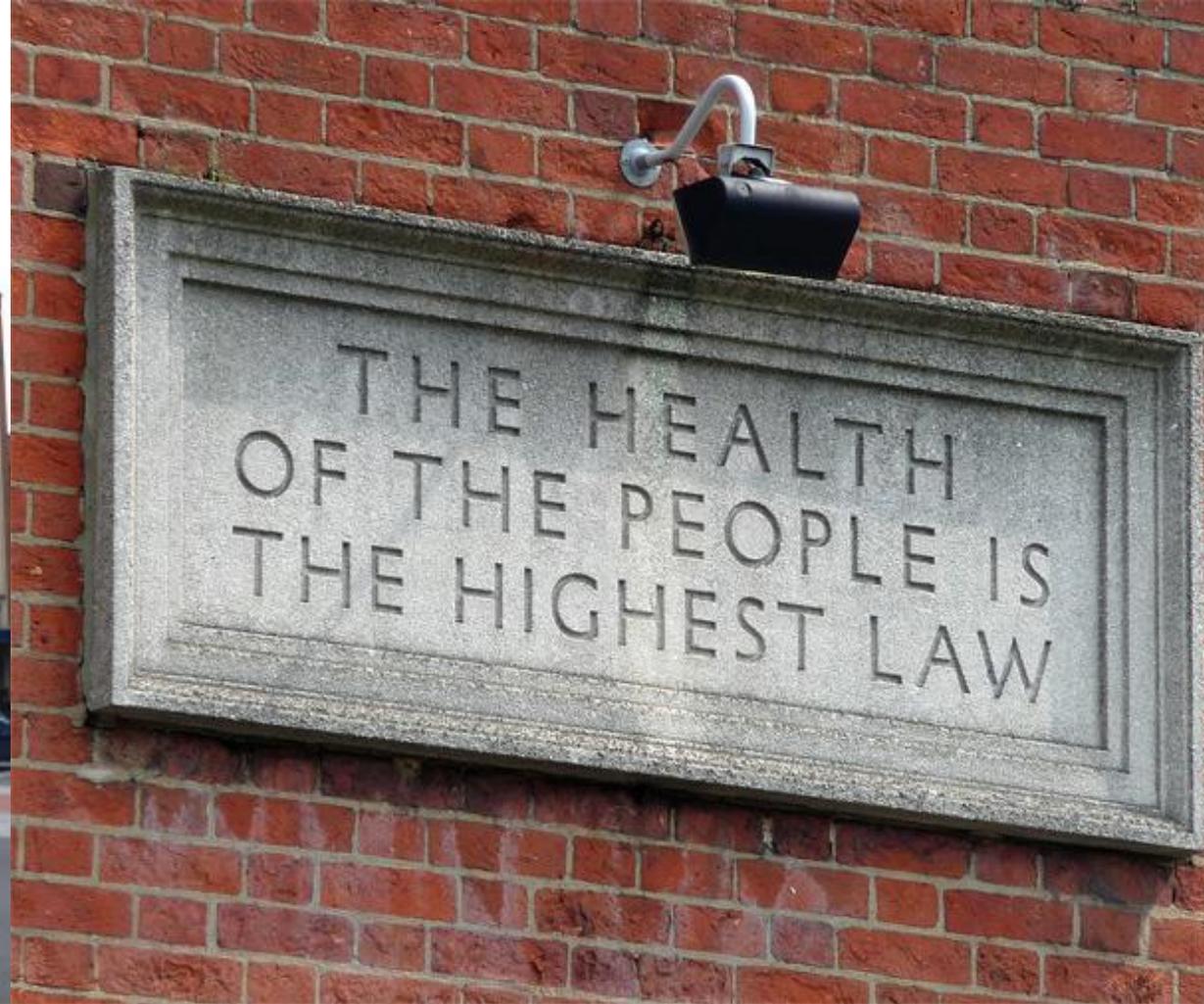
“Big data for medical applications workshop”



Drury Consulting Ltd – [druryconsultingltd@gmail.com](mailto:druryconsultingltd@gmail.com)



# TWO STORIES



*"Salus populi suprema lex est"* **Cicero**  
**de Legibus** (book III, part III, sub. VIII) 100BC-1AD



**Ahu Tongariki**

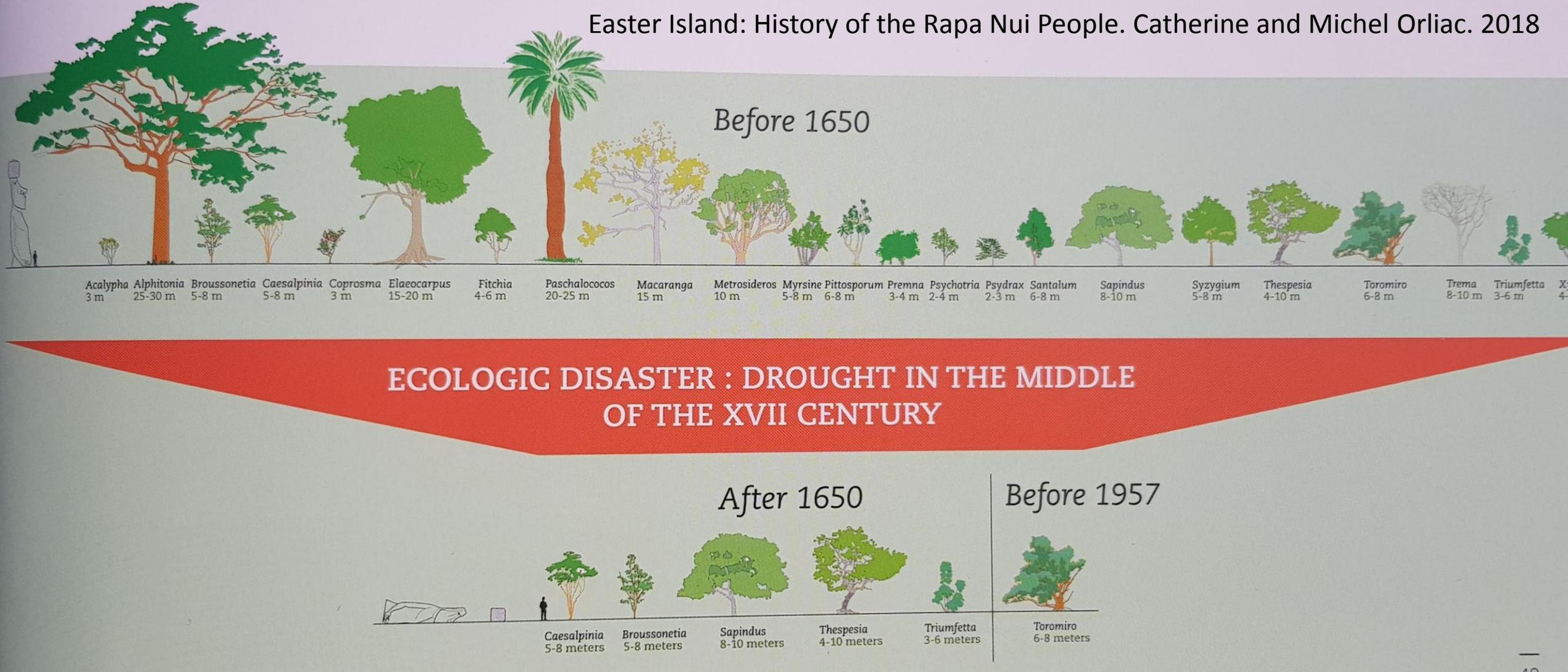


Rapa Nui

Population:  
1200-1650 =  
3-10,000

1722 Roggeveen  
described the  
people as “tall,  
muscular, and  
well-  
proportioned”.

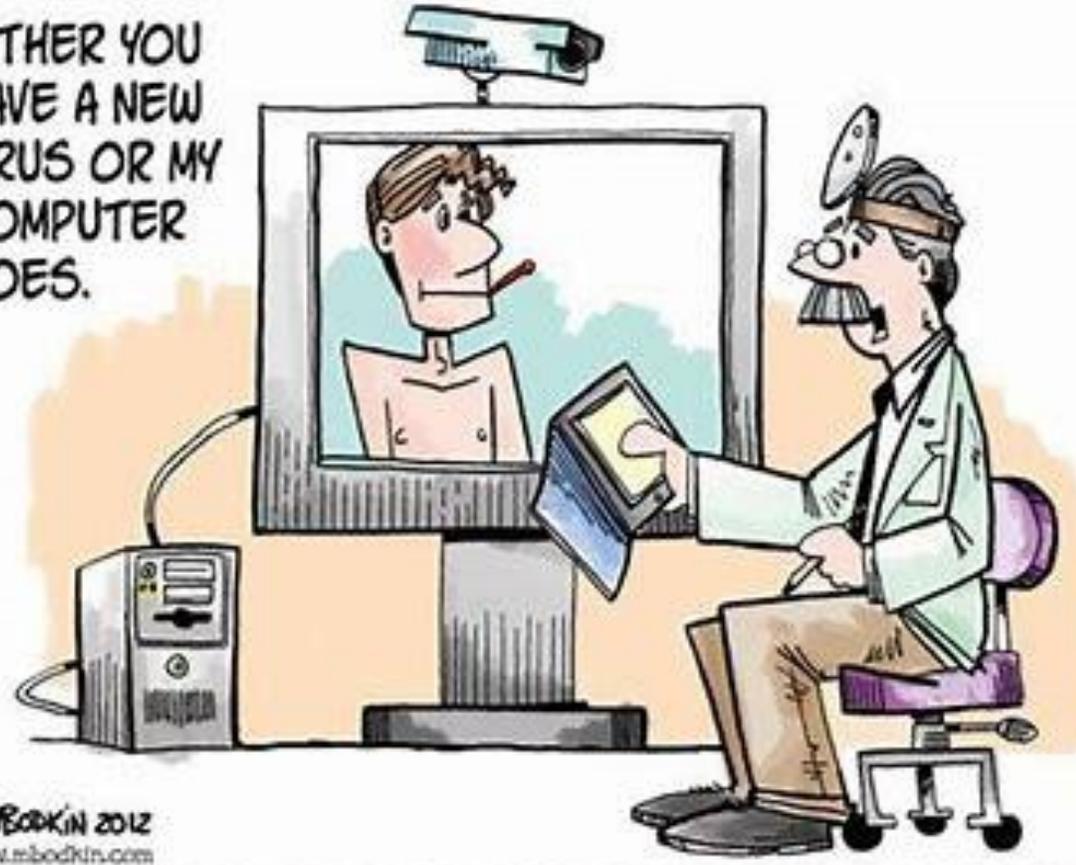
1877 = 110



“The clearest example of a society that destroyed itself by overexploiting its own resources“ Jared Diamond. Collapse. 2005

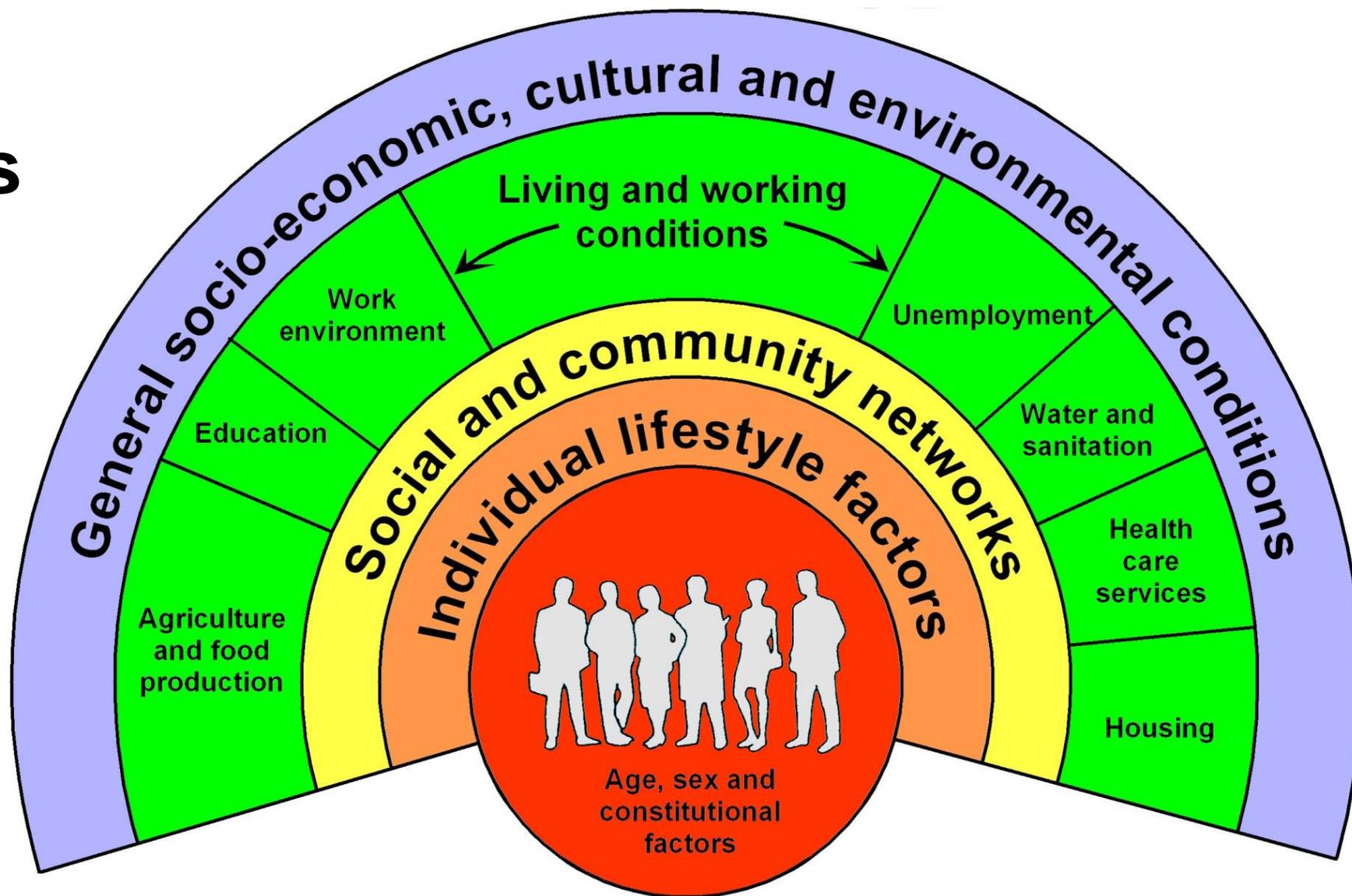
“To date, there is no conclusive evidence for the proposed precontact collapse of Rapa Nui society” Mara Mulrooney et al 2010.

EITHER YOU  
HAVE A NEW  
VIRUS OR MY  
COMPUTER  
DOES.



# SOME DETERMINANTS AND HEALTH TRENDS

# The main determinants of health



Dahlgren, G and Whitehead M. 1991. Policies and strategies to promote social equity in health

<https://core.ac.uk/download/pdf/6472456.pdf>

“Annually, 41 million people worldwide die from NCDs, including cancer, cardiovascular disease, diabetes, respiratory diseases, and mental disorders. Approximately 85% of these deaths occur in low- and middle-income countries”.

## Trends in health

“NCDs pose a greater threat to global economic development than natural disasters, crime, and corruption. Infections and environmental exposures associated with poverty greatly contribute to the death and disability caused by NCDs”.



People are both living longer, and suffering more dramatically from the effects of their bad habits.



The world's current population of 7.6 billion is expected to increase to 8.6 billion by 2030, and 9.8 billion by 2050.



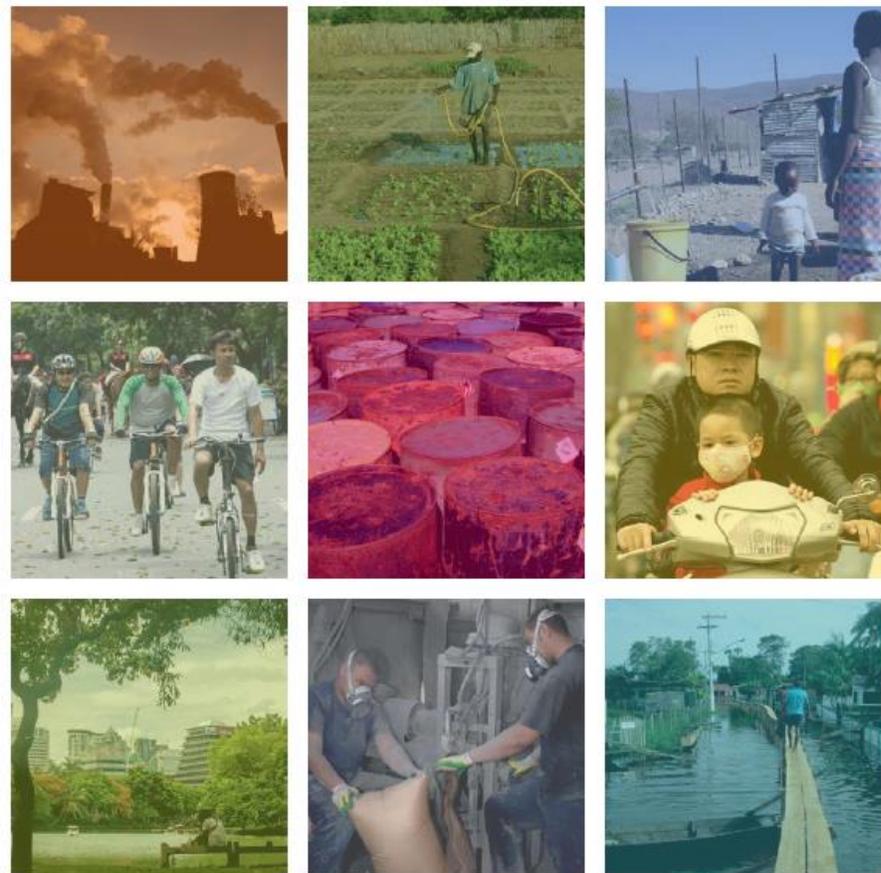
Increasing life expectancy will lead to a doubling of people 60+ by 2050.



Much of this population expansion will be the result of reductions in mortality, both from infectious disease and for those under five years old.



But 70% of deaths worldwide are from non-communicable diseases (often lifestyle-related).



## PREVENTING DISEASE THROUGH HEALTHY ENVIRONMENTS

A global assessment of the burden of disease from environmental risks

A Prüss-Ustün, J Wolf, C Corvalán, R Bos and M Neira



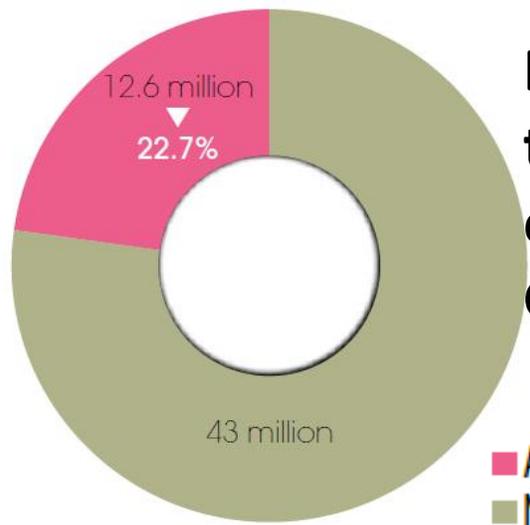
A Prüss-Ustün, J Wolf, C Corvalán, R Bos and M Neira 2016

## INCLUDED



Included factors are the modifiable parts of:

- Pollution of air (including from second-hand tobacco smoke), water or soil with chemical or biological agents
- Ultraviolet (in particular, protection from) and ionizing radiation
- Noise, electromagnetic fields
- Occupational risks, including physical, chemical, biological and psychosocial risks, and working conditions
- Built environments, including housing, workplaces, land-use patterns, roads
- Agricultural methods
- Man-made climate and ecosystem change
- Behaviour related to environmental factors, e.g. the availability of safe water for washing hands, physical activity fostered through improved urban design

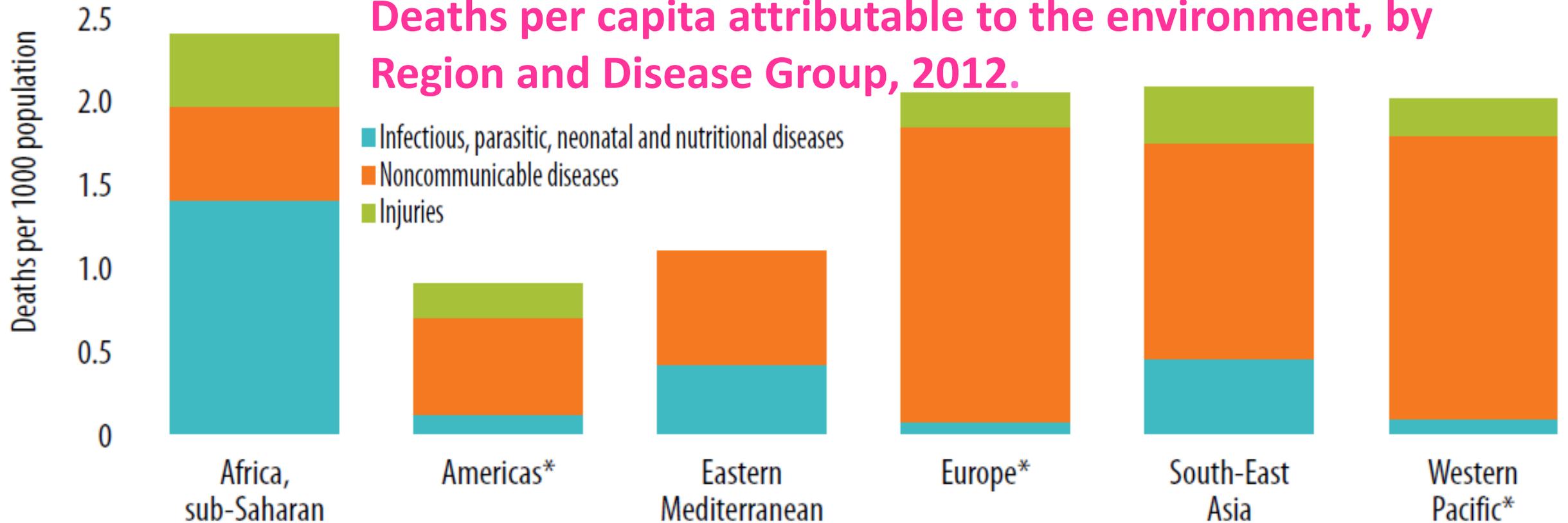


## Deaths attributable to the environment, Globally (2012).

- Attributable to the environment
- Not attributable to the environment

“A change in perception to view the environment as an essential element of health protection, while adequately preserving it, would greatly benefit people’s health. Coordinating and acting across sectors will be necessary, as many different sectors play a crucial role (e.g. energy, industry/manufacturing, water and sanitation, agriculture, housing, transport) in determining environmental risks and conditions”.

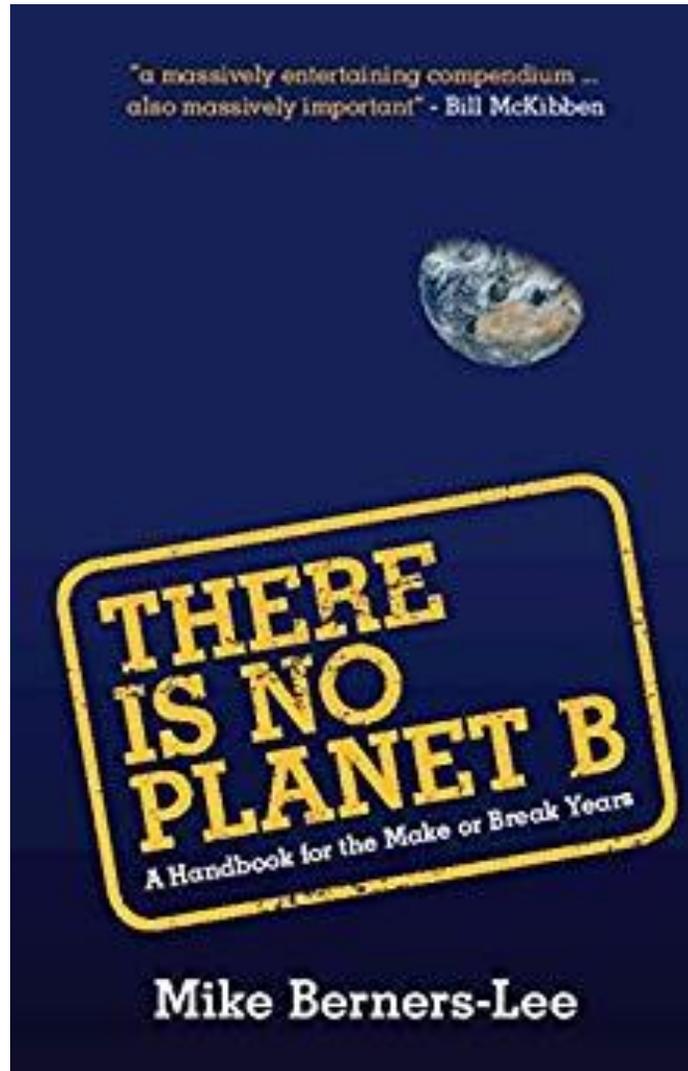
## Deaths per capita attributable to the environment, by Region and Disease Group, 2012.





# SEEING THE BIGGER PICTURE: WORLD-WIDE

# Berners-Lee



“I have taken on just about everything at once, simply because no other approach will do. It doesn’t work anymore to look at technical questions of food, energy or climate change separately from each other or separately from questions of values, economics or the very ways in which we think. All these things are too inescapably intertwined for the traditional “one bit at a time” approach to be adequate” (Berners-Lee, 2019 p4)

# Sustainable Development Goals, and Health

## HEALTH IN THE SDG ERA



“Fundamental to achieving the SDGs will be the recognition that eradicating poverty and inequality, creating inclusive economic growth, preserving the planet and improving population health are not just linked but interdependent.”

Margaret Chan; WHO 2015

# Health in all Policies

## Example: Air Pollution

“Scan your policy and political environment to determine what might work best in your context. The use of existing whole-of-government strategies, international “thinkers”, or a crisis or escalating problem can be the types of windows to look for when trying to initiate HiAP.”

*WHO 2018 Key learning on Health in All Policies implementation from around the world p3.*



Source: WHO 2018

# Digital in all Policies:

INNOVATION, TECHNOLOGY, AND EDUCATION FOR GROWTH

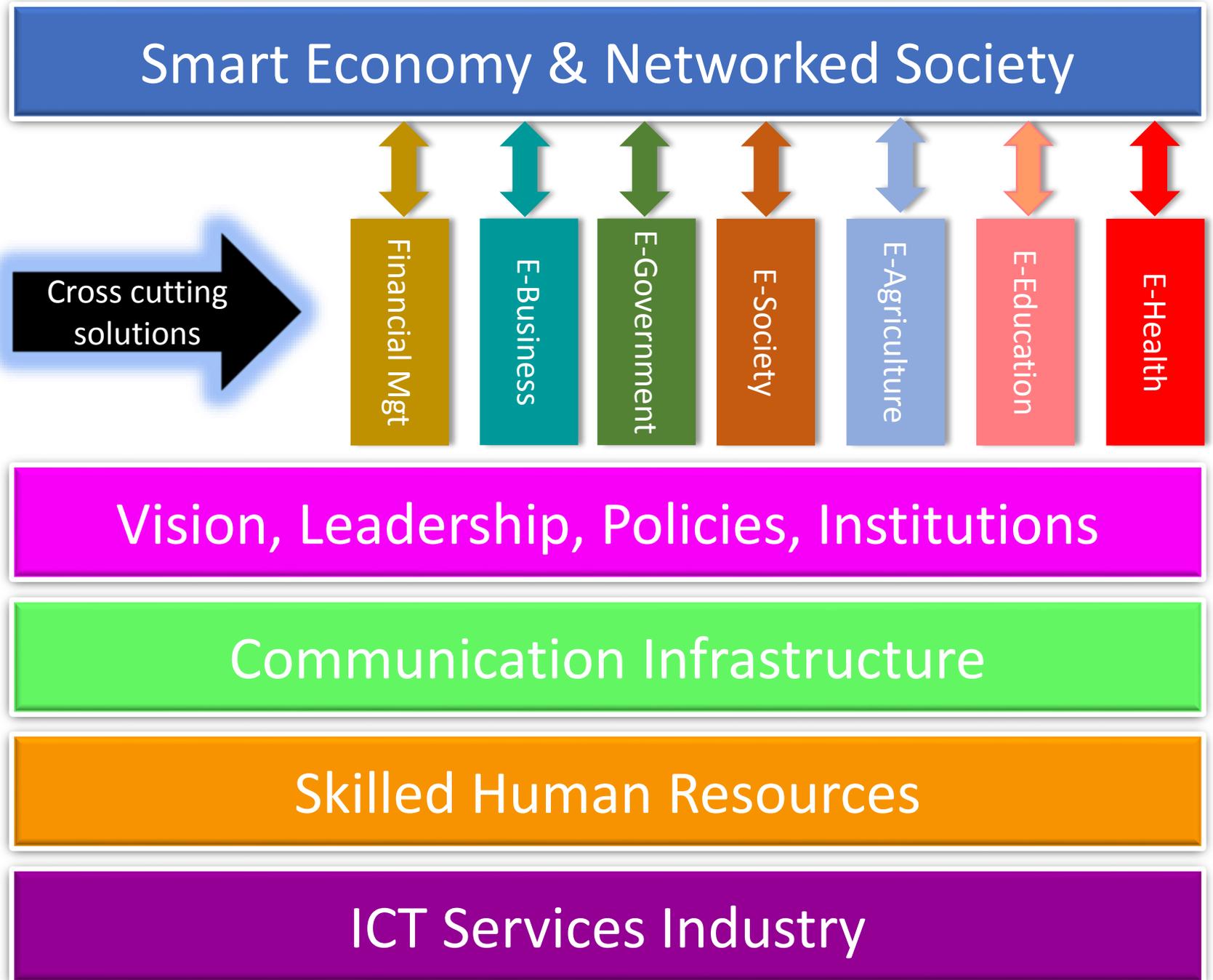
## MASTERING DIGITAL TRANSFORMATION

Towards a Smarter Society, Economy, City and Nation

NAGY K. HANNA



2016





# DIGITAL HEALTH

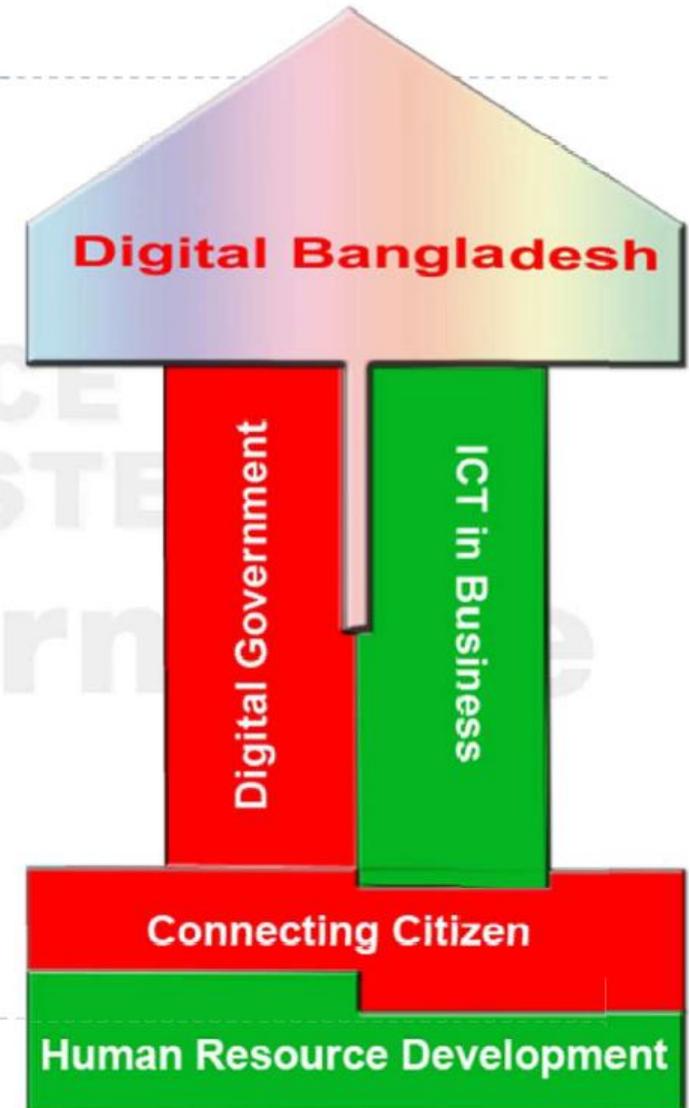
# ICTs Key Ingredient to Achieve Vision 2021

“Digital Health by 2021” :  
to establish a comprehensive information and communication technology (ICT) network across Bangladesh to cover all health facilities up to the subdistrict level”  
WHO SEARO Regional Committee 23 September 2009.

## ICTs as a pro-poor tool for

- ▶ Poverty alleviation
- ▶ Establishing good governance
- ▶ Social equity through
  - ▶ Quality education
  - ▶ **Universal healthcare**
  - ▶ Law enforcement for all
- ▶ Climate change adaptation

Anil Chowdhury **PMNCH Board Meetings**  
**8th Board Meeting (2010)**  
29-30 April 2010, Dhaka, Bangladesh

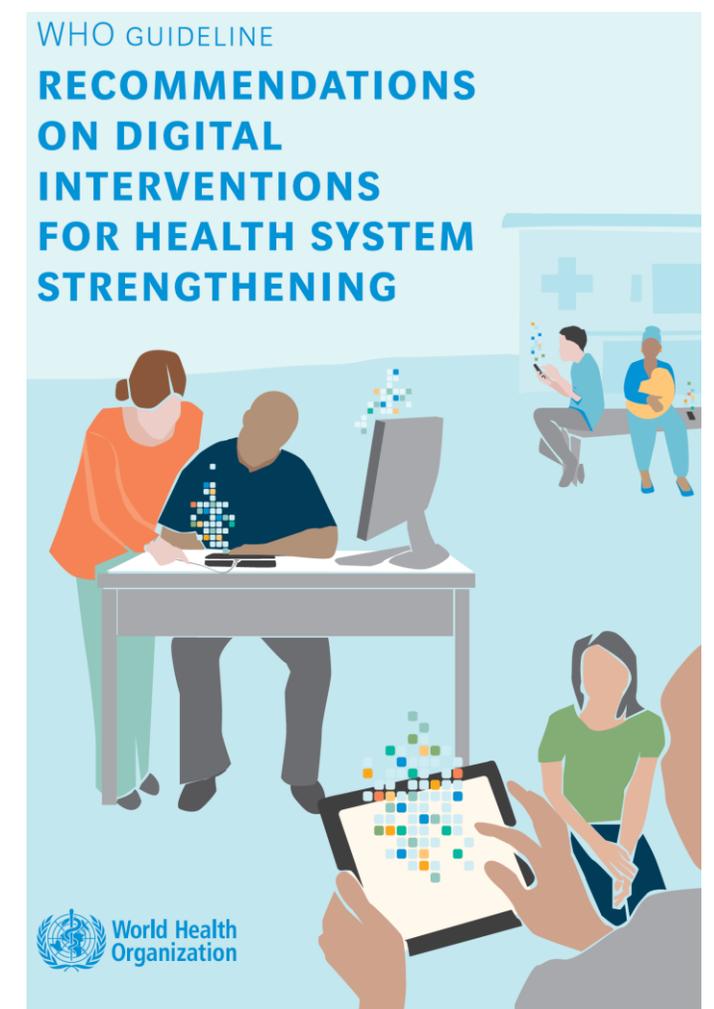




2012



2019



2019

Digital Health is understood to mean “*the field of knowledge and practice associated with any aspect of adopting digital technologies to improve health, from inception to operation*”.

But:

## Public sector digital technology projects

- Total failure **30%**
- Partial failure **50% to 60%**
- Success **20% at best**

# DIGITAL HEALTH ECOSYSTEMS

### Clinical Admin

### Digital Med Devices

### EHR/EMR

### Population Health Mgmt

### Online Health Communities

### Patient Engagement

### Genomics

### Services Search

## Digital Health

509 Companies  
\$7.05B Funding

See the updated scan and more:  
[venturescanner.com/scans/digital-health](http://venturescanner.com/scans/digital-health)

### Doctor Networks

### Medical Big Data

### teleHealth

### Remote Monitoring

### Online Health Destination

### Healthcare Mobile Communications

### Mobile Fitness / Health Apps

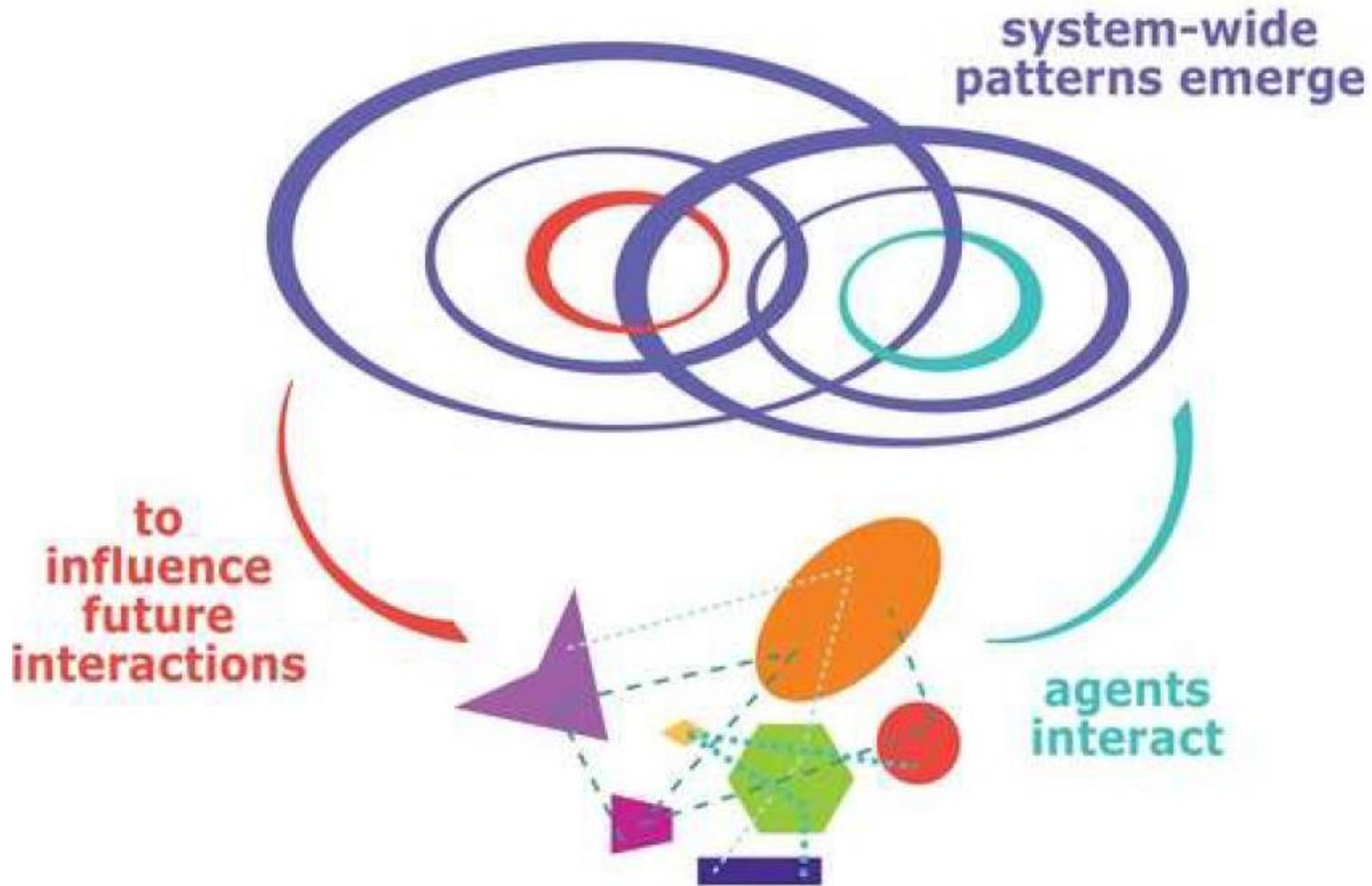
### IOT Health & Wellness

### Robotics

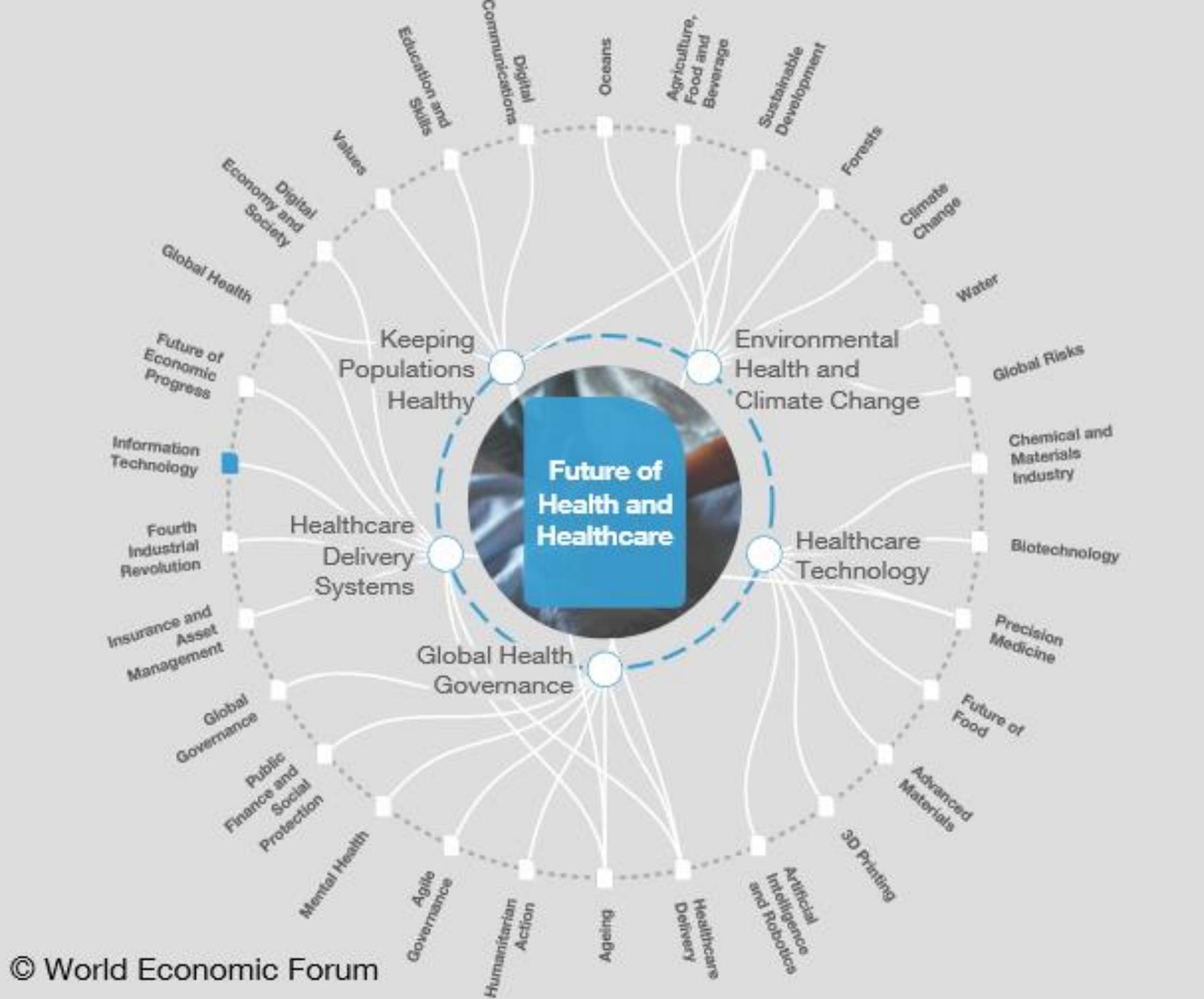
### Healthcare Marketing

Venture Scanner

# Digital Health is difficult because health is a complex adaptive system

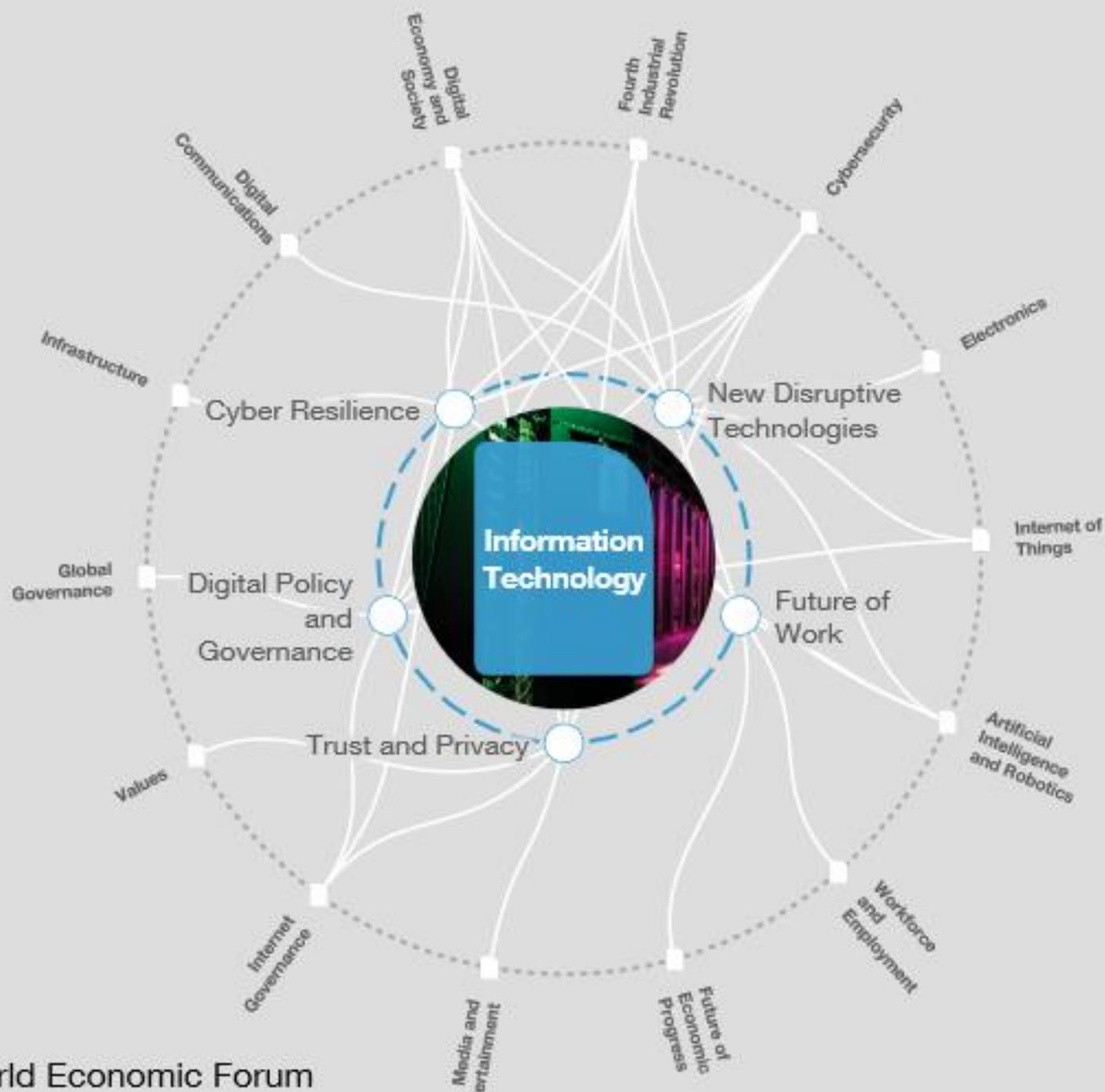


A complex adaptive system (CAS) was defined by Kevin Dooley in 1997 as “a group of semi-autonomous agents who interact in interdependent ways to produce system-wide patterns, such that those patterns then influence behavior of the agents.”

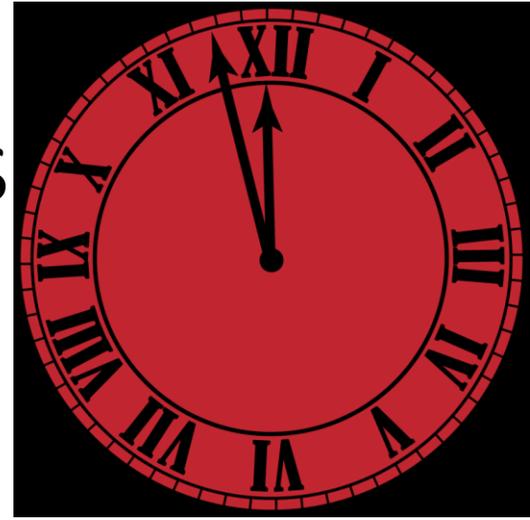


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World Economic Forum. Strategic Intelligence. 2019. <https://intelligence.weforum.org/topics/a1Gb0000038u3nEAA?tab=data>



# Health systems in Developing countries



## GAPS

- Resources to deal with high, and changing, burden of disease
- Capacity
  - Health workforce (gap of 18m by 2030)
  - Community-based knowledge

## CHALLENGES

- Time
  - Demographic change
  - Ecological change
- Interdependencies
  - Shifting the Paradigm
  - S(t)imulating new realities

# Digital Health Ecosystems

## GAPS

- Silos: data, information etc
  - Disease
  - Treatment vs Prevention
- Infrastructure
  - Technical: Interoperability
  - Social: Governance
- Poor Organisational Intelligence
  - Routine vs novel
  - Hindsight vs foresight

## CHALLENGES

- Joined up policy thinking
  - National with Development Partners
  - Investment with Affordability
- Leap frog solutions
  - Identity
  - Innovation Labs
- Organisational learning
  - Ecosystems
  - Risk management



How can Digital Health manage big data about the health of ecosystems and people?

- Creating a **PLATFORM (with Partners)** to collate and enable intelligent digital investigations of health ecosystems
  - The Determinants of Health
  - Bring Your Own Data about Gaps, Challenges and Interventions
  - Bring Your Own People and learn what may work for you
- **TECHNICAL** Requirements
  - Data Centre Technologies and Infrastructures
  - High computing performance and software
  - Machine learning and data analytics
  - Standards
- Digital Health **POLICY** Development
  - Using the Platform + People for sharing, developing, testing etc, to inform policy and implementation, and impact evaluations

# How to boil the ocean

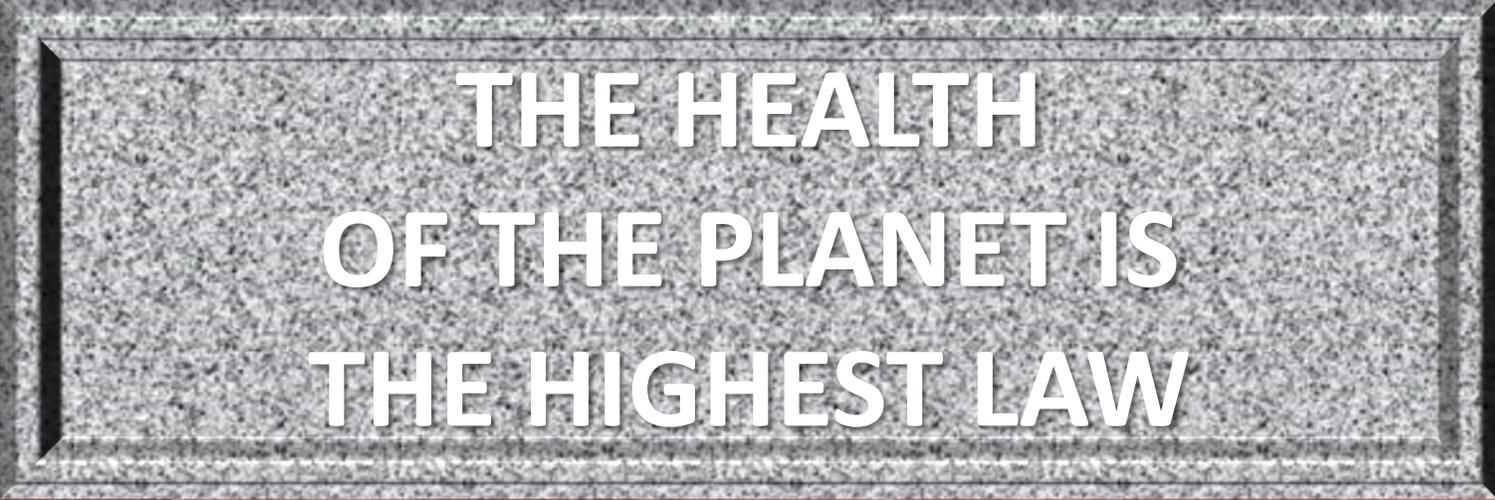
- Start with what you know
- Translate predictive factors from your domestic efforts



# Making a start: Digital Health Interventions and Challenges

WHO. 2018.

<https://www.who.int/reproductivehealth/publications/mhealth/classification-digital-health-interventions/en/>



**THE HEALTH  
OF THE PLANET IS  
THE HIGHEST LAW**

**Planetary Health: the human health impacts of human-caused disruptions of Earth's natural systems. Everything is connected — what we do to the world comes back to affect us, and not always in ways that we would expect. Understanding and acting upon these challenges calls for massive collaboration across disciplinary and national boundaries to safeguard our health.**

<https://planetaryhealthalliance.org/>

The image shows a large, illuminated globe structure on the left, composed of many small, glowing panels. To its right is a modern, abstract sculpture made of curved, metallic bands, also illuminated from within. The scene is set against a dark blue twilight sky. The text "Thank You!" is overlaid in the upper right corner.

Thank You!

The Globe of Science and Innovation is a symbol of Planet Earth