



Capacity Building through networking: Example of the ONWARD Network

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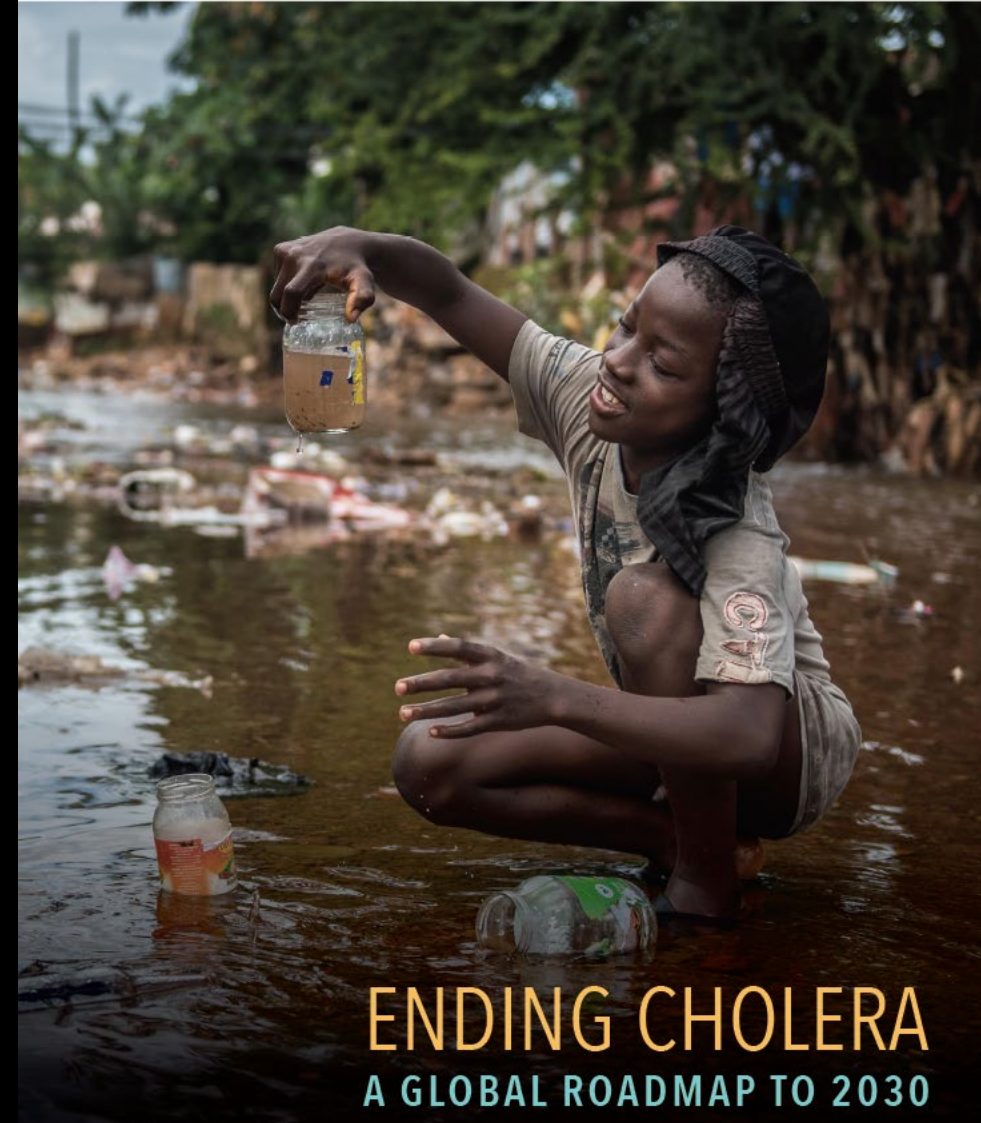
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³Nansen Environmental Research Centre, India



Infectious Diseases

Infectious diseases are caused by pathogenic microorganisms, such as bacteria, viruses, parasites or fungi; and can spread, directly or indirectly, from one person to another.



Relevance

- Malaria: Estimated cases: 241 million; deaths: 627 000 (worldwide, in 2020)
- Cholera: Estimated cases: 1.3 to 4.0 million; deaths: 21,000 to 143,000 per year

Drinking water:

- Contaminated water can transmit diseases such as diarrhoea, cholera, dysentery, typhoid, and polio.
- 785 million people lack basic drinking-water service; 144 million people are dependent on surface water
- Globally, at least 2 billion people use a drinking water source contaminated with faeces
- Contaminated drinking water is estimated to cause 485 000 diarrhoeal deaths each year.
- By 2025, half of the world's population will be living in water-stressed areas.
- Provision of safe drinking water often breaks down in extreme weather and flooding.

Hence the need to address also the resilience of human communities to perturbation of the supply of safe drinking water, especially under extreme weather events associated with a changing climate.

<https://www.who.int/news-room/fact-sheets/detail/malaria>; <https://www.who.int/news-room/fact-sheets/detail/cholera>; <https://www.who.int/news-room/fact-sheets/detail/drinking-water>

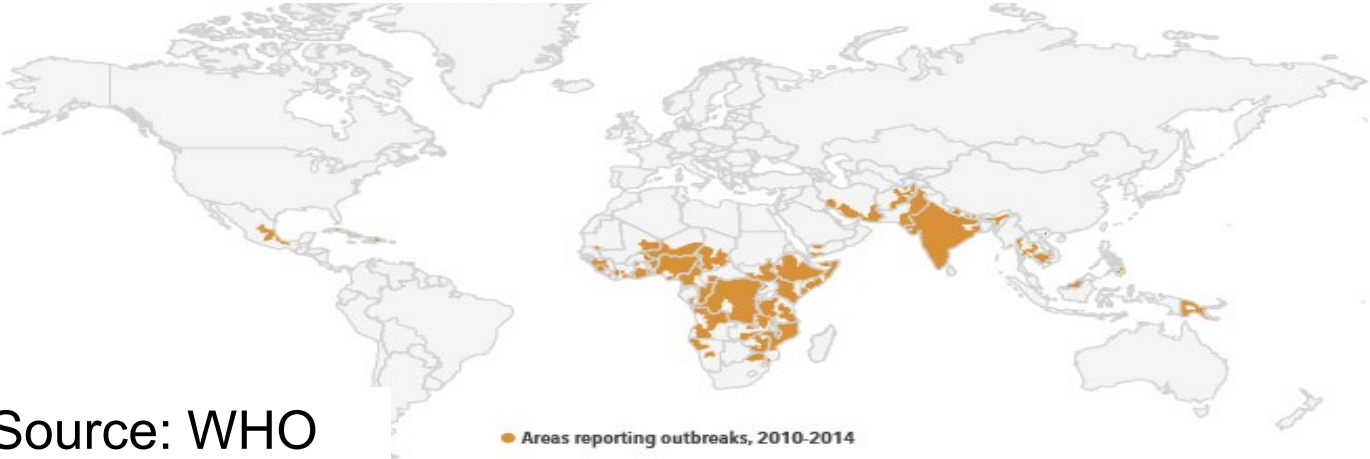
Infectious Diseases



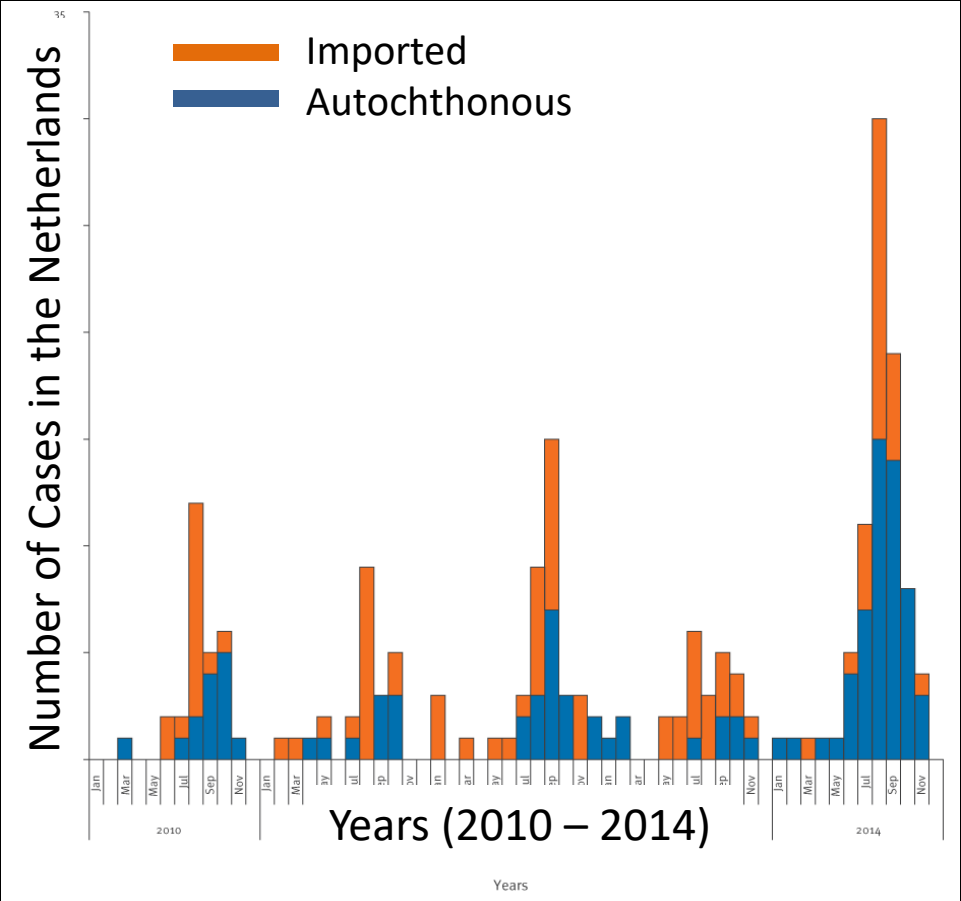
Diseases within animal populations are crossing into human populations with increasing frequency -WHO

Leptospirosis is a disease that spreads from animals to humans, caused by infection with the bacteria *Leptospira*. The most common sources of infection are contact with the urine of infected animals and/or contaminated soil or water. Outbreaks may occur following periods of heavy rain or flooding.

Areas reporting cholera outbreaks 2010-2014



Source: WHO



Pijnacker et al. 2015. *Euro Surveill.*

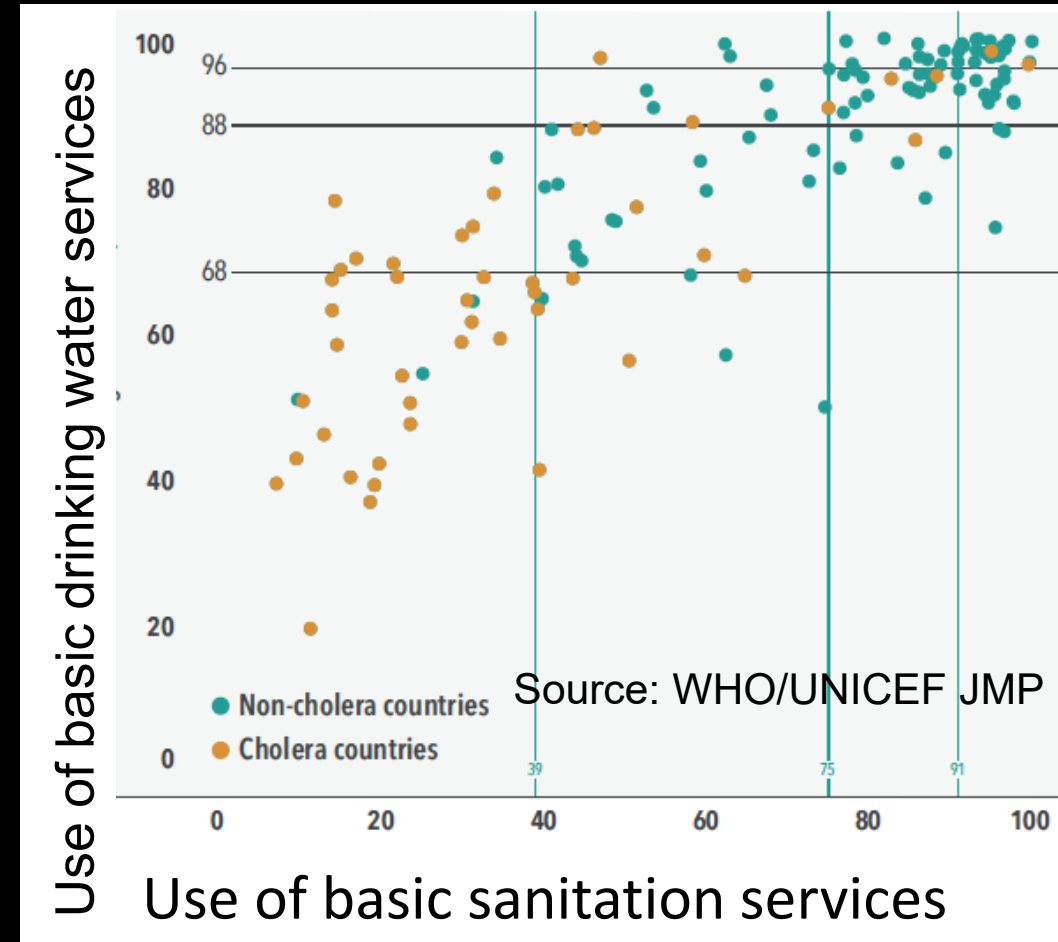
Infectious Diseases

Many of the key determinants of health and the causes of infectious diseases lie outside the direct control of the health sector.

Other sectors involved are those dealing with sanitation and water supply, environmental and climate change, education, agriculture, trade, tourism, transport, industrial development and housing.

(<http://www.emro.who.int/health-topics/infectious-diseases/index.html>)

The question: How can we bring these different sectors together, to share information, and to work together?



Earth Observation has much to offer...

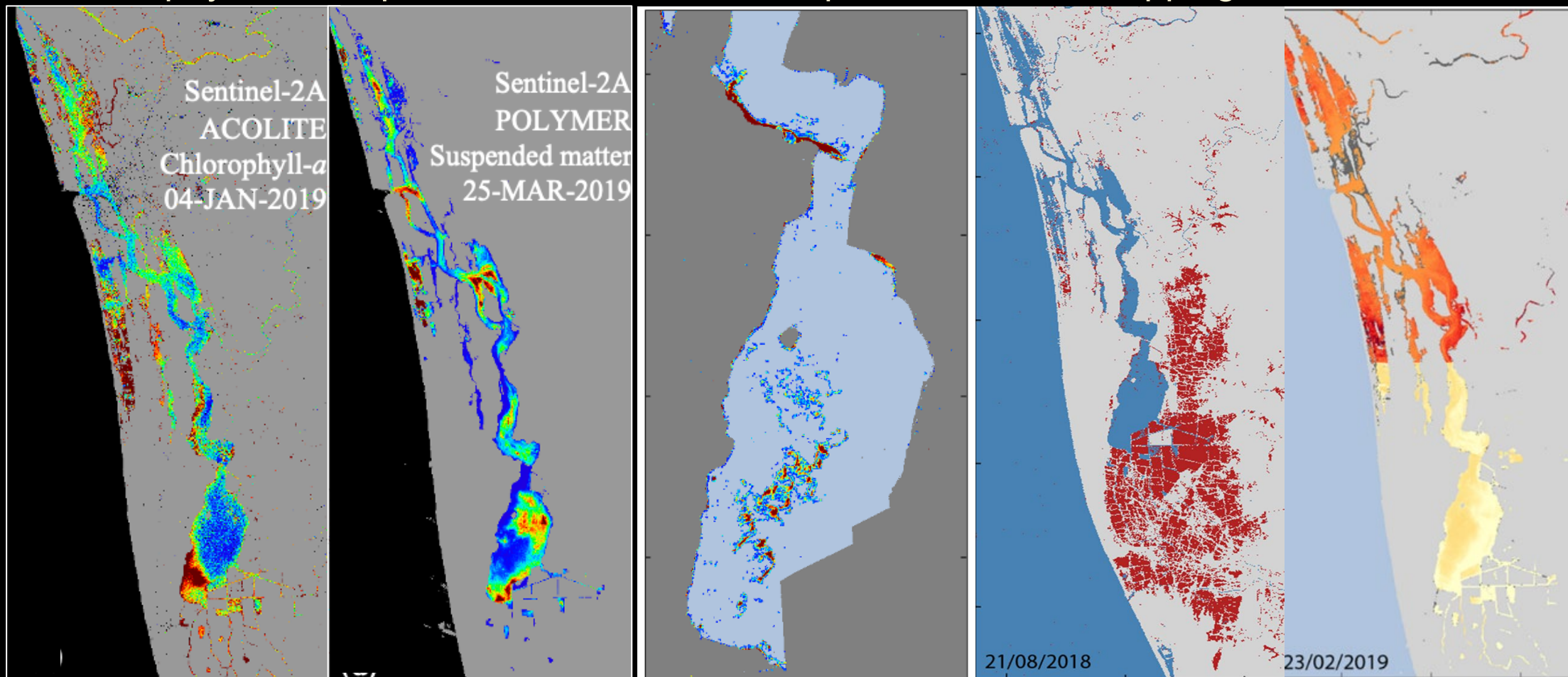
Chlorophyll

Suspended matter

Invasive species

Flood mapping

Cholera risk



See posters of Varunan Theenathayalan, Gemma Kulk's talk to follow. See also Anas et al. (2021)

...but this is only a small part of the solution

What is ONWARD?

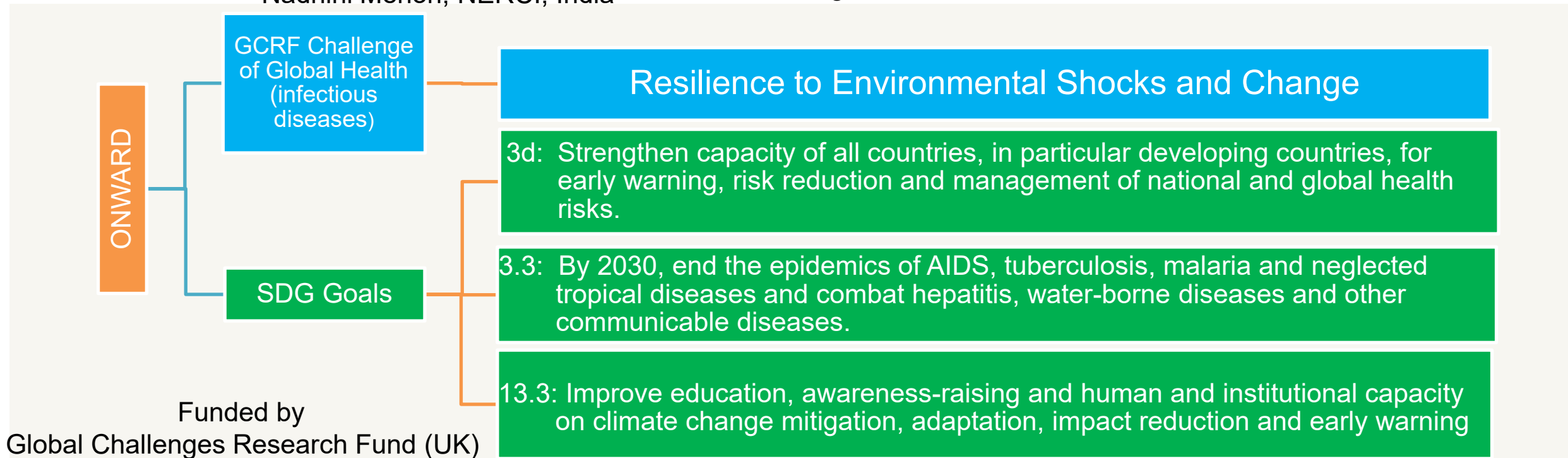
- Open Network for Water-Related Diseases
- ONWARD is dedicated to developing an open network to improve forecasting and risk mapping for water-associated diseases through remote sensing, field observations and mathematical modelling.
- ONWARD is an open network committed to promote better dialogue and collaboration among experts from all relevant disciplines and with stakeholders.

Lead: Milton Kampel, INPE, Brazil

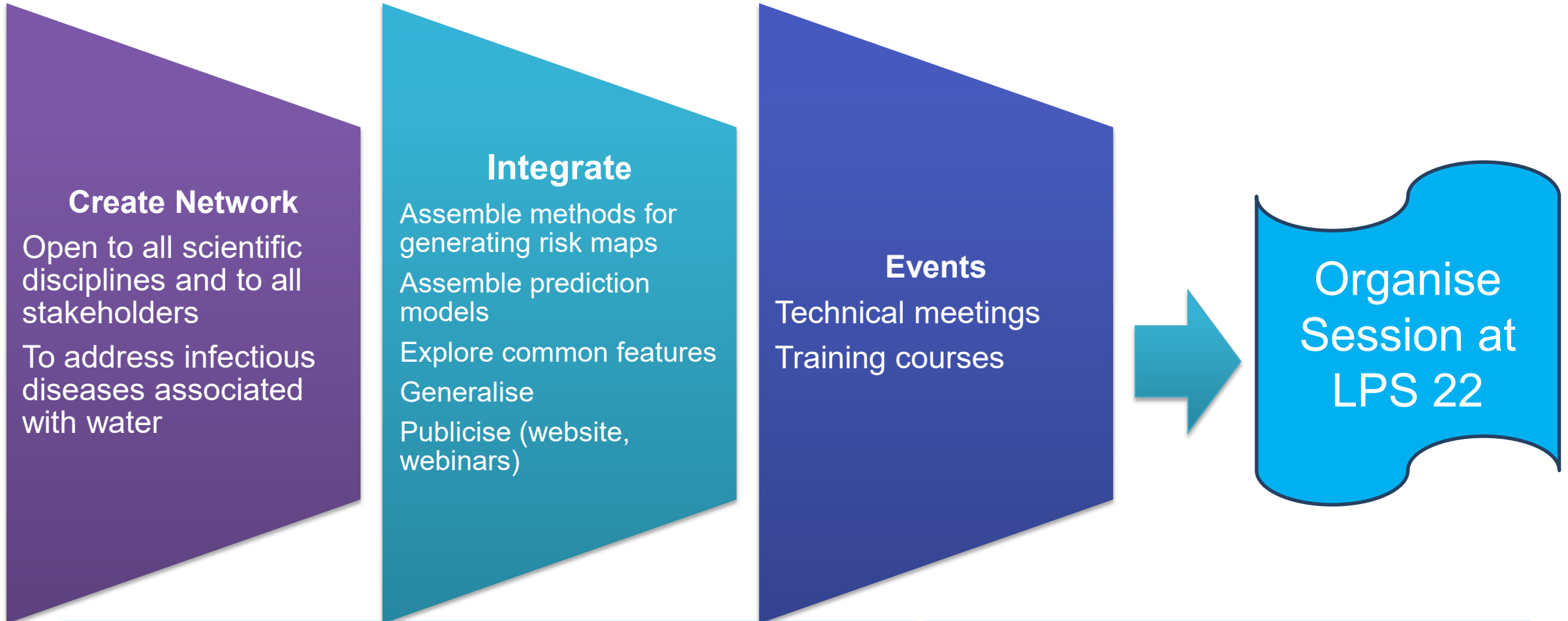
Co-Investigators: Shubha Sathyendranath, PML, UK,
Nadnini Menon, NERCI, India

Board:

Anas Abdulaziz, Craig Baker Austin, Rita Colwell, Grinson George, Nicholas Thomson, Bess Ward



What is ONWARD doing?



Link to other relevant initiatives and organisations:
Trevor Platt Science Foundation
Nansen Environmental Research Centre, India
Plymouth Marine Laboratory, EUMETSAT

Identify gaps:
promote collaboration to fill gaps

ONWARD Webinars in collaboration with AIR Centre, Portugal

Dr. Ricardo José de Paula Souza e Guimarães



Biomedical Research, Public Health, Brazil

Dr. Jamie Shutler



University of Exeter, UK

Ms Cristiane Giroto



University of West London, UK

Prof. Rita Colwell



University of Maryland, USA

Ms. Verónica Jurquiza



National Institute for Fishery Research and Development – INIDEP, Argentina

Dr. Anas Abdulaziz



National Institute of Oceanography (NIO), India

Dr. Grinson George



Senior Program Specialist (Fisheries), Bangladesh

Dr. Philippe Riskalla Leal



National Institute for Space Research (INPE), Brazil



Online Course
~200 participants
14 countries

In-person
Laboratory & Field
Training (India)
13 participants

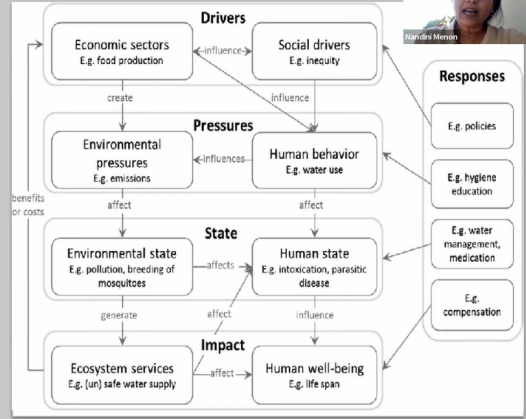
Internship
(Local)
2 people

In collaboration with
TPS Foundation

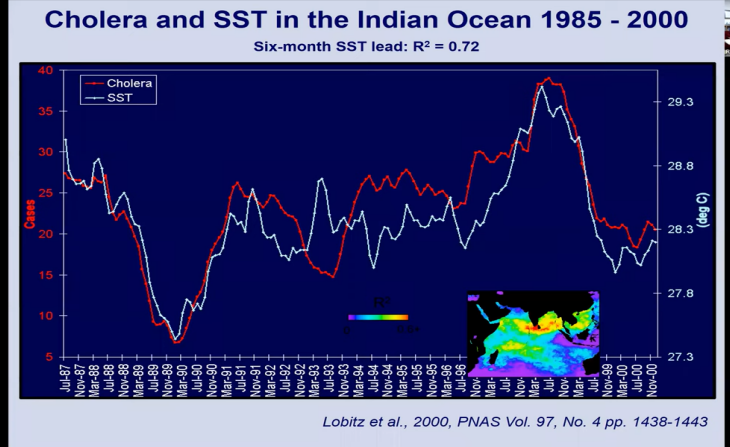


How to address the problem?

Analysis of water related environmental and human health issues by applying the DPSIR (Drivers, Pressures, State, Impacts and Response) framework
(Boelee et al. (2019): Acta Tropica, 193: 217-226)

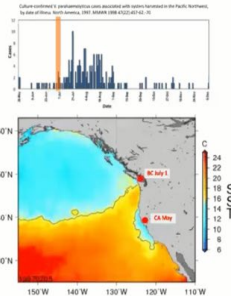


Onward Training Course February 2022 Monitoring Microbial Quality of Water



Pacific Northwest outbreak, 1997

- During the summer of 1997, the largest reported outbreak in North America of culture-confirmed *Vibrio parahaemolyticus* infections occurred.
- 209 infections reported, all associated with eating seafood harvested from California, Oregon, and Washington in the United States and from British Columbia (BC) in Canada; one person died.
- Mean Pacific coastal sea surface temperatures were significantly higher (typically 3-5 °C) in areas where cases were subsequently reported.
- As with the example from Spain, the movement and retention of very warm water can be clearly seen using remote sensing data. Again, this probably caused these outbreaks.



Source: J. Trinanes, C. Baker-Austin and J. Martinez-Urtaza (2012)



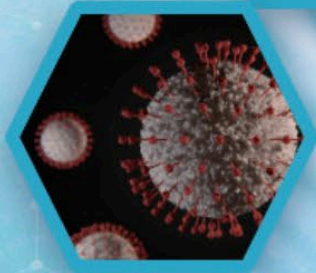
Remote Sensing and Geospatial Analyses for Human Health

Being Organised in three modules:

- Module 1: Introduction to remote sensing, in collaboration with EUMETSAT, led by Hayley Evers-King
- Module 2: Geospatial data and analyses, led by INPE and Milton Kampel
- Module 3: Case studies on Earth Observation for Human Health, organised by INPE and Milton Kampel
- Scheduled for three weeks in July: 11-15, 18-22 and 25

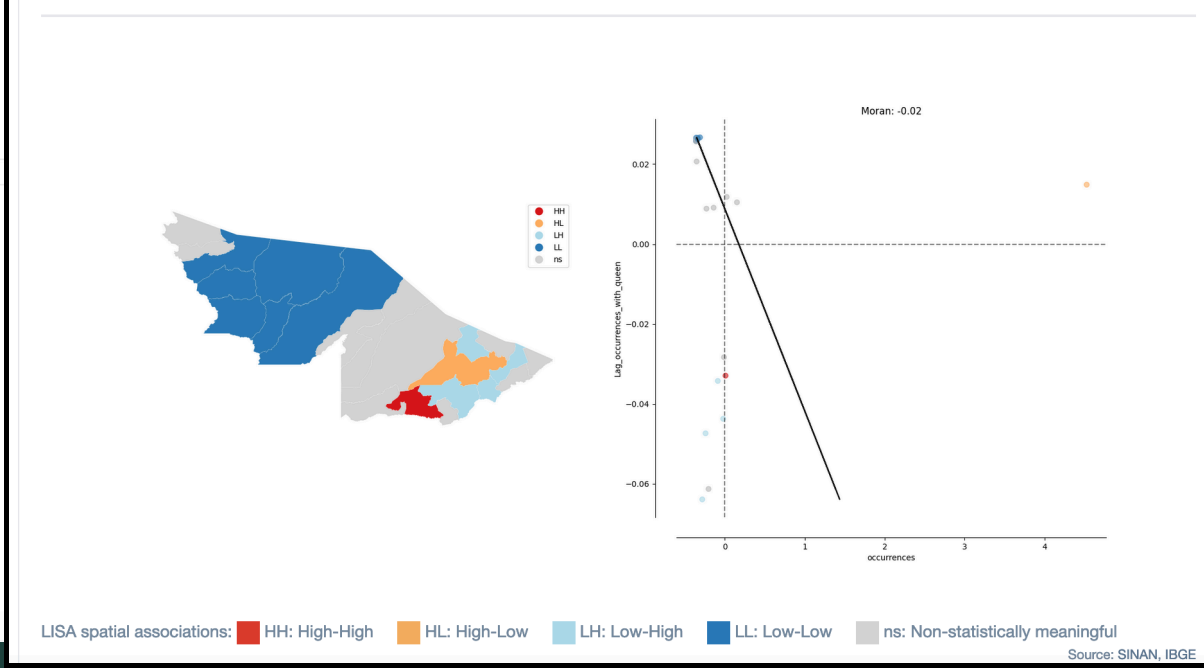
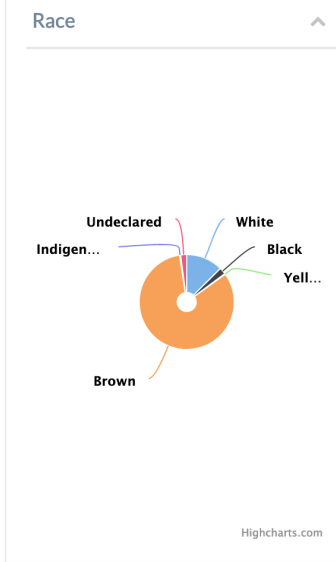
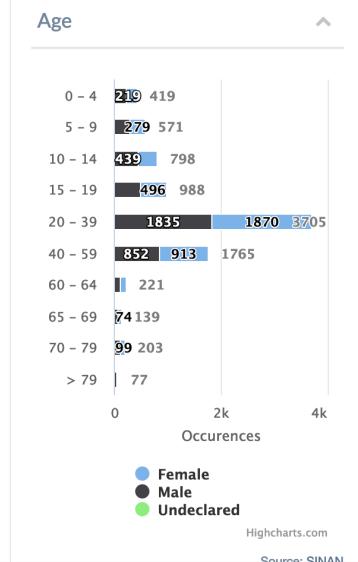
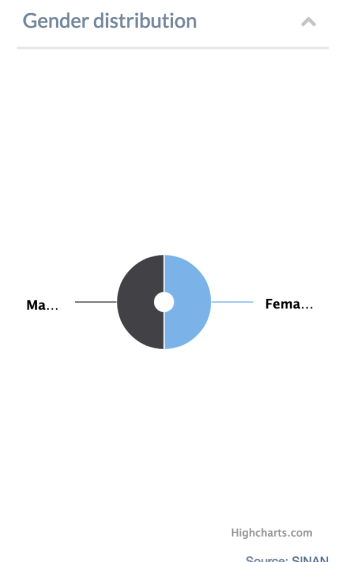
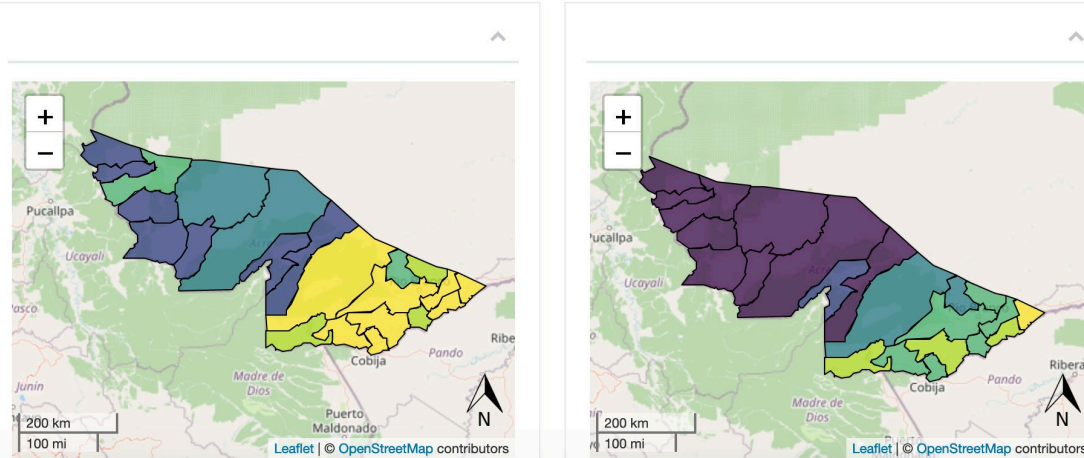
Those interested, please contact: onward.gcrf@gmail.com





Configuration

Disease: **Dengue** State: **AC** Year: **2013**



Interactive Diseases Data Portal for Brazil

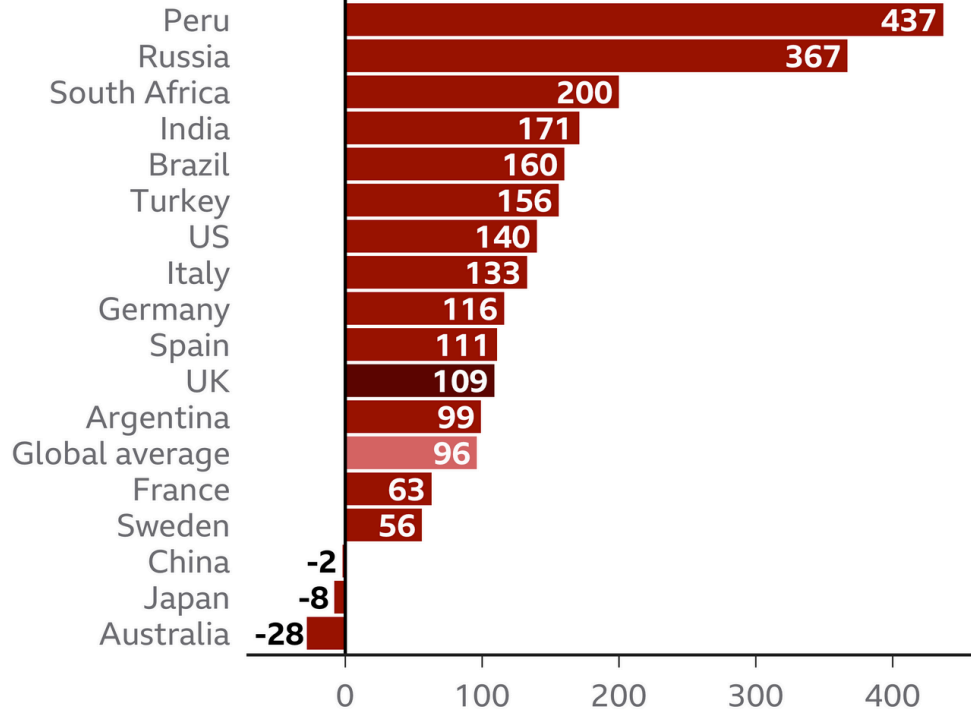


Importance of Data Quality

- Quality of any analysis we might do with the data will depend on the quality of the data themselves.
- The COVID-19 is a well studied example of problems associated with undersampling.
- Problems with data quality tend to be higher for other infectious diseases
- Data quality issues tend to worsen in low-income countries, and the burden of water-borne diseases is higher in tropical, low-income countries
- Within country differences important for big countries: high spatial and temporal resolution needed

Different countries, different pandemics

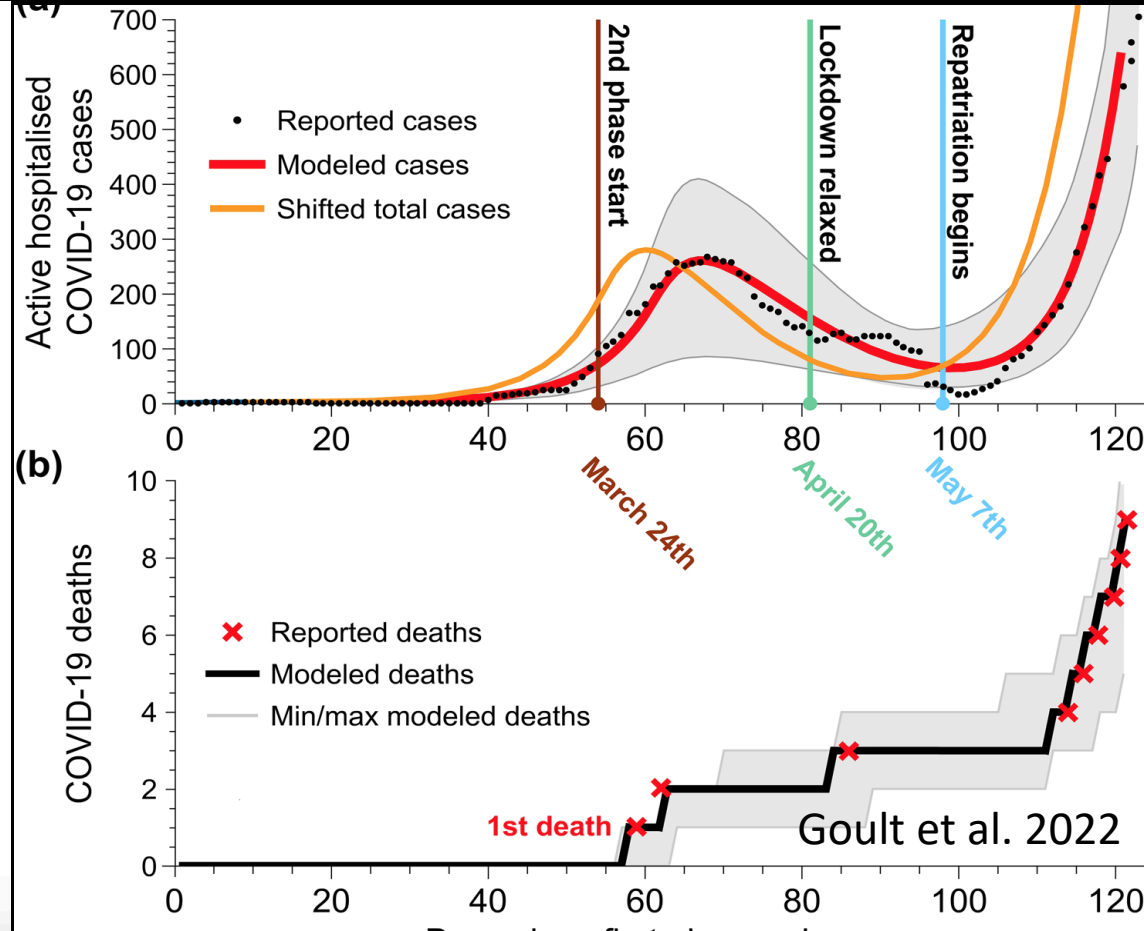
Excess deaths per 100,000 in 2020 & 2021, selected countries



Note: Excess death rates are calculated as an average of the rates for 2020 & 2021

Source: World Health Organization

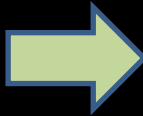
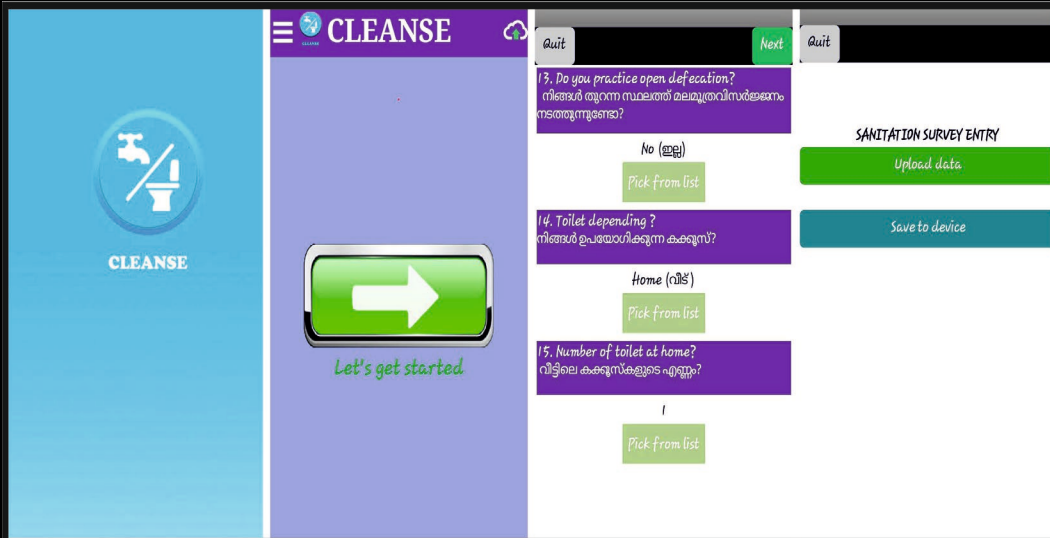
B B C



More than 4.7 million people in India - nearly 10 times higher than official records suggest - are thought to have died because of Covid-19, according to a new World Health Organization report.

Important to Engage with the Affected Population

Smart phone Sanitation App: Cleanse



Next steps:

- Assemble data to create dynamic sanitation maps
- Maps will be open access
- Citizens, local authorities and health workers will get real-time information on sanitation conditions and health
- Link to EO based risk maps

All citizens can participate.

Bilingual questionnaire on:

- Sanitation conditions
- Signs of infectious disease in household
- Report change in conditions

Why?

- A citizen science approach to filling some of the gaps in data
- Make citizens part of the solution
- A collective approach to building resilience to increasing threats from extreme events

Sustaining Networks and Capacity Building



We have set up a not-for-profit organisation:
The Trevor Platt Science Foundation: for the betterment of our environment and our society by equipping young scientists to take up leadership roles for stewardship of our planet.

Current activities:

- Outreach
- Mentoring
- Internships
- Webinars

NGOs can play an important role in:

- developing a network of committed citizens for stewardship of our environment
- sustained capacity building;
- informing the general public; and

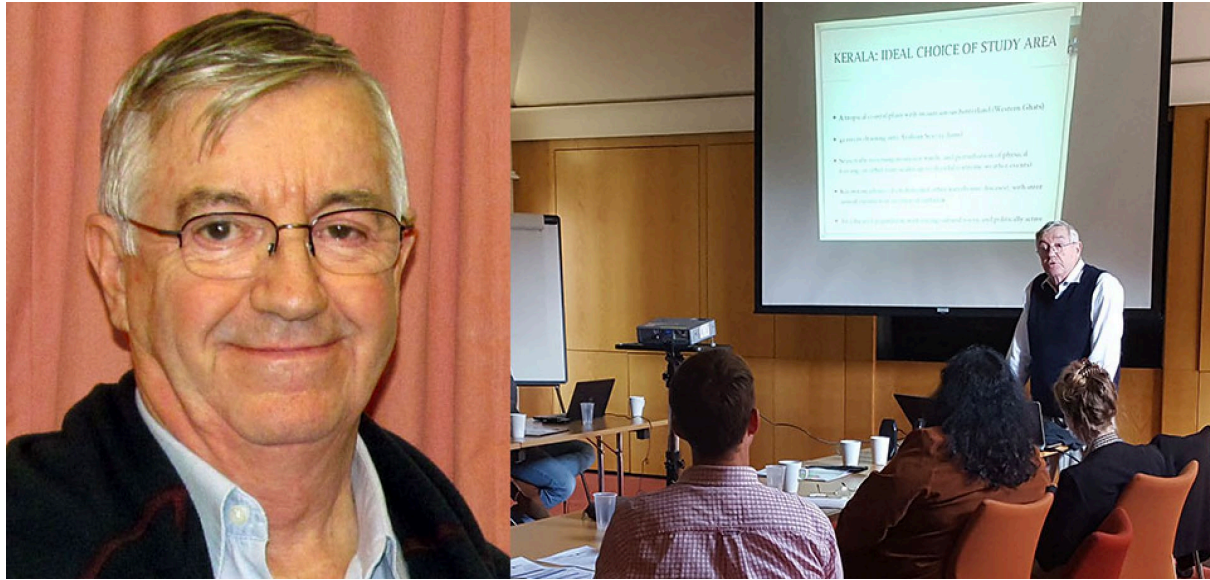


But no single organisation can meet all the requirements.

Broad collaboration is key.

We are grateful for continued help from
AIR Centre with our webinar series
EUMETSAT support with the training course.





ONWARD project owes its inception to
PROF. Trevor Platt, FRS

Who continues to guide us and light our ways in science and in life

THANK YOU

Who can join ONWARD?

We invite all interested parties to join ONWARD. These may include (but are not limited to)

- Remote-sensing scientists
- Microbiologists
- Ecologists
- Social scientists
- Epidemiologists
- Medical practitioners
- Mathematical modellers
- Aquatic scientists (oceanographers, limnologists, wetlands experts)

How to join ONWARD?

Those interested in joining the network please write to:
onward.gcrf@gmail.com with "ONWARD Membership" in the subject line.