Waterborne pathogens: Innovating evidence based practice for safe sanitation in Uganda

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https://www.youtube.com/watch?reload=9&v=TcpuE8vBOyQ

United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

Sustainable Development Goals

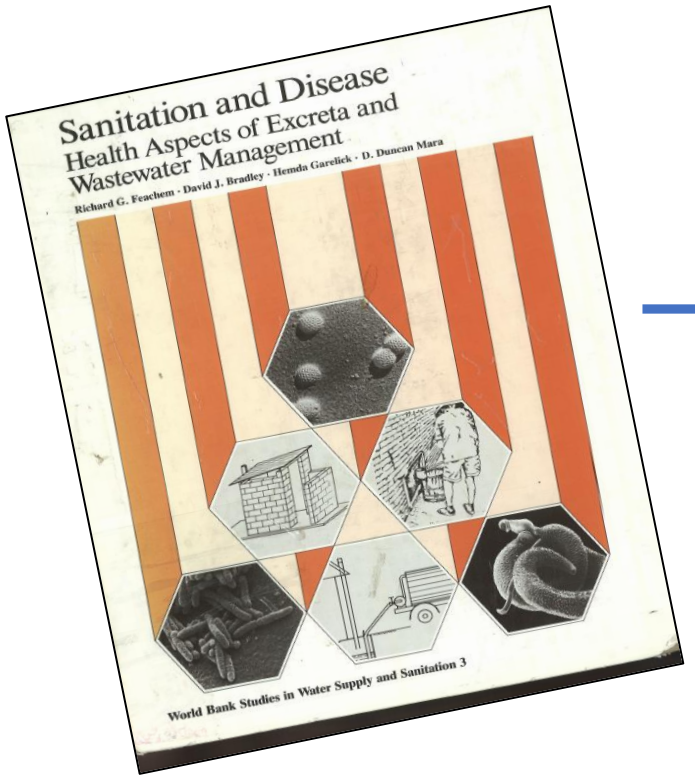
What Knowledge to Practice (K2P) is about?

- Improving accessibility to data through new ICT tools to support evidence-based practice for safe sanitation

- Using scientific data on pathogens to advocate for best practices

- Empowering Water and Sanitation Service Providers
  - Decision support tools
  - Knowledge sharing
  - Capacity building (training & awareness raising)

K2P- Using data generated from the Global Water Pathogen Project (GWPP)

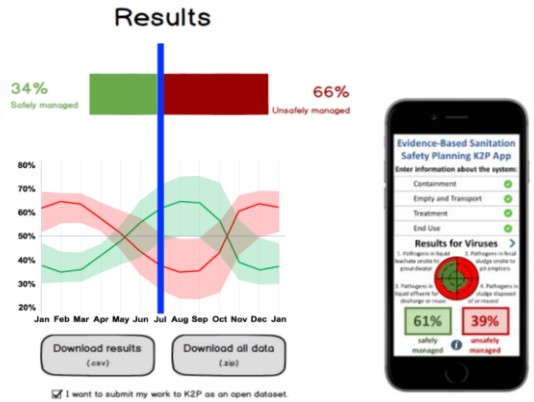


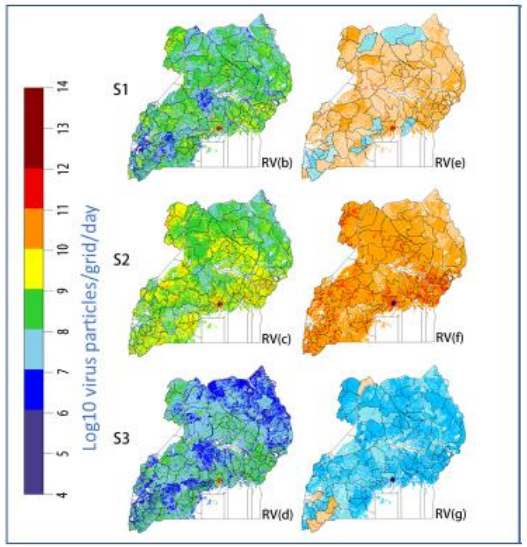
GWPP
Global Water Pathogen Project

www.waterpathogens.org

254 contributors from 49 countries

Pathogen Flow Tools



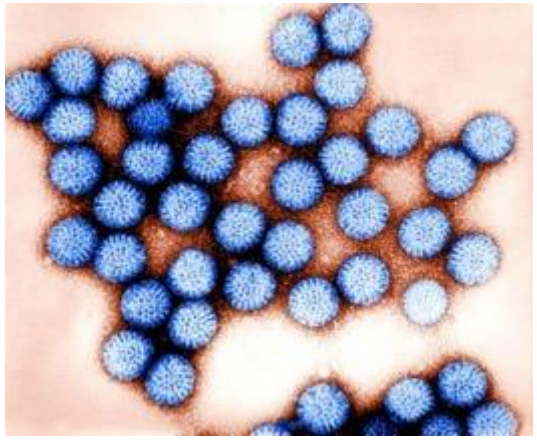


Pathogen Emissions Mapping Tool

Target Stakeholder Groups and Uses of Tools

Scale	Possible Uses	User Groups
Global	Guidelines and policies, educational programs	UNESCO, WHO, UNICEF, UNDP
National/ Regional	Large scale implementation, resource prioritization, working across communities, watersheds, sectors	Govt, Ministries, Water Authorities
Local	Building/ choosing sanitation systems, integration with education	Institutions, utilities, NGOs, community coalitions

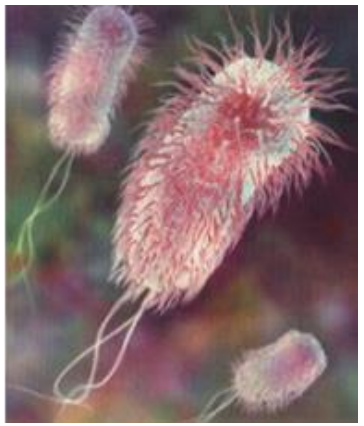
What pathogens are found in sewage and excreta?



Viruses

rotavirus

- Extremely small
- Infectious
- Often move like chemicals



Bacteria

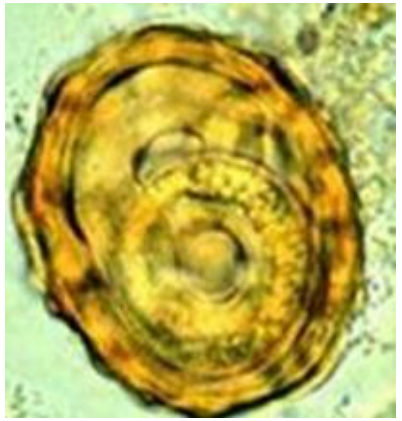
Cholera, Typhoid

- Microscopic (smaller than algae)
- *E.coli*/ coliforms are bacteria

Protozoa

Entamoeba Histolytica

- Size of algae
- Produce egg like cysts
- Resistant to chlorine



Helminths eggs

Hookworm

- Large
- Produce eggs
- Often need to mature in the environment
- Long survival

Why pathogen type is important?

- **Size (viruses < bacteria < protozoa < helminths)**
  - Important for removal or disinfection through treatment systems
  - Important for transport into groundwater
- **Persistence/ survival in the environment** and **treatment systems** varies by organism type

Differences between pathogens and indicator organisms

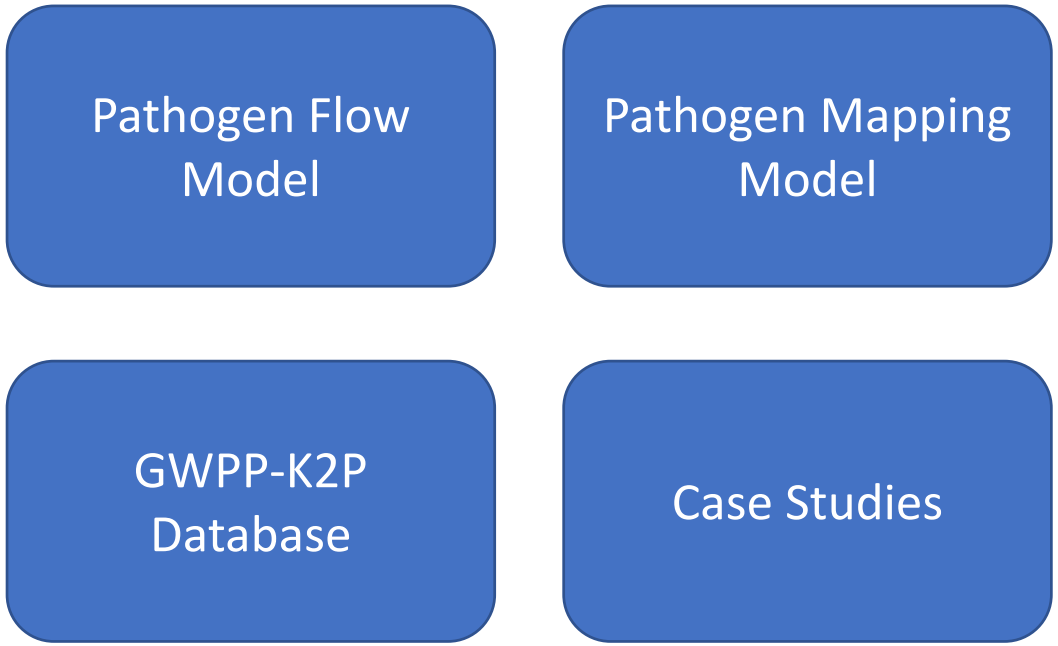
Indicators

Total coliforms, fecal coliforms and *E.coli* belong to the bacteria group and don't behave like viruses, protozoa or helminths

- Easier to detect/ measure
- Less costly to monitor
- **Indirectly can suggest a health risk**

GWPP-K2P App: Sanitation Decision Support Tool

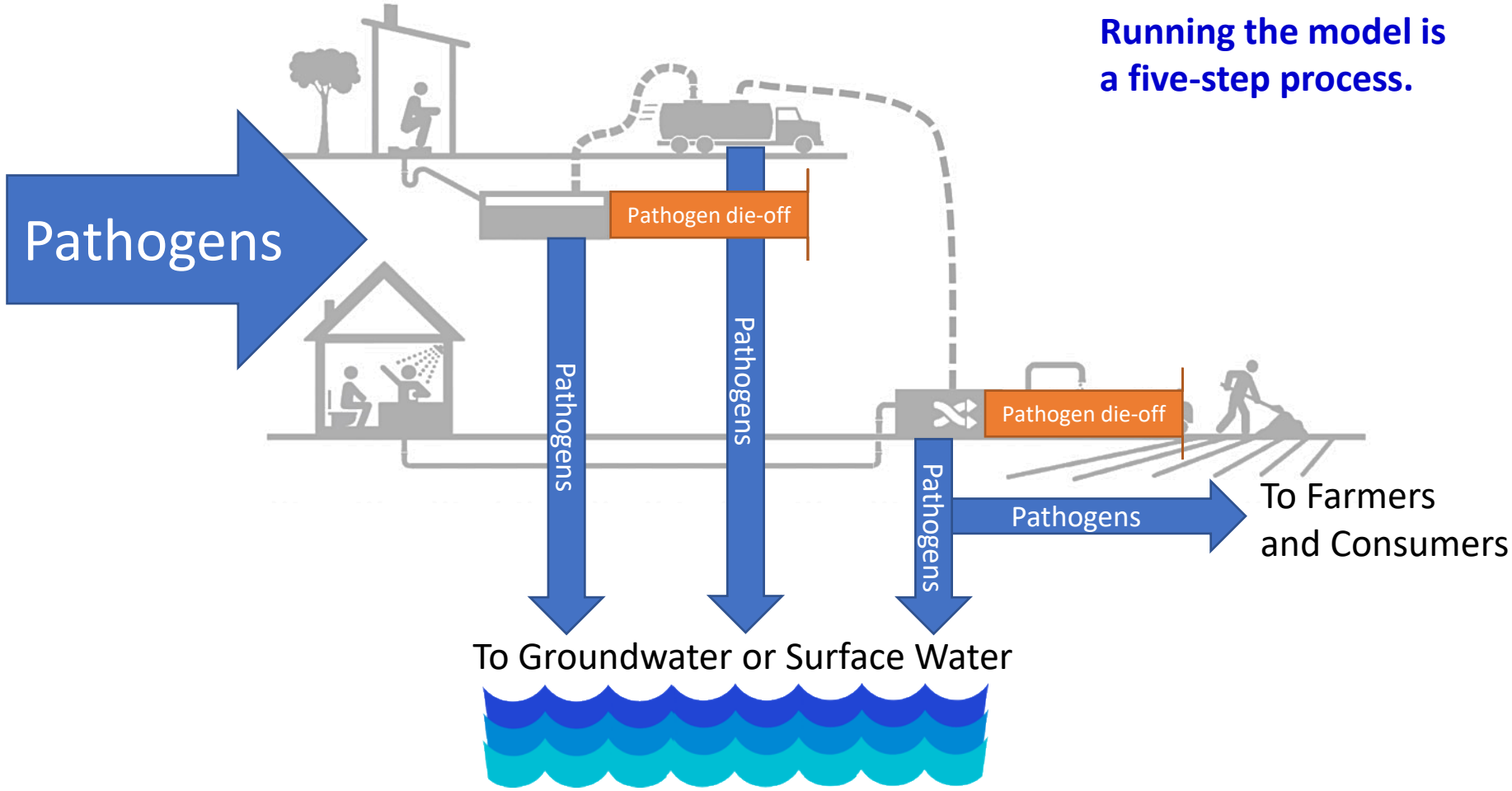
Choose one of the following options:



Pathogen Flow Model

Predicts **pathogen reduction** for a given treatment technology based on design, environmental, and operational factors

Running the model is a five-step process.



Step 1. Define the boundary

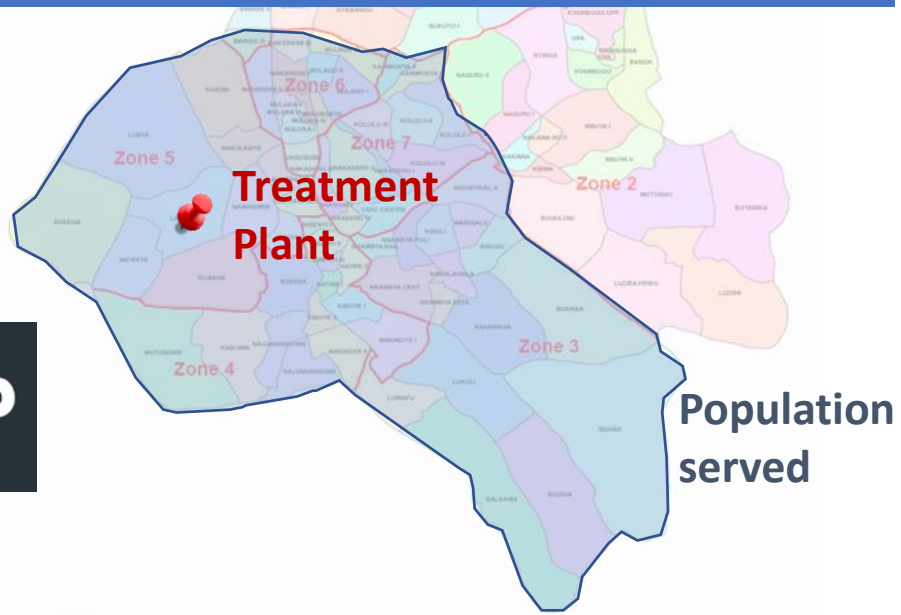
Step 2. Set the health target

Step 3. Upload and input data

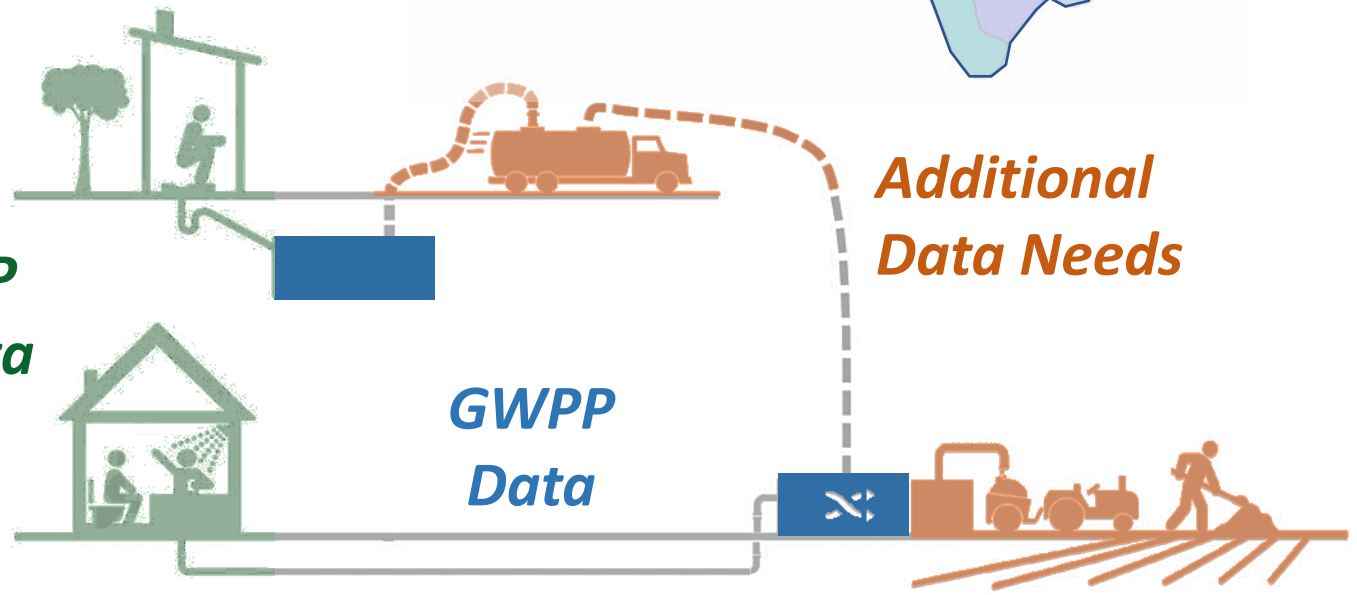
Step 4. Run the model

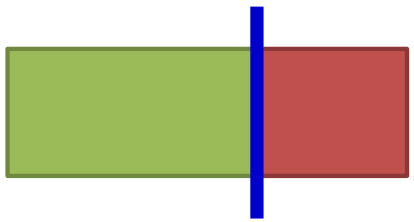
Step 5. Save or share results

Maximum tolerable probability of infection?	1 in 1,000 per year
	4-log reduction



WHO UNICEF JMP

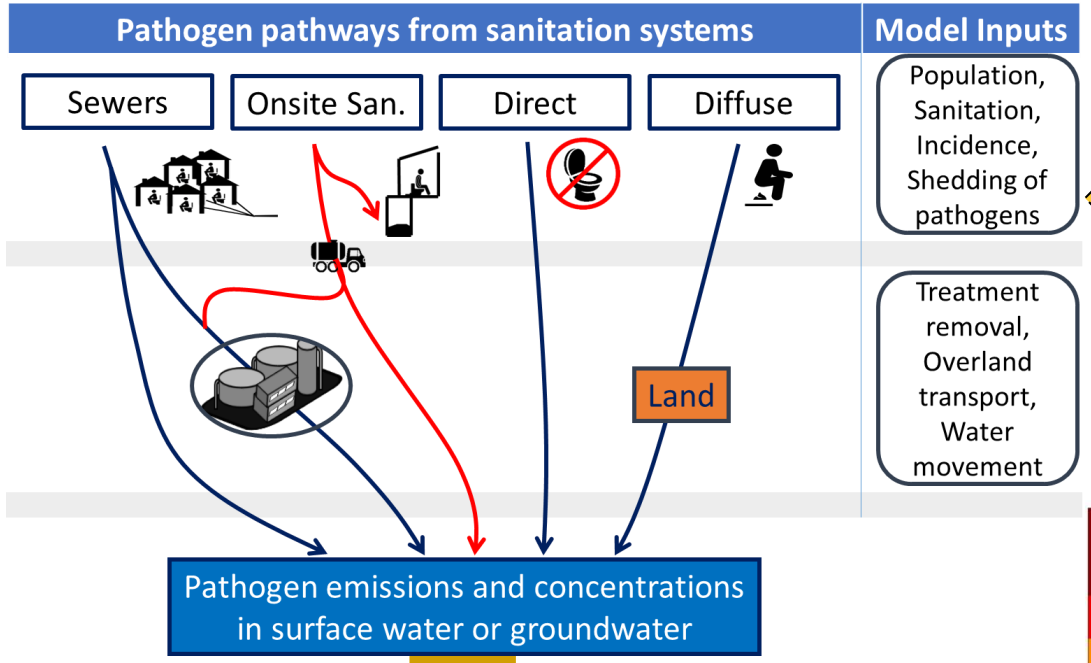




65%
Probability Target Log Reduction Achieved

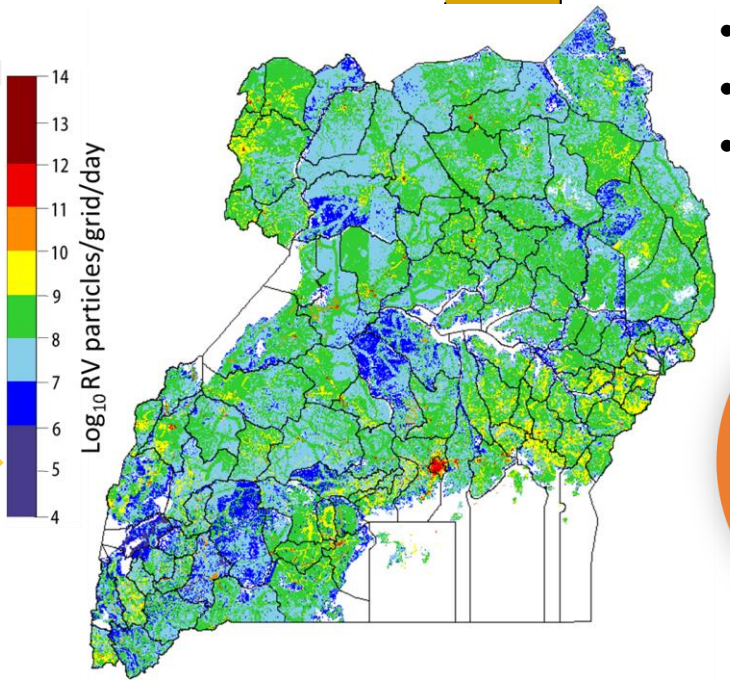
35%
Probability Target Log Reduction Not Achieved

Modelling and mapping approach



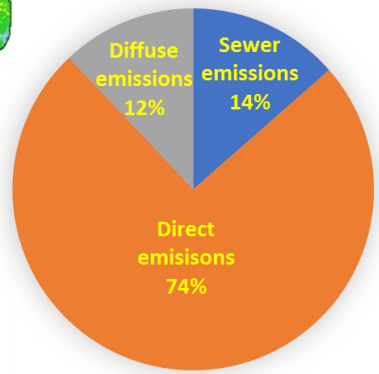
Build exposure cases of the population to pathogens in water sources

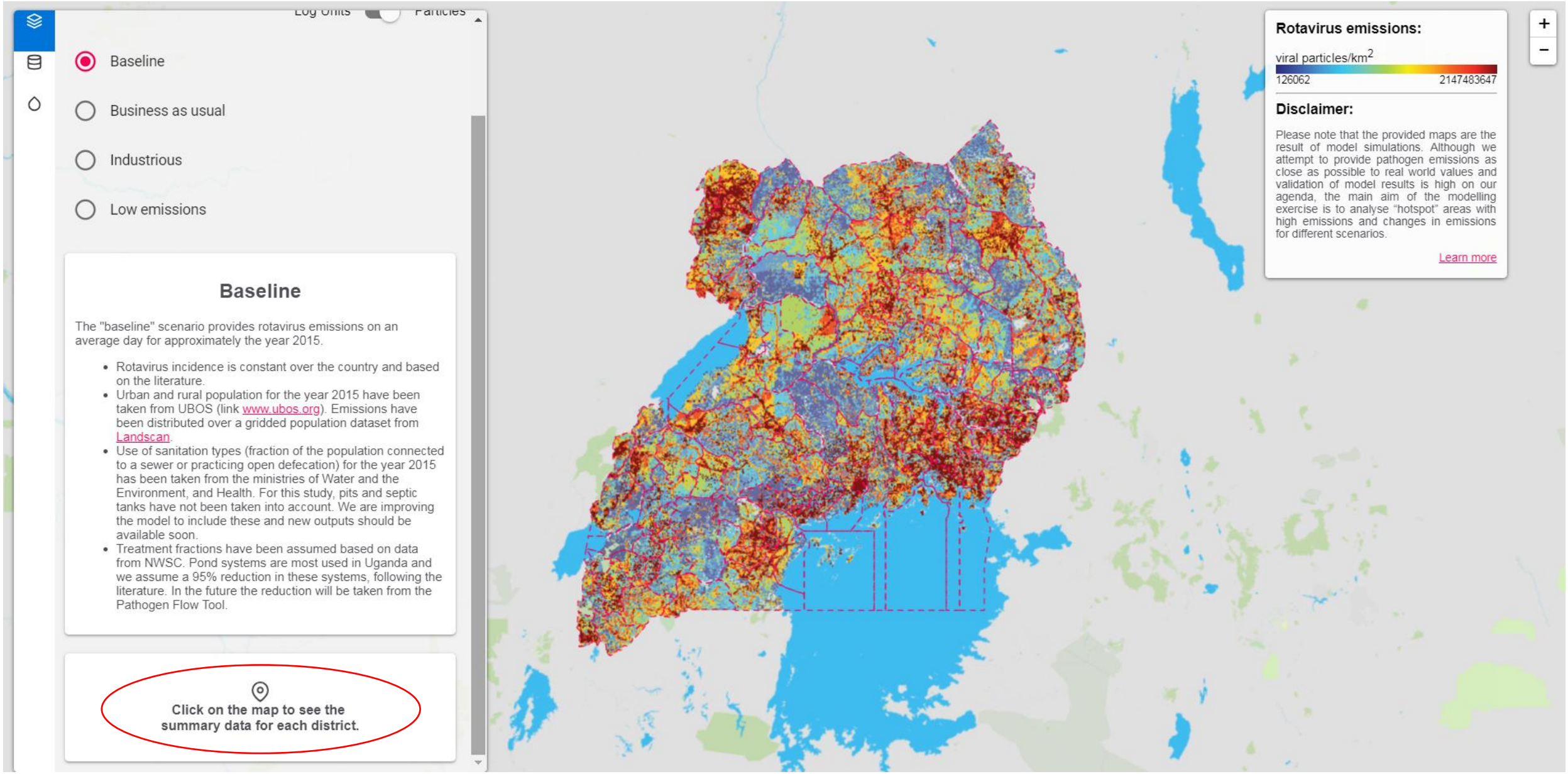
Build scenarios to quantify pathogens in water sources



Relevance:

- Show hotspots
- Find important sources
- Relative spread patterns
- SDG progress monitoring
- Manage sanitation-related health outcomes





You can put the link above: http://dev.k2p.agroknow.com/map/#datasets

AMR in excreta and wastewater

- Interested in studying AMR along the sanitation service value chain (containment, emptying, transportation, treatment, dispose of /reuse)

- From this AMR Symposium we are interested in obtaining surveillance data for Kampala for the annual number of cases of:
  - ✓Drug-resistant Non-typhoidal *Salmonella*,
  - ✓Drug-resistant *Salmonella Typhi*,
  - ✓Drug-resistant *Campylobacter*,
  - ✓Drug-resistant *Shigella*,
  - ✓Extended Spectrum Beta-Lactamases (ESBL) *E.coli*,
  - ✓Drug-resistant enterotoxigenic *E. coli*

- We are interested in collaborating with hospitals/clinics in Kampala that
  - Regularly **screen for AMR pathogens**, and **collect rectal swabs or stool** samples
  - Clinics/ hospitals that would be interested in this type of work

- We are interested in the priorities of the MoH, in terms of AMR pathogens of national importance that would be meaningfully and be of relevance to the country

Thanks for listening

For more information, visit: GWPP (http://www.waterpathogens.org)

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K2P PIs

- **Joan B. Rose -** Michigan State University in Partnership with Agroknow
- **Matthew E. Verbyla -** San Diego State University
- **Nynke Hofstra -** Wageningen University
- **Heather Murphy -** Temple University
- **Rose C. Kaggwa -** National Water and Sewerage Corporation, Kampala - Uganda