APSI Alliance for Pathogen Surveillance Innovations – India

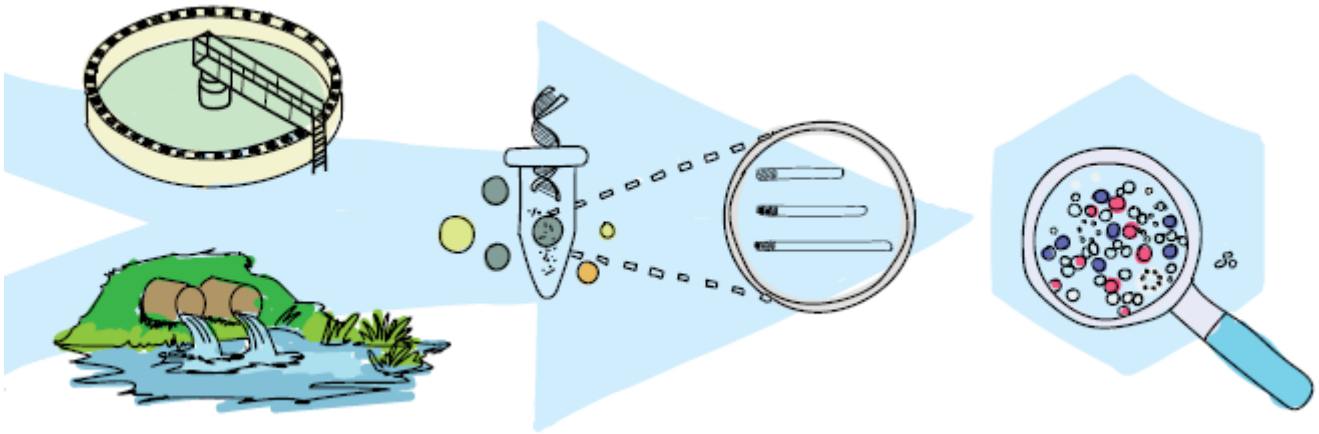
The ROCKEFELLER FOUNDATION

# Surabhi Srivastava

## APSI Program Lead

Chief Scientific Officer
Tata Institute for Genetics and Society
Bengaluru, India

17th November 2023



From a surveillance point of view, wastewater is attractive because it provides community-level data that is not reliant on clinical testing and its biases

*- Environmental surveillance for SARS-CoV-2 to complement other public health surveillance*

# The APSI Network

Real time data-driven monitoring

↓

Technology platforms for pathogen surveillance

Bioinformatics, data sharing and analysis pipelines

Unified network for coordinated implementation

Supplement SARS-CoV-2 genome sequencing efforts

Identification of circulating variants

~75% viral genomes from the consortium cities are RF tagged

GISAID

**Disease monitoring system**

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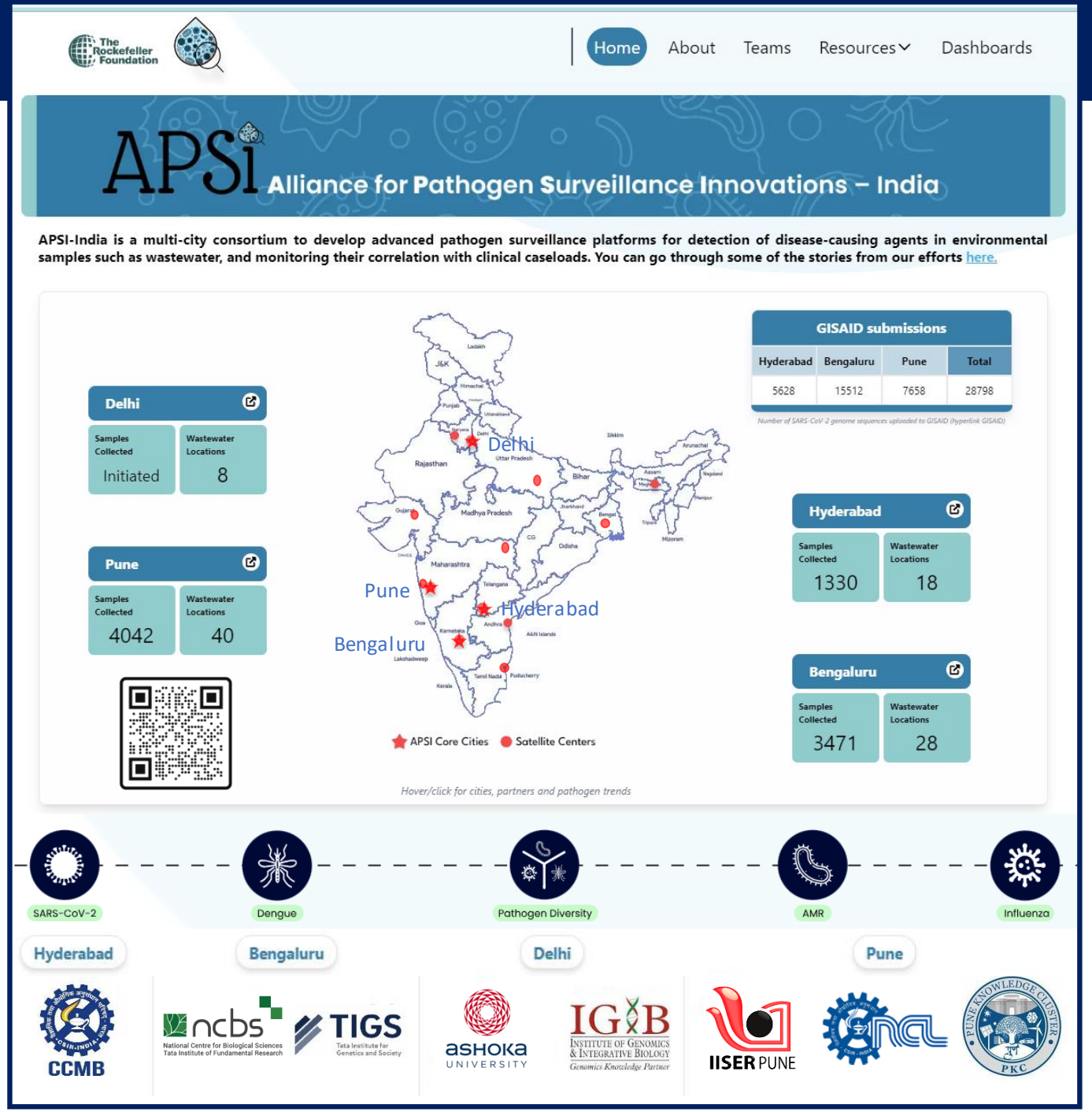
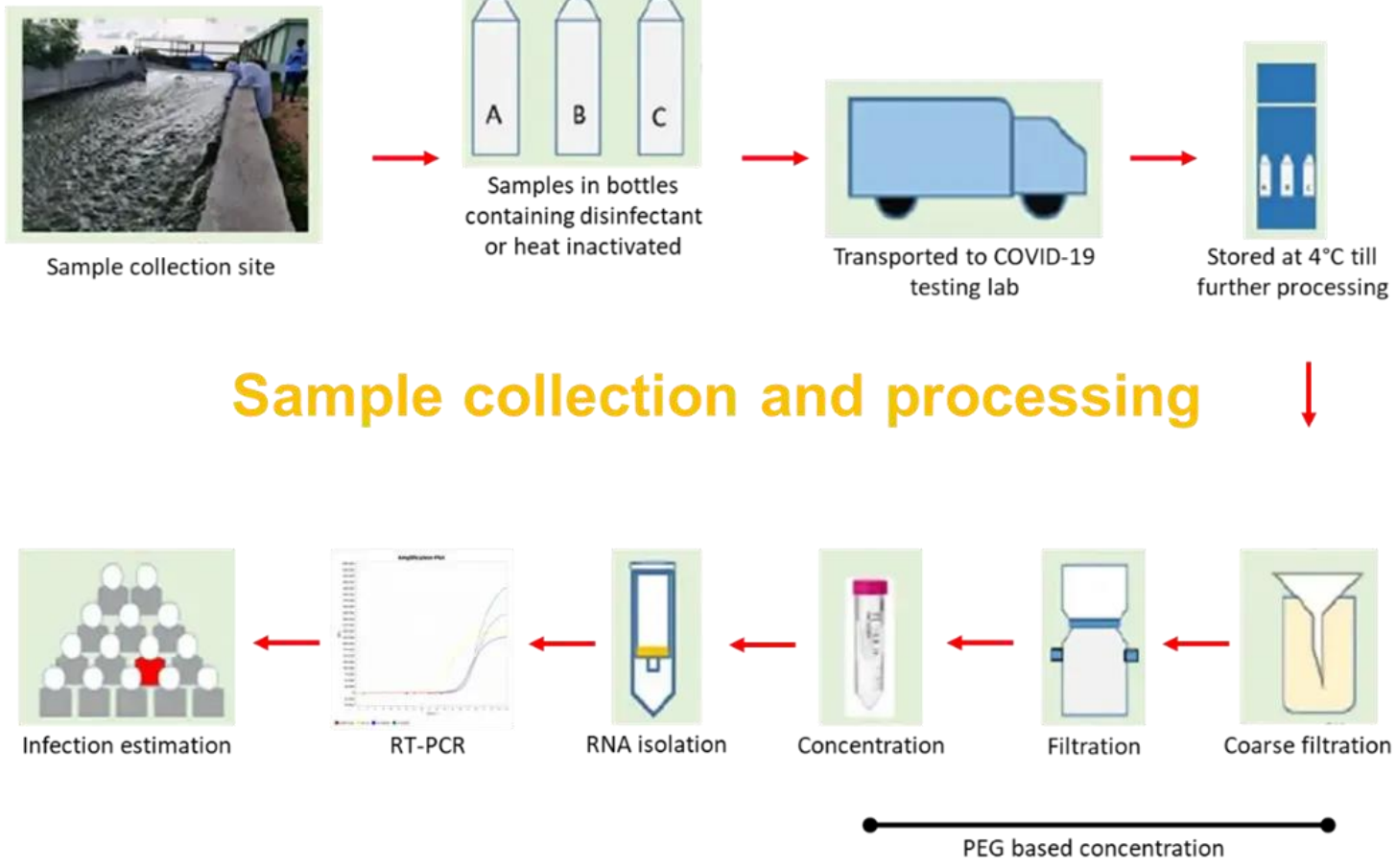


# Wastewater Surveillance (WWS)




Adapted from Manupati et al., 2021, Science of The Total Environment

**~10,000 wastewater samples**
**Early warning system for rise in Covid cases**

**Capacity development**
**– building a multi-city WWS network**

Optimized methodologies & shared protocols to ensure reproducibility

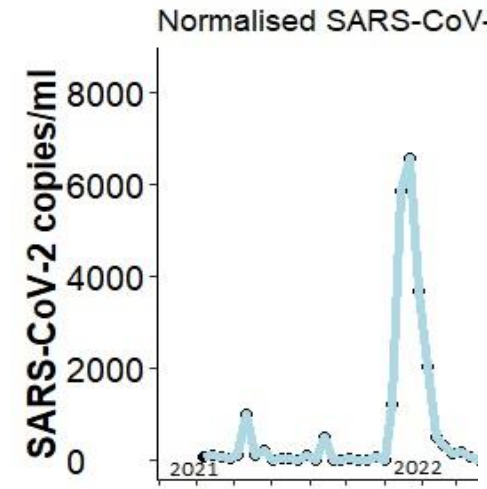
Targeted both STPs and open drains

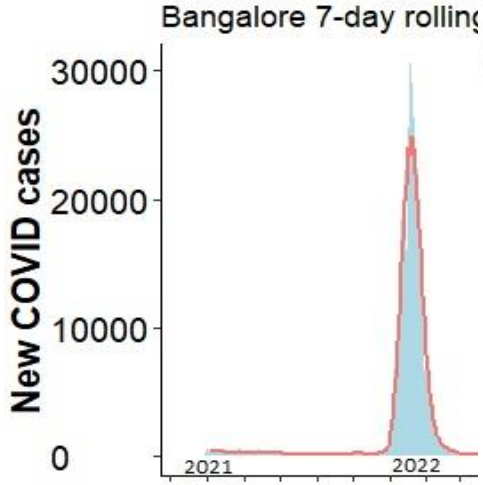
Multiple cities and geographical regions

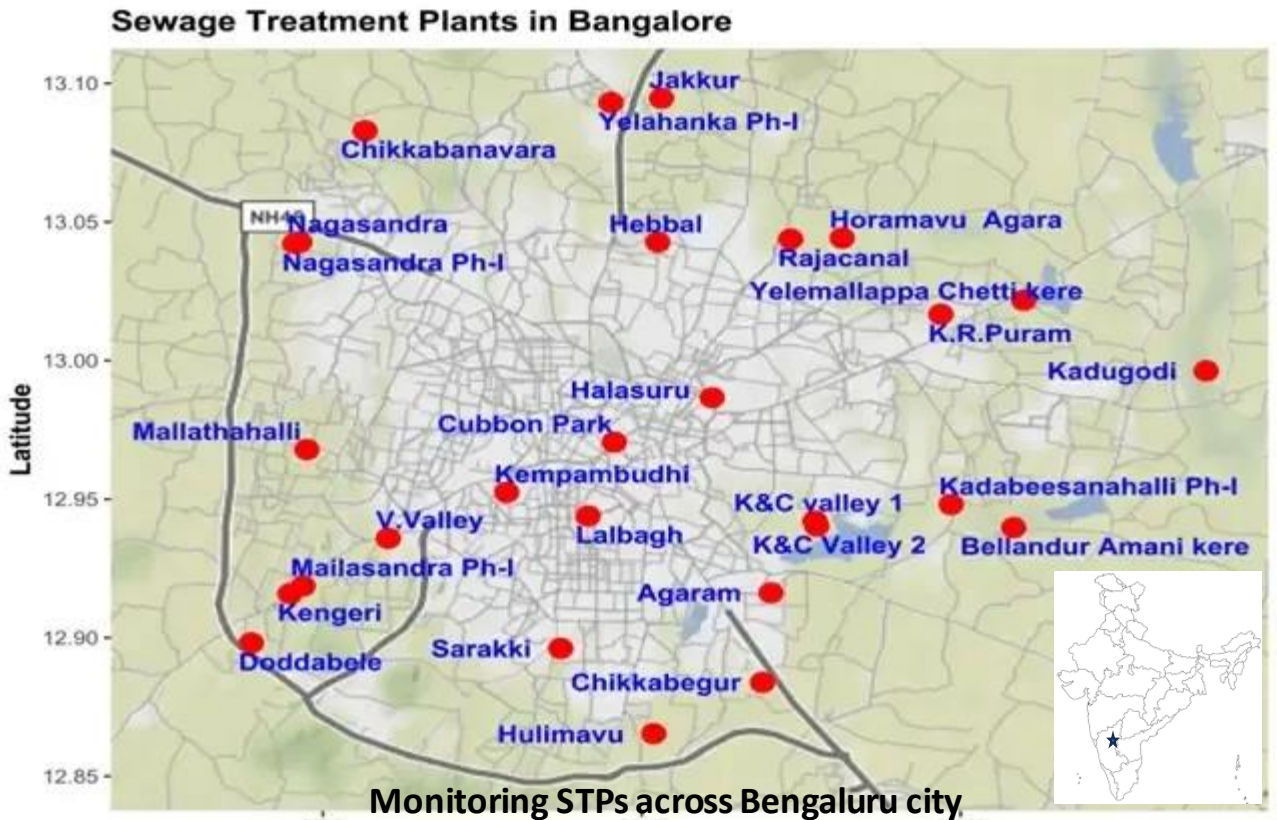
Genomic sequencing to identify variants causing change in pathogen load

Systems for viral load monitoring and sharing information with authorities

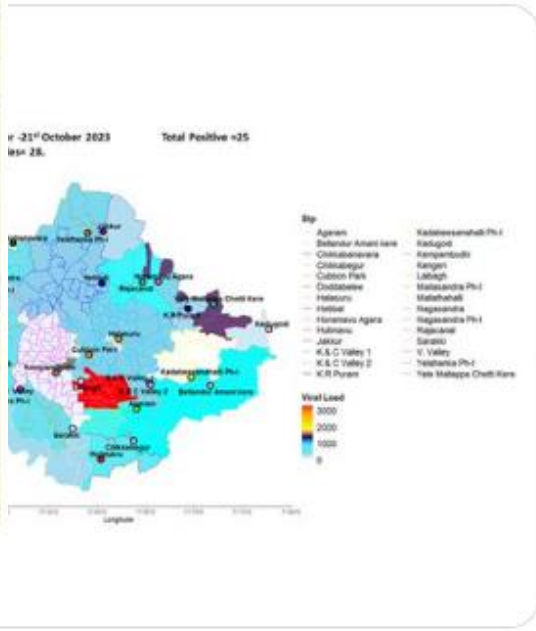
# Two Years of SARS-CoV-2 WWS




Monitoring STPs across Bengaluru city

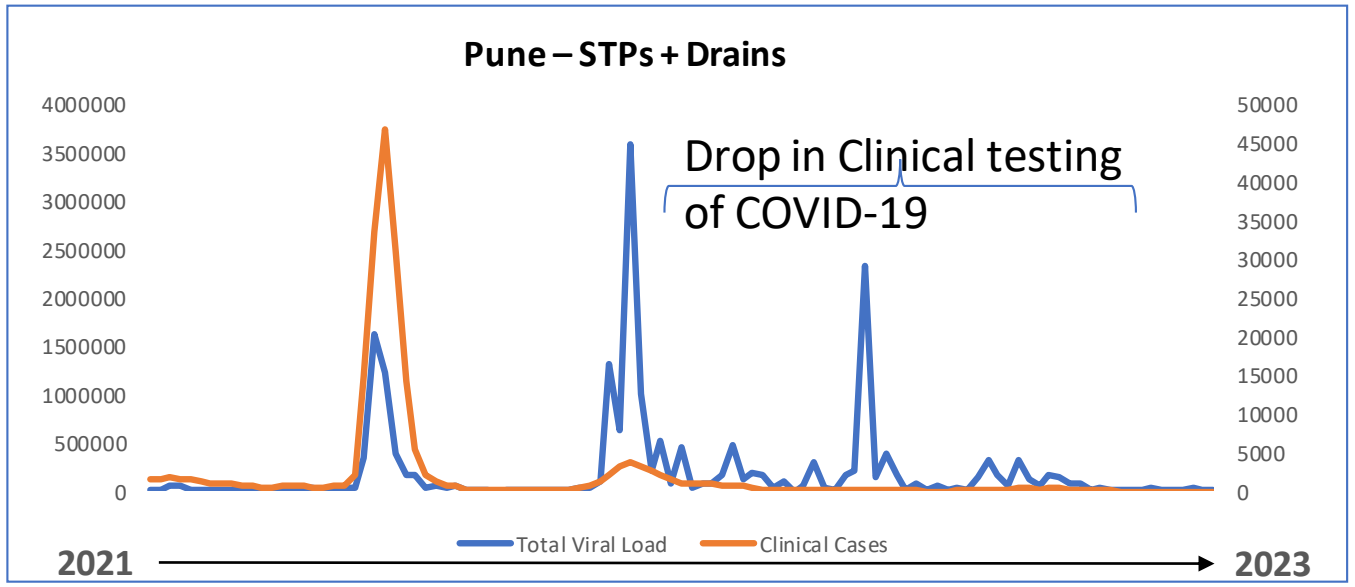


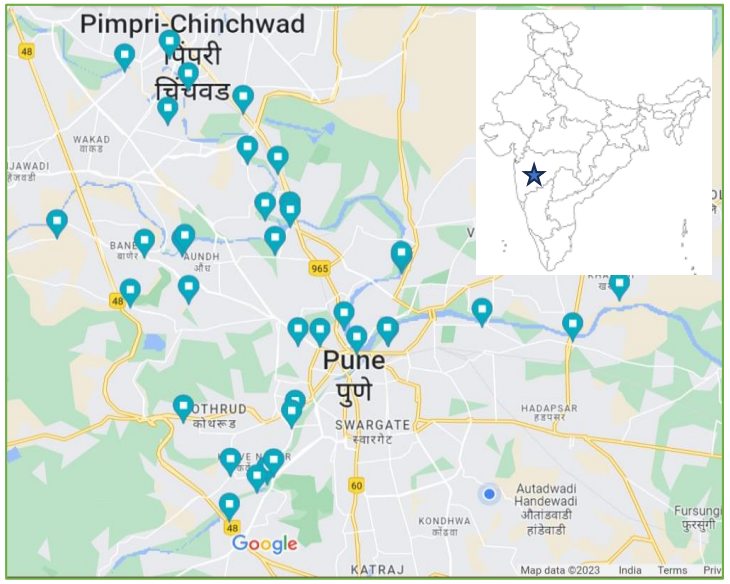

Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct

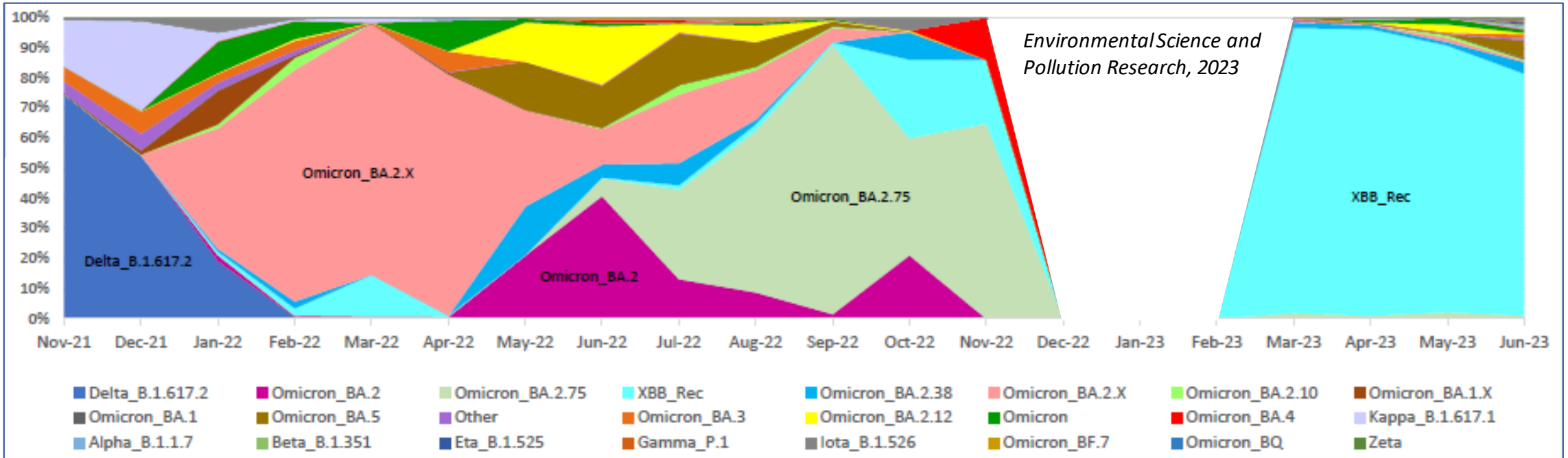
**2021** → **2023**

*The Lancet Regional Health - Southeast Asia, Volume 11, April 2023, 100151*

# Two Years of SARS-CoV-2 WWS



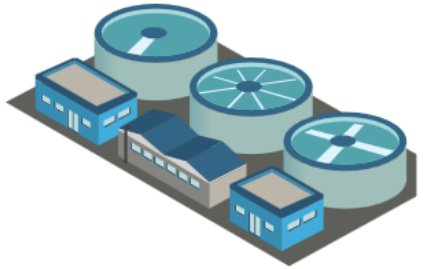




*Environmental Science and Pollution Research, 2023*

# Surveillance of Antimicrobial Resistance in Wastewater

Understanding AMR transmission and spread - relationship between wastewater-borne and clinical AMR

Surveillance for AMR diversity and abundance - temporal and spatial dynamics and trends in microbial populations and drug-resistance mechanisms



Wastewater sampling from STPs and open drains

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Identify ARG candidates and markers

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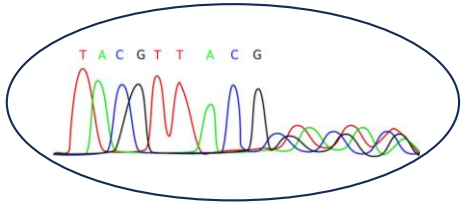
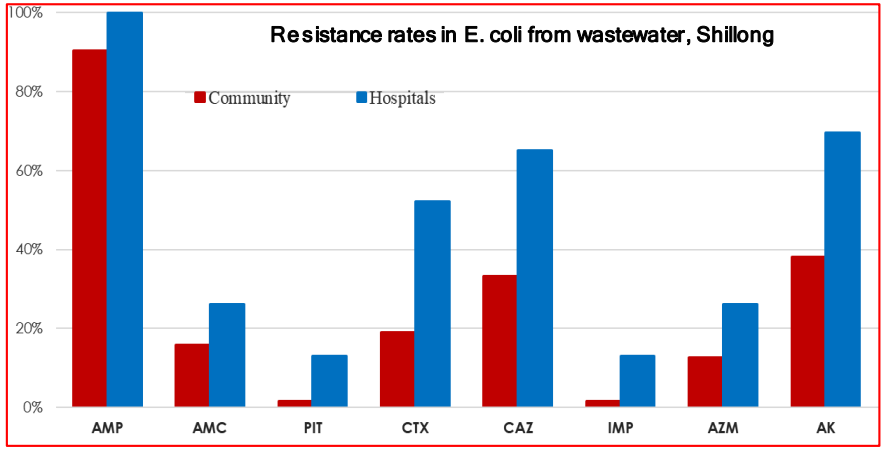
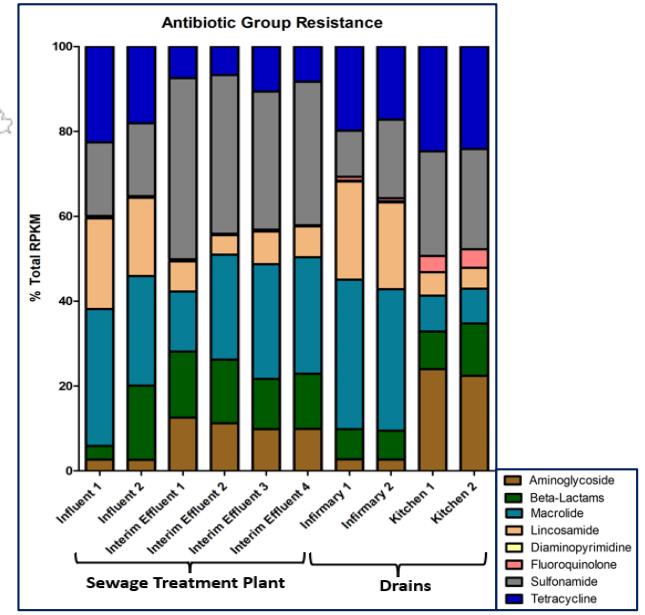
Develop cost-effective tools for on-site surveillance

**PCR**

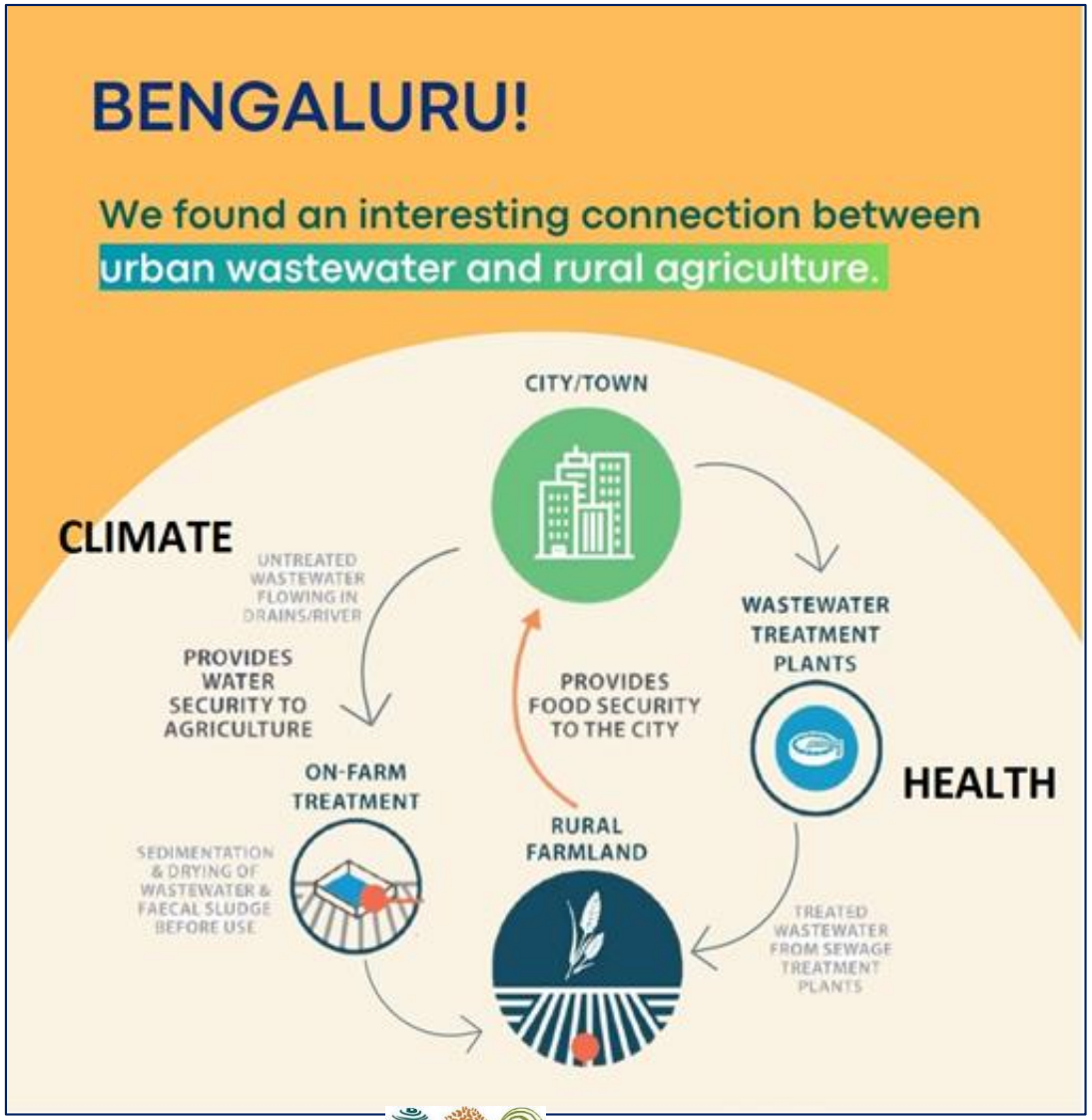


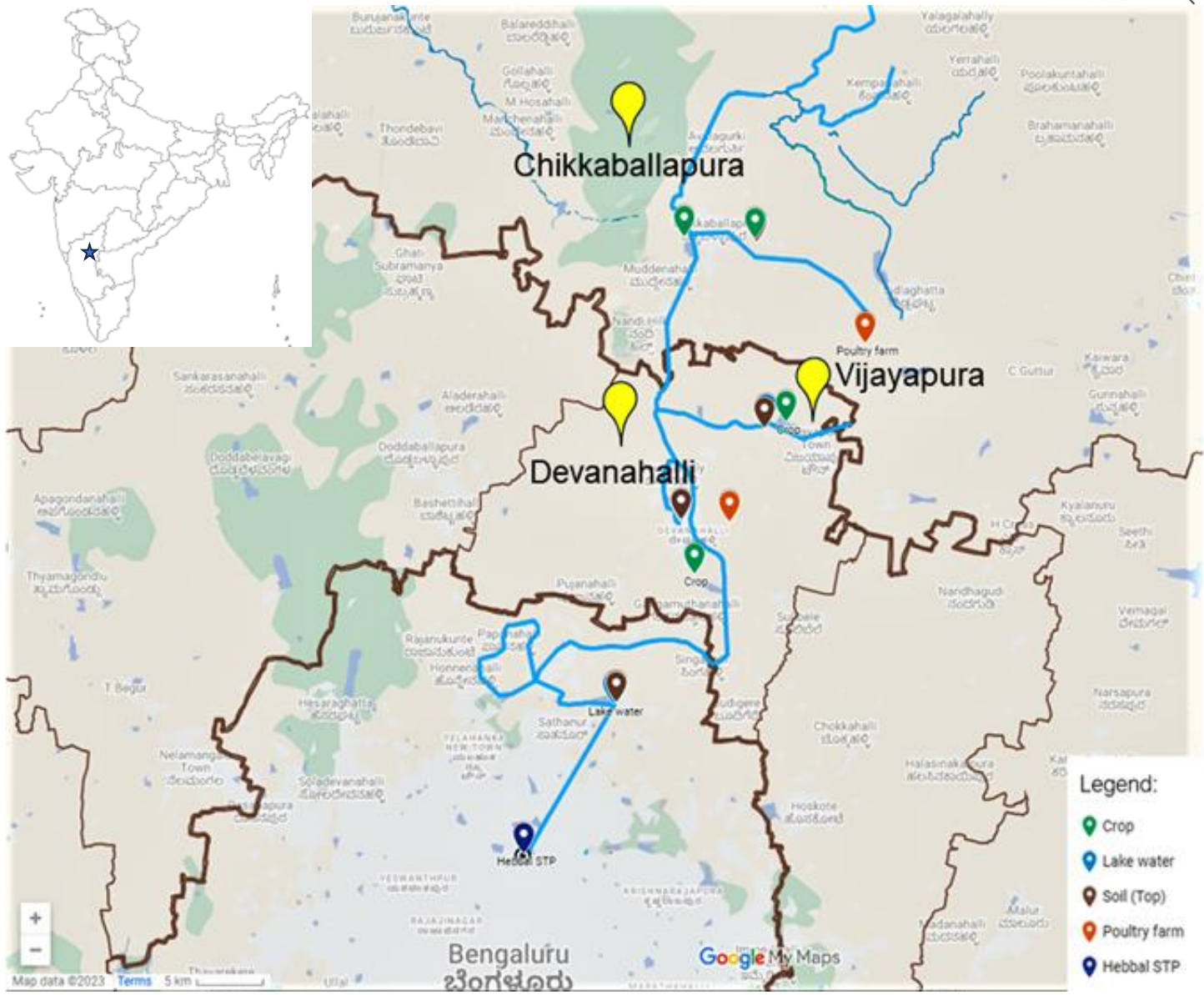

**Genomics**



# AMR and One Health




TIGS Tata Institute for Genetics and Society

biome Environmental

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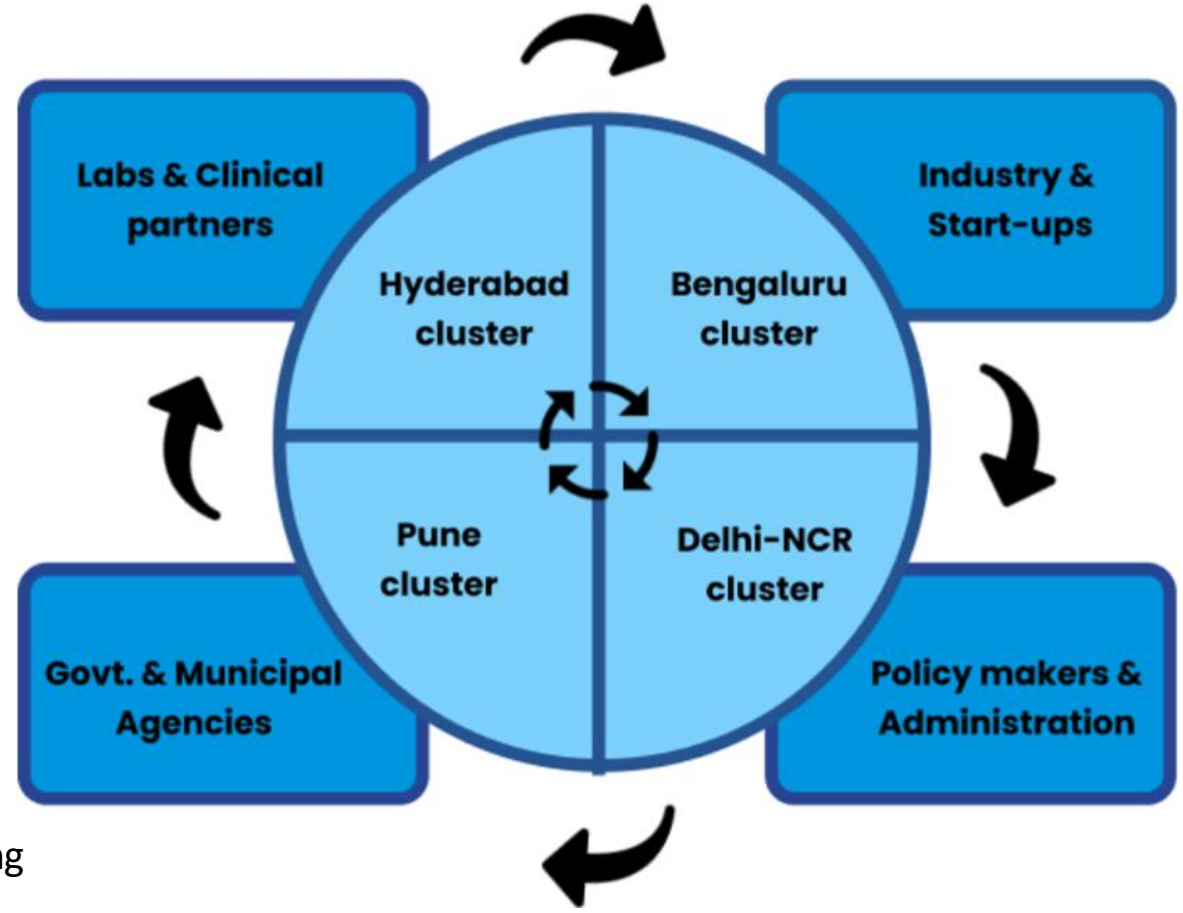
# A Multi-pronged Approach

**Environmental surveillance for routine disease monitoring**
Sampling multiple sites for analysis in cities, peri-urban zones, villages and towns

**Disease epidemiology**
Establishing baselines with clinical caseloads
Disease spread & predictive modeling

**Microbiome and AMR**
Tracking AMR emergence
Environmental pathogen profiling & metagenomics




**Skilling**
Training personnel in urban & rural settings
Diagnostics & point-of-care testing

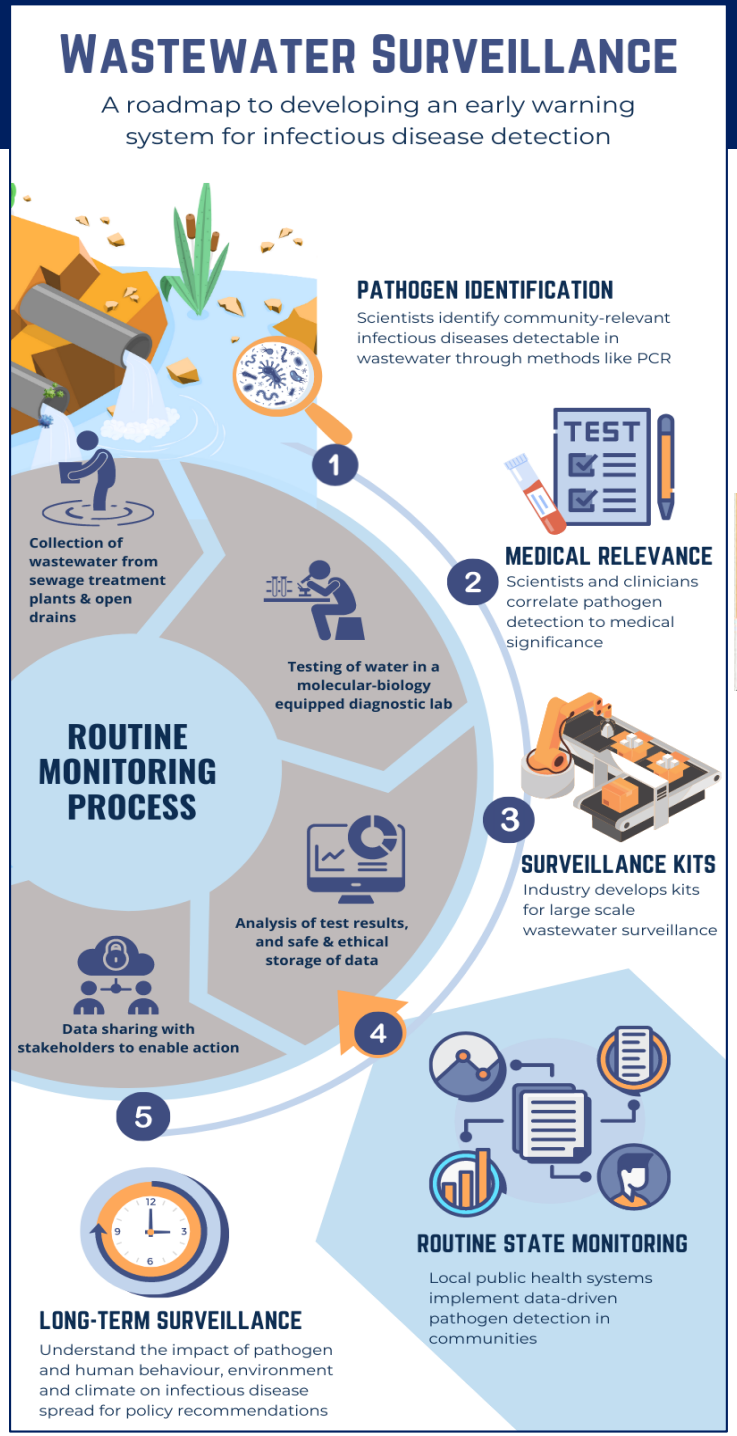
**Indigenization**
Developing kits & reagents
Identifying industry partners
Technology transfer & handholding

**Knowledge dissemination & outreach**
Real-time data sharing
Stakeholder connects & policy advocacy

# APSI's Vision

**Sustainable disease surveillance model for public health systems**

- Identification of early indicators of infection outbreak
- Developing systems to report them to public health authorities
- Developing low cost and easy to adopt SOPs/technologies
- Setting up of partner networks for routine surveillance
- Capacity building, training and indigenization
- Deployment by health personnel as a routine monitoring process




वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद्
Council of Scientific & Industrial Research
(विज्ञान एवं प्रौद्योगिकी मंत्रालय, भारत सरकार)
Ministry of Science & Technology, Govt. of India

National Centre for Disease Control
(formerly National Institute of Communicable Diseases)
Directorate General of Health Services , Ministry of Health & Family Welfare
Government of India

NITI Aayog

G20 भारत 2023 INDIA

DEPARTMENT OF BIOTECHNOLOGY
MINISTRY OF SCIENCE & TECHNOLOGY , GOVERNMENT OF INDIA

Office of the Principal Scientific Adviser to the Government of India

# Stakeholder Engagement

Microplanning workshops with municipal corporators

Roundtable with infectious disease & WWS researchers

Interactions with government & administrative functionaries, and public health experts

AMR surveillance workshops for clinicians


# WWS in the NEWS!

Defining a research agenda for environmental wastewater surveillance of pathogens

Alexander G. Shaw, Catherine Troman, Joyce Odeke Akello, Kathleen M. O'Reilly, Jillian Gauld, Stephanie Grow, Nicholas Grassly, Duncan Steele, David Blazes, Supriya Kumar & The Environmental Surveillance Working Group

01/09/2023 • Article

A tale of two waves: Delineating diverse genomic and transmission landscapes driving the COVID-19 pandemic in Pune, India

Divya Niveditha, Soumen Khan, Ajinkya Khilari, Sanica Nadkarni, Unnati Bhalerao, Pradnya Kadam, Ritu Yadav, Jugal B. Kanekar, Nikita Shah, Bhagyashree Likhitkar, Rutuja Sawant, Shikha Thakur, Manisha Tupekar, Dhriti Nagarc, Anjani G. Rao, Rutuja Jagtap, Shraddha Jogi, Madhuri Belekar, Maitreyee Pathak, Priyanki Shah, Krishanpal Karmodiya

01/08/2023 • Article

Ignoring wastewater is a wasted opportunity to improve disease response

Farah Ishtiaq

15/06/2023 • Article

SARS-CoV-2 infection dynamics and genomic surveillance to detect variants in wastewater – a longitudinal study in Bengaluru, India

Sanjay Lamba, Sutharsan Ganesan, Namrta Daroch, Kiran Paul, Soumya Gopal Joshi, Darshan Sreenivas, Annamalai Nataraj, Vishwanath Srikantaiah, Rakesh Mishra, Uma Ramakrishnan, Farah Ishtiaq

01/04/2023 • Article

Campus Sewage Water Surveillance based dynamics and infection trends of SARS-CoV-2 variants during third wave of COVID-19 in Pune, India

Vinita Malik, Vinay Rajput, Rinka Pramanik, Rachel Samson, Rakesh kumar Yadav, Pradnya Kadam, Nikita Shah, Rutuja Sawant, Unnati Bhalerao, Manisha Tupekar, View ORCID ProfileSoumen Khan, Priyanki Shah, View ORCID ProfileLS Shashidhara, Sanjay Kamble, View ORCID ProfileSyed Dastager, View ORCID ProfileKrishanpal Karmodiya, View ORCID ProfileMahesh Dharne

06/03/2023 • Article

Genomic surveillance reveals early detection and transition of Delta to Omicron Lineages of SARS-CoV-2 Variants in wastewater treatment plants of Pune, India

Vinay Rajput, Rinka Pramanik, Vinita Malik, Rakeshkumar Yadav, Pradnya Kadam, Unnati Bhalerao, Manisha Tupekar, Dipti Deshpande, Priyanki Shah, View ORCID ProfileLS Shashidhara, Radhika Boargaonkar, Dhawal Patil, Saurabh Kale, Asim Bhalerao, Nidhi Jain, Sanjay Kamble, Syed Dastager, View ORCID ProfileKrishanpal Karmodiya, View ORCID ProfileMahesh Dharne

24/02/2023 • Article

India must scale up wastewater analysis for health surveillance

15/12/2022 • Article

## A Bengaluru group is knee-deep in wastewater—looking for secrets on future diseases

Ecologist Farah Ishtiaq and her team are tracking viruses and diseases through Bangalore's underbelly. Their wastewater-based epidemiology project is catching attention.

SANDHYA RAMESH 01 March, 2023 11:42 am IST

ThePrint

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NEWS / CITY NEWS / PUNE NEWS / Better Surveillance Needed To Avert Pandemics: Experts

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THIS STORY IS FROM JULY 11, 2023

## Better surveillance needed to avert pandemics: Experts

Steffy Thevar / TNN / Updated: Jul 11, 2023, 10:52 IST

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Pune: Medical experts on Monday stressed on the need for better environmental surveillance to prevent new pandemics as well as treat existing ones.

They said that traditional methods of surveillance were slower and cost a lot more while speaking at a G20 Chief Science Advisers' Roundtable held at IISER Pune on Monday. The event was organised by Pune Knowledge Cluster, a

TH India World Opinion Sports e-Paper

TH F

## From sewer to safety: top scientist moots wastewater monitoring in new STPs

July 23, 2023 12:07 am | Updated 12:35 pm IST - HYDERABAD

Karnataka official who took on mining mafia killed in

## Bengaluru: Sewage surveillance indicates rise in Covid cases, viral load

This is a drastic change compared to December, when only around half the collected samples were testing positive

DHNS

Last Updated 11 March 2023, 15:20 IST

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The Tata Institute of Genetics and Society (TIGS) tests samples from 28 sewage treatment plants in the city every week. All samples collected in the previous two weeks — between February 27 and March 4, and between February 20 and 25 — have turned Covid-positive.

This is a drastic change compared to December, when only around half the collected samples were testing positive.

Viral loads seem to have increased as well.

From January to mid-February, the maximum viral load was within 1,250 (SARS-Cov-2 genome copies per ml). Whereas in the week of February 20 to 25, the maximum levels increased to 2,500. And in the week from February 27 to March 4, the maximum level recorded was 6,000 in Nagasandra.

There has been an overall increase in viral load in other parts of the city as well. Eastern areas like Bellandur and Agara have had relatively high viral loads over the past two weeks.

Farah Ishtiaq, principal scientist at TIGS, said the reason for the rise in positivity isn't clear yet as genomic sequencing for these samples have not been completed.

## Focus on sewage surveillance to detect emerging variants

This will provide early warning on impending local surge of COVID-19

TH India World Opinion Sports e-Paper

TH FREE TRIAL

## Why environmental surveillance for avian influenza is vital

TH PREMIUM

**Birds infected with avian influenza virus shed large quantities of virus in their faeces as well as in their saliva and nasal secretions for about a week**

TIMES CITY

## Mahadevapura has highest viral load: Sewage analysis

It's Followed By East Zone, Bommanahalli

DAILY COVID COUNT IN KARNATAKA UP 25%

How surveillance works

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THE TIMES OF INDIA

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CIVIC ISSUES CRIME POLITICS SCHOOL AND COLLEGES MAHARASHTRA ELECTIONS VIDEOS PHOTOS WEATHER EVENTS

NEWS / CITY NEWS / PUNE NEWS / 'Omicron Found In Pune Sewage Before Detection In Botswana'

TRENDING Elvish Yadav Zika Virus in Bangalore Delhi Pollution News Delhi Air Pollution Earthquake Today

THIS STORY IS FROM MARCH 26, 2023

## 'Omicron found in Pune sewage before detection in Botswana'

TNN / Updated: Mar 26, 2023, 21:19 IST

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# Thank You

**Dr. Farah Ishtiaq**

Environmental and vector surveillance

*Principal Scientist*

TIGS

**Dr. Olisha Sumer**

Co-Investigator

*Junior Specialist (Microbiology)*

Pasteur Institute

**Dr. Phibangipan Warjri**

Principal Investigator

*Assistant Biochemist*

Pasteur Institute

**Dr. Mahesh Dharne**

*Principal Scientist*

CSIR-NCL

**Dr. Laasya Samhita**

*Assistant Professor*

Ashoka university

**Prof L. S. Shashidhara**

Co-Principal Investigator

*Director NCBS*

NCBS

**Dr. Rakesh Mishra**

Chief Principal Investigator

*Director TIGS*

TIGS

Bangalore

Hyderabad

Delhi

Pune

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