WHO Integrated Global Surveillance on ESBL Producing E coli
Tricycle – Epi X Project

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World Health Organization
REGIONAL OFFICE FOR South-East Asia

HEALTH EMERGENCIES programme

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Background

- 68th WHA in 2015 adopted the Global Action Plan (GAP) on AMR; expected to translate into National Action Plans (NAP) by May 2017
- GAP recommends development of NAP that is comprehensive, holistic, collaborative and imbibes One Health approach
- WHO's obligations: to report on the development, implementation, monitoring, and evaluation of the national action plans for the containment of AMR developed by member states

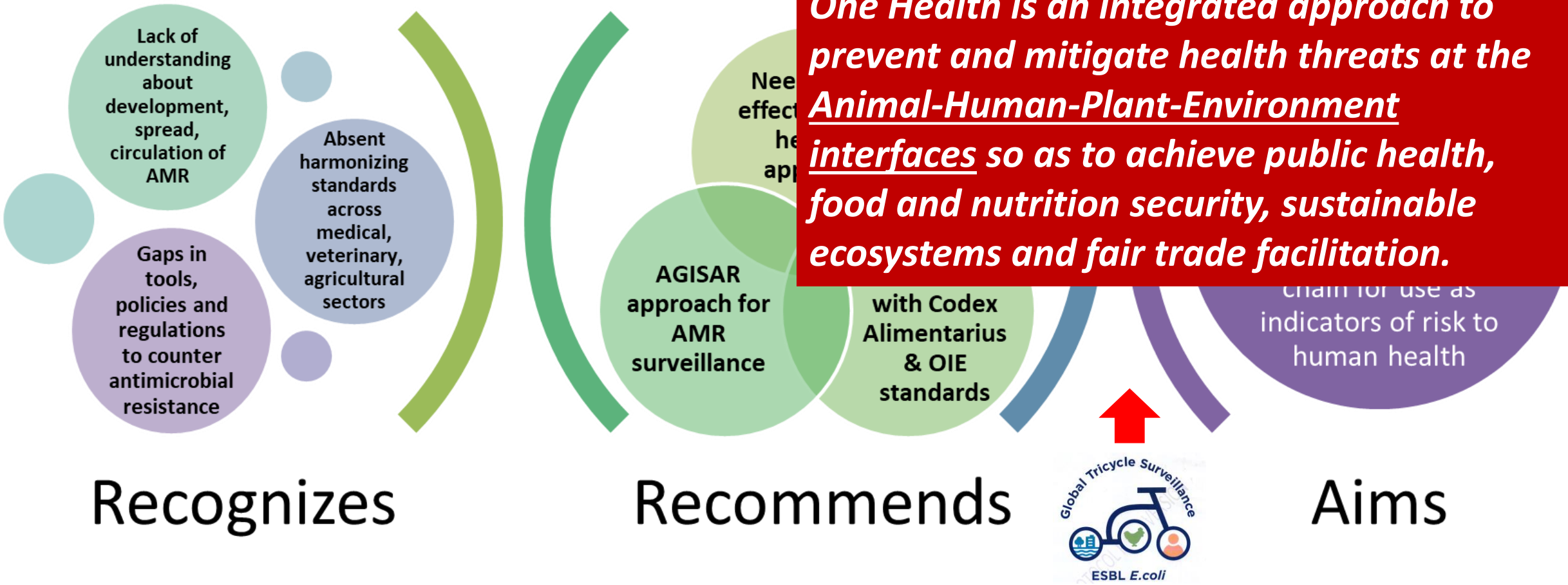
Strategic objectives of GAP AMR

1. Improve awareness of AMR
2. **Strengthen knowledge through surveillance and research**
3. Infection prevention control measures, including WaSH
4. Optimise use of AMAs in animal and human health
5. Economic case for sustainable investment

GAP: Emphasizes 'Integrated' One Health surveillance

WHAT IS ONE HEALTH?

One Health is an integrated approach to prevent and mitigate health threats at the <u>Animal-Human-Plant-Environment interfaces</u> so as to achieve public health, food and nutrition security, sustainable ecosystems and fair trade facilitation.



AGISAR*-WHO's Global Survey on ESBL procuring E coli project: "Tricycle" Project

- AGISAR and the Food Safety and Zoonoses Department of WHO developed the Tricycle Project
- Tricycle implies **simultaneously addressing three aspects of bacterial resistance** - human health, food chain and the environment
- Comprises of **epidemiological and microbiological procedures** specifically designed to be conducted in harmonised manner in all countries
- Data gathered on AMR, antimicrobial use, demographics and molecular characteristics to explore pathways of dissemination
- To be rolled out globally by Member States as **part of the Global Antimicrobial Resistance Surveillance System (GLASS)**

Tricycle project: aim and objectives

- Aim:
  - **Support the development of the National Integrated Surveillance System on AMR in Member States**

- Objectives
  - **Establish an Integrated Surveillance system** to monitor ESBL producing E coli in three main areas, human, food, and environment across Member States
  - **Establish a simple and standardized methodology** to isolate and monitor ESBL producing E coli
  - **Compare the prevalence of ESBL E coli in each of the three sectors** among Member States
  - Have a **longitudinal system in place** to assess effect of interventions

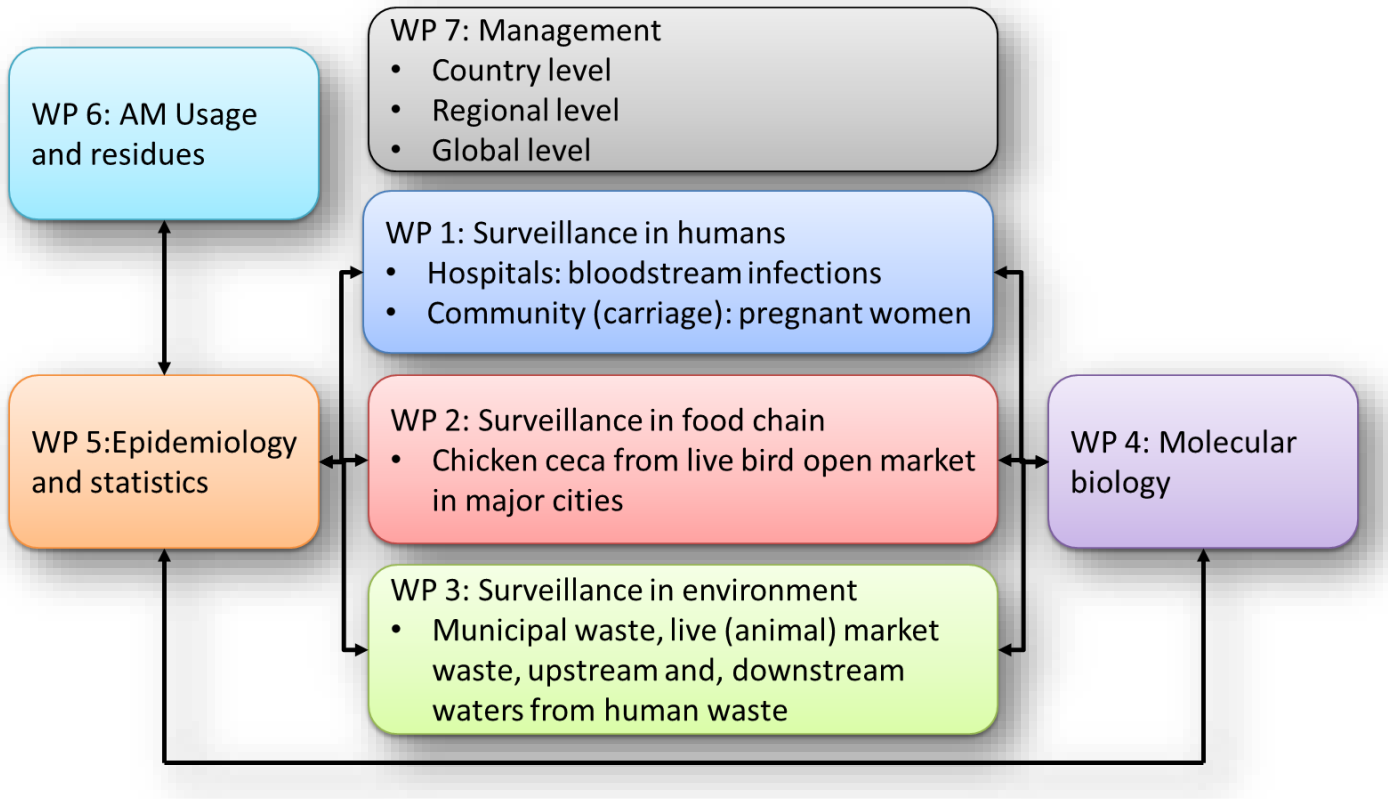
Tricycle project: main feature

- Focuses on single key indicator – frequency rates of ESBL-Ec measured yearly under identical and controlled conditions in humans, food chain and environment

- Why ESBL Ec?
  - Severe morbidity, mortality and economic burden; often linked to AMU in food chain
  - Great variation in colonization rates and prevalence in humans and animals
  - Decrease in rates in response to decrease use
  - Relevant and representative proxy for magnitude and leading edge of AMR problem
  - Role of different sectors in emergence and spread unclear

Tricycle project: work packages

- **Work package 1: ESBL Ec in humans**
  - Hospitals with blood culture positive with E coli (blood culture)
  - Pregnant women otherwise healthy and close to delivery (faecal sample culture)
- **Work package 2: ESBL Ec in food chain**
  - Wet bird market (chicken slaughterhouse when no wet bird market) (cecal contents)
- **Work package 3: ESBL Ec in Environment**
  - Major (capital city) and sentinel city (100,000 population) with presence of river
  - Four sample types: upstream, downstream, wet market/harvest facility (WP2), and communal waste



Tricycle – Epi X Protocol

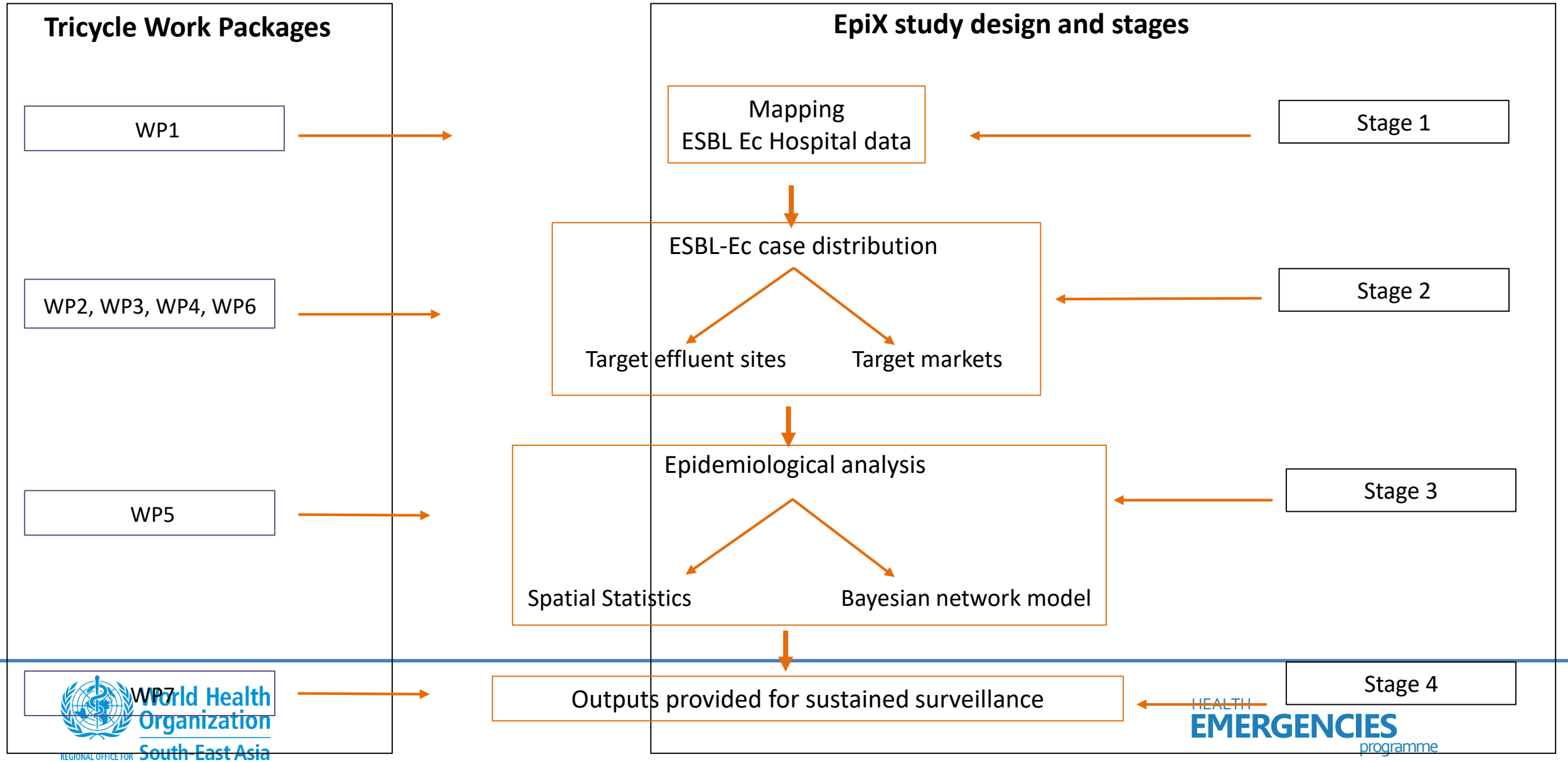
Tricycle project with expanded epidemiological study design

Main considerations

- Accomplish the tasks in each of the WHO-T WP's
- A study design to be able to identify transmission pathways across the three sectors.
- An analytical framework to measure indicators for long-term surveillance sites to monitor transfer and emergence of AMR

Tricycle- Epi X protocol is currently being implemented in three cities in SEAR: Jakarta, Kolkata and Kathmandu

Tricycle - EpiX study framework



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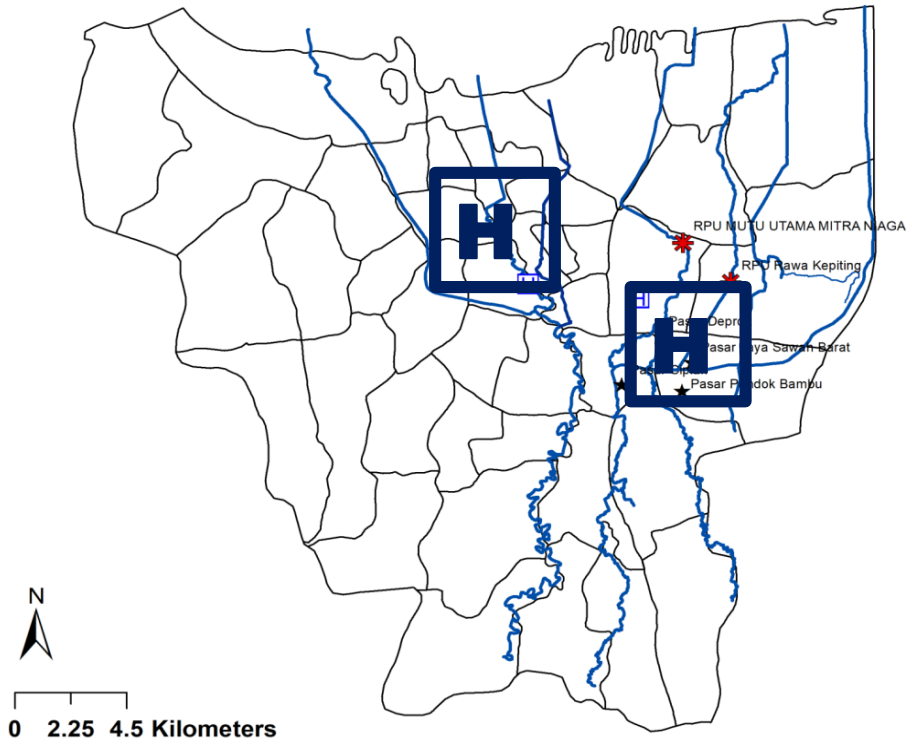
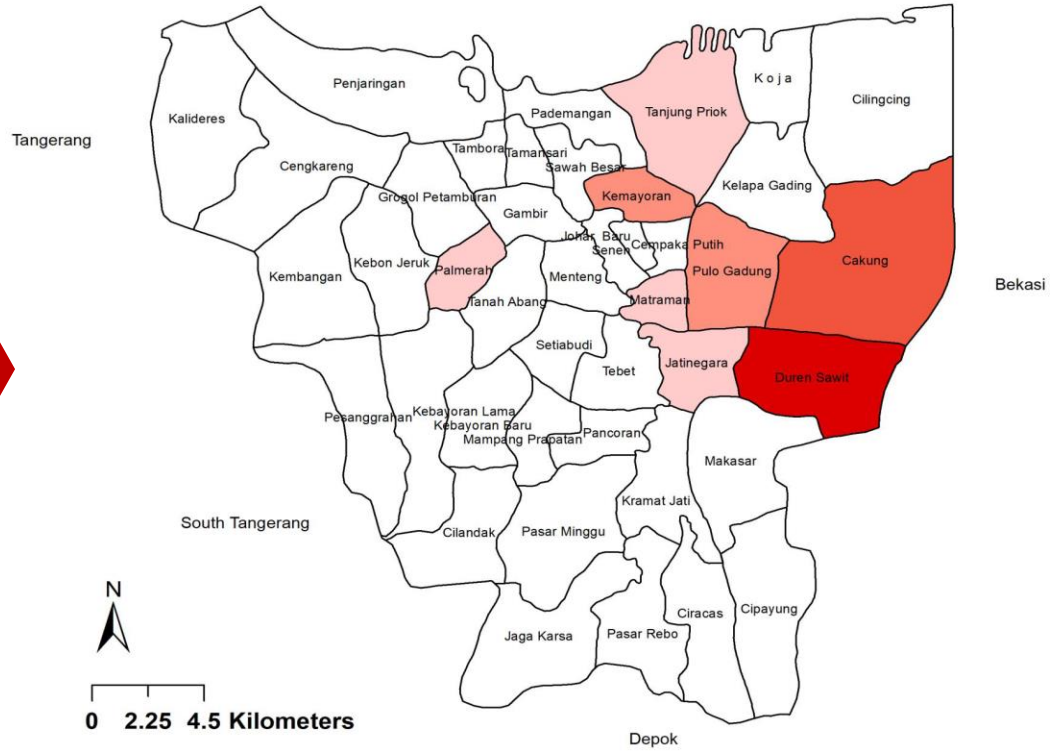
Epi X study design: stage 1

Enrolment of Hospitals, collection of historical ESBL-Ec human cases



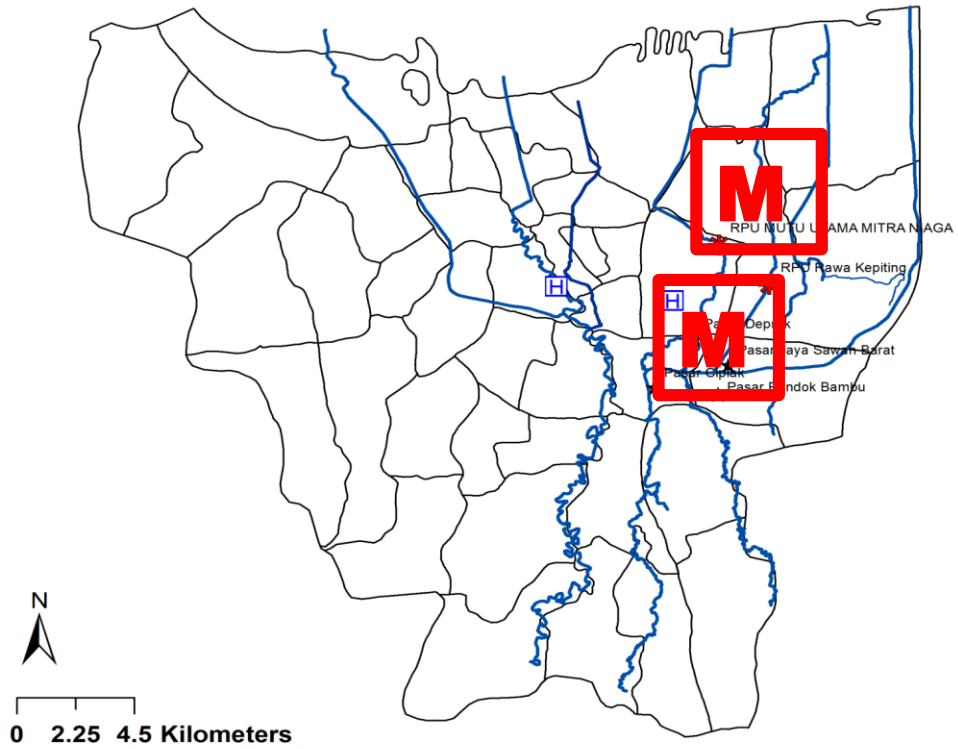
Mapping, identification of hotspots



Epi X study design: stage 2

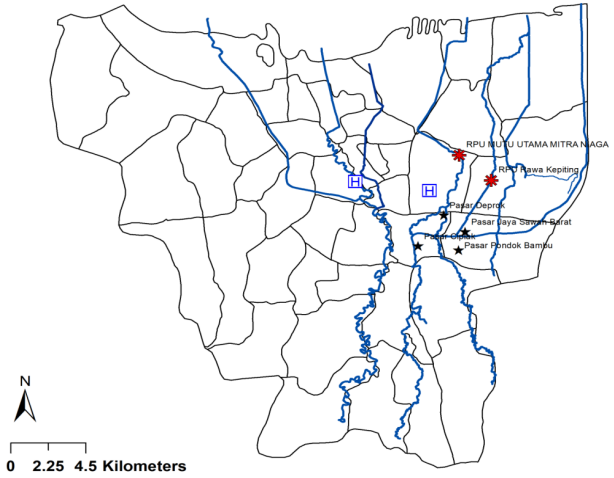
From the hotspots analysis

Selection of Markets and effluent sites

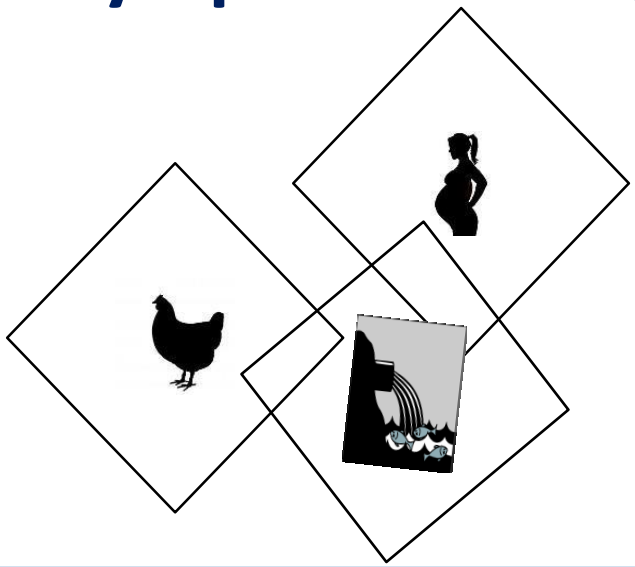


Epi X study design: stage 3 (Epidemiological analysis pipeline)

Map geographical risk of ESBL-Ec and identify environmental drivers of transmission

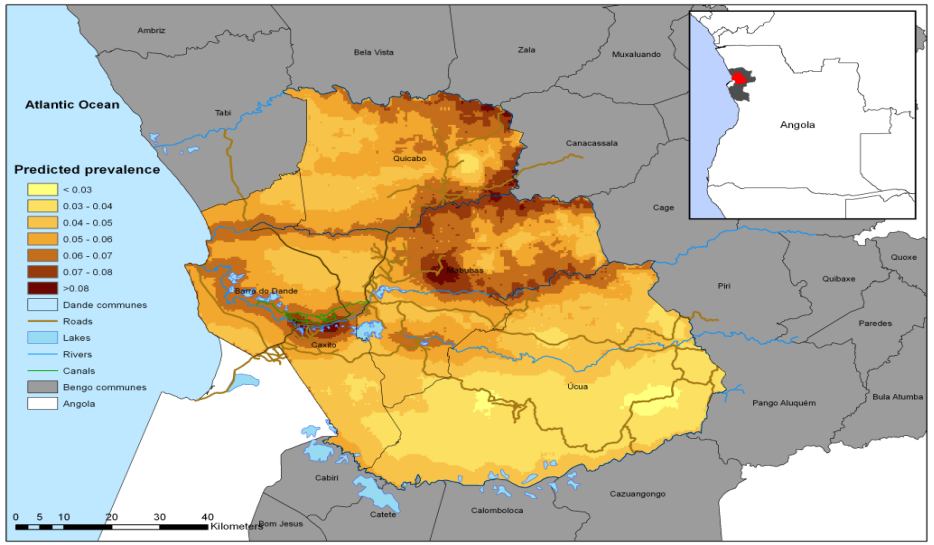


Track the spread of ESBL-Ec within and between human, animal and environmental populations in concurrent and sympatric settings

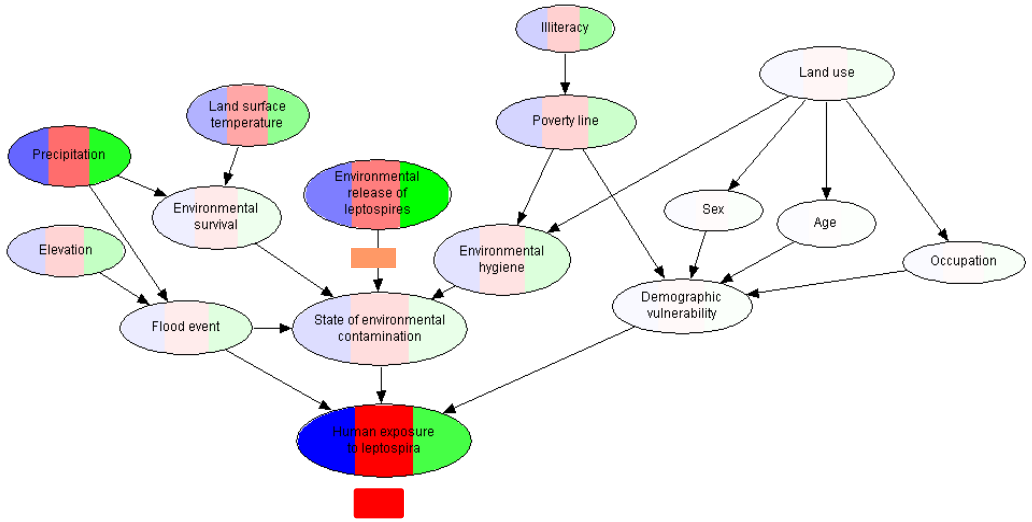


Epi X study design: stage 3 (Epidemiological analysis pipeline)

Identify factors playing central role in seeding transmission clusters

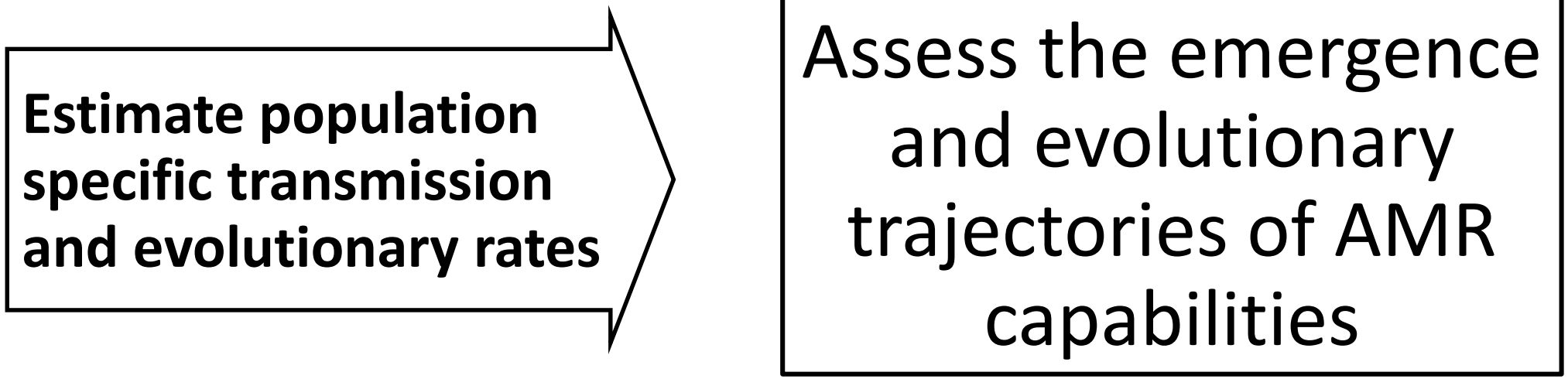


Spatial effects and predictive maps



Spatial Bayesian network models

Epi X study design: stage 3 (Epidemiological analysis pipeline)



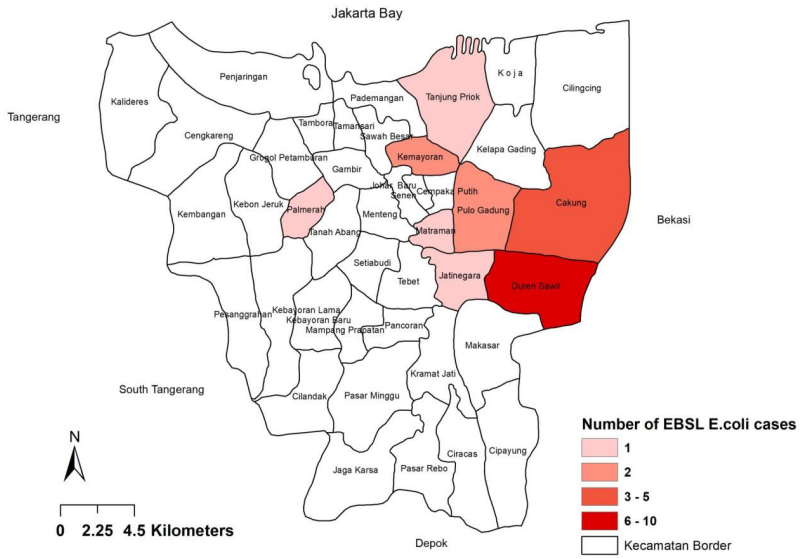
Epi X study design: stage 4 (Outputs for sustained surveillance)

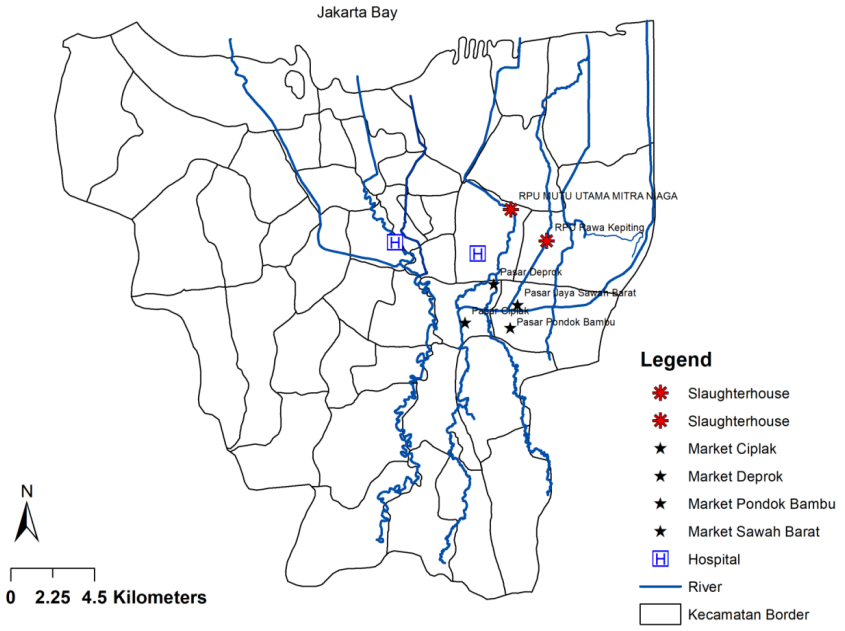
- Mapping geographical risk of ESBL-Ec
- Identification of the environmental drivers of transmission
- Indicators of risk of the spread of ESBL-Ec intra and inter species
- Identification of the evolutionary drivers of ESBL-Ec

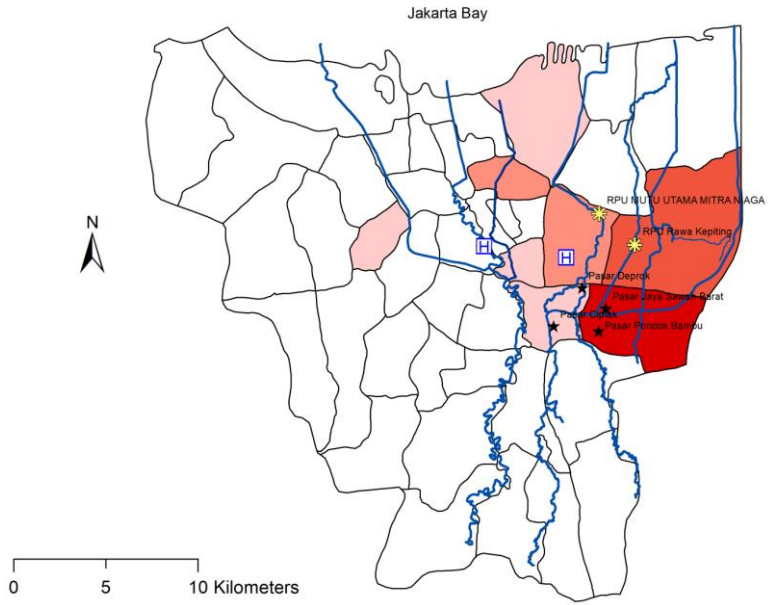
TRICYCLE – EPI X IN JAKARTA

Jakarta – Stage 1 and Stage 2

Enrolment hospitals, human ESBL-Ec data, hotspots analysis, selection of markets / effluent sites







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Epi X Sampling Protocol – Jakarta

Jakarta: Sampling protocol

Tricycle	Epi X
Human • 100 blood cultures positive for ESBL Ec	Human • 100 blood cultures positive for ESBL Ec • **1 main pre-treated hospital sewage sample per 2months**
Food sample • 240 fresh poultry (cecum) samples over 12 months from 10 markets	Food sample • 240 fresh poultry (cecum) samples over 12 months from **8 markets**
Environment • 48-64 samples per year	Environment • 48-64 samples per year

Jakarta: Risk factor data

Human cases (and pregnant females)	Food chain	Environment
• Age, Gender, Location (address), **Educational status and years of education** • Department, Institution • Isolate number, ESBL Screening result, Isolate ID confirmation, AST results • Invasive procedure and antibiotic consumption history • **SES including drinking water and toilet** • **Animal rearing and poultry housing** • **Antibiotic use in poultry and frequency of use** • **Effluent treatment of animal waste**	• Market name • Specimen number, sample type, market name, sample collection date • Isolate number, ESBL Screening result, Isolate ID confirmation, AST results • Average slaughter rate • **Age, Gender, Location (address), Educational status and years of education*** • **Poultry stunning and bleeding, scalding, viscera disposal*** • **Biosecurity and disinfection*** • **Source of poultry$**	• Sample site, • Sample number, collection round number, sample type, sample collection date • Isolate number, ESBL Screening result, Isolate ID confirmation, AST results • E coli concentration, ESBL concentration, ESBL/E coli ratio

** Information to be collected only on first visit; $ Information to be collected on all follow up visits*

Summary

- GAP recognizes integrated One Health AMR surveillance as a strategy for effective response to AMR
- Tricycle-Epi X protocol is a simple, robust and standardized model in line with above strategy
- Tricycle-Epi X protocol is proposed to provide insights into AMR trends, hotspots of emergence & spread and pathways of AMR transmission within and between sectors to inform targeted control of AMR

Acknowledgments

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THANK YOU

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