

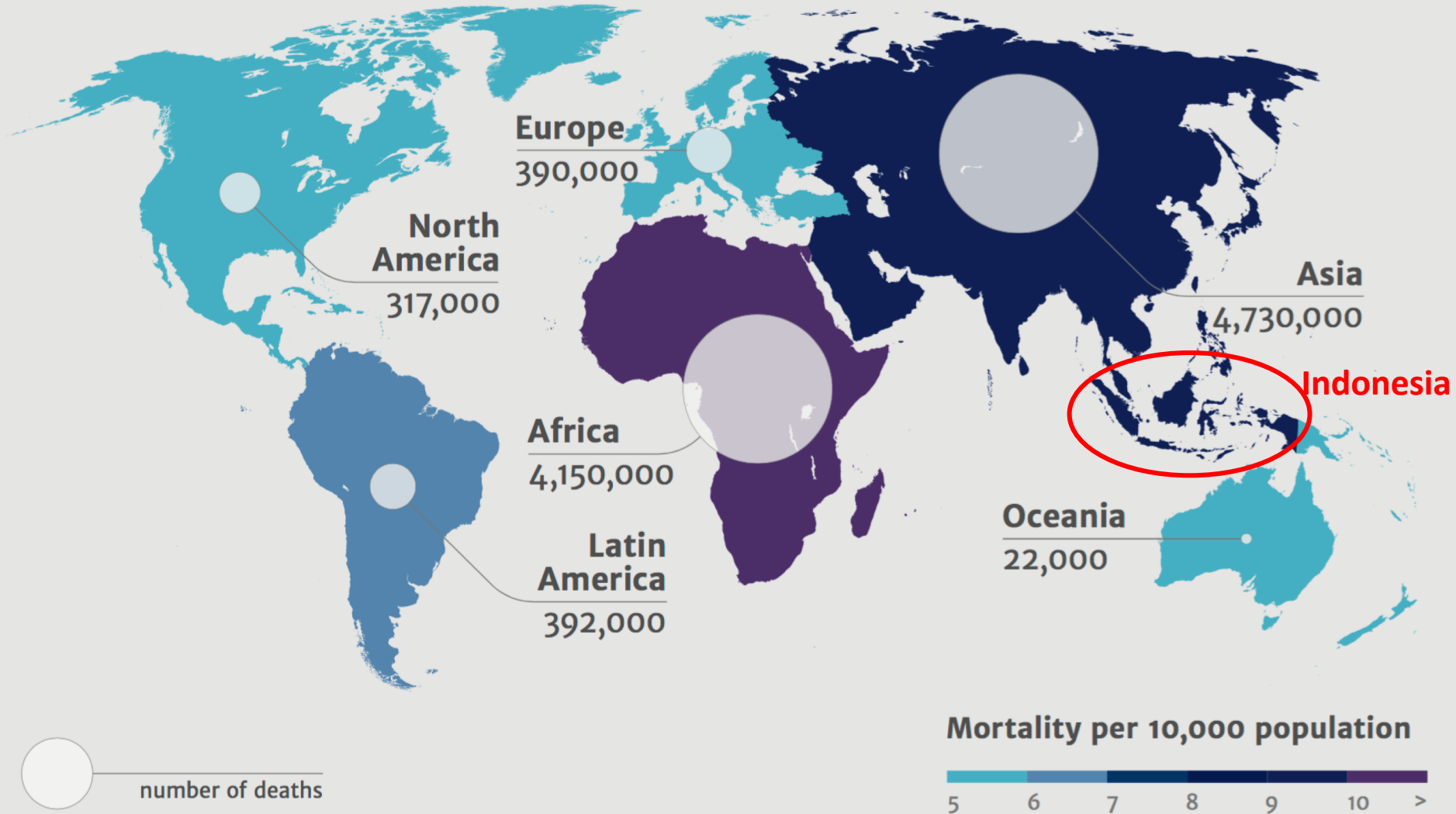


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# Antimicrobial resistance gene, an emerging pollution in river environment in Indonesia



# In 2050, predicted deaths caused by Antimicrobial Resistance (AMR)

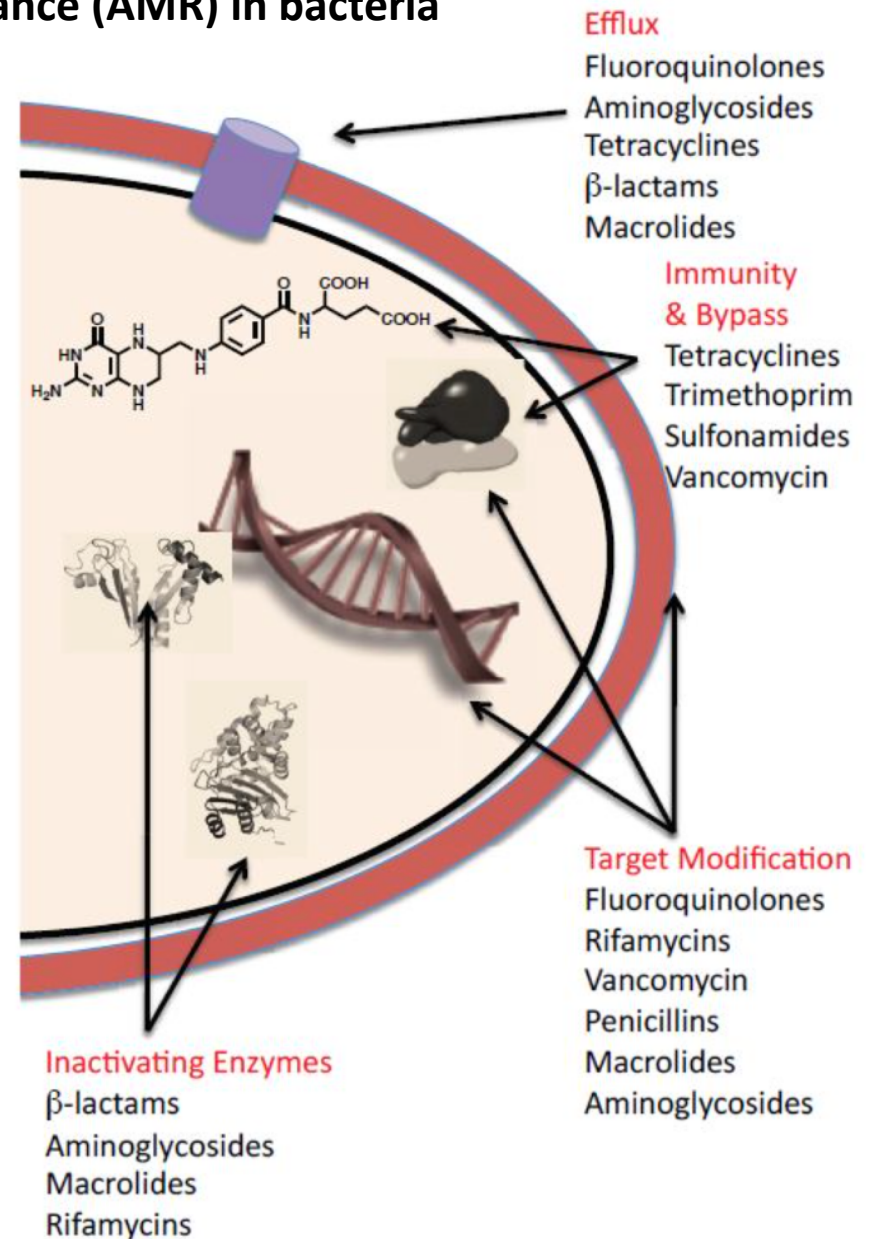




# Mechanism of Antimicrobial Resistance (AMR) in bacteria

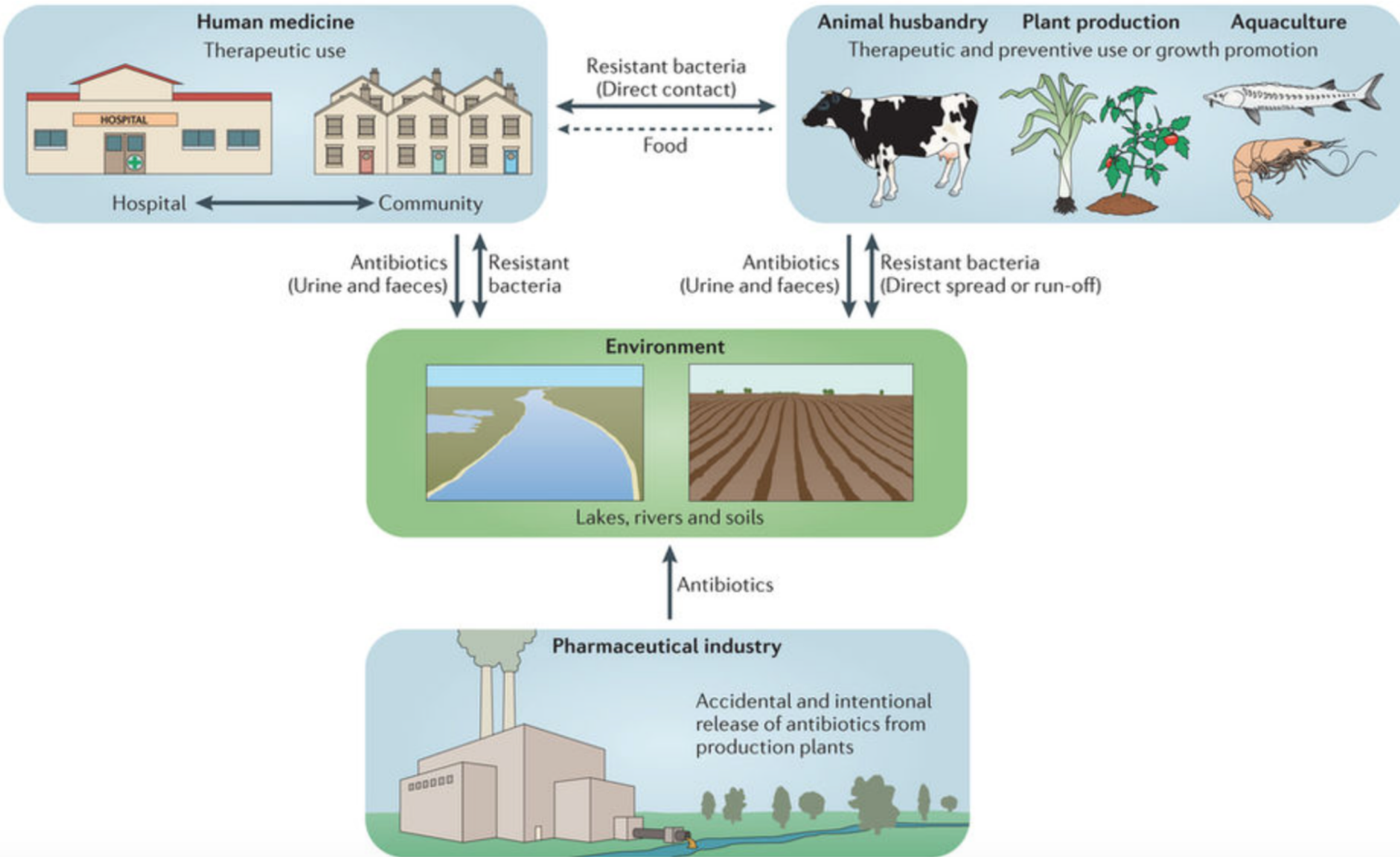


AMR genes





# Spread of AMR genes in the environment





# **Study on Antimicrobial Resistance (AMR) in Indonesia**

- No published data on AMR in the environment
- Most of AMR studies are from hospitals and in pathogens



# **Project: Antimicrobial Resistance in Indonesia**

## **Objective:**

to produce quantitative data on the AMR genes in river environment in Indonesia.

Research results will be proposed as **general recommendations for the Indonesian government.**





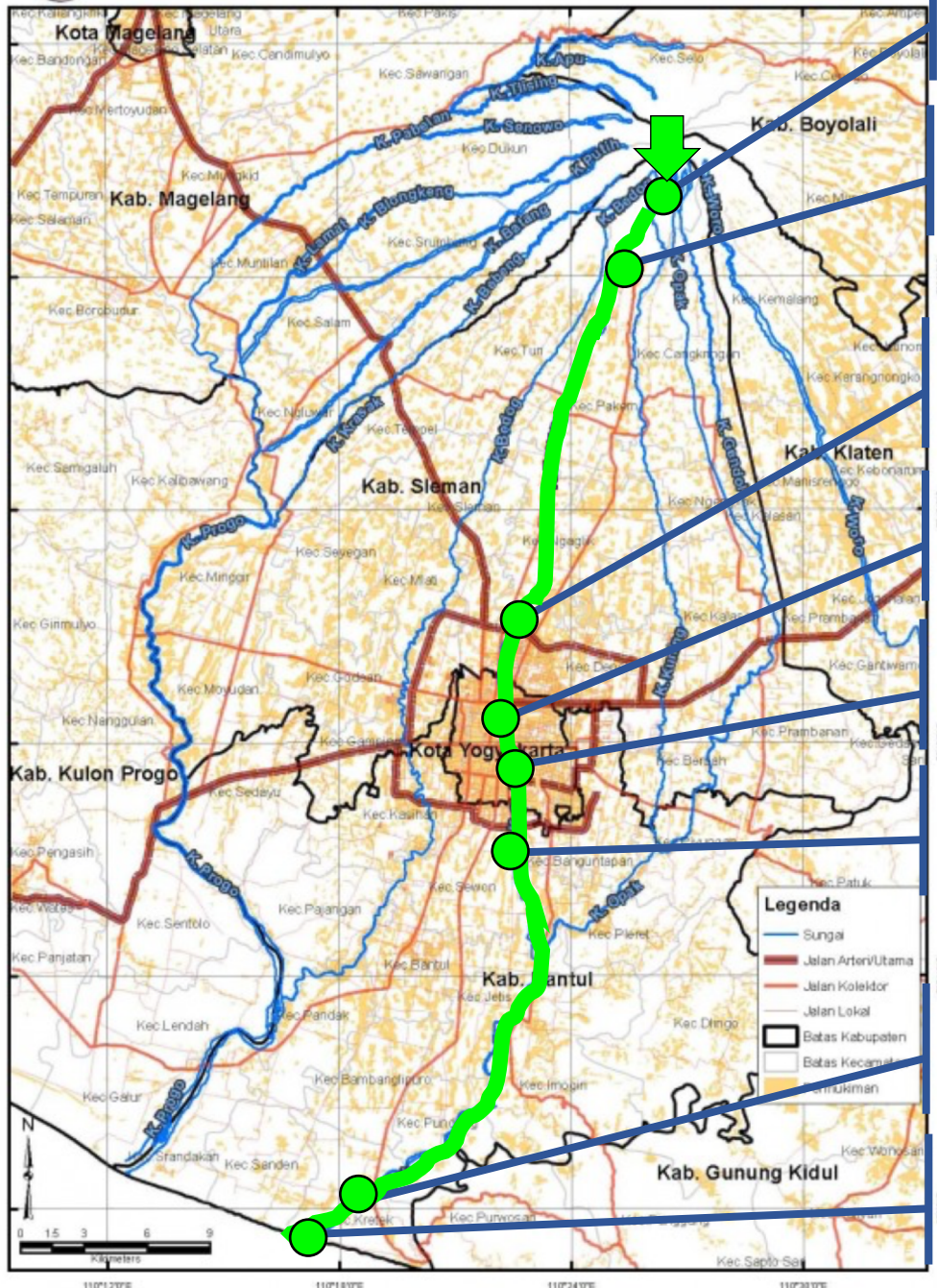
# REPUBLIC OF INDONESIA

The largest island state (17 500 islands)

Population: 261 million (the 4<sup>th</sup> after China, India and USA)

60% of population live in Java Island

# Code River, Yogyakarta (approx. 63 km)



**1: Spring water**

**2: Cattle farm waste impact**

**3: Chicken slaughterhouse waste impact**

**4: Hospital waste impact**

**5: City waste impact**

**6: Downstream city**

**7: Estuary-Freshwater**

**8: Estuary-Seawater**



Surface river water  
sample collection

Isolation of total  
environmental DNA

Quantification of AMR  
genes with qPCR Array

Data analysis using  
R program

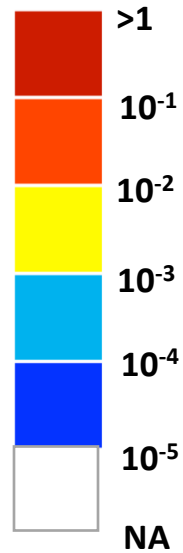
Presence and abundance of  
AMR genes



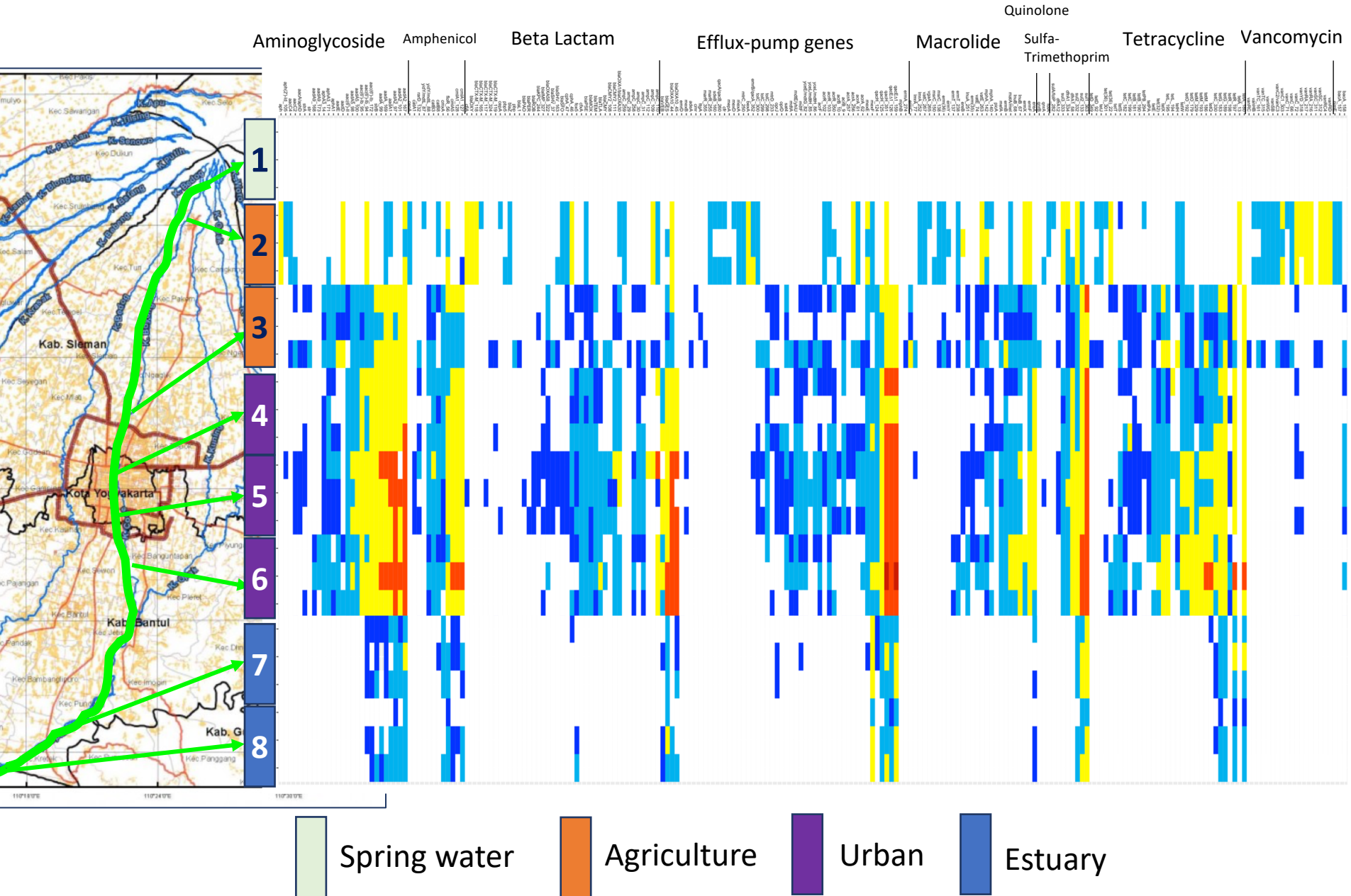
SmartChip (5184 wells):  
up to 384 genes



**The proportion of AMR gene copy numbers  
to 16S rRNA gene (numbers of bacteria)**



# The presence and abundance of 224 AMR genes in Code River





# Summary

- ❖ SmartChip system is a high-throughput method for monitoring AMR genes in aquatic environment
- ❖ Urban activity plays a bigger role as the source of AMR genes in the Code River compared to that of agriculture
- ❖ Actions to reduce the AMR gene pollution can be targeted first in the urban areas
- ❖ In the future, it is important to study the impact of AMR genes in the environment to human health. For example to study which bacteria carrying the AMR genes, are they pathogens or not?

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