SaniPath Exposure Assessment in Dhaka, Bangladesh

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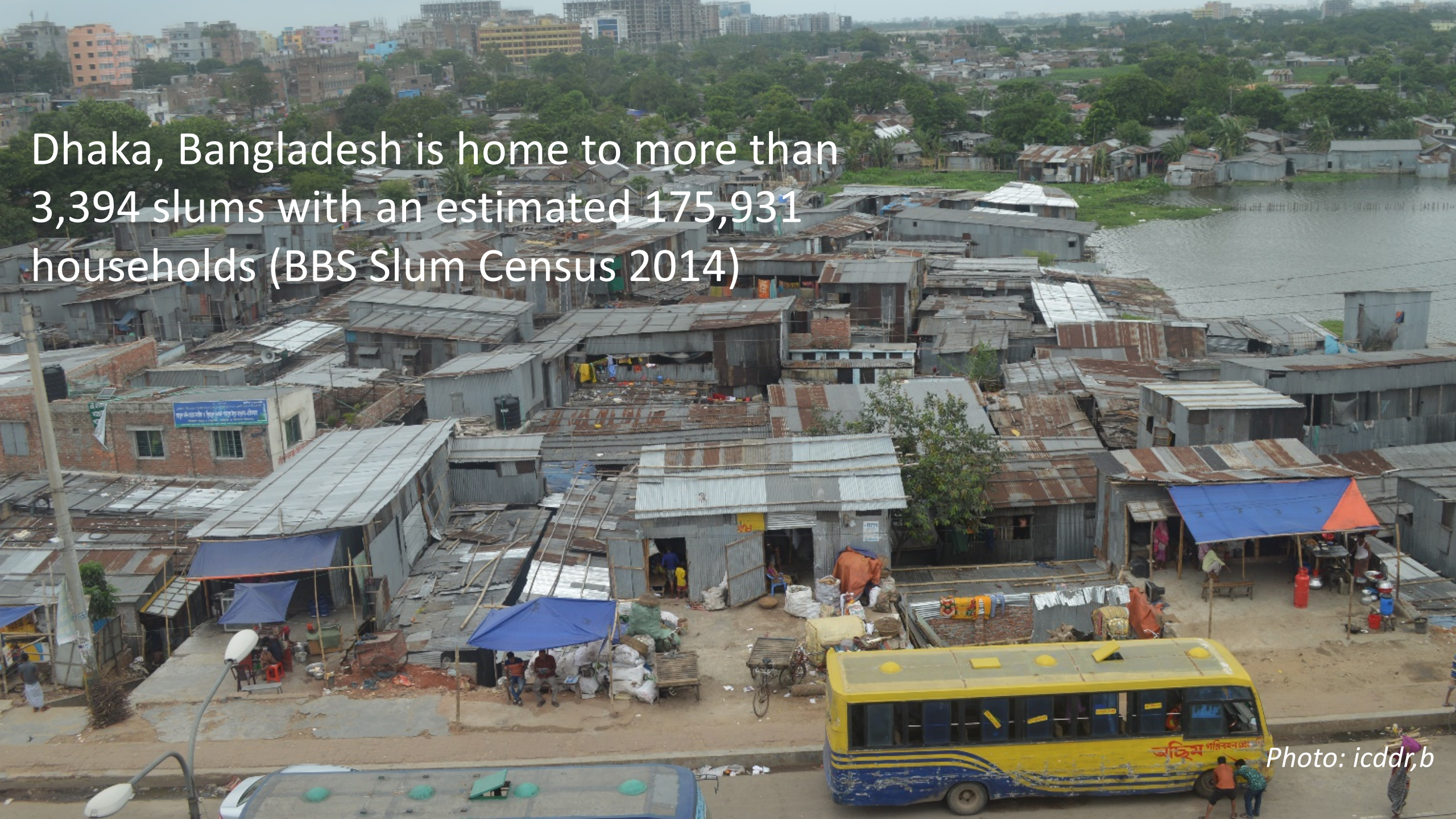
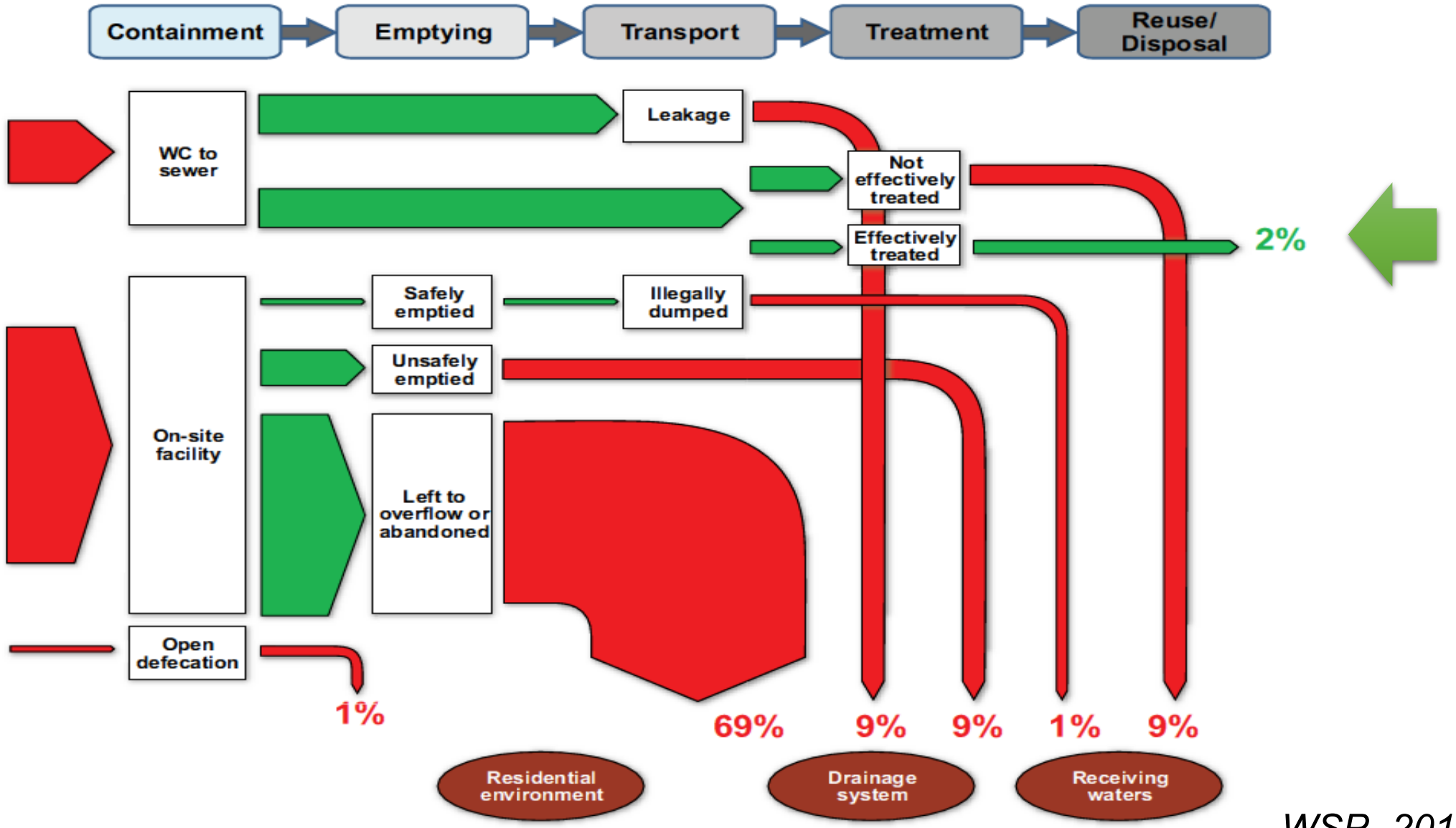
Background


Dhaka, Bangladesh is home to more than 3,394 slums with an estimated 175,931 households (BBS Slum Census 2014)
Photo: icddr,b

Fecal sludge is not contained in Dhaka



WSP- 2014

SaniPath

Exposure Assessment Tool

The SaniPath Exposure Assessment Tool is designed to:

- **Assess public health risks** related to poor sanitation and FSM
- **Raise awareness** about these risks among stakeholders
- **Help prioritize sanitation investments** based on the exposures that have the greatest public health impact.

Our goal was to compare the exposure to fecal contamination from different environmental pathways in urban neighborhoods of Dhaka city, Bangladesh.

Methods

Study Site

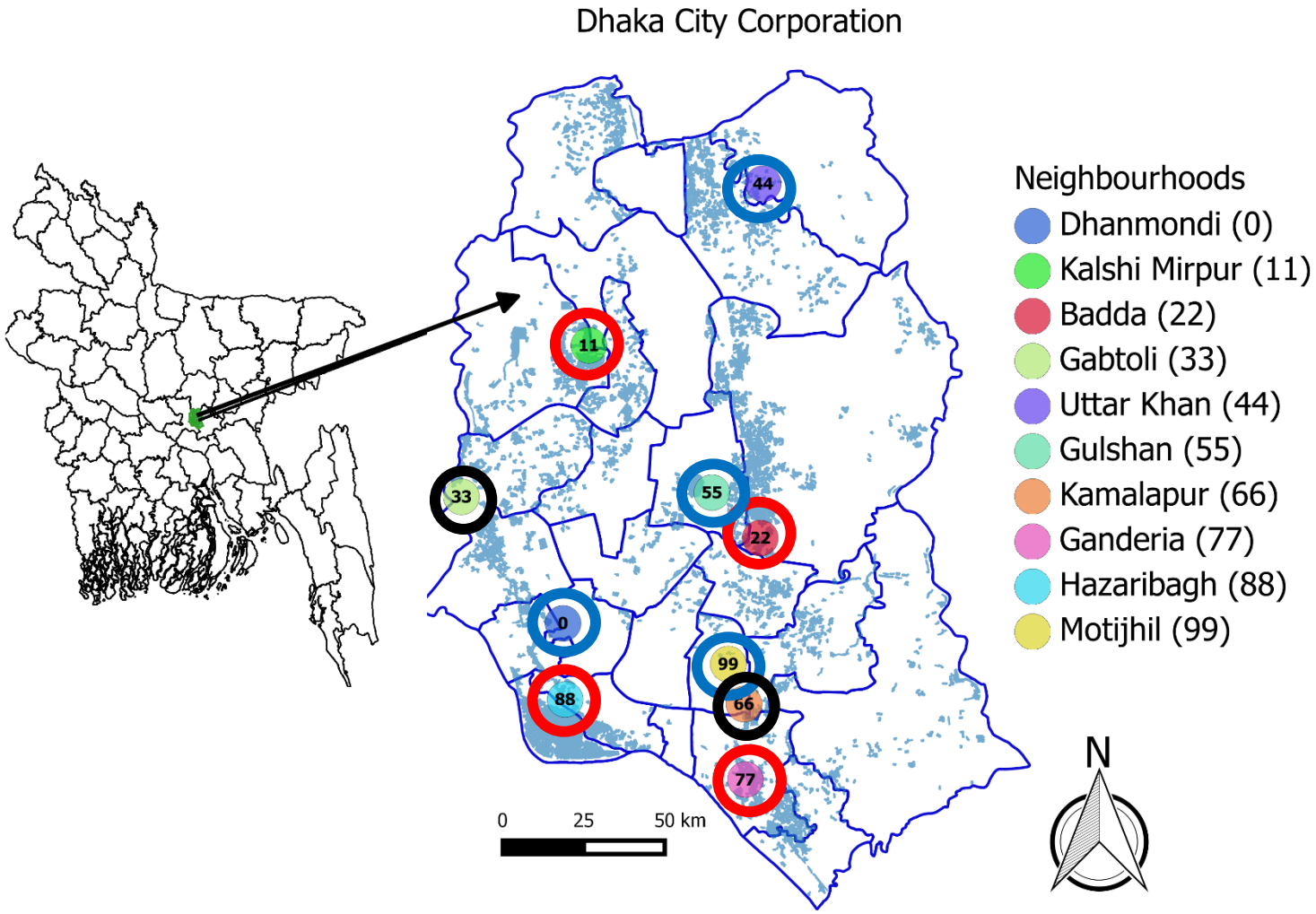
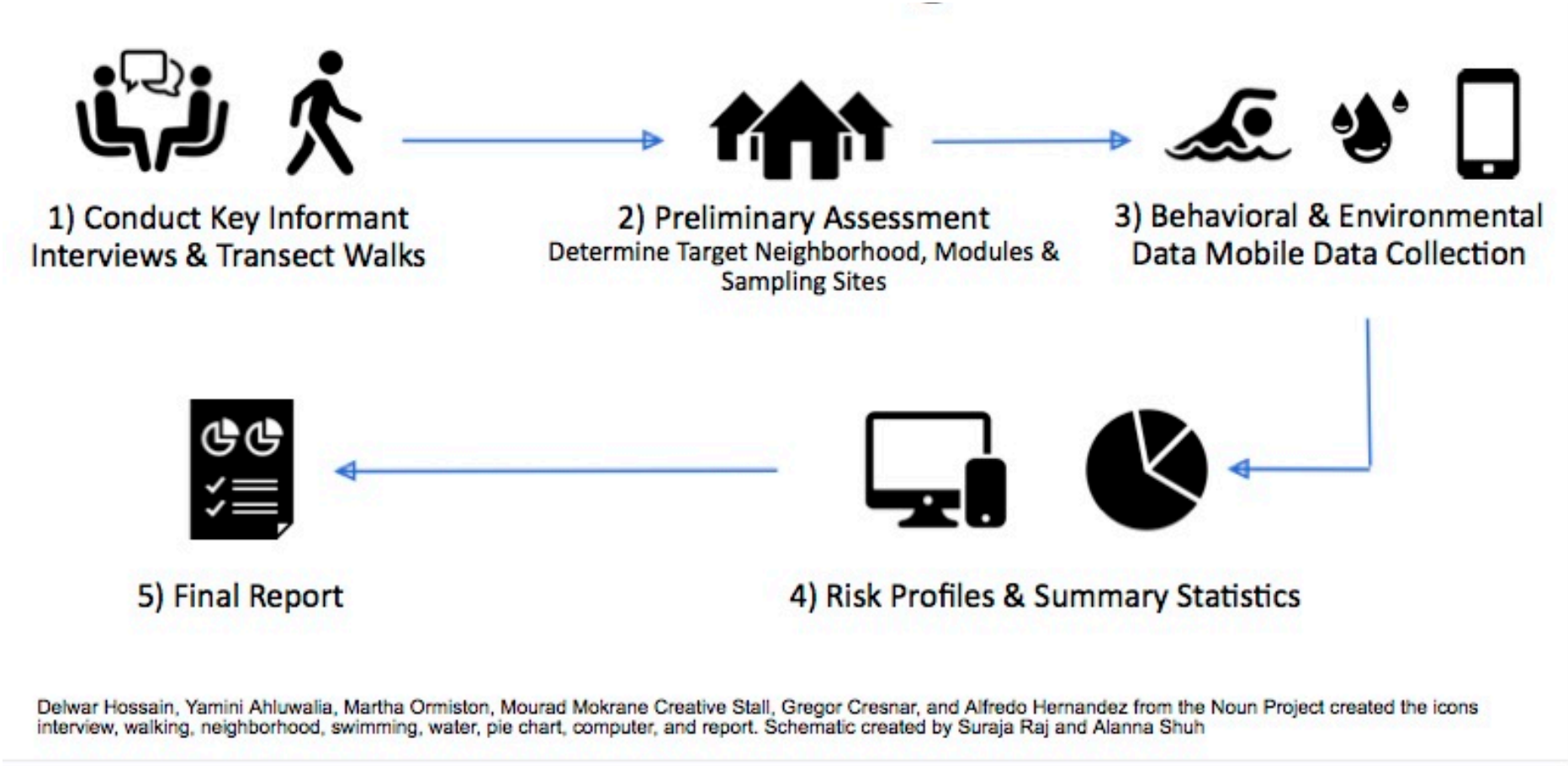


Figure: icddr,b

The SaniPath Tool Deployment Process



Delwar Hossain, Yamini Ahluwalia, Martha Ormiston, Mourad Mokrane Creative Stall, Gregor Cresnar, and Alfredo Hernandez from the Noun Project created the icons interview, walking, neighborhood, swimming, water, pie chart, computer, and report. Schematic created by Suraja Raj and Alanna Shuh

Pathways Investigated in Dhaka

Surface water

Non-WASA water

Soil

Latrine Swab

Flood water

Street food

Raw produce

WASA Water

Open drain

Bathing water

Photos: Icddr,b

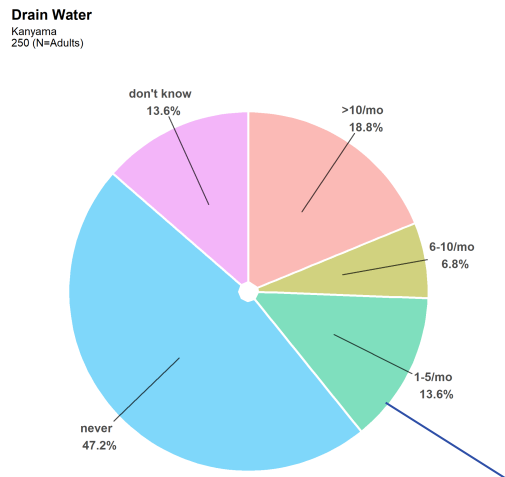
Data Collection Methods

- **Behavioral Exposure Data**
  - reported frequency of behavior of adults and children that leads to exposure to fecal contamination
- **Environmental Microbiology Data**
  - Collect environmental samples from relevant exposure pathways
  - Analyze for *E. coli* via IDEXX

Photo: Icddr,b

Estimating Exposure to Fecal Contamination

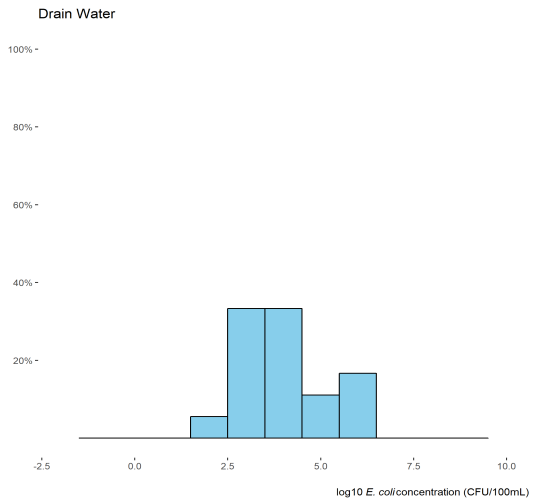
Behavior Frequency



Tool uses Bayesian analysis to estimate the distribution of environmental contamination and frequency of exposure.

Other parameters: intake volumes, duration of exposure, etc.

Environmental Contamination

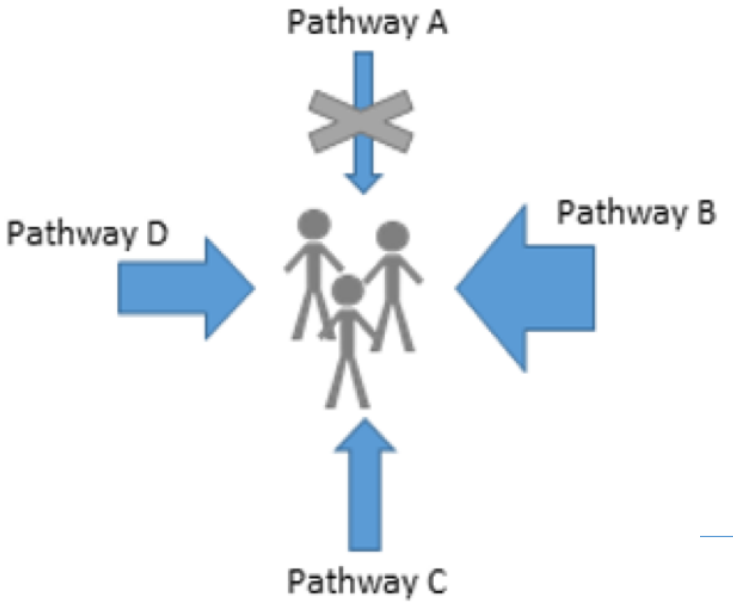


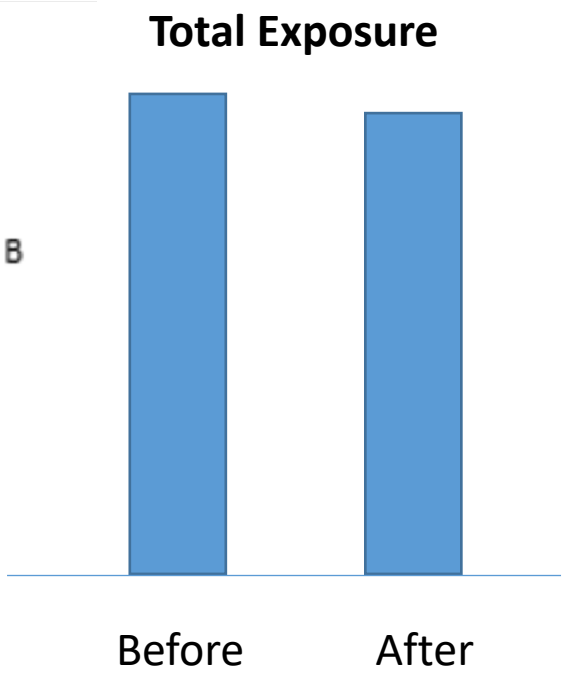
The mean dose and proportion of the population exposed are summarized from simulated distributions and displayed in risk profiles.

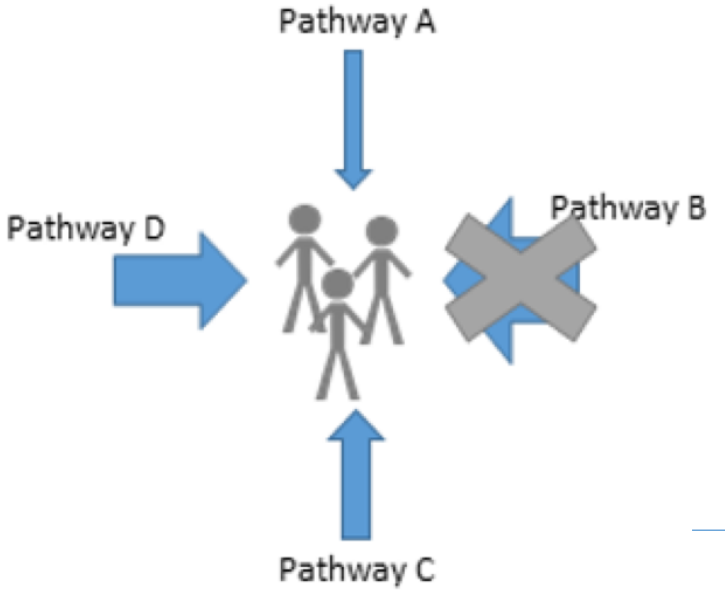
Results are presented in a normalized and comparable unit – Dose as MPN *E. coli* **ingested** per month

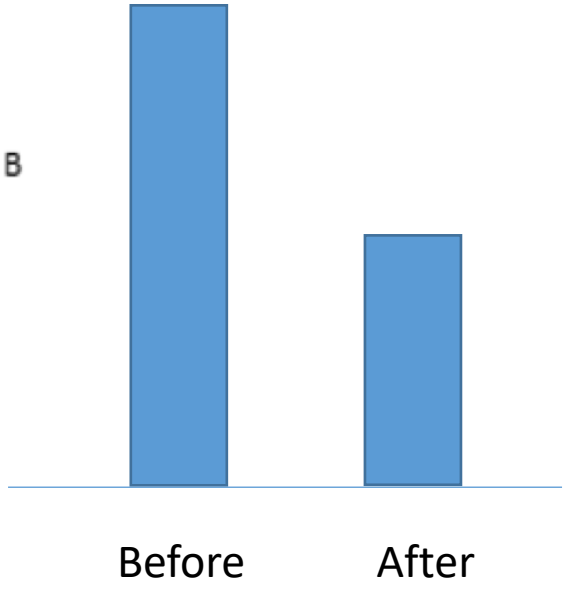
Dominant Pathway(s)

The dominant pathway(s) is defined as the pathway(s) that make the greatest contribution(s) to the total exposure.







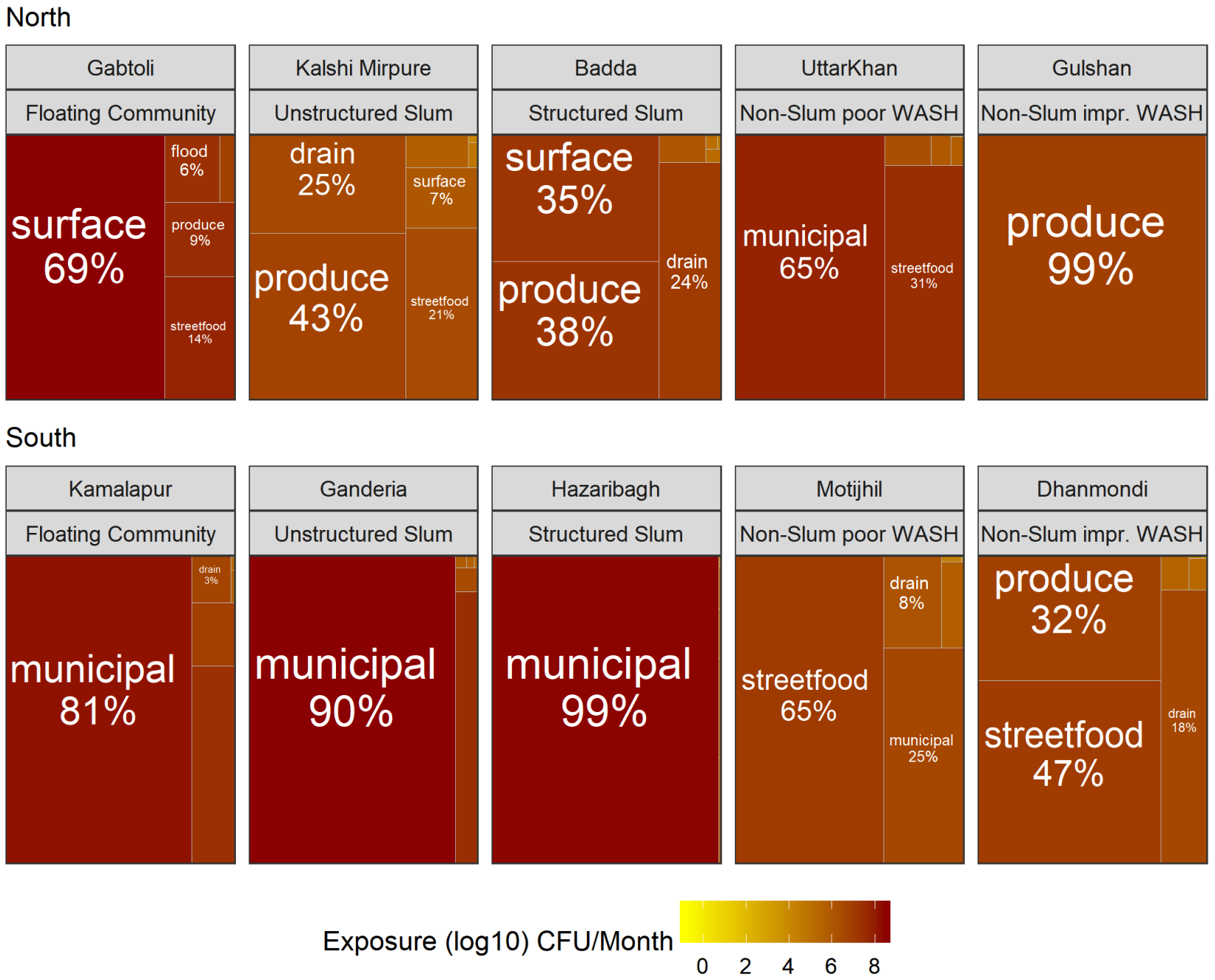


Results

Total Exposure for Adults

Dominant Pathways:

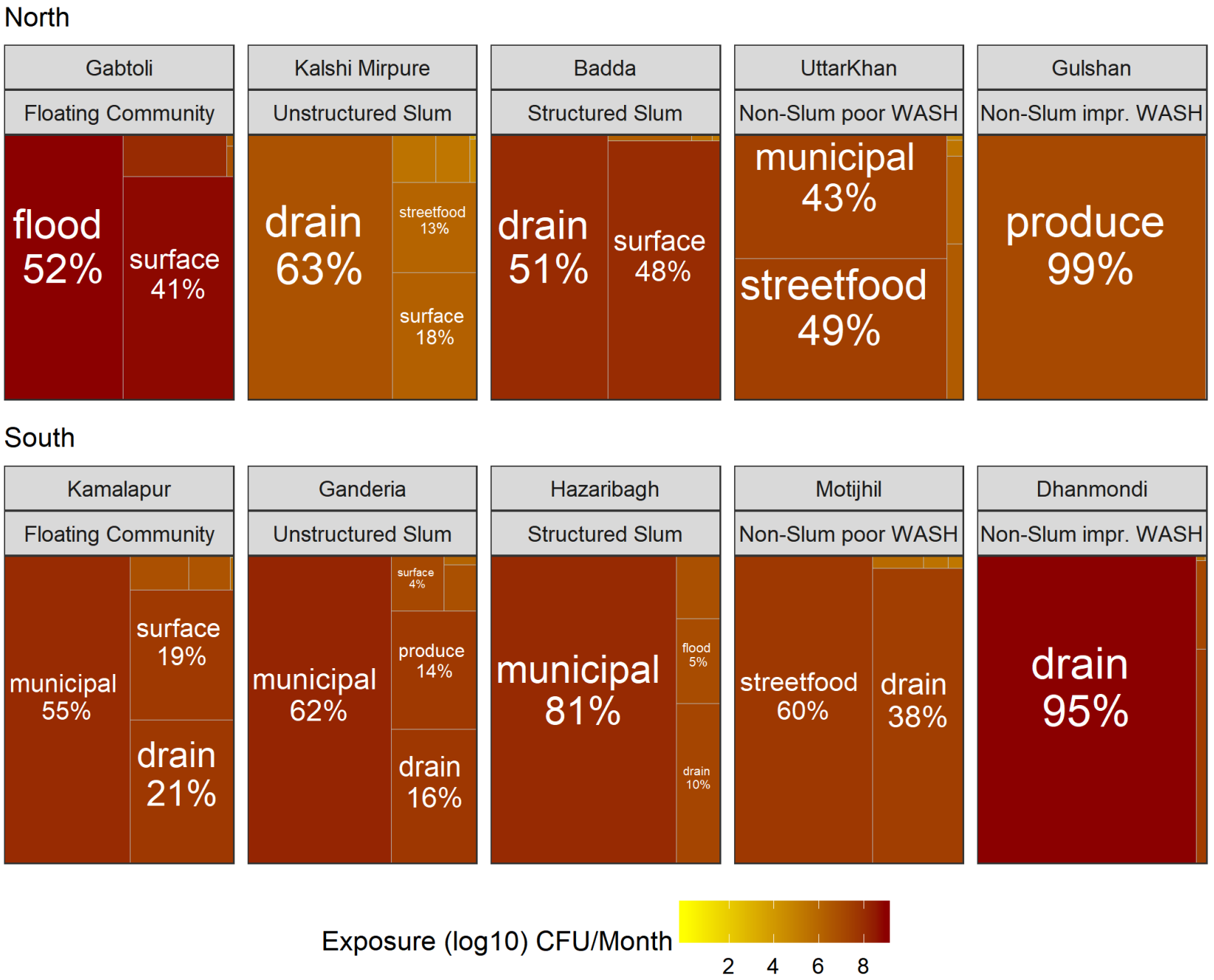
- Produce (6)
- Street Food (5)
- Municipal Water (5)
- Open Drains (4)
- Surface Water (3)



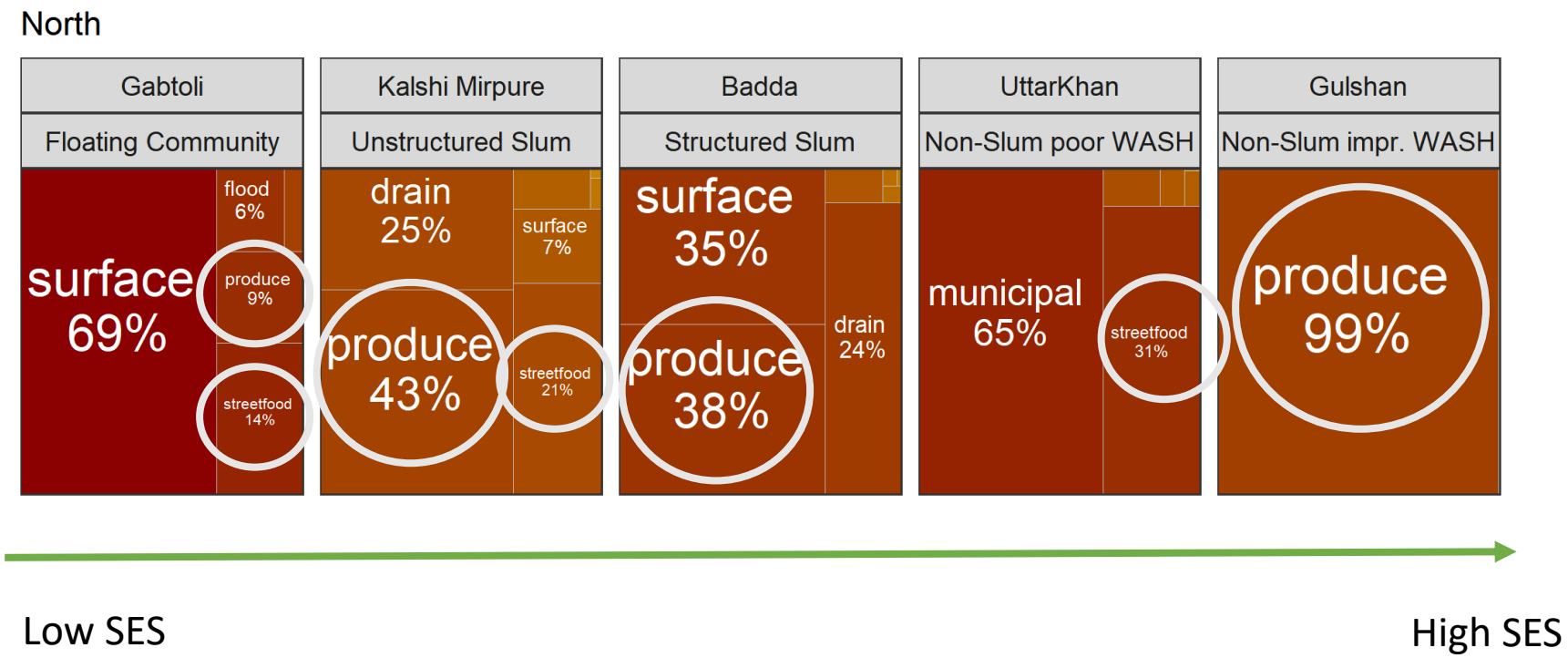
Total Exposure for Children

Dominant Pathways:

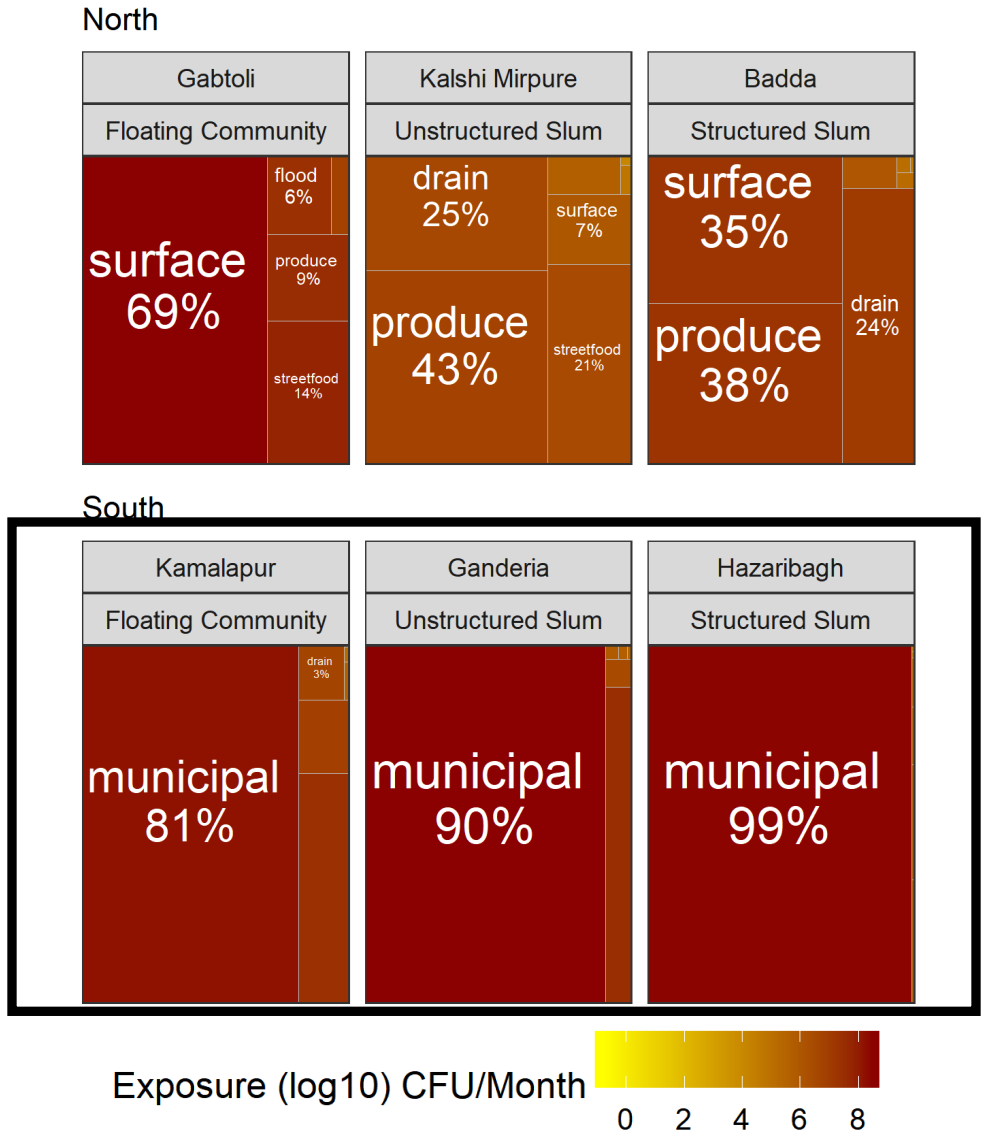
- Open Drains (7)
- Municipal Water (4)
- Surface Water (4)
- Produce (2)
- Street Food (2)
- Flood Water (1)



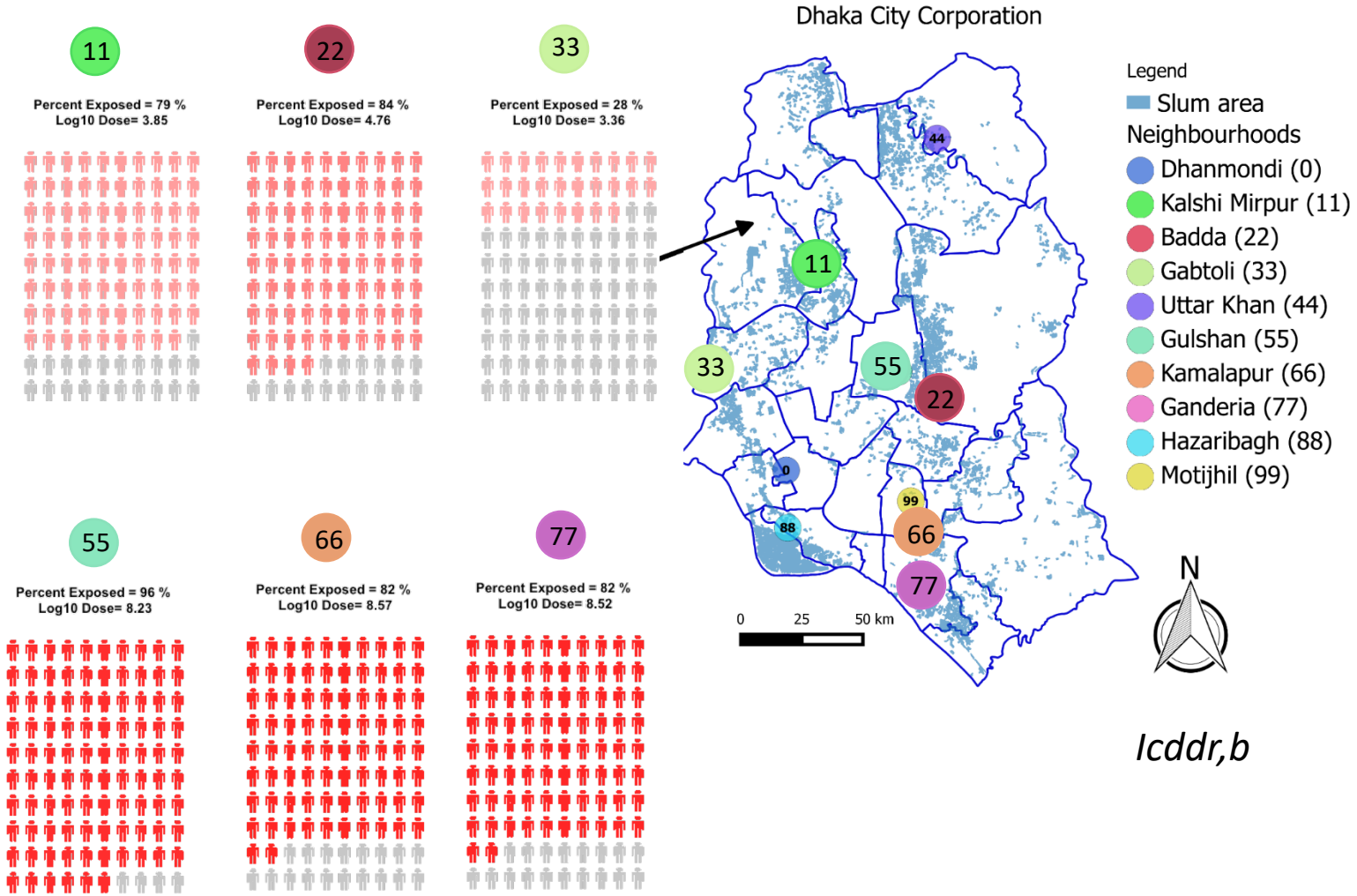
High Income Communities are Also Exposed to Contamination Through Produce and Street Food



Municipal Water Contributes More to Total Exposure in the South



A Closer Look: Municipal Water



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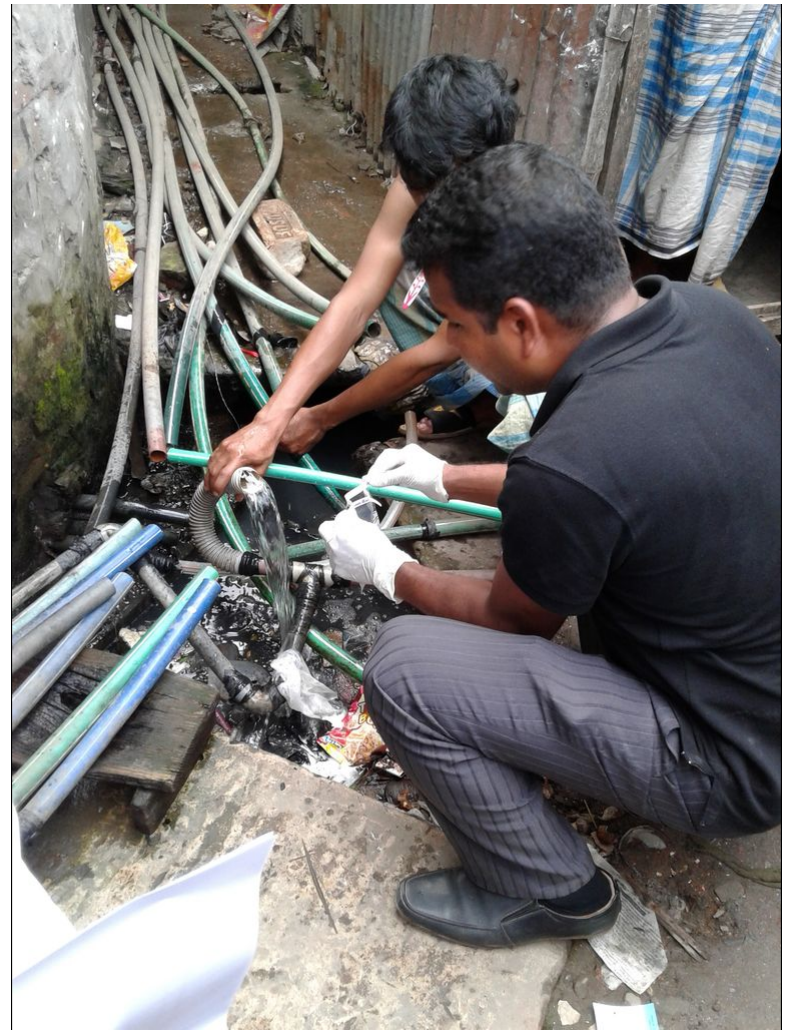

So What?

How does Dhaka compare with other cities?

Key Findings and Observations

- All dominant pathways were driven by both high contamination and high frequency of exposure
- Produce and street food were highly contaminated and frequently consumed across the city in all neighborhoods
- Important differences between risks for adults and children (see dominant pathways)
- SES and geographical location may be good predictors of WASH quality and fecal exposure for certain pathways such as municipal water, surface water, open drains, and flood water

Limitations

- 10 neighborhoods is a small portion of Dhaka
- Challenges in collecting data from high-income neighborhoods
- Capturing Rainy Season
- Limitations of SaniPath Tool
  - Single cross-sectional deployment
  - Relies on self-reported behavior
  - Hygiene, food preparation, and risk mitigating behaviors are not considered in model
  - Limited published literature on intake and duration of exposure activities
  - No household-level fecal contamination

Next Steps

- Stakeholder meeting to share results
- Further studies on produce and street food in Dhaka
- Comparison of a city with “poor FSM” (Dhaka, Bangladesh) and “improving” FSM (Durban, South Africa)
- Multi-city comparisons and standardized exposure assessment

Acknowledgements

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  Zahidul Hassan, Imrul Hasan, Field Enumerators

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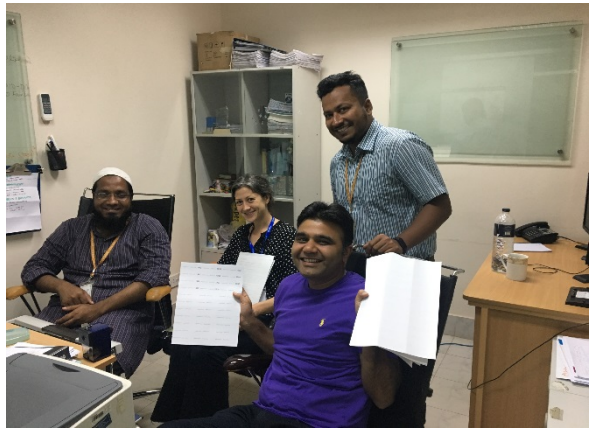
  Christine Moe, Jamie Green, Andrew Wang, Wolfgang Mairinger, James Michiel, Ashutosh Wadhwa

- Participating Dhaka communities



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