

A Data-Driven Approach for Identifying Open Dumping Sites in the Global South

Wenlan Zhang, CASA, UCL

Dr. Angela Abascal, Universidad de Navarra

Dr. Chen Zhong, CASA, UCL

Dr. Qunshan Zhao, UBDC, University of Glasgow

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Background

- The flood in Nairobi was caused by waste blockages in the drainage system.



Image: Kounkuey Design Initiative



Image: Wenlan

Dumpsites and open burning of waste represent more dangerous practices, than landfills and incinerations, are particularly common in low- and middle-income countries.



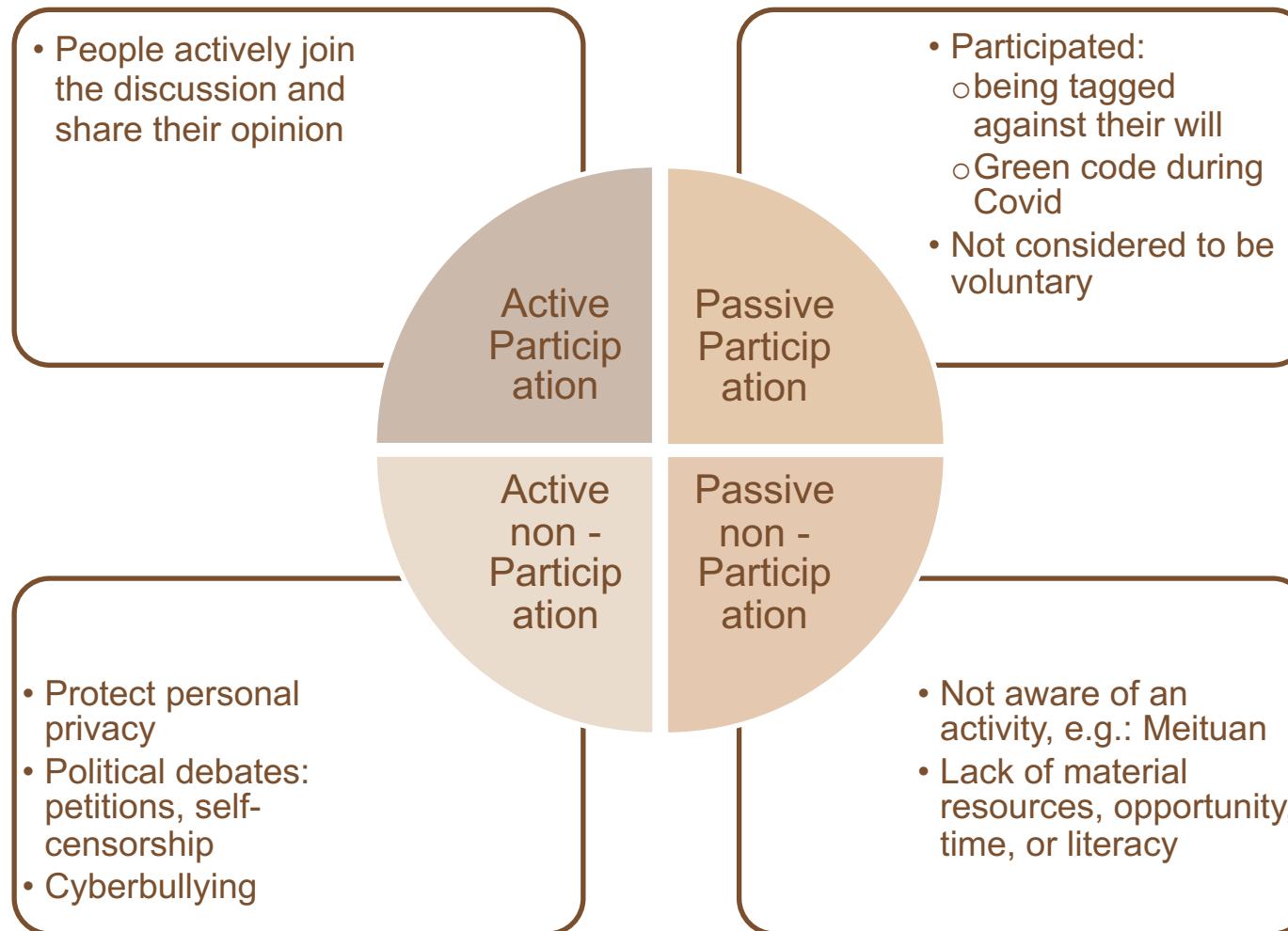
Image:
GSVI

Literature Review – Waste identification

- State of the art: Remote Sensing data driven (Chen et al., 2021)

	Cost	Spatial resolution	Coverage	Frequency
Public satellite	Free	10m plus	Good	Revisit: 5-10 days
Commercial satellite	Costly	1-10m	Good	Revisit: 1 day
Street view images	Free	1-10m	Sparse	1-3 years update

Literature Review – Digital Injustice



- State of the art:
Drainage system identification in Switzerland.



Aim and Objectives

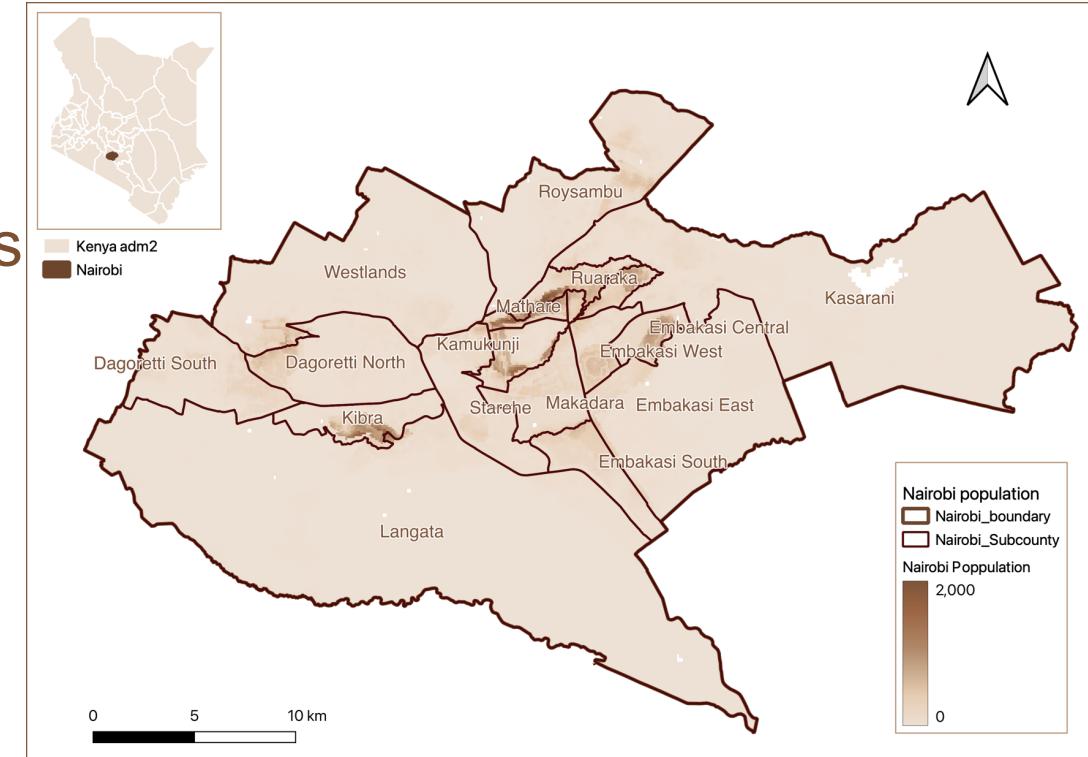
- Aim:

To identify waste piles and open dumping sites with sound spatial-temporal resolution in the context of global south

- Objectives:

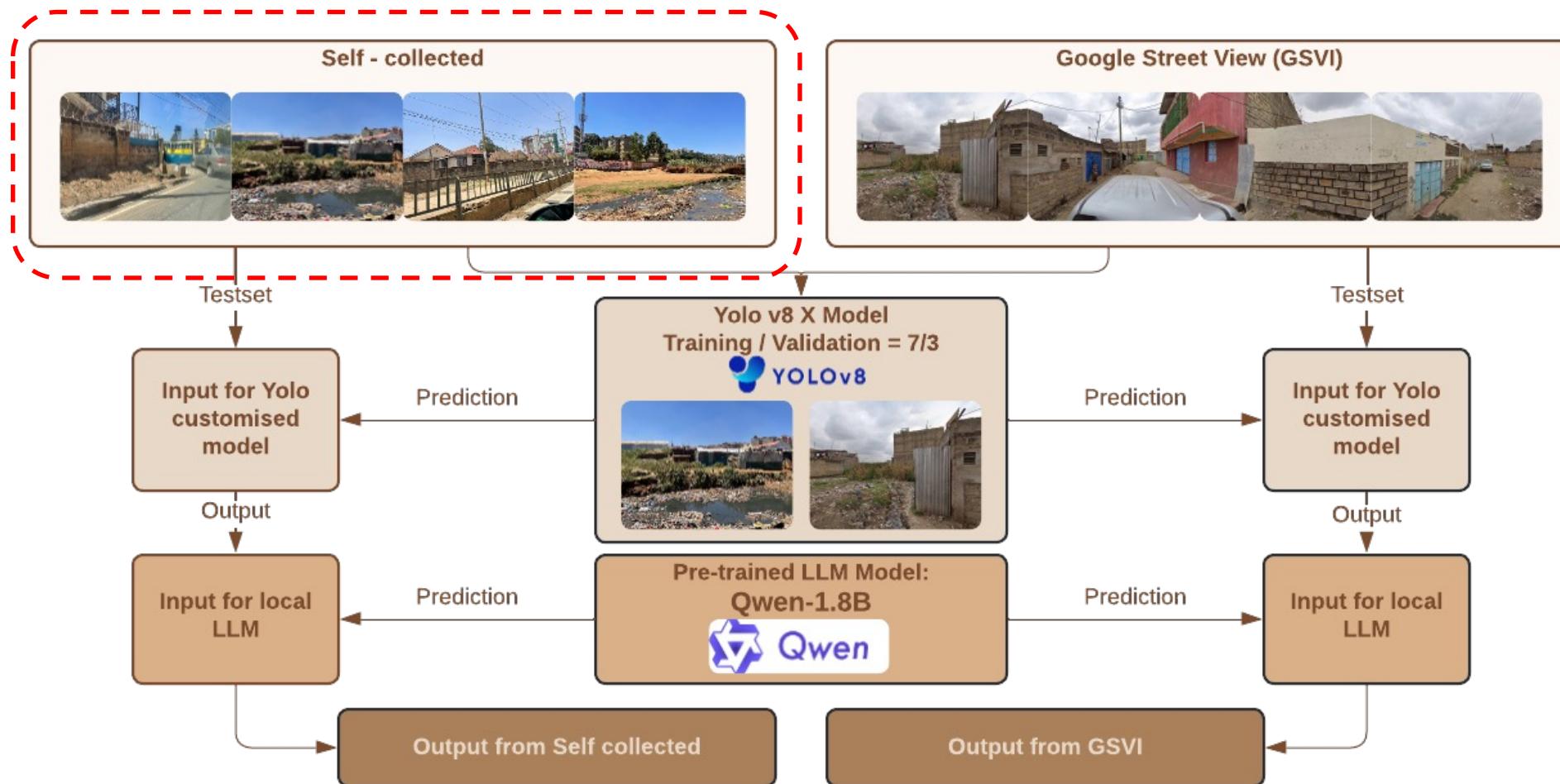
Develop a framework for detecting open dumping sites using street view imagery

Mitigate digital injustice by citizen science, in particular, using primary data collection to enhance the results



- Deprived areas accommodate more than 60% of total population while occupy less than 5% of the city extension (Georganos et al., 2021)

Methodology and Data



- Methodology
 - Object detection: Yolov8x

- LLM: Qwen 7B

▪ Data

- GSVI

Sampled 10-15m,
2021-2022, 2017-2019

- Self:

Phone camera,
2023

Preliminary Result – Waste Detection

	Yolov8: Train and validation set		Yolo detection output LLM input	LLM detection output	
	Object	Background			
Google SVI		 321	 303	 17,446	 1,589, 94%
Self collected		 33	 41	 289	 84, 77%

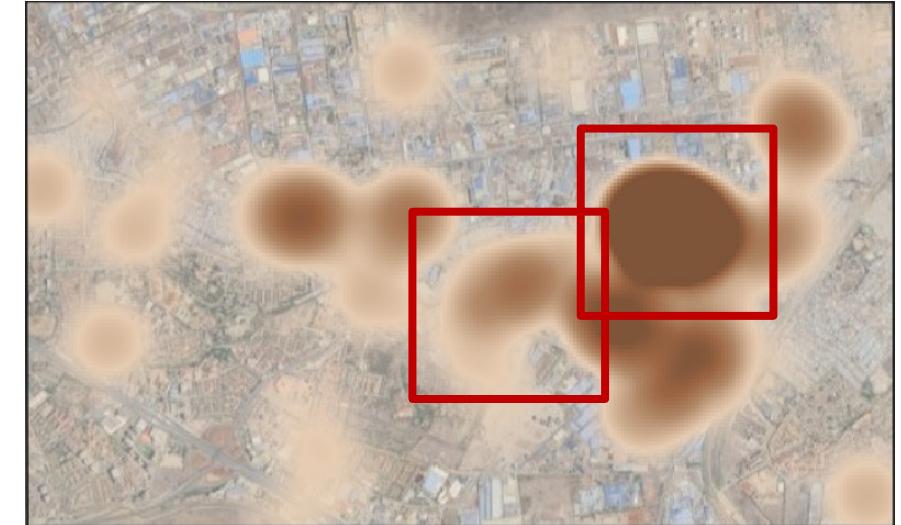
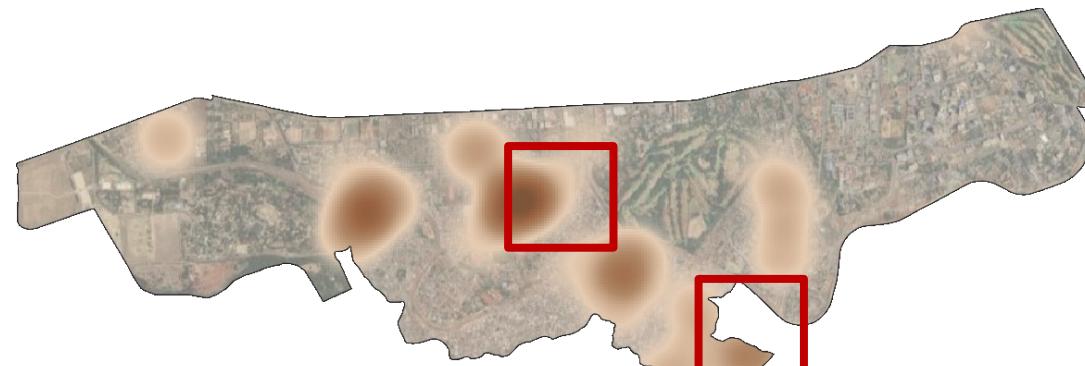
Preliminary Result – Waste detection



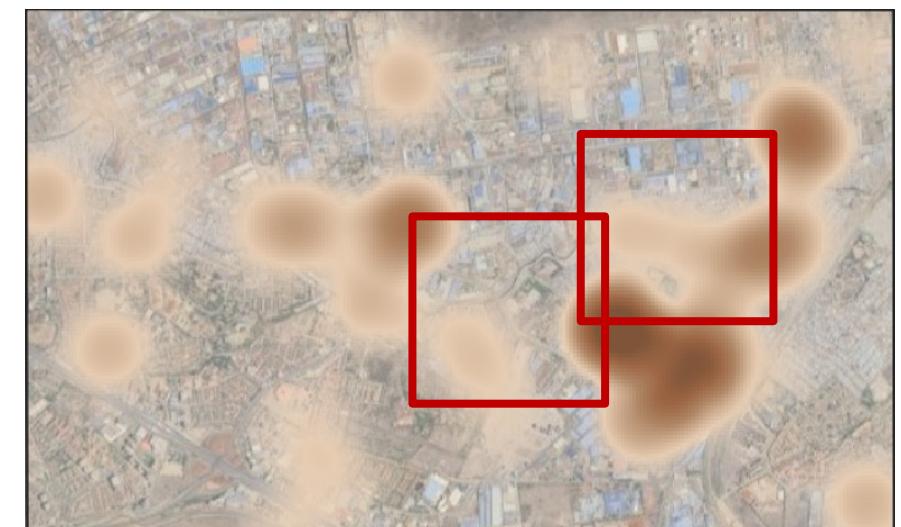
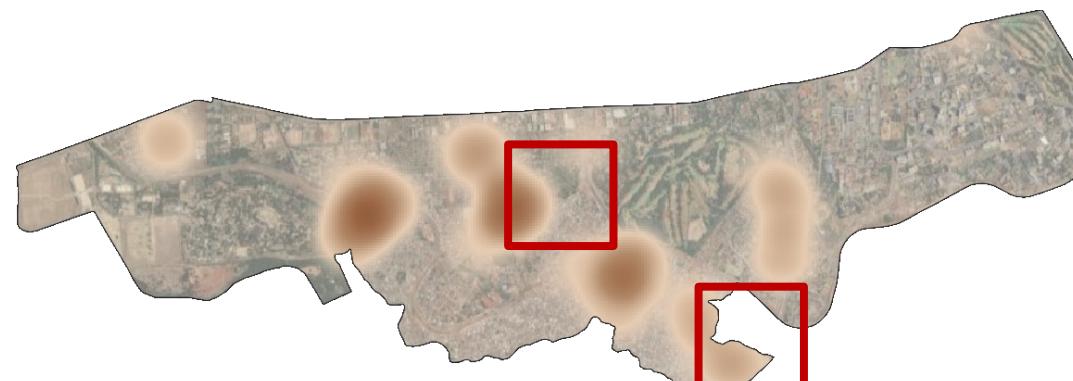
- Confounding factors: leaves, sparse grass / leaves, informal markets, wet and dry dirt, gravel, haystack etc.

Preliminary Result – Digital injustice

Combined

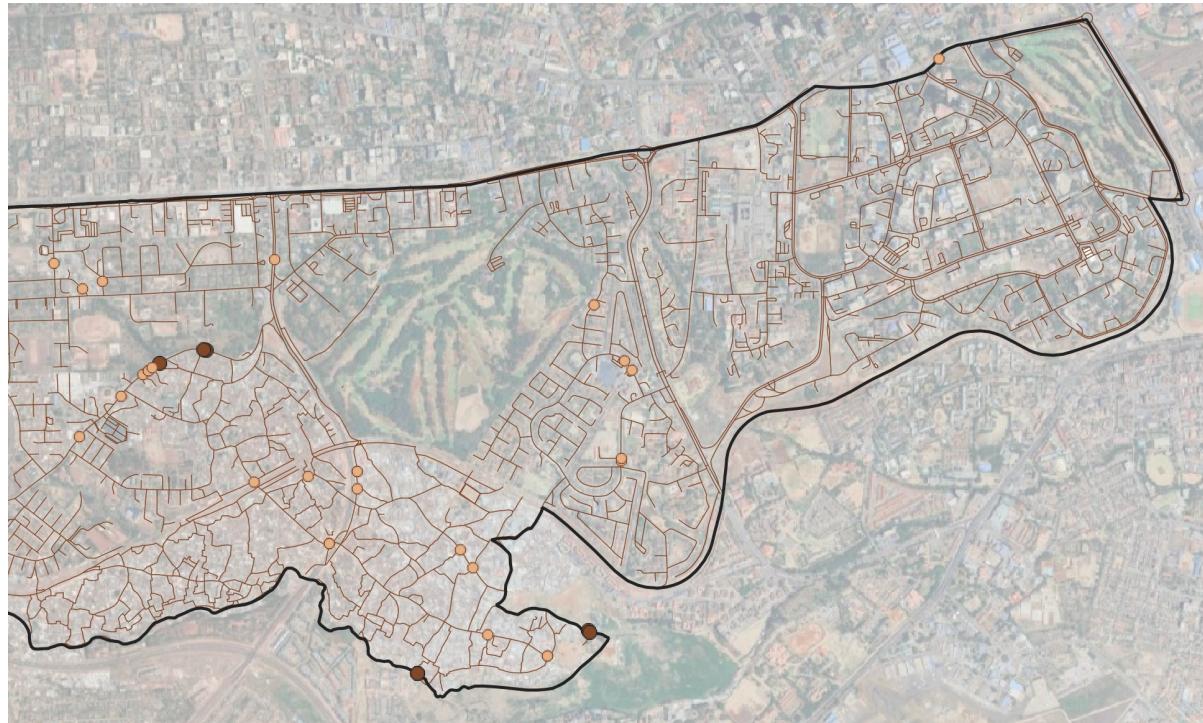


GSVI



- Site 1: Kibera, Site 2: Mukuru

Preliminary Result – Digital injustice



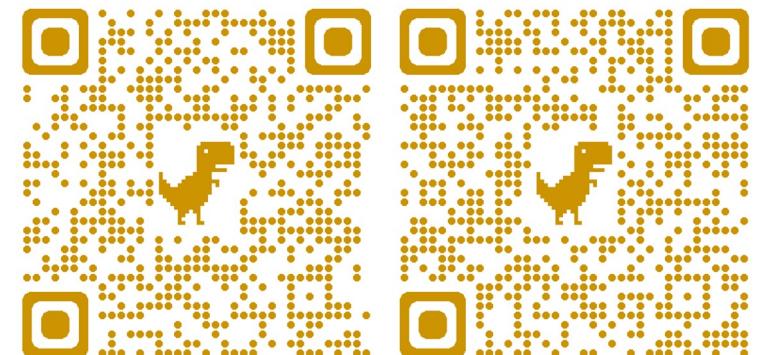
■ Site 1: Kibera



■ Site 2: Mukuru

Limitations and future work

- Limitations
 - Waste detection model - No data about false negative
 - Citizen science - can mitigate but it is difficult to validate
- Future work
 - IDEAMAPS: Conduct local co-design workshops for citizen science data collection



Website

LinkedIn

Twitter: @IDEAMAPSNetwork



THANK YOU



TWITTER
[@ZHANGWENLAN54](https://twitter.com/ZHANGWENLAN54)



EMAIL
wenlan.zhang.21@ucl.ac.uk



WEBSITE
www.zhangwenlan.com/



LINKEDIN
www.linkedin.com/in/wenlan-zhang

