

# SPATIAL INTERACTION MODELLING BY TRANSPORT MODE: A GLIMPSE INTO THE IMPACTS OF A MOTORBIKE BAN IN HANOI

Eric Wanjau<sup>1</sup>, Kristina Bratkova<sup>1</sup>, Alexis Comber<sup>2</sup>, Phe Hoang Huu<sup>3</sup>, Minh Kieu<sup>4</sup>, Nick Malleson<sup>1,2</sup>, Thanh Bui Quang<sup>5</sup> and Hang Nguyen Thi Thuy<sup>6</sup>

<sup>1</sup>Leeds Institute for Data Analytics, University of Leeds, UK | <sup>2</sup>School of Geography, University of Leeds, UK | <sup>3</sup>R&D Consultants, Hanoi City, Vietnam | <sup>4</sup>Faculty of Engineering, University of Auckland, New Zealand | <sup>5</sup>Faculty of Geography, VNU University Science, Hanoi, Vietnam | <sup>6</sup>VNU Vietnam Japan University, Vietnam National University, Hanoi

## Introduction

An overwhelming majority in Hanoi city use motorbikes as their primary means: around 2 motorbikes per person.

Implications are serious traffic congestion, air and noise pollution

Transport survey which currently has 26K responses has been undertaken to capture:

- Demographics: age, gender, location
- Travel behavior: origin, destination, transport mode, purpose
- Attitudes toward a motorbike ban: opinion, awareness, alternative vehicle

**Objective 3:**  
Dashboard to visualize results

**Objective 1:**  
addressing the effect of proposed motorbike ban on traffic flows

**Objective 2:**  
Predict attitudes towards ban

## Methods: Spatial Interaction Model Considering Transport Mode

Traditional SIM

$$F_{ij} = kV_i^\mu W_j^\alpha c_{ij}^{-\beta}$$

Modal SIM

$$F_{ij}^m = A_i O_i W_j^\alpha c_{ij}^{m-\beta}$$

$$\lambda_{ij}^m = \exp(\mu_i + \alpha \ln W_j - \beta \ln c_{ij}^m)$$

RMSE: 9.833  
R<sup>2</sup>: 0.385

$\mu_i$ : Spatial fixed effects

$\beta$ : Influence of cost on flows

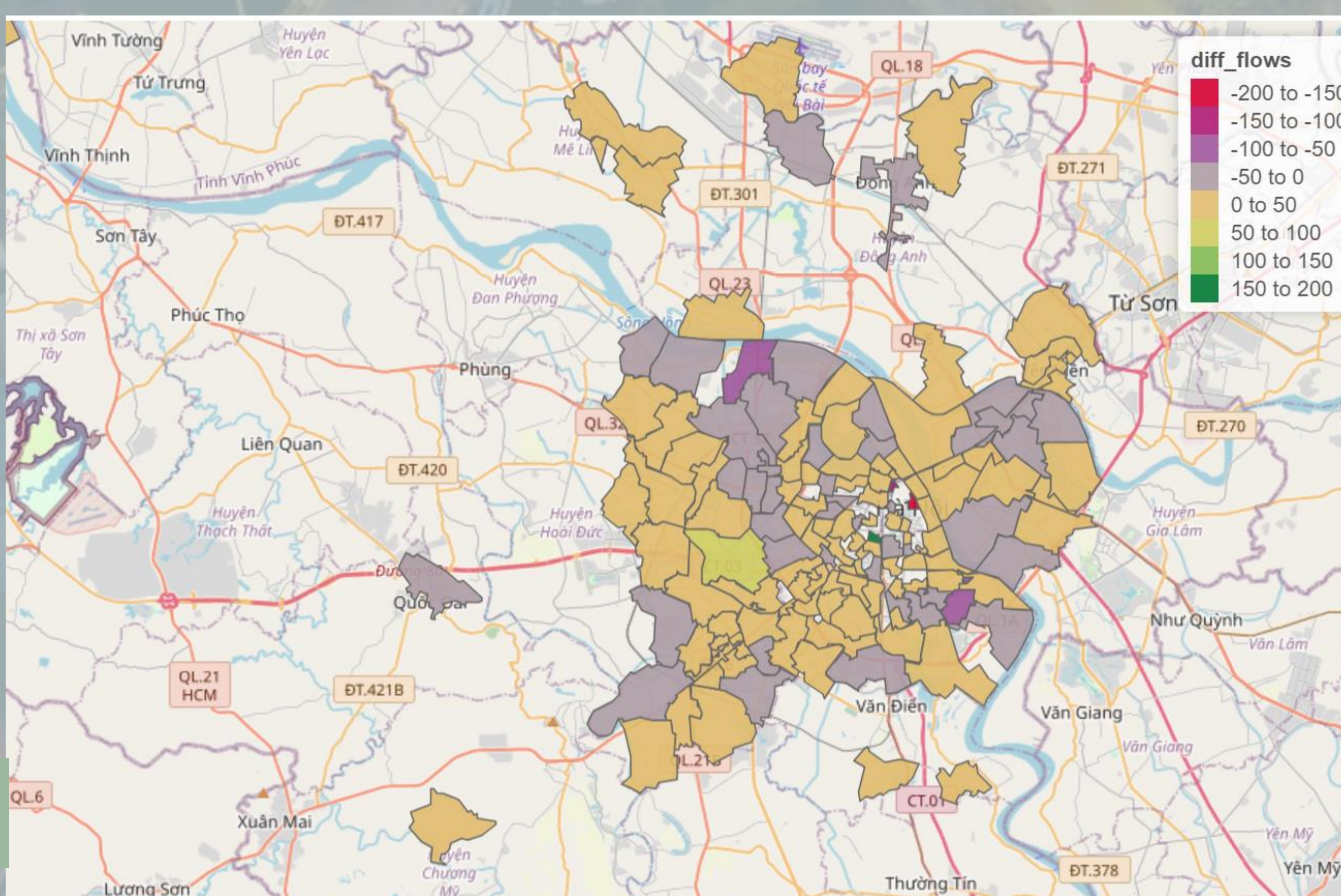
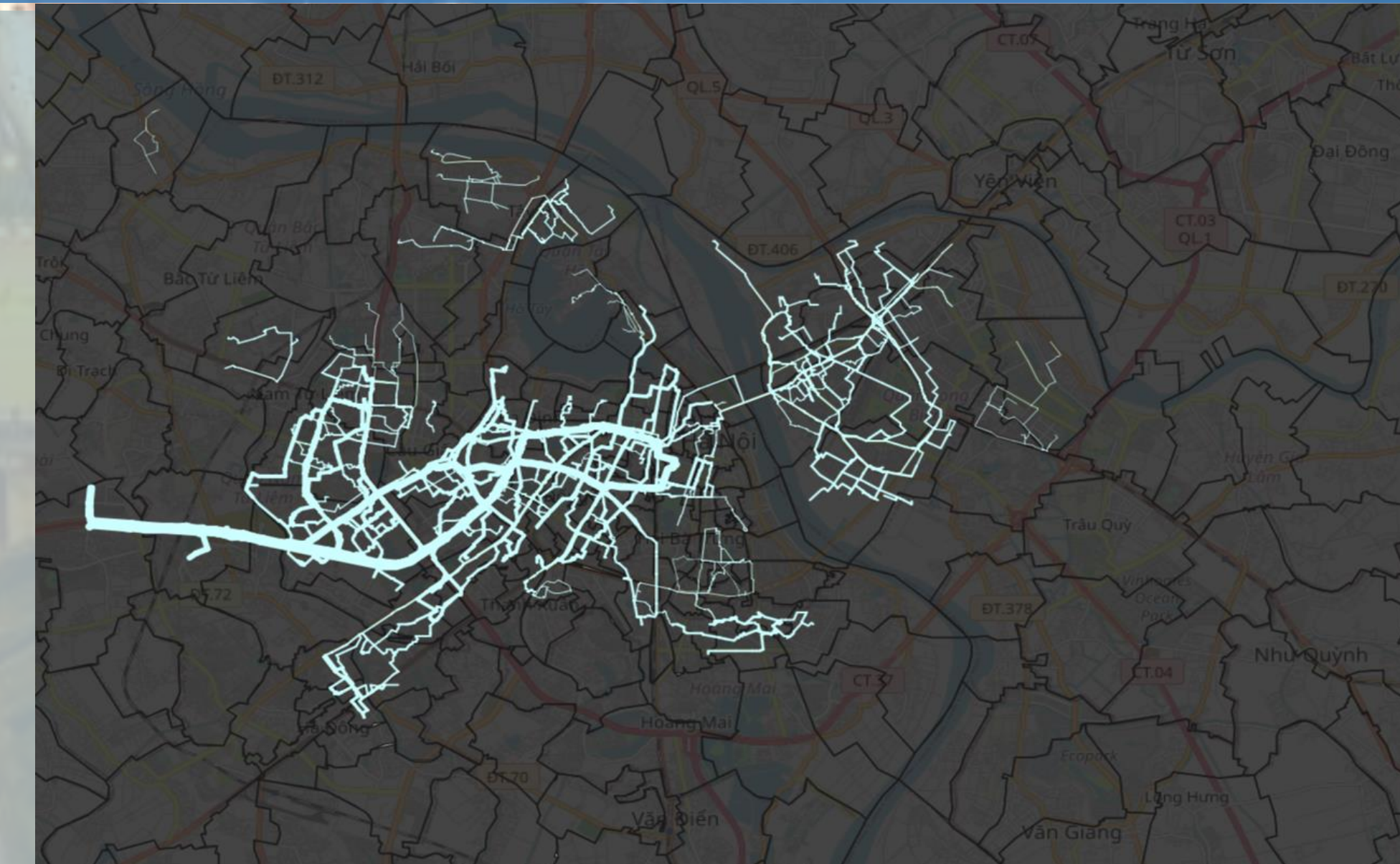
$W_j$ : Destination attractiveness

$c_{ij}^m$ : Cost for each mode

## Preliminary results: Motorbike Ban Scenario

- Distance < 2 km
- 2 km < Distance < 15 km
- Distance > 15 km

	vehic	observed_flows	estimated_flows	diff_flows
1	ebike	933	9893	8960
2	bike	800	2555	1755
3	bus	126	240	114
4	taxi	118	115	-3
5	walk	248	234	-14
6	car	4681	4555	-126
7	moto	10667	0	-10667



Change in flows at destination communes

## Preliminary Discussion

Presented modal SIM allows prediction of the impact of motorbike ban by accounting for **area's emissivity** & effect of **travel cost** for each mode

## Future work

- Better measure of  $W_j$  to improve R<sup>2</sup>
- Using  $\beta$ , investigate impact of monetary cost on flows
- Account for trip purposes using Discrete Choice Models

## Acknowledgements

British Academy project undertaking urban transport modelling in Hanoi [grant number UWB190190].

## References

Dennett, A. (2018) 'Modelling population flows using spatial interaction models', Australian Population Studies. doi: 10.37970/aps.v2i2.38.

e.wanjau@leeds.ac.uk