From Gridlocks to Greenways: Analyzing the Network Effects of Computationally Generated Low Traffic Neighborhoods (LTNs)

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Question:

1. How does the travel time change if all neighborhoods were LTNs?
2. What LTN configuration can we suggest for different types of cities?

Idea:

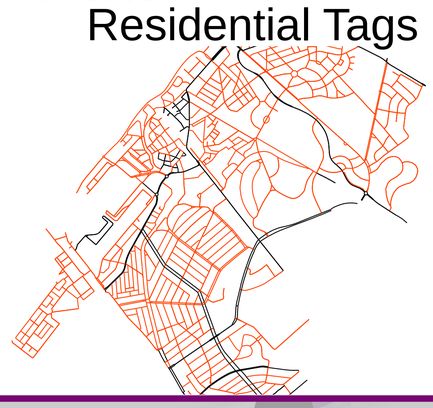
1. Ban traffic through all neighborhoods
2. Measure all-to-all travel time before/after

Shortest Paths

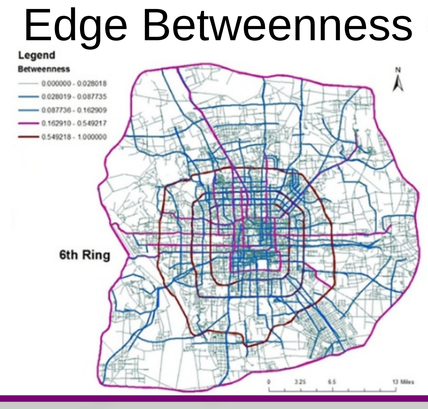
$$d_{\mathrm{S}}(i,j) \Rightarrow d_{\mathrm{LTN}}(i,j)$$

Approaches

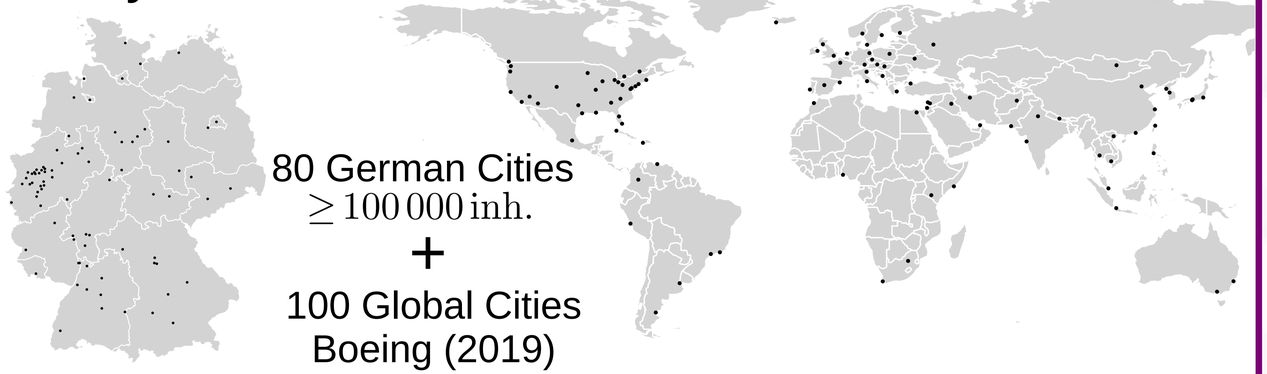
Residential Tags



Edge Betweenness Cutoff.

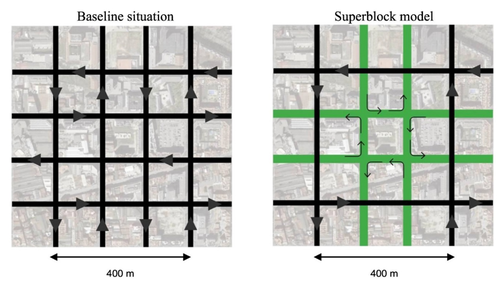


Study Cities

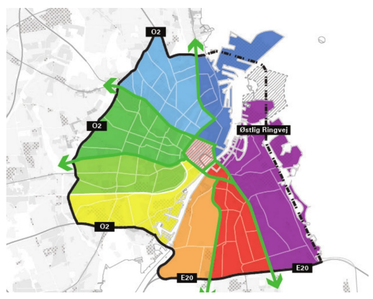


Various Low Traffic Neighborhoods (LTN) Concepts

Superblocks



Traffic Islands



$$A_{\mathrm{Superblock}} < A_{\mathrm{Traffic\ Island}}$$

Metrics

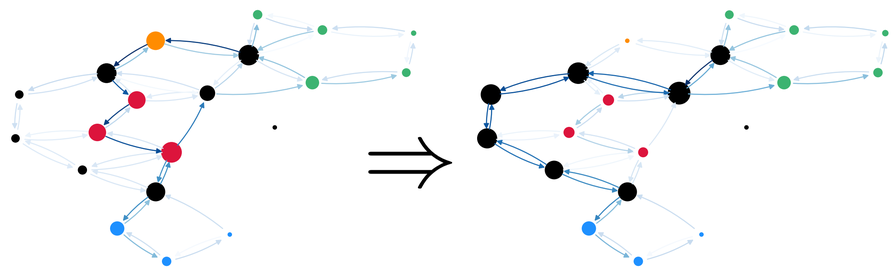
Effectiveness

$$E_{\mathrm{LTN/S}} = \frac{\sum_{i \neq j} \frac{1}{d_{\mathrm{LTN}}(i,j)}}{\sum_{i \neq j} \frac{1}{d_{S}(i,j)}}$$

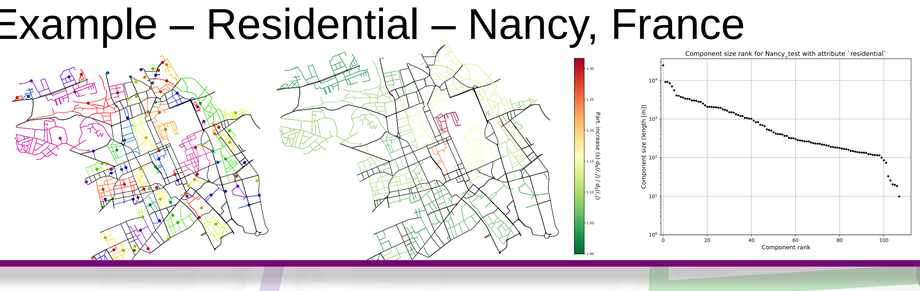
Directness

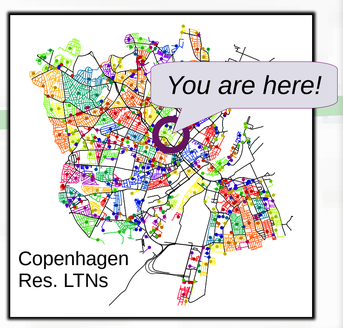
$$D_{\mathrm{S/LTN}} = \left\langle \frac{d_{\mathrm{S}}(i,j)}{d_{\mathrm{LTN}}(i,j)} \right\rangle_{i \neq j}$$

Demand Change



Example – Residential – Nancy, France





Results: ⇒ Marginal travel time increase ⇒ Noticably less traffic in neighborhoods

Residential:

$\Delta D = -2.7\%$ (80% CI: -0.7% to -18.6%)

$\Delta E = -3.0\%$ (80% CI: -0.9% to -21.2%)

Betweenness:

$\Delta D = -0.6\%$ (80% CI: -0.1% to -2.3%)

$\Delta E = -1.2\%$ (80% CI: -0.2% to -3.8%)

Res.: $\Delta C_B = -(26 \pm 3)\%$

Betw.: $\Delta C_B = -(39 \pm 1)\%$