How Many Minutes Matter? Identifying the X-Minute City Threshold for Sustainable Transportation in Indonesia

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RESEARCH QUESTION & OBJECTIVE

Is a fixed 15-minute threshold suitable for Indonesian cities?

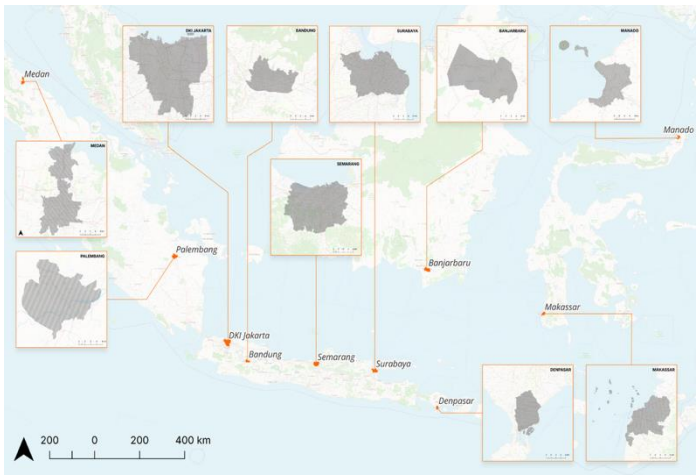
This study tests six walking-time thresholds (5–30 minutes) and examines how accessibility to essential services varies by city, center/non-center location, and age–gender group.

12.1%
of city–service combinations reach 80% population coverage within 15 minutes

55.9%
do not reach 80% population coverage even within 30 minutes

48.88%
of inequality is attributable to within-group variation in non-center areas

10 INDONESIAN STUDY CITIES



Original delineation map: Jakarta, Bandung, Banjarbaru, Denpasar, Makassar, Manado, Medan, Palembang, Semarang and Surabaya. | Thesis Fig. V.1

ANALYTICAL FRAMEWORK

01 SPATIAL UNITS & CONTEXT
H3 hexagonal grids: H9 for network origins, H10 for analysis. Delineation of center and non-center areas.

02 SERVICE BUNDLES & POPULATION
Seven essential-service categories from OpenStreetMap; WorldPop 2026 age–gender population estimates.

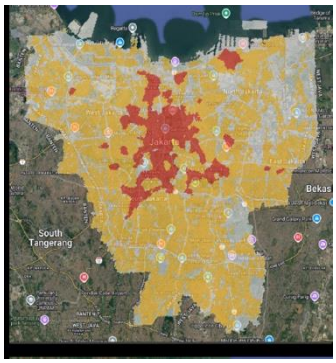
03 WALKING ACCESSIBILITY
Network-based isochrones (Dijkstra) at 5, 10, 15, 20, 25 and 30 minutes, with differentiated walking speeds.

04 INEQUALITY DECOMPOSITION
Nested population-weighted Theil index: between cities, center/non-center, and age–gender groups.

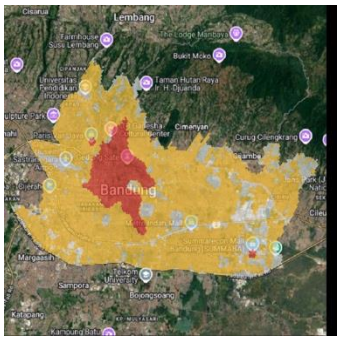
Focus: potential walking accessibility; observed travel behavior is not measured.

CENTER VS NON-CENTER: SPATIAL RESULTS

Jakarta



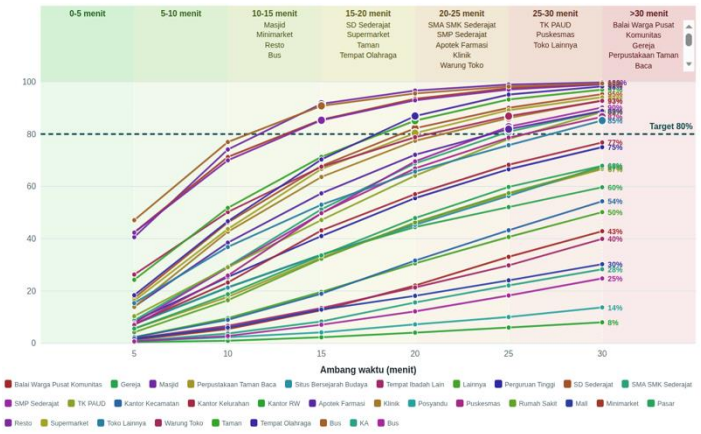
Bandung



Center | Non-center | Other grid

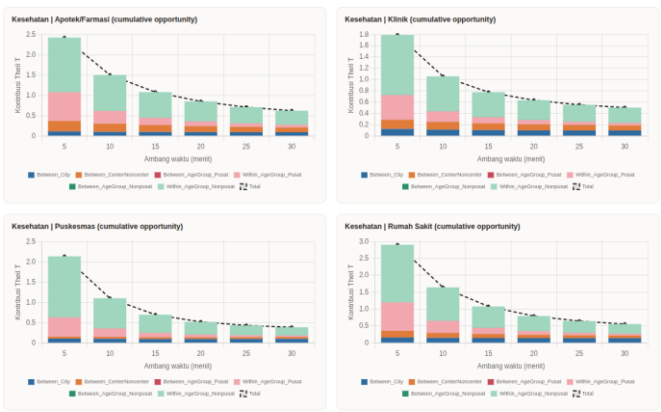
Unaltered map panels extracted from Thesis Fig. V.1; city panels retain their original proportions.

CUMULATIVE WALKING ACCESSIBILITY



Bandung: cumulative service coverage at successive thresholds. Dashed line = 80% target. | Thesis Fig. V.3

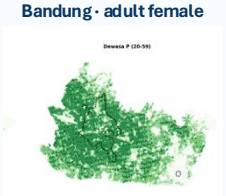
THEIL INEQUALITY DECOMPOSITION



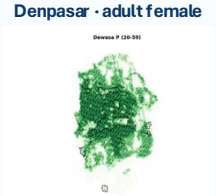
Four health-service examples: the within-group/non-center component dominates. | Thesis Fig. V.5

SOCIODEMOGRAPHIC CONTEXT & POLICY

Bandung · adult female



Denpasar · adult female



Age–gender maps cropped from the original thesis figure V.2.

PLANNING IMPLICATIONS

Set contextual thresholds by service hierarchy and population group. Prioritize basic services in underserved non-center areas, alongside public-transport links to higher-order facilities.