

Supplementary material

DETERMINING STRATEGIC LOCATIONS FOR RENTAL HOUSING DEVELOPMENT WITH GIS AND EXPERT SYSTEMS AROUND THE EDUCATIONAL AREA OF UNIVERSITAS SULAWESI BARAT

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Geodesy and Cartography

<https://doi.org/10.3846/gac.2026.22599>

Table S1. Problem statement, research objectives, and data variables

No	Objective	Variable	Data type	Data source	Analysis technique	Output
1.	Formulate factors influencing the selection of potential locations	Physical environmental factors	Development suitability	Secondary and primary data	Theory-based analysis	Factors influencing potential locations for rental housing
		Socioeconomic factors	- Comfort (cleanliness level) - Distance from public and social facilities- Distance from campus	Secondary		
		Applicable policies/ regulations	Spatial and Regional Planning (RTRW)			
2.	Identify potential rental housing areas based on influencing factors	Expert assessment of the importance of influencing factors	Determined weight values for each influencing factor	Primary	Analytic Hierarchy Process (AHP)	Attribute value of each factor
		Assessment of factors influencing potential locations	Attribute of analysis results for each influencing factor	Primary	Spatial Analysis (SMCA) Classification using geometric interval method	Classification of potential locations for rental housing

This table presents the full combination of nine Land Capability Unit (LCU) score values across all 20 land-class units in the study area, including the area in hectares and the resulting binary suitability score. The results of the land capability analysis yielded five land capability classes, categorized as Class A, B, C, D, and E. Referring to the existing literature, Classes D and E are recommended for residential area development. These classifications also provide an overview of locations that are potentially suitable for rental housing (boarding houses), representing the value of environmental physical factors. For further analysis, the development classes D and E will be assigned a score of 1, while Classes A, B, and C will be assigned a score of 0.

Table S2. Scoring table for environmental physical factor determination (source: author's data processing results, 2024)

SKL Value * SKL weight criteria									Total	Land capability class	Development capability	Land capability class	Area (Ha)	Environmental physical score
Development capability	Water availability	Disaster vulnerability	Waste disposal	Erosion susceptibility	Morphology	Foundation stability	Slope stability	Drainage						
4	10	15	0	6	20	12	20	10	97	89–97	Low development capability	B	1.33	0
4	10	15	0	12	10	9	10	10	80	80–88	Very low development capability	A	44.74	0
4	10	15	0	12	10	9	15	10	85	80–88	Very low development capability	A	10.25	0
4	15	15	0	6	20	12	20	10	102	98–105	Medium development capability	C	37.06	0
4	15	15	0	12	10	9	10	10	85	80–88	Very low development capability	A	31.40	0
4	15	15	0	12	10	9	15	10	90	89–97	Low development capability	B	1,055.86	0
4	20	15	0	12	10	9	15	10	95	89–97	Low development capability	B	2.71	0
5	10	15	0	3	25	12	25	10	105	98–105	Medium development capability	C	69.55	0
5	10	15	0	3	25	15	25	15	113	106–114	Slightly high development capability	D	315.73	1
5	10	15	0	6	20	12	20	10	98	98–105	Medium development capability	C	17.25	0
5	10	15	0	6	20	12	20	15	103	98–105	Medium development capability	C	1.75	0
5	15	15	0	3	25	12	25	10	110	106–114	Slightly high development capability	D	50.11	1
5	15	15	0	3	25	15	25	15	118	115–123	Very high development capability	E	454.86	1
5	15	15	0	6	20	12	20	10	103	98–105	Medium development capability	C	341.15	0
5	15	15	0	6	20	12	20	15	108	106–114	Slightly high development capability	D	22.29	1
5	15	15	0	9	15	9	15	10	93	89–97	Low development capability	B	889.57	0
5	20	15	0	3	25	15	25	15	123	115–123	Very high development capability	E	3.33	1
5	20	15	0	6	20	12	20	10	108	106–114	Slightly high development capability	D	2.98	1
5	20	15	0	6	20	12	20	15	113	106–114	Slightly high development capability	D	0.62	1
5	20	15	0	9	15	9	15	10	98	98–105	Medium development capability	C	21.14	0

Table S3 presents the complete distribution of potential rental housing locations across all villages within Banggae Timur subdistrict, organized by the three classification levels (low, medium, high) produced by the geometric interval method

Table S3. Analysis results of potential location classification for rental housing areas (source: author’s data processing, 2024)

Distribution of potential location classification for rental housing areas in Banggae Timur Sub-district					
Low		Medium		High	
Subdistrict/Village	Area (Ha)	Subdistrict/Village	Area (Ha)	Subdistrict/Village	Area (Ha)
Betteng	1.78	Buttu Baruga	45.70	Buttu Baruga	3.92
Buttu Baruga	311.68	Galung Lombok	1.53	Baruga	30.69
Banggae	0.68	Baruga	282.46	Baruga Dhua	10.76
Baruga	277.66	Baruga Dhua	147.64	Baurung	307.92
Baruga Dhua	584.81	Baurung	5.27	Galung	1.71
Baurung	11.42	Galung	26.18	Labuang	18.10
Galung	5.83	Labuang	8.34	Labuang Utara	52.26
Labuang	0.32	Labuang Utara	7.80	Lembang	266.81
Labuang Utara	0.61	Lembang	47.09	Tande	18.57
Lembang	8.64	Tande	269.71	Tande Timur	147.65
Pangali Ali	7.94	Tande Timur	137.95	Tandasura	0.17
Tande	124.94			Tandung	0.39
Tande Timur	73.60				
Pamboborang	100.46				
Tandasura	1.24				
Tangan Baru	0.07				

Table S4. Advantages and limitations of the study

Aspect	Advantages	Limitations
Methodology	Integration of SMCA + AHP + GIS produces a transparent, reproducible, and directly applicable decision-making process	Depends on subjective judgments of only three expert groups (although CR < 0.1)
Factors considered	Comprehensive combination of environmental physical factors, socio-economic, and policy (RTRW) factors	Socio-economic indicators still use binary classification and fixed distance thresholds
Scientific contribution	Specific focus on rental housing in educational areas; provides concrete spatial guidance (858.95 ha high-potential area)	Limited to the administrative boundary of Banggae Timur Subdistrict
Practical benefits	Supports cost-effective spatial planning and sprawl risk assessment	Relies on the quality and timeliness of secondary data (land capability maps)
Replicability	Model is easily adoptable in other education-driven agglomeration areas in Indonesia	Does not yet incorporate dynamic variables (student enrollment growth, real-time land prices)

Nine Land Capability Unit (LCU) Thematic Layers

Figure S1a-i presents the individual thematic maps for each of the nine LCU parameters used in the environmental physical factor analysis. These nine layers were subsequently overlaid and combined to produce the composite land capability map (Figure 3 in the main manuscript).

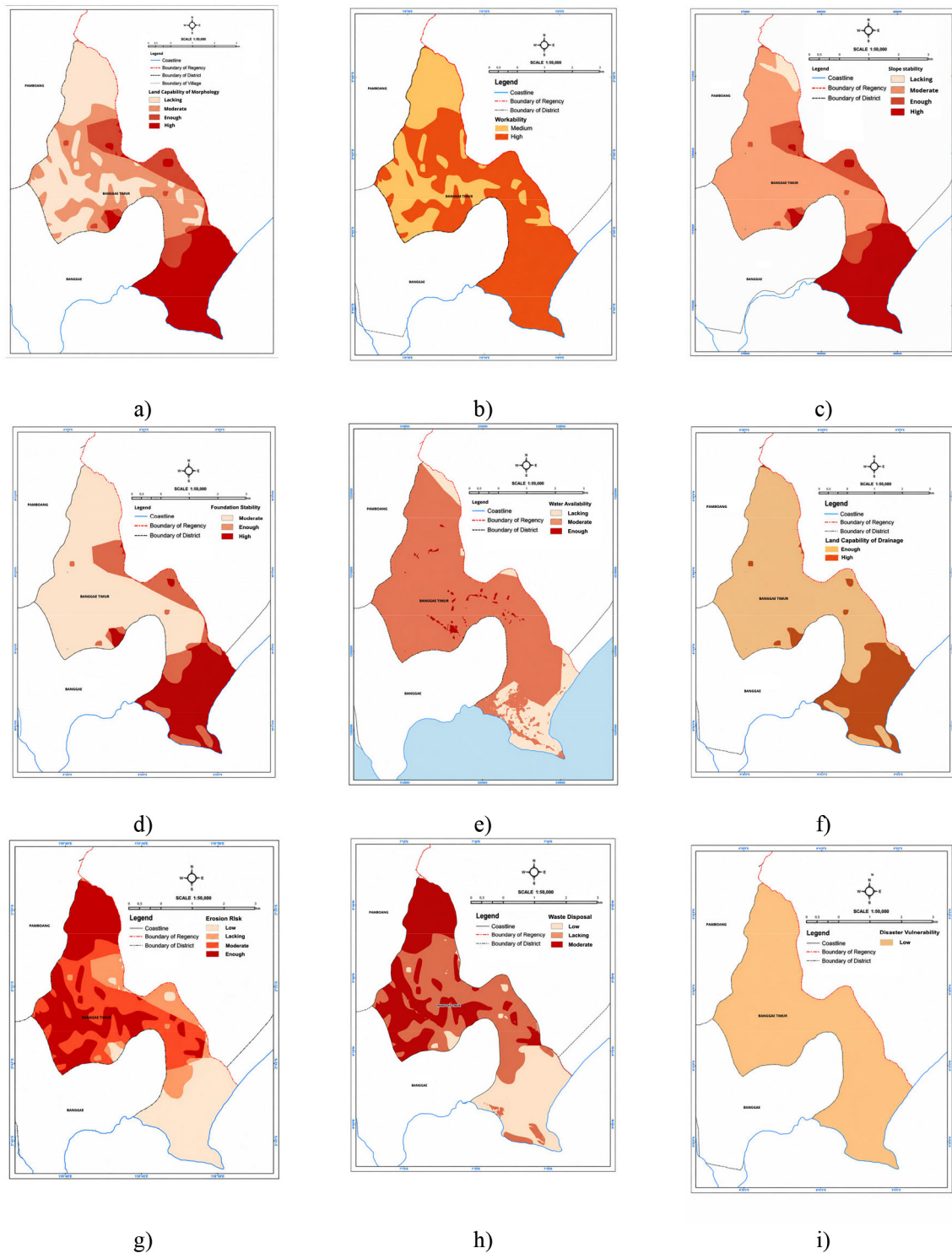


Figure S1. Nine Land Capability Unit (LCU) thematic layers: a) LCU of Morphology; b) LCU of workability; c) LCU of slope stability; d) LCU of foundation stability; e) LCU of water availability; f) LCU of drainage; g) LCU of erosion risk; h) LCU of waste disposal; i) LCU of disaster vulnerability (source: author's data processing, 2024)

AHP weighting by government expert respondent



Figure S2. Analysis results of weighting supporting factors by government experts (source: author's data processing, 2024)

AHP weighting by academic expert respondent



Figure S3. Analysis results of weighting supporting factors by academic experts (source: author's data processing, 2024)

AHP weighting by business practitioner respondent



Figure S4. Analysis results of weighting supporting factors by business experts (source: author's data processing, 2024)

Combined AHP Weighting (Aggregated Across All Respondents)



Figure S5. Combined analysis results of supporting factor weighting (source: author's data processing, 2024)