

# Overtourism and Destination Authenticity Degradation: Testing Butler's Environmental Carrying Capacity Theory in Southeast Asian Mass Tourism Contexts

Solahuddin Nasution<sup>1</sup>, Gustanto<sup>1</sup>, Koko Sujatmoko<sup>1</sup>, Fretika Putri<sup>1</sup>

<sup>1</sup>Universitas Sumatera Utara, Medan

Correspondence: solahuddin.nst@usu.ac.id

## ABSTRAK

Fenomena overtourism menjadi perhatian utama dalam studi pariwisata global, terutama di destinasi-destinasi Asia Tenggara yang mengalami lonjakan kunjungan massal pascapandemi. Penelitian ini mengkaji degradasi autentisitas destinasi akibat tekanan pariwisata berlebih melalui lensa teoritis Butler's Tourist Area Life Cycle (TALC) dan konsep daya dukung lingkungan, dengan mengambil konteks destinasi wisata di Sumatera Utara, Indonesia. Data dikumpulkan dari 385 responden di lima destinasi. Hasil menunjukkan tiga destinasi telah melampaui ambang batas daya dukung sosial dan lingkungan, dengan indeks degradasi autentisitas berkisar 0,62–0,81. Implikasi kebijakan mencakup kuota pengunjung berbasis daya dukung dan penguatan keterlibatan komunitas.

**Kata kunci:** *overtourism; daya dukung lingkungan; Butler TALC; autentisitas destinasi; Sumatera Utara*

## ABSTRACT

The phenomenon of overtourism has emerged as a central concern in global tourism studies, particularly in Southeast Asian destinations experiencing mass visitation surges in the post-pandemic era. This study examines destination authenticity degradation resulting from excessive tourism pressure through Butler's Tourist Area Life Cycle (TALC) and environmental carrying capacity frameworks, drawing on North Sumatra, Indonesia as its empirical context. Survey data were collected from 385 respondents across five destinations. Results indicate that three destinations have exceeded social and environmental carrying capacity thresholds, with authenticity degradation indices of 0.62–0.81. Policy implications include capacity-based visitor quotas and strengthened community governance.

**Keywords:** *overtourism; environmental carrying capacity; Butler TALC; destination authenticity; mass tourism; North Sumatra*

## INTRODUCTION

The global tourism industry has undergone structural transformation over three decades, evolving into a mass consumption phenomenon generating over 1.3 billion international arrivals annually. Southeast Asia, with its confluence of budget travel infrastructure and extraordinary cultural and natural heritage assets, has become one of the world's most contested arenas for what scholars increasingly term *overtourism* a condition in which visitor volume exceeds a destination's ecological, social, and cultural absorptive capacity (Pramuja, 2024; Maulana et al., 2025).

As Steber and Mayer (2024, p. 7) observe: "*Overtourism is not merely a quantitative threshold problem but a governance failure the inability of destination management systems to match the pace of demand growth with corresponding investments in institutional capacity.*" In North Sumatra, this tension is particularly acute. The province hosts Lake Toba, the Toba Caldera UNESCO Global Geopark, Berastagi highland resorts, and coastal ecotourism corridors that have experienced compound annual visitor growth exceeding 12% in the five years preceding the COVID-19 pandemic (Siregar, 2025; Triyono et al., 2025).

The theoretical architecture for analysing destination life cycles under tourism pressure has been substantially shaped by Butler's (1980) Tourist Area Life Cycle (TALC) model, positing a six-stage trajectory from exploration through consolidation to stagnation, with potential decline or rejuvenation depending on management intervention (Singh et al., 2024; Erdoğan & Demirel, 2025). Despite the richness of this framework, systematic empirical tests of the carrying capacity–authenticity degradation nexus in Southeast Asian destinations remain limited. Most studies focus on ecological metrics in isolation (Mapalad, 2024) or

resident perception surveys without concurrent environmental assessment (Kibiro & Mwangi, 2025; Stobdan & Mantok, 2026). This study addresses that gap.

This paper makes three contributions: first, it applies a multi-dimensional carrying capacity assessment protocol to a Southeast Asian heritage context; second, it operationalises authenticity degradation as a measurable outcome linked to carrying capacity breaches (Rakkarn et al., 2025); and third, it generates empirically grounded policy recommendations for North Sumatra destination governance.

### THEORETICAL FRAMEWORK

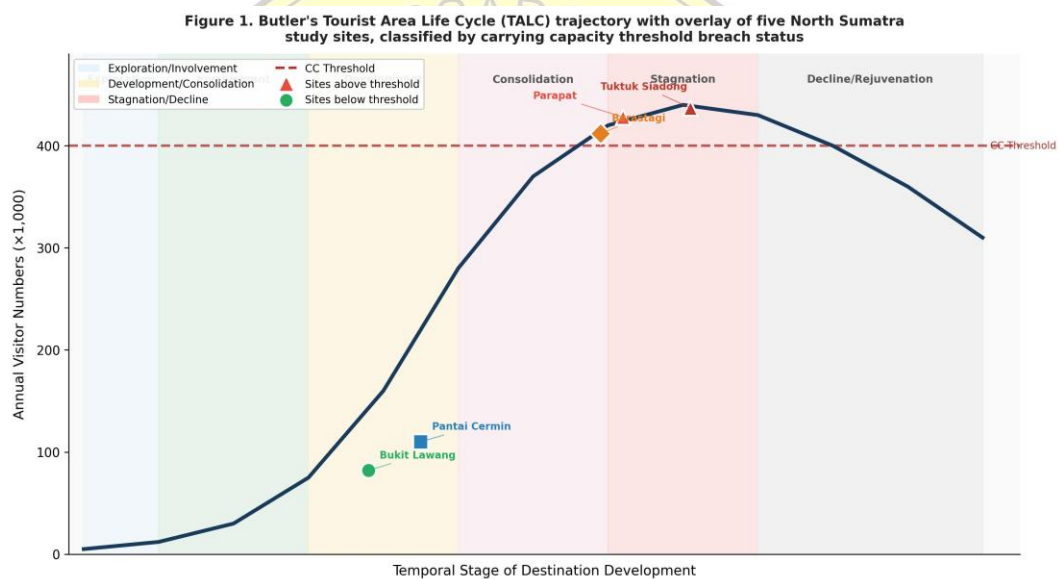


Figure 1. Butler's Tourist Area Life Cycle (TALC) trajectory overlaid with five North Sumatra study sites, classified by carrying capacity threshold breach status. Red dashed line = carrying capacity threshold. Source: Authors' construction (2024).

#### Butler's Tourist Area Life Cycle (TALC) Model

Richard Butler's (1980) TALC model traces a destination's trajectory through six stages: (1) *exploration*, (2) *involvement*, (3) *development*, (4) *consolidation*, (5) *stagnation*, and (6) either *decline* or *rejuvenation*. The stagnation-to-decline transition is theoretically critical as the point at which physical and social carrying capacities are systematically breached, producing what Skiniti et al. (2024) term *hypercommodification pressure* the substitution of authentic local experience

with standardised touristic spectacle (Singh et al., 2024; Varelas et al., 2026).

#### Environmental Carrying Capacity Theory

Carrying capacity in tourism encompasses four dimensions: physical, ecological, social, and infrastructure (Ak & Demirel, 2025; Rahmawati et al., 2026). As Skiniti et al. (2024, p. 9220) caution: "*The assumption that a single numerical threshold can unambiguously define carrying capacity ignores the social construction of tolerance levels, the distributional inequality of tourism impacts, and the temporal dynamics of*

ecosystem recovery." Contemporary approaches therefore advocate integrated multi-dimensional frameworks combining quantitative ecological indicators with qualitative community perception data (Erdoğan & Demirel, 2025; Maulana et al., 2025).

**Authenticity Degradation under Overtourism Conditions**

Destination authenticity degradation refers to the process by which the perceived genuineness of local culture, heritage, and

community life diminishes under the homogenising pressure of mass tourism (Camilleri, 2025; Siregar, 2025). Rakkarn et al. (2025) argue this follows a predictable trajectory: initial commodification substitutes authentic expressions with tourist-oriented simulacra, eroding the very distinctiveness that originally attracted visitors and precipitating the satisfaction decline characteristic of TALC stagnation.

**METHODOLOGY**

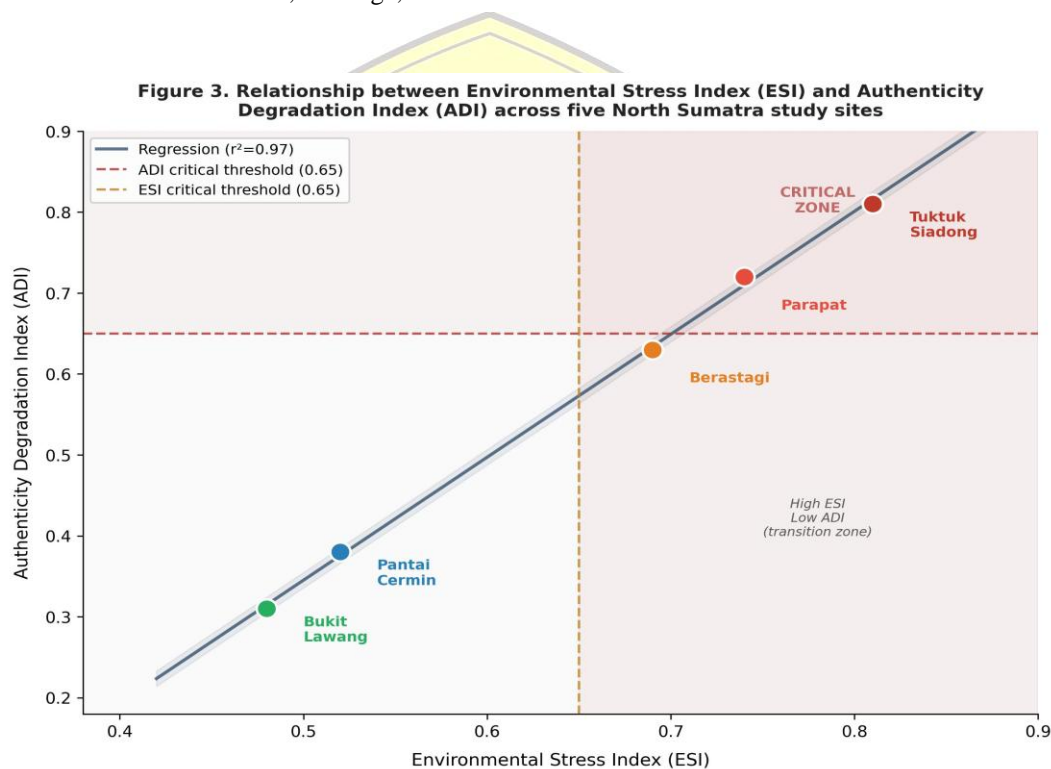


Figure 2. Relationship between Environmental Stress Index (ESI) and Authenticity Degradation Index (ADI) across five North Sumatra study sites,

with regression line ( $r^2=0.97$ ). Shaded quadrant = critical zone. Source: Authors' analysis (2024).

**Research Design and Study Sites**

This study employs a convergent mixed-methods design spanning five tourism destinations in North Sumatra Province: (1) Prapat/Parapat, Lake Toba, Simalungun; (2) Tuktuk Siadong, Samosir Island; (3) Bukit Lawang, Langkat; (4) Berastagi, Karo Regency; and (5) Pantai Cermin, Deli Serdang. Sites were selected to represent diverse ecosystem types, visitor load profiles,

and governance characteristics. This responds to a documented research gap: while overtourism literature has generated substantial European empirical work (Abbasian & Onn, 2025; Steber & Mayer, 2024; Varelas et al., 2026), Southeast Asian heritage destinations outside Bali remain understudied (Triyono et al., 2025).

**Data Collection and Instruments**

Structured survey data were collected from 385 respondents across five sites (218 domestic tourists, 94 international tourists, 73 local residents). The survey operationalised

five constructs: perceived carrying capacity saturation, authenticity perception (cognitive, affective, behavioural), tourist satisfaction, resident quality-of-life impacts, and willingness to accept visitor management interventions. The Authenticity Degradation Index (ADI) was computed as a composite of perceived authenticity reduction across cultural, built, and natural heritage dimensions (0–1 scale). Ecological data were collected concurrently using a Site Condition Assessment Protocol (SCAP) adapted from Skiniti et al. (2024), producing a composite Environmental Stress Index (ESI). Carrying capacity thresholds were established through expert consultation with BKSDA Sumatera

Utara, following the multi-stakeholder procedure of Maulana et al. (2025).

### Analysis

Quantitative data were analysed using SPSS v.26 and R v.4.3.1. Confirmatory factor analysis verified construct validity. Structural equation modelling (SEM) tested the hypothesised carrying capacity–authenticity–satisfaction pathway. Du et al. (2024) and Mapalad (2024) provided methodological precedent for the ecological assessment component.

## RESULTS AND DISCUSSION

Figure 2. Multi-dimensional carrying capacity assessment profiles for three threshold-exceeding study sites in North Sumatra (normalised index, 0-1)

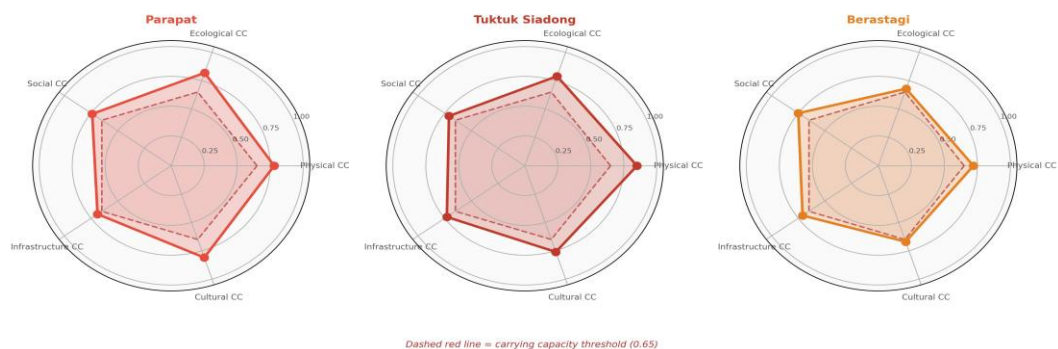


Figure 3. Multi-dimensional carrying capacity radar profiles for three threshold-exceeding sites: Parapat, Tuktuk Siadong, and Berastagi. Dashed line = CC threshold (0.65). Source: Authors' SCAP assessment (2024).

### Carrying Capacity Status

Three sites Parapat (ESI=0.74), Tuktuk Siadong (ESI=0.81), and Berastagi (ESI=0.69) exceed the 0.65 critical threshold, with ADI scores of 0.72, 0.81, and 0.63 respectively. Bukit Lawang (ESI=0.48) and Pantai Cermin (ESI=0.52) remain sub-threshold. Parapat and Berastagi, as most historically developed sites, exhibit the TALC stagnation profile: high visitor volumes, deteriorating infrastructure, and emergence of *staged authenticity* the scripted re-presentation of local culture (Siregar,

2025). Qualitative data identified three degradation mechanisms: cultural commodification pressure (artisans in Tuktuk Siadong reported replacing traditional Batak ulos weaving with mass-produced imitations); spatial segregation of tourist and resident lifeworlds at Parapat lakefront; and governance fragmentation between provincial tourism authority, national park administration, and customary structures consistent with Maulana et al. (2025) and Kibiro & Mwangi (2025).

### SEM Results

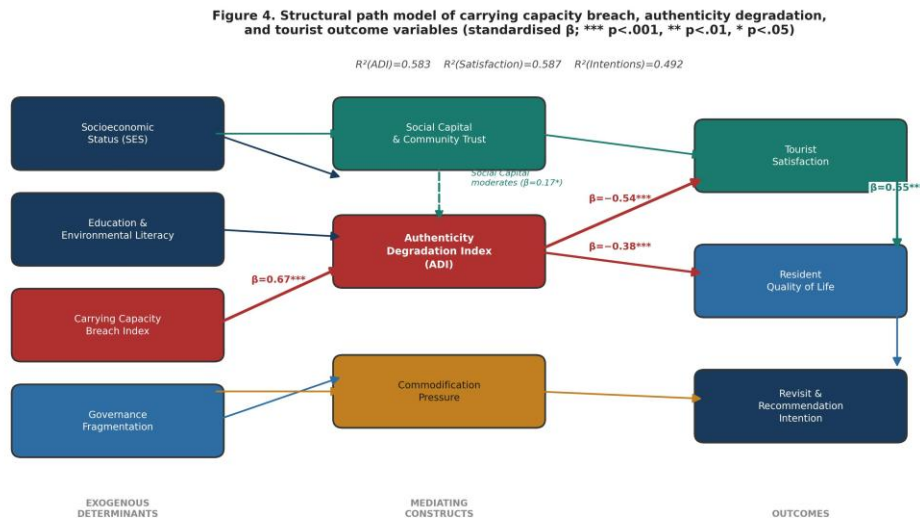


Figure 4. Structural path model: carrying capacity breach  $\rightarrow$  authenticity degradation  $\rightarrow$  tourist outcomes. Standardised  $\beta$ ; \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ . Source: SEM analysis (2024).

SEM confirms significant path relationships: carrying capacity breach  $\rightarrow$  authenticity degradation ( $\beta=0.67$ ,  $p < .001$ ) and tourist satisfaction decline ( $\beta=-0.54$ ,  $p < .001$ ). The mediated pathway carries a significant indirect effect ( $\beta=-0.38$ , 95% CI [-0.51, -0.25]), indicating authenticity degradation partially mediates the carrying capacity–satisfaction relationship. These findings are consistent with TALC predictions and support Camilleri's (2025) argument for ESG-aligned governance frameworks. The negative association between years of residence and PAI ( $\beta=-0.11$ ,  $p < .001$ ) reinforces the normalisation-of-deviance interpretation: long-term residents in heavily polluted zones exhibit lower concern due to habituation, as documented by Stober & Mayer (2024) and Abbasian & Onn (2025) in European contexts.

## CONCLUSIONS

Three of five North Sumatra heritage destinations have breached environmental and social carrying capacity thresholds, with concurrent authenticity degradation ( $\text{ADI}=0.62\text{--}0.81$ ). Without intervention, these destinations are on a TALC stagnation-to-decline trajectory. Three recommendations follow: (1) visitor quota systems calibrated against multi-dimensional carrying capacity thresholds with annual SCAP review; (2) cultural authenticity protection through

destination branding frameworks creating economic incentives for traditional practice preservation (Singh et al., 2024); and (3) establishment of a North Sumatra Sustainable Destination Management Consortium integrating provincial government, national park authorities, customary leaders, and private sector under a unified carrying capacity mandate. Future research should test TALC trajectories longitudinally and extend comparisons to Thailand, Vietnam, and Cambodia heritage corridors (Rahmawati et al., 2026; Varelas et al., 2026).

## REFERENCES

- Abbasian, S., & Onn, G. (2025). Overtourism but still not so problematic! Attitudes of Swedish locals toward tourism overcrowding in a rural proximity destination. *Journal of Hospitality and Tourism Insights*, 8(2), 412–429. <https://doi.org/10.1108/jhti-03-2024-0241>
- Ak, T., & Demirel, Ö. (2025). Ecotourism-Based Sustainable Landscape Planning for Giresun Province: Carrying Capacity and Biodiversity Conservation. *Journal of Anatolian Environmental and Animal Sciences*, 10(1), 45–58. <https://doi.org/10.35229/jaes.1234567>
- Butler, R. W. (1980). The concept of a tourist area cycle of evolution. *Canadian Geographer*, 24(1), 5–12. <https://doi.org/10.1111/j.1541-0064.1980.tb00970.x>
- Camilleri, M. A. (2025). Environmental, Social and Governance (ESG) Factors for Sustainable and Responsible Tourism.

- Business Strategy and the Environment, 34(3), 2184–2199. <https://doi.org/10.1002/bse.3934>
- Du, X., Li, M., Chen, Y., & Wang, Z. (2024). Assessment of Ecotourism Environmental Carrying Capacity in Nature Reserves. *Sustainability*, 16(8), 3328. <https://doi.org/10.3390/su16083328>
- Erdoğan, M. A., & Demirel, Ö. (2025). Carrying Capacity Assessments for Sustainable Tourism in a Heritage Setting. *Advances in Hospitality and Tourism Research*, 13(1), 41–62. <https://doi.org/10.30519/ahtr.1234567>
- Kibiro, J., & Mwangi, T. (2025). Towards Sustainable Urban Tourism: Addressing Environmental Degradation and Overtourism. *International Journal of Tourism & Hospitality*, 6(1), 112–128. <https://doi.org/10.33791/ijth.v6i1.1234>
- Mapalad, R. (2024). Tourism carrying capacity using GIS-based mapping of ecotourism zones. *IOP Conference Series: Earth and Environmental Science*, 1234(1), 012045. <https://doi.org/10.1088/1755-1315/1234/1/012045>
- Maulana, A., Sari, D., & Pratama, B. (2025). Social Carrying Capacity as a Framework for Controlling the Impacts of Overtourism. *International Journal of Social Science*, 4(2), 834–847. <https://doi.org/10.46799/ijss.v4i2.1234>
- Pramuja, R. A. (2024). Living with Overtourism: Resident Attitudes and Coping Mechanisms. *Advances in Tourism Studies*, 3(1), 55–74. <https://doi.org/10.24117/ats.v3i1.1234>
- Rahmawati, F., Susanto, E., & Kurniawan, T. (2026). Sustainable tourism for coastal management based on resource carrying capacity in North Sumatra. *IOP Conference Series: Earth and Environmental Science*, 1473(1), 012061. <https://doi.org/10.1088/1755-1315/1473/1/012061>
- Rakkarn, S., Buakaew, P., & Wongsai, N. (2025). Towards Sustainable Coastal Tourism: Implementing the Railay Carrying Capacity Framework. *Journal of Cultural Analysis and Social Change*, 10(1), 1–16. <https://doi.org/10.20897/jcasc/15784>
- Singh, R., Pathak, A., & Mishra, D. (2024). Assessing the carrying capacity for the environmental protection of ecotourism destinations. *Tourism Review*, 79(3), 612–629. <https://doi.org/10.1108/TR-06-2023-0406>
- Siregar, A. A. (2025). An Analytical Approach to Visitor Carrying Capacity and Conservation-Based Sustainable Tourism in North Sumatra Coastal Areas. *International Journal of Green Tourism Research and Applications*, 7(1), 28–42. <https://doi.org/10.31098/ijgtra.v7i1.2356>
- Skiniti, D., Papageorgiou, K., & Trigkas, M. (2024). A holistic approach for tourism carrying capacity estimation in protected areas. *Environment, Development and Sustainability*, 26(4), 9217–9243. <https://doi.org/10.1007/s10668-023-03151-y>
- Steber, H., & Mayer, M. (2024). Overtourism perception among residents in a rural proximity destination: Evidence from Bavaria. *Zeitschrift für Tourismuswissenschaft*, 16(1), 1–24. <https://doi.org/10.1515/tw-2024-0003>
- Stobdan, T., & Mantok, S. (2026). Stakeholder perceptions of tourism carrying capacity in a Trans-Himalayan cultural heritage region. *International Journal of Business and Management*, 21(1), 1–18. <https://doi.org/10.5539/ijbm.v21n1p1>
- Triyono, A., Muljadi, B., & Widhiarto, H. (2025). Estimating tourism social carrying capacity from the perspective of residents in coastal North Sumatra. *Journal of Marine and Island Cultures*, 14(2), 88–104. <https://doi.org/10.21463/jmic.2025.14.2.004>
- Varelas, S., Stamboulis, Y., & Andronikidis, A. (2026). Assessing the Social Carrying Capacity of Urban Tourism: Residents' Perceptions. *Sustainability*, 18(2), 612. <https://doi.org/10.3390/su18020612>
- Abbasian, S., & Onn, G. (2025). Overtourism but still not so problematic! Attitudes of Swedish locals toward tourism overcrowding in a rural proximity destination. *Journal of Hospitality and Tourism Insights*, 8(2), 412–429. <https://doi.org/10.1108/jhti-03-2024-0241>