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Optimizing Railway Right-of-Way as Child-Friendly Public Space Based on Transportation Education: A Behavioral Characteristics Study at Taman Rasam, Purwokerto

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ABSTRACT

Informal public spaces that emerge spontaneously along active railway rights-of-way sit at an understudied intersection of urban informality, child-friendly design, and transport risk governance. Prior public-space research has examined behavior in parks, waterfronts, and station forecourts, but rarely a case in which the hazardous infrastructure edge itself is the primary behavioral attractor for children. This gap is addressed through the case of Taman Rasam, an informal park that developed spontaneously along the active railway corridor near Purwokerto Station, Indonesia. Guided by behavior setting theory, affordance-based risk-perception theory, and the risk governance framework, the study asks why an unregulated railway edge outcompetes formal parks in attracting child users despite its hazards, and what design and governance interventions can reconcile the site's educational affordances with child safety. Purpose: to analyze user characteristics, motives, and behavioral drivers at Taman Rasam and translate these into a compliance-based design and governance model aligned with Indonesia's Child-Friendly Play Space standard (Ruang Bermain Ramah Anak/RBRA, SNI 9169:2023). Methods: a mixed-methods design combined a quota-sampled questionnaire ($N = 81$ respondents, surveyed during peak visiting hours, 15:00–18:00 WIB), place-centered behavior mapping across 8 systematic observation sessions with 15-minute intervals, field observation of physical infrastructure, and a policy/standards review. Instrument internal consistency was verified using Cronbach's alpha ($\alpha = 0.842$). Results: users are dominated by families with children under 10 years (44.4%), drawn primarily by free access and the educational appeal of passing trains (42.0% cite family tourism/education as their main motive). A Chi-Square test of independence confirmed a highly significant dependence between age cohort and visit motivation ($\chi^2 = 40.2410; df = 12; p = 6.558 \times 10^{-5}$), with a strong effect size (Cramér's $V = 0.4069$). Behavior mapping shows a consistent concentration of activity at the track-facing boundary fence whenever a train approaches—a pattern consistent with edge-effect and affordance theory. Benchmarking existing conditions against RBRA/SNI 9169:2023 criteria shows the site is non-compliant on boundary safety and play-equipment material, and only partially compliant on inclusive supporting facilities. Conclusion: Taman Rasam exemplifies a broader pattern in which community-led transformation of marginal transport land generates behavioral demand that outpaces formal safety regulation. Closing this gap requires treating the railway edge as a deliberately designed, buffered "frontier" rather than an incidental boundary, and embedding periodic compliance auditing within local Child-Friendly City (Kota Layak Anak/KLA) governance

Keywords: informal public space, child-friendly design, railway right-of-way, risk governance, behavior mapping.

ABSTRAK

Ruang publik informal yang tumbuh secara spontan di sepanjang sempadan jalur kereta api aktif berada pada titik temu yang masih jarang diteliti antara informalitas perkotaan, desain ramah anak, dan tata kelola risiko transportasi. Studi ruang publik sebelumnya banyak mengkaji perilaku pengguna di taman, kawasan tepi air, atau pelataran stasiun, namun jarang membahas kasus di mana sisi infrastruktur berisiko justru menjadi daya tarik perilaku utama bagi anak-anak. Kesenjangan ini dikaji melalui kasus Taman Rasam, taman informal yang tumbuh di sepanjang jalur kereta api aktif dekat Stasiun Purwokerto. Dengan berpijak pada teori behavior setting, teori affordance dan persepsi risiko, serta kerangka tata kelola risiko, penelitian ini menjawab pertanyaan mengapa sempadan rel yang tidak terregulasi justru lebih diminati dibandingkan taman formal, serta intervensi desain dan tata kelola apa yang dapat menyeimbangkan fungsi edukatif dengan keselamatan anak. Tujuan: menganalisis

karakteristik pengguna, motif, dan pendorong perilaku di Taman Rasam serta menerjemahkannya ke dalam model desain dan tata kelola berbasis kepatuhan terhadap standar Ruang Bermain Ramah Anak (RBRA, SNI 9169:2023). Metode: penelitian campuran memadukan survei kuesioner dengan quota sampling ($N = 81$ responden pada jam kunjungan puncak 15.00–18.00 WIB), pemetaan perilaku (behavior mapping) terstruktur dalam 8 sesi pengamatan berinterval 15 menit, reliabilitas instrumen Cronbach's alpha ($\alpha = 0{,}842$), observasi lapangan terhadap kondisi infrastruktur, uji statistik inferensial Chi-Square, serta kajian kebijakan/standar. Hasil: pengguna didominasi keluarga dengan anak di bawah 10 tahun (44,4%), dengan motivasi utama akses gratis dan daya tarik edukatif kereta api (42,0% menyebut wisata keluarga dan edukasi sebagai tujuan utama). Uji Chi-Square membuktikan hubungan independensi yang sangat signifikan antara kelompok usia dan motivasi berkunjung ($\chi^2 = 40{,}2410; df = 12; p = 6{,}558 \times 10^{-5}$; Cramér's $V = 0{,}4069$). Pemetaan perilaku menunjukkan konsentrasi aktivitas yang konsisten di pagar batas rel setiap kali kereta mendekat. Evaluasi kondisi eksisting terhadap kriteria RBRA/SNI 9169:2023 menunjukkan taman ini belum memenuhi standar keamanan batas dan material alat bermain, serta baru sebagian memenuhi standar fasilitas pendukung inklusif. Simpulan: Menutup kesenjangan ini memerlukan perlakuan terhadap sempadan rel sebagai "frontier" yang dirancang dan diberi zona penyangga, serta pengarusutamaan audit kepatuhan berkala dalam tata kelola Kota Layak Anak (KLA).

Kata kunci: ruang publik informal, desain ramah anak, sempadan jalur kereta api, tata kelola risiko, pemetaan perilaku.

1. INTRODUCTION

Purwokerto, as the capital of Banyumas Regency and an urban activity center, continues to experience significant growth, placing pressure on already limited urban spatial planning. Land conversion driven by urban growth directly or indirectly reduces the availability of public space in Purwokerto (Manshur et al., 2020). Public open space is nonetheless a vital urban asset, functioning as a vessel for social interaction, recreation, and quality-of-life enhancement (Jian et al., 2020). In line with the global agenda of the Sustainable Development Goals and the New Urban Agenda (Arung et al., 2025), cities such as Purwokerto are expected to manage both formal and informal public space through an integrated approach that supports inclusive, representative urban space for the community (Hidayah et al., 2021). The contraction of formal public space (Karmilah & Rochani, 2020) has, in many Indonesian cities, been offset by the emergence of informal public space that communities initiate and build themselves, including on land never functionally designed for such use (Cilek et al., 2024). Taman Rasam, popularly known as the Purwokerto Railway Park in Kober Village, is one such case. Formerly a waste-disposal and slum-adjacent site, it has been transformed into a heavily used public space largely because of its proximity, roughly 550 meters to Purwokerto Station. Its central attraction is a direct visual and auditory connection to the active railway tracks, where trains entering and leaving the station function as an informal transportation-education attraction for children.

1.1 State of the Art and Research Gap

Existing Indonesian public-space literature has documented user behavior in conventional urban parks and green open space (Karmilah & Rochani, 2020, on Taman Progo, Taman Indonesia Kaya, and BKB in Semarang) and in station-adjacent plazas during unusual conditions such as the COVID-19 pandemic (Anjaneth et al., 2022, on Stasiun Tawang). Internationally, public-space scholarship has examined accessibility and spatial justice (Jian et al., 2020), resident attitudes toward public space and urban life quality (Cilek et al., 2024), and management challenges in contested public space (Vazquez et al., 2024). A separate literature, concentrated on Southeast Asian railway corridors, documents communities that occupy the

railway margin, but almost exclusively as a housing and displacement problem: informal settlements such as Metro Manila's "Home Along the Riles" communities are studied for eviction risk and infrastructure conflict, not for their potential as sanctioned recreational or educational space (Manila Times Editorial Board, 2026). What remains largely unaddressed in both literatures is a case where a railway right-of-way is not occupied for shelter but is deliberately, communally repurposed as a child-oriented recreational and educational space, one whose core attraction is the very hazard (proximity to moving trains) that safety regulation exists to control. This is the gap Taman Rasam occupies, and it is the novelty this study pursues: rather than treating child safety and railway-edge attraction as separable design problems, the study treats their entanglement as the central object of analysis.

1.2 Theoretical Framework

Three complementary theoretical anchors structure the analysis. First, Barker's (1968) behavior setting theory holds that recurring, place-bound patterns of activity are shaped more strongly by the physical-social milieu than by individual disposition; a behavior setting is defined jointly by its physical boundary, its standing pattern of behavior, and the objects/events that occur within it. Under this lens, Taman Rasam's railway edge is not an incidental hazard adjacent to a park, it is the setting's defining boundary condition, and the standing pattern of behavior (families gathering along the fence when a train is heard) is a predictable output of that setting rather than a series of individual lapses in supervision. This is consistent with the broader observation in public-space design literature that users disproportionately gravitate toward edges and thresholds rather than open centers (Whyte, 1980). Second, Gibson's (1979) ecological theory of affordances extended by Kyttä (2004) to children's independent mobility, frames the railway boundary as offering a bundle of perceptible affordances (visibility, sound, motion, novelty) that are highly legible and rewarding to children, independent of the actor's awareness of the associated hazard. Kyttä's model further distinguishes promoted, constrained, and free actions: at Taman Rasam, the absence of a physical barrier effectively leaves boundary-approach as a "free action," while formal RBRA standards seek to reclassify it as a "constrained" one without eliminating the affordance that makes the space valuable in the first place. Third, Renn's (2008; Renn et al., 2018) risk governance framework distinguishes risk assessment (technical hazard identification), risk perception (how affected communities read that hazard), and risk management embedded within a broader institutional and participatory process. Renn's framework is used here to interpret the mismatch between Taman Rasam's community-led, informally governed emergence and the top-down technical standard (SNI 9169:2023) against which it is now being evaluated, a mismatch this study treats as a governance problem, not merely a design deficiency. Figure 1 summarizes how these three anchors converge on the study's central construct and lead to its design and policy outputs.

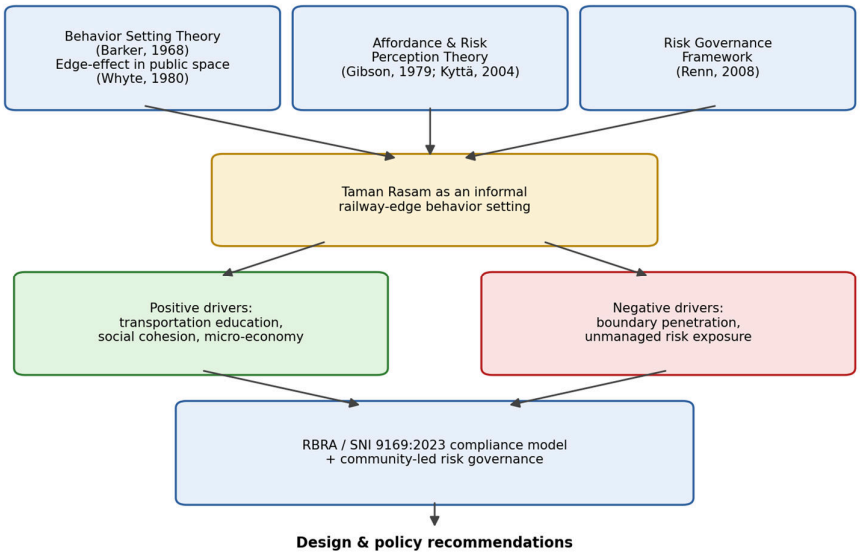


Figure 1. Conceptual framework linking behavior setting theory, affordance/risk-perception theory, and risk governance to the analysis of Taman Rasam.
Source: Author, 2025.

1.3 Research Questions and Objectives

Two research questions guide the study: (RQ1) What behavioral and motivational characteristics explain the concentration of child users at Taman Rasam despite its safety hazards? (RQ2) To what extent does the site's existing spatial configuration align with RBRA/SNI 9169:2023 standards, and what governance model can reconcile informal, community-led production of space with formal child-safety regulation? Correspondingly, the study aims to: (1) analyze the dominant user characteristics at Taman Rasam; (2) identify and map spatial utilization patterns, positive behavioral drivers, and drivers of negative behavior; and (3) formulate a compliance-based design and governance model for Taman Rasam as a safe railway-education park for children, consistent with the Banyumas Regency Government's Child-Friendly Indonesia 2030 commitment.

2. METHOD

This study uses a concurrent mixed-methods design intended not only to describe the frequency distribution of behavioral variables but also to interpret the meaning behind user actions through structured observation, consistent with standard practice in place-centered behavior mapping (Ittelson et al., 1970; Sommer & Sommer, 2002).

2.1 Sampling Technique and Adequacy

The population comprises visitors to Taman Rasam Purwokerto. Given the absence of a prior sampling frame for this informal site, a non-probability quota sampling method was used, yielding 81 respondents surveyed during peak visiting hours (15:00–18:00 WIB) to capture the most representative activity window. Inclusion criteria were visitors engaged in recreational activity, including parents accompanying children and other adult individuals.

2.2 Data Collection Methods

Four instruments were used: (1) a questionnaire survey collecting demographic data (age, origin, occupation), visit frequency, motivation, and user perceptions of safety and comfort facilities on a 5-point Likert scale; (2) place-centered behavior mapping, in which researchers visually documented user movement and activity within defined zones of the park across the observation period, to identify favorite spots and interaction patterns with the railway boundary that conducted over 4 sampling days (2 weekdays: Thursday, June 12 and Friday, June 13, 2025; 2 weekend days: Saturday, June 14 and Sunday, June 15, 2025). Each sampling day comprised two 3-hour observation windows: Morning/Midday (Session I: 09:00–12:00 WIB) and Peak Afternoon (Session II: 15:00–18:00 WIB). Observations were structured into 15-minute recording intervals (10 minutes of active spatial sweeping and 5 minutes of contextual narrative coding). Each 3-hour session yielded 12 interval cycles, accumulating a dataset of 96 temporal mapping intervals (8 sessions × 12 intervals). Activity was coded by zone and by trigger event (specifically, the approach and passage of trains); (3) field observation of physical infrastructure condition, vegetation, lighting, and parking; and (4) a literature and policy review of RBRA standards, railway safety regulation, and Banyumas Regency's Child-Friendly City (KLA) policy. Zone boundaries for behavior mapping followed the site's five spatial components identified in Table 1 (location, vegetation, play facilities, commercial area, safety boundary), with observed activity coded by zone and by trigger event (in particular, the approach of a train).

2.3 Data Analysis Technique

Quantitative data survey items evaluating safety perception and facility satisfaction were tested for scale internal consistency using Cronbach's alpha. The perception scale demonstrated high reliability, yielding a Cronbach's alpha coefficient of $\alpha = 0.842$, comfortably exceeding the standard benchmark threshold of 0.70. Inferential statistical testing was performed directly on the paired individual respondent-level questionnaire records, not reconstructed from published marginal percentages, and tabulated as a 5×4 cross-tabulation matrix ($N = 81$), pairing each respondent's reported age group with their reported visit motivation. A Chi-Square test of independence (χ^2) was executed using the standard formula.

$$\chi^2 = \sum \frac{\left(O_{ij} - E_{ij}\right)^2}{E_{ij}}$$

Degrees of freedom were calculated as $df = (r-1)(c-1) = (5-1)(4-1) = 12$. Effect size and strength of association were evaluated using Cramér's V and Contingency Coefficient (C):

$$\text{Cramér's } V = \sqrt{\frac{\chi^2}{N \times \min(r-1, c-1)}}$$

$$C = \sqrt{\frac{\chi^2}{\chi^2 + N}}$$

A post hoc check of the primary 5×4 matrix found that 14 of its 20 cells (70%) have expected frequencies below 5 (range ≈1.04–15.11), indicating that the asymptotic Pearson chi-square approximation is not well satisfied for this table; the significance of the 5×4 result

(χ^2=40.2410, p=6.558×10^{-5}) should therefore not, on its own, be treated as strong confirmatory evidence. As a robustness check, an exact Monte Carlo significance test was additionally run (100,000 random 5×4 tables generated under the null hypothesis of independence with the observed row and column margins held fixed, following the r×c generalization of Fisher's exact test); this returned p≈6.0×10^{-5}, closely matching the asymptotic value and indicating that the association is not an artefact of the chi-square approximation. Given the sparseness of the 5×4 matrix, however, the theoretically justified, a priori collapsed 2×2 comparison described next, in which every expected cell count exceeds 5, is treated as the primary confirmatory test, with the 5×4 result reported as supporting, exploratory evidence.

As the primary confirmatory test, a theoretically grounded, a priori collapsed 2×2 matrix comparing Family Cohorts (Children < 10 years + Parents 30–39 years) against Non-Family Cohorts across Education versus Non-Education motives was evaluated. Qualitative behavior mapping data were integrated by cross-referencing spatial density against RBRA/SNI 9169:2023 technical standards.

2.4 Scope and Methodological Limitations

The study scope is subject to specific methodological boundaries. Non-probability quota sampling ($N = 81$) captured peak-hour activity windows but restricts population-level generalizability beyond the Taman Rasam context. Furthermore, behavior mapping was temporally bounded to 4 sampling days, capturing representative weekday/weekend variations but excluding extreme weather or multi-season shifts. In addition, 70% of cells in the primary 5×4 age-by-motivation contingency table have expected frequencies below 5 because of the modest sample size spread across 20 cells; results from that table are therefore interpreted cautiously and corroborated using an exact Monte Carlo significance test and a theoretically grounded, a priori collapsed 2×2 comparison (Section 2.3).

3. RESULTS AND DISCUSSION

3.1 Spatial Characteristics of Taman Rasam

Taman Rasam is located in Kober Village, West Purwokerto District, immediately adjacent to vital transportation infrastructure (Figure 2). Historically marginal, non-productive land frequently misused as an illegal waste-disposal site, it was transformed through local leadership and community support into a functional green open space. Its defining attraction, distinguishing it from other city parks in Purwokerto, is the direct visual and auditory presence of trains: visitors observe train sets ranging from executive-class long-distance services to logistics and commuter trains passing at high frequency. Mini waterwheels installed in the irrigation flow and miniature trains built from recycled materials reinforce the park's transportation theme.



Figure 2. Delineation of Taman Rasam Purwokerto
Source: Google Earth and Authors, 2025.

Table 1. Existing spatial characteristics at Taman Rasam Purwokerto

No.	Spatial Component	Existing Characteristics	Condition and Potential
1	Location	Beside the railway tracks, near Purwokerto Station	Very strategic as a transportation-education node
2	Vegetation	Shade trees (acacia, rain tree/trembesi)	Sufficiently shady, but requires specific plant species
3	Playing Facilities	Swings, simple seesaws	Still limited and does not yet meet RBRA standards
4	Commercial Area	Street vendor stalls (MSMEs)	Stimulates the local economy, but requires sanitation management
5	Safety Boundary	Simple fencing and open sightlines	High risk of penetration onto the tracks; requires SNI-standard barriers

Source: Authors, 2025.

3.2 User Profile, Characteristics, Motives and Purposes of Visit

The survey of $N = 81$ respondents established that adults aged 30–39 years account for 19.8% ($n = 16$) of adult visitors. However, when primary child subjects accompanied by parents are evaluated, children under 10 years constitute 44.4% ($n = 36$) of overall site users. Teens aged 10–19 years account for 14.8% ($n = 12$), young adults aged 20–29 years comprise 12.3% ($n = 10$), and adults/elderly aged ≥ 40 years represent 8.6% ($n = 7$).

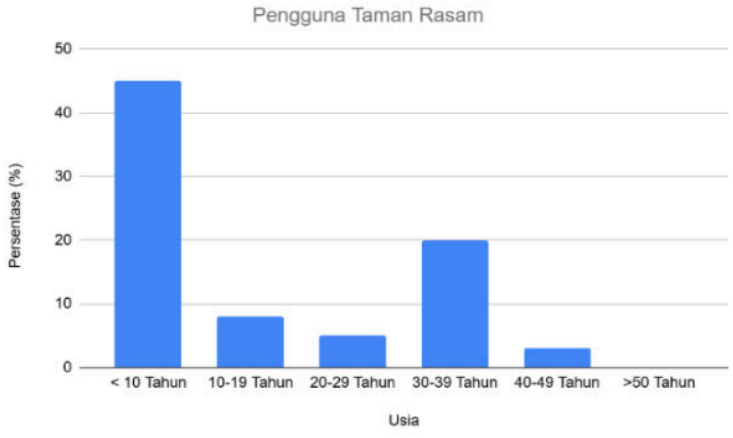


Figure 3. Age distribution of visitors at Taman Rasam Purwokerto
Source: Author, 2025.

Visit motivation is strongly shaped by the site's unique locational characteristics. Family Tourism and Education is the leading motive, driven by the park's ease of access and its adjacency to Purwokerto Station; children learn to recognize carriage and locomotive types through direct observation, with visits peaking between 16:00 and 18:00 WIB. Meeting Point and Social, chiefly teenagers and local community members using the park's free access as a gathering point before travel or for general socializing, with the railway's visual identity functioning as a community landmark. Relaxation (healing) dominated by adults and workers, for whom the combination of rice-field views to the west and the rhythmic movement of trains produces a visual relaxation effect. The remaining is culinary tourism: although not the primary draw, affordable traditional snacks sold by street vendors create a micro-economic ecosystem that revitalizes the Kober Village area and extends visitors' duration of stay.

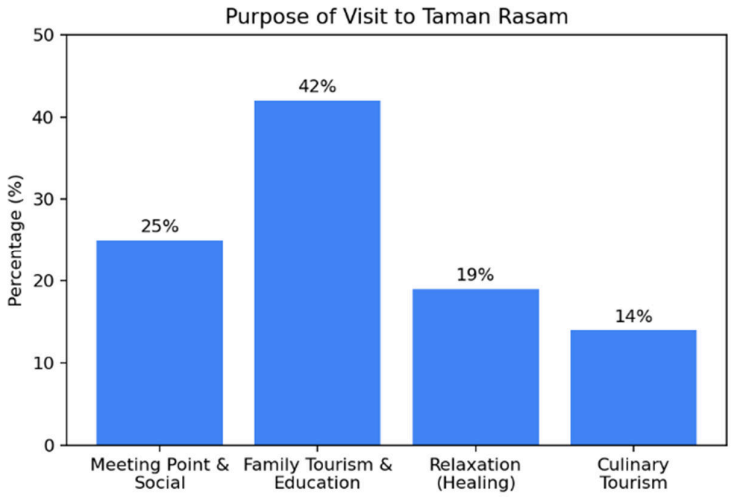


Figure 4. Purpose of visit to Taman Rasam, plotted from reported survey percentages
Source: Author, 2025.

Visit motives are led by Family Tourism & Education (42.0%, $n = 34$), followed by Meeting Point & Social (25%, $n = 20$), Relaxation/Healing (19%, $n = 15$), and Culinary Tourism (14%, $n = 12$). To test whether visit motivation depends on visitor age cohort, the 5×4 contingency table shown in Table 2 was analyzed.

Table 2. Visit Motivation Integrated To Visitor Age Cohort

Age Group Cohort	Family Tourism & Education	Meeting Point & Social	Relaxation Healing	Culinary Tourism	Row Total (n)	Marginal (%)
< 10 Years (Accompanied Children)	24	6	4	2	36	44.4%
10–19 Years (Teens / Youth)	0	7	2	3	12	14.8%
20–29 Years (Young Adults)	0	5	3	2	10	12.3%
30–39 Years (Adult Parents)	10	0	3	3	16	19.8%
≥ 40 Years (Older Adults / Elders)	0	2	3	2	7	8.6%
Column Total (n)	34	20	15	12	81	100%

Source: Authors, 2025.

The Chi-Square test of independence yielded $\chi^2 = 40.2410$ ($df = 12, p = 6.558 \times 10^{-5}$). Because $p < 0.001$, the null hypothesis of independence is rejected. Age group and visit motivation exhibit a statistically significant dependent relationship. The strength of association was confirmed as strong, with Cramér's $V = 0.4069$ and Contingency Coefficient $C = 0.5761$. The confirmatory 2×2 collapsed Chi-Square test (continuity-corrected; all expected cell counts exceed 5) comparing the Family Cohort ($n = 52$) against the Non-Family Cohort ($n = 29$) on Transportation Education motives yielded $\chi^2 = 30.0490$ ($df = 1, p = 4.213 \times 10^{-8}$, Cramér's $V = 0.6091$). Because one cell of this 2×2 table has zero observed cases, Fisher's exact test was also computed as a further check and confirmed the association ($p=5.99\times10^{-10}$). Table 3 details the comparative statistical metrics.

Table 3. Details The Comparative Statistical Metrics

Statistical Test Metric	Primary 5×4 Matrix	Collapsed 2×2 Family Matrix	Interpretation
Sample Size (N)	81	81	Complete observational sample
Chi-Square Statistic (χ^2)	40.2410	30.0490	Statistically significant deviation from expected
Degrees of Freedom (df)	12	1	Calculated as $(r-1)(c-1)$
p-value	6.558×10^{-5}	4.213×10^{-8}	Highly significant ($p < 0.001$)
Cramér's V	0.4069	0.6091	Indicates strong-to-very-strong association
Contingency Coefficient (C)	0.5761	0.5202	Confirms a strong age-motivation association (age × motivation only; not itself a measure of spatial/locational behavior)
Exact / Monte Carlo p-value (robustness check)	≈6.0×10^{-5} (100,000-sample Monte Carlo)	5.99×10^{-10} (Fisher exact)	Confirms significance is robust despite sparse expected counts in the 5×4 table

Source: Authors, 2025.

3.4 Behavioral Characteristics and the Railway-Attraction Effect

Behavior mapping shows the highest user concentration along the edge of the tracks (the park's northern boundary) at the moment the sound of an approaching train is heard: users spontaneously move toward the fence line for a clearer view; Figure 5 presents photographic documentation of this pattern rather than a quantitative spatial-frequency output, while the underlying 96 mapping-interval tallies by zone (Section 2.2) are summarized narratively in this section. Read through Barker's (1968) behavior setting theory, this is not a series of isolated lapses in supervision but a predictable, setting-driven standing pattern of behavior, the train-approach event functions as a behavioral trigger built into the setting itself, and the fence line is the setting's de facto stage. This also mirrors the well-documented "edge effect" in public-space design, in which users disproportionately favor the periphery of a space over its open center (Whyte, 1980); here, the periphery also happens to be the hazard boundary, which is precisely what elevates the phenomenon from a design curiosity to a safety concern warranting the label "railway-attraction effect."



Figure 5. Documentation of visitor concentration at the track-facing boundary fence during train-approach events
Source: Author, 2025.

Other favorite zones include: (1) the children's play area centered on swings and seesaws, used more heavily in cooler weather; (2) the shaded seating area, where parents supervise children while resting, the availability of park benches measurably extends visitors' duration of stay; and (3) the miniature-train spot, a favored location for photography shared on social media, functioning as organic promotion for the park. Table 4 summarizes the positive behavioral drivers identified through mapping and observation; Table 5 summarizes negative drivers and their safety implications.

Table 4. Positive behavioral drivers at Taman Rasam

No.	Positive Behavior Driver	Description
1	Early Transportation Education	Children gain a concrete understanding of the size, sound, and speed of trains, fostering interest in public transportation systems.
2	Social Cohesion	Interaction occurs between previously unacquainted community members, building a sense of togetherness.
3	Micro-Economic Support	Street vendors gain income opportunities that support the local economy.

Source: Authors, 2025.

Table 5. Drivers of negative behavior at Taman Rasam

No.	Negative Behavior Driver	Form of Negative Behavior	Safety/Security Implication
1	Unsafe fence design	Children repeatedly attempt to climb or open the wire-mesh boundary toward the tracks	Risk of fatal injury from passing trains
2	No four-wheeled parking area	Disorganized parking on narrow road shoulders	Traffic disruption and conflict with local residents
3	Lack of covered trash cans	Littering in the irrigation stream or on the tracks	Degraded environmental quality and park aesthetics
4	Minimal night lighting	Potential use of space for antisocial activity	Reduced sense of security for family visitors
5	Poorly maintained facilities	Vandalism of benches, damaged play equipment	Reduced comfort for other users

Source: Authors, 2025.

3.5 Discussion: Informality, Attraction, and the Governance Gap

The pattern documented above raises a question with broader relevance beyond Purwokerto: why do informal, community-produced spaces so often outperform formally planned parks in generating sustained user attraction, even where they carry demonstrably

higher physical risk? Three interpretive threads help answer this. First, from an affordance perspective (Gibson, 1979; Kyttä, 2004), informal spaces retain a high density of directly perceptible, high-reward affordances (motion, sound, proximity to real infrastructure) that formal parks routinely engineer away in the name of safety, the same barriers that reduce risk also reduce perceptible affordance, so formalization is rarely affordance-neutral. Second, from a risk governance perspective (Renn, 2008; Renn et al., 2018), Taman Rasam emerged through community-level risk perception and informal management rather than through a technical risk-assessment process; its current gap against RBRA/SNI 9169:2023 is therefore not simply a construction deficiency but a governance mismatch between an informally legitimated space and a formally imposed standard that arrived after the behavior pattern was already established. Third, comparable dynamics recur internationally wherever active railway margins meet under-provisioned public space: in Metro Manila, communities along the Philippine National Railways corridor have long occupied the trackside margin under conditions of chronic risk exposure and weak formal oversight, and recent commentary on Philippine railway safety explicitly identifies unmarked, informally used trackside stretches as de facto "playgrounds for children" precisely because municipal governments treat the corridor as national, not local, territory (Manila Times Editorial Board, 2026). Taman Rasam differs in one crucial respect, it is a sanctioned, purpose-built recreational space rather than an unplanned settlement, but it shares the same underlying governance vacuum: national/operator-level railway safety authority does not extend into the design of adjacent community-initiated public space, leaving that space to develop without the safety review a formal park would undergo. This tension also cautions against a purely additive response, simply erecting a taller fence, because the fence line is also the setting's primary affordance surface (Section 3.4). A credible design response, following affordance theory, should preserve visual and auditory access to trains while removing the physical possibility of track penetration, which is the logic behind the buffered, transparent-barrier recommendation developed in Section 3.6. Whether formalizing the site under RBRA standards preserves the spontaneity and community ownership that currently make it successful, or instead produces a sanitized space that loses its distinctive appeal, is an open question this study cannot resolve with cross-sectional data alone; it is flagged as a priority for the longitudinal research suggested in Section 4.3.

3.6 Compliance Evaluation Against Child-Friendly Play Space (RBRA) Standards

In line with Banyumas Regency's Child-Friendly City (KLA) policy, Taman Rasam's future development should be benchmarked against SNI 9169:2023 criteria for Ruang Bermain Ramah Anak (RBRA). Rather than a narrative checklist, Table 6 recasts the evaluation as a three-level compliance matrix (Non-compliant/Partially compliant/Compliant), so that the scale of the gap, not just its existence, is visible to planners and can be tracked over successive audits.

Table 6. Compliance matrix for Taman Rasam against RBRA/SNI 9169:2023

Standardization Aspect	Existing Condition	Ideal Condition (RBRA Standard)	Compliance Level
Play Equipment & Materials	Conventional iron, showing corrosion/rust	Pollutant-free (non-toxic), no sharp corners, sponge/rubber sleeves on high-impact parts	Non-compliant

Standardization Aspect	Existing Condition	Ideal Condition (RBRA Standard)	Compliance Level
Railway Area Safety	Low iron fencing secured only with wire hooks	Permanent, unclimbable-yet-transparent primary barrier (min. 2 m) plus a 1–2 m thorny/planted buffer zone before the fence	Non-compliant
Inclusive Supporting Facilities	No separate adult/child toilets; blind spots present; minimal signage; supervision is voluntary and irregular	Separate low-height child facilities; play-rule and railway-warning signage with site maps; CCTV and security personnel	Partially compliant

Source: Authors, 2025.

All three audited aspects fall short of full compliance, and two of the three, play equipment and railway-area safety, the components with the most direct bearing on physical injury risk, are fully non-compliant. This concentration of risk in exactly the two categories that determine physical harm, rather than an even spread of minor deficiencies, is what elevates the case from a routine facility-upgrade list to a governance priority: it indicates that safety-critical elements were the least addressed in the site's organic development, consistent with the interpretation in Section 3.5 that the space grew through community risk-tolerance rather than technical risk assessment. And to reconcile community recreation with formal safety standards, four integrated design and governance directions are established: (1) Tiered Spatial Risk Zoning; Zone 0 (Primary Buffer/Track Margin, 0.0–2.0 m from rail): Strictly sterile, fenced-off zone containing dense vegetation buffers, Zone 1 (Controlled Viewing / Education Deck, 2.0–5.0 m from rail): Equipped with stepped seating amphitheaters and railway education displays for supervised viewing, Zone 2 (Active Play & Service Zone, > 5.0 m from rail): Houses certified play structures with rubber shock-absorbing surfacing, vendor stalls, and child-friendly restrooms. The 0–2 m/2–5 m/ >5 m thresholds are a site-adapted, graduated risk-tiering scheme for the park's interior activity zones; they are narrower than, and are intended to sit nested within, the statutory railway safety corridor defined by Law No. 23/2007 on Railways and Government Regulation No. 56/2009 on Railway Operation, which reserves a Ruang Manfaat Jalur (Rumaja) of at least 6 m from the track axis for construction and operational safety, plus a further Ruang Milik Jalur (Rumija) of at least 6 m beyond that for construction protection (Undang-Undang Nomor 23 Tahun 2007 and Peraturan Pemerintah Nomor 56 Tahun 2009). Because Taman Rasam's existing footprint already sits close to, and in places within, this statutory corridor, Zone 0 (0–2 m) is proposed as the minimum unclimbable-barrier clearance needed to prevent direct fence contact given the site's constrained width, while the final gazetted extent of the Rumaja/Rumija/Ruwasja boundary and therefore the outer limit of any permanent construction in Zones 1 and 2, should be confirmed jointly with PT Kereta Api Indonesia (KAI) and the Direktorat Jenderal Perkeretaapian (DJKA) before implementation. (2) Integrated Railway Education Elements; Developing the site into the Purwokerto Railway Education Park featuring QR-code-enabled educational signage detailing locomotive model, rail safety rules, and interactive miniature transport exhibits. (3) Collaborative Tripartite Governance Model; establishing a formal coordination mechanism among PT Kereta Api Indonesia (as the railway right-of-way authority), the Banyumas Regency Government (as KLA/RBRA regulator and park manager), and the Kober Village community/local park-management group (as day-to-day steward and first-line supervisor), with clearly assigned responsibilities for infrastructure maintenance, safety enforcement, and community engagement. (4) Periodic Compliance

Auditing; instituting a scheduled (e.g., annual) RBRA/SNI 9169:2023 compliance audit using the three-level matrix in Table 6 as the standing instrument, with results reported to the Banyumas KLA taskforce so that non-compliance is tracked and remediated over successive cycles rather than assessed once and left unmonitored.

4. CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

1. The concentration of child users at Taman Rasam is driven by the railway-attraction effect. Inferential statistics confirm a statistically significant and strong relationship between visitor age group and visit motivation ($\chi^2 = 40.2410; p = 6.558 \times 10^{-5}$; Cramér's $V = 0.4069$), with family cohorts exhibiting strong lock-in to educational motives ($\chi^2 = 30.0490$; Cramér's $V = 0.6091$).

2. Taman Rasam remains non-compliant with SNI 9169:2023 regarding play equipment safety and railway boundary fencing. Bridging this gap requires tiered risk zoning, transparent buffered barriers, a collaborative tripartite governance model, and periodic compliance auditing (Section 3.6).

4.2 Theoretical and Managerial Contribution

Theoretically, this study defines the railway-attraction effect within behavior setting and affordance frameworks. Managerially, the RBRA compliance matrix offers local municipal authorities a practical audit tool for upgrading informal public spaces along transport corridors.

4.3 Limitations and Future Research

Limitations include non-probability sampling ($N = 81$) and temporal confinement to 4 observation days. Future research should pursue longitudinal post-occupancy evaluations following barrier installation and multi-case agent-based simulations of child movement patterns near infrastructure edges.

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