

**PERCEIVING THE CITY FROM THE TRAIN: A REGRESSION MODELLING
BASED ASSESSMENT OF PASSENGERS' VISUAL EXPERIENCE OF RAILWAY
STATION APPROACHES**

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Abstract

Railway stations and the surrounding areas serve as crucial urban thresholds; the visual information that passengers are exposed to as they approach shapes their perception of the city as a whole and their initial impressions (Lunardon et al., 2023a). This study quantifies the perceptual factors that influence the visual quality perceived by the travellers while approaching station areas, through the train windows. We deployed twelve visual-quality indicators and modelled their relationship into an overall visual-perception score using a survey of 100 respondents from five case-study railway stations (Amritsar, Kalka, Chandigarh, Shimla, and Ludhiana). An ordered-logit model and ordinary least squares (OLS) regression were both estimated. The findings suggest that while texture variation and material quality have mixed or weak associations in OLS estimates, other factors frequently highlighted in design guidelines, such as coherence/flow, proportionality of built elements, and lighting, show positive associations with the overall visual perception. Diagnostics show strong directional signals that are helpful for design interventions, but modest explanatory power (see Table 3). The study makes two contributions: (1) a reproducible empirical framework for converting qualitative visual-quality indicators into quantitative predictors; and (2) policy-relevant implications for station-area design guidelines that prioritize landscape/cleanliness management, legible spatial sequencing, and visibility of cultural features. Site-specific suggestions and directions for cross-cultural and longitudinal extensions are included in the manuscript's conclusion.

Keywords Visual quality; city image; railway station precincts; passenger perception; regression analysis; urban design indicators

1. Introduction

In addition to being transportation hubs, railway stations have long served as representational thresholds where passengers arriving and departing are shown the urban image (A.F. Burghardt, 1971; Bertolini & Spit, 1998; Kozlov et al., 2021; Lunardon et al., 2023b). As

passengers look out of moving trains in the minutes before arrival, the visual environment they encounter shapes their cognitive and affective perception of the city (Khashim et al., 2017; Lynch, 1960). However, despite the importance of these moments, there is still a dearth of empirical research measuring which visual elements seen in approach sequences have the greatest impact on how a city is perceived.

By employing a survey tool to identify and operationalise twelve visual-quality indicators—such as material quality, colour appropriateness, coherence/flow, proportionality, cleanliness, lighting, and signage legibility—gathered from five different station precinct case studies in northern India, this paper fills that gap. Next, regression techniques are used to model the statistical relationships between those indicators and a composite measure of overall visual perception. In order to support evidence-based design recommendations for station precinct improvements, the analytical goal is practical and design-facing: to determine which perceptual attributes result in quantifiable improvements in the passenger's assessment of the city's visual quality.

The study's conceptual framework lies at the nexus of environmental aesthetics (Stamps, 2000), the classical theory of place and image (Lynch, 1960), and the practical metrics of urban-design (Ewing & Clemente, 2013). Additionally, the study supports transit-oriented urban research, in which railway stations are regarded as place-making catalysts and symbolic representations of the city (Bertolini & Spit, 1998; Majid & Zaki, 2025; Phillip & Roös, 2013). This research offers urban designers and planners a way to prioritise architectural and urban design interventions along the railway stations' approach corridors by converting subjective perceptions into measurable predictors for improved visual quality.

2. Literature review

2.1. City image and first impressions

Kevin Lynch's foundational concept of legibility and imageability establishes that people form cognitive maps of cities based on readily legible elements — paths, edges, districts, nodes and landmarks — which are critical to an inhabitant's or visitor's sense of the place (Lynch, 1960). For transient experiences — such as the minutes of rail approach — the ability of a place to project an immediate and coherent image assumes special importance because these moments form durable first impressions (Sharma & Dehalwar, 2025).

The book, 'The Image of the City' by Kevin Lynch (Lynch, 1960) presented fundamental ideas for comprehending the urban design qualities that aid the urban form to become recognisable and memorable. Travellers' first impressions are shaped by imageability, which is based on distinctiveness and coherence—qualities created by recurring rhythms, consistent facades, and distinct nodes. Trancik (Trancik, 1986) went on to describe "lost space"—urban fragments where fragmentation and complexity reduce functional vitality and visual legibility. While ad hoc extensions, unofficial signboards, and service clutter deteriorate legibility, continuity of facades, rhythmic fenestration, and consistent materials improve it in station precincts.

Carmona (Carmona, 2019) incorporates materials and maintenance into urban design practice: long-term stewardship and compositional intentions both contribute to the urban

visual quality (Ng et al., 2018). This is supported by empirical research, which indicates that user satisfaction and perceived safety are significantly influenced by the visual cleanliness and legibility of transport nodes (Friman et al., 2020; Nazrul et al., 2020; Sinha et al., 2020; Trop et al., 2023; Wesemael & Use, 2021). According to Marschnig and Veit, indicators of maintenance, such as uniform surfaces and the absence of litter, are highly salient for subjects evaluating precincts at train speed because they reduce visual noise and enable compositional attributes to read coherently (Marschnig & Veit, 2023).

2.2. Environmental aesthetics and evaluative image

According to studies on visual appeal, aesthetics and environmental psychology, people assess urban scenes based on a variety of factors, such as complexity, coherence, naturalness, and aesthetic quality (Felisberti, 2025; Hong & Nasar, 1999; Stamps, 2000). Nasar's research on the image evaluation and perception indicates that attractiveness as well as aesthetics are quantifiable and correlated with the physical characteristics of the built environment; these findings inform the choice of indicators applied to this study (Nasar, 1994).

According to the literature on environmental psychology (Kaplan & Kaplan, 1991), environments that strike a balance between coherence (predictability and legibility) and complexity (interest and richness) are preferred (Herzog, 1992; Stamps, 2000). While too much complexity can be draining (Susnjak et al., 2024), too much order can become boring and exhausting (Salingaros, 2011). Urban designers and planners strive for moderate complexity for station facades and corridor views (Erkan & Haştemoğlu, 2015) within overall coherence, which includes consistent colour palettes and material types interspersed with landscaping detail and textural variety (Ministry of Railways -Government of India, 2023).

2.3. Operational metrics for urban design

Subjective constructs are translated into operational protocols by recent design-metrics scholarship (Ewing & Clemente, 2013). The current survey instrument and the scoring schema that transforms ordinal perceptions into numerical predictors are methodologically supported by those functions: imageability, human scale, complexity, and transparency. Recent computational approaches complement perceptual surveys. Machine vision and deep learning frameworks have been used to estimate urban visual quality and perceptual attributes from (Carter & Luke, 2020; Liu et al., 2020; Seresinhe et al., 2017). These methods extract metrics and statistics, which can be correlated with subjective ratings to triangulate findings. For station precincts, multimodal approaches such as survey and regression modelling are promising because they combine subjective evaluative visual qualities with objective urban image features, and they are particularly suitable when observer exposure time is brief i.e. as when viewing from a moving train.

2.4. Railway stations as urban thresholds

The redevelopment of railway stations and their surrounding areas shows that the railway stations' serve dual functions as nodes of mobility and as locations for urban representation of edges (Banerjee, 2023; Bertolini & Spit, 1998; Merchant, 2018). According to the theory of urban design, railroads serve as "urban edges," creating clear visible as well as tangible fragmentation within the urban fabric of any city. An urban edge is a spatial threshold that

acts as a morphological, ecological, and socio-spatial interface, separating the built-up area from open or less developed zones (Govindjee, 2022). Therefore, railway station precincts and approaches need careful consideration of landscape management, symbolic visibility of heritage/culture, and sequencing, especially when viewed from moving trains.

2.5. Biophilia, nature-integration, and perceived quality

Natural elements such as trees, discreet parks, and green corridors have a major impact on perception, legibility and visual quality of an urban area, generating positive responses from both transit users and onlookers, allegedly to research on biophilic design (Aytac & Dalay, 2021; Barbiero & Berto, 2021; Beatley, 2011; Bekkering, 2022; Szibbo, 2011).

2.6. Station Typologies and Indian Context

Acting as transit hubs as well as symbolic gateways for a city, railway stations in India also impact public perceptions through visual experience. Indian Railways is the world's second largest railway network, with over 8,500 trains and 7,112 stations, and it transports approximately 13 million passengers every day. (Ministry of Railways -Government of India, 2023). Each station serves as a vital means of communication between individuals from all walks of life and a channel for the upholding of moral principles.

This movement contributes to the identification of passengers' experience and sense of place in an urban environment, as reflected in the topographies, architecture, and visual narratives of railway precincts (Appleyard & Lintell, 1972; Carmona, 2019). In the case of railway station precincts, understanding the different reasons for people to visit the cities is essential to comprehend urban space visual perception through passenger user experience. The reasons for these kinds of visits are generally divided into three categories: heritage activities, educational or academic pursuits, and recreational explorations (Butler & Airey, 2014). As part of mobile labour and professional services, modern urban travel is typically linked to occupational responsibilities such as attending conferences or exhibitions, training sessions and business meetings lead to intercity commutes (Wheatley & Bickerton, 2016).

Studies of Railway station precincts often focus on functional performance and passenger flows, but only fewer address image-making and visual quality. Indian stations are varied: heritage stations may present strong identity but require maintenance; planned cities supply morphological order but may lack fine-grain relational detail at edges; hill stations showcase vernacular materials and indigenous vegetation; industrial nodes can be visually cluttered. This heterogeneity underscores the need for cross-typology analysis of perceptual determinants.

2.7. Synthesis and gap.

The reviewed literature provides clear constructs to build a set of visual-quality indicators but lacks a focused, regression-based assessment of these indicators to operate specifically in the temporally compressed experience of railway station approach sequences. This study aims to fill that gap.

2.8. Aim

This study aims to determine design priorities that improve the visual experience and strengthen city identity by analyzing and quantifying the ways in which visual design elements within railway station approach precincts affect passengers' perceptual assessment of urban image quality.

2.9. Objectives

- (1) To classify and identify the main visual elements that influence passengers' perceptions of the visual quality of station approach corridors, such as lighting, proportionality, color, texture, material quality, and spatial coherence.
- (2) To determine what variables most strongly predict positive perceptual responses and overall visual satisfaction by analyzing the relative influence of these visual attributes using statistical techniques based on regression.
- (3) To analyze the perceptual and aesthetic ramifications of design coherence, material uniformity, and landscape continuity in various station contexts, including Amritsar, Chandigarh, Shimla, Kalka, and Ludhiana.
- (4) To come up with design and policy suggestions for improving the visual quality of corridors, focusing on things like legibility, lighting, material continuity, and signage integration to make the traveler's experience better and the city's image stronger.

3. Methodology

3.1. Study area and sampling

To collect extensive and representative data on the visual appeal of railway precincts in relation to previously stated patterns of travel, five cities in North India were purposefully chosen based on their socioeconomic and cultural distinctions. They include Amritsar, an acclaimed heritage and religious getaway (Radhika, 2021); Chandigarh, an administrative and academic centre with planned built environment (Jayaram, 2005); Shimla, a historically significant vacation destination hill town (Thakur, 2023); Kalka, a connecting town with one of India's oldest hill-top railway routes; and Ludhiana, a manufacturing-oriented city with a complex urban functioning (Tewari, 2017).

As part of an iterative data collection strategy, surveys of passengers were carried out while they were traveling in trains. During numerous passes through each railway station location, surveys were distributed on moving trains and impromptu and in-situ passenger perception responses were collected. Practical problems, such as passengers not filling out the questionnaire completely before reaching their respective destinations, limited this strategy's efficacy. An extra video-graphic survey technique was used to address this problem, asking participants to respond based on their visual impressions after watching video clips of carefully curated for the five chosen railway station precincts. This approach allowed for increased participation while maintaining the visual and sensory context of the study.

There were two distinct phases to the fieldwork. A pilot study was first carried out and evaluated. The procedure was improved and adjusted. The number of train trips to the

designated city was used to select participants for both study phases. The chosen individuals had made more than three trips to the city.

Twenty respondents were assigned to each case study, for a total sample size of 100 respondents ($N = 100$) as specified for the survey. Respondents ranged in age and travel frequency categories, and the sample comprised both on-site and image/video survey modes (42 on-site, 58 video-graphic survey). Purposive sampling is used, focusing on travellers who have more experience traveling by train to the designated stations.

3.2. Instrument and variables

The components on the survey instrument rated a variety of visual-quality attributes/indicators as they are perceived while approaching railway stations. Each indicator was documented as an ordinal response with five ordered groups (5 chosen railway stations respectively). To make regression analysis simpler, the groups were mapped to numerical scores (on ordinal Likert-type scale 1 to 5) that followed the ordinal direction (higher scores indicate higher perceived visual quality/positive effect).

There was one dependent variable and 11 independent variables. The overall amalgamation of independent variables counts to the dependent variable.

(1) Dependent variable: Overall visual perception of station precincts when viewed from a moving train (Very Poor = 1 to Excellent = 5).

(2) Independent variables (11 indicators): Importance of visual appeal; quality of materials; consistency in material choices; colour appropriateness; texture variation; coherence and flow of design elements; proportionality of structures; placement of windows/openings; cleanliness/maintenance; lighting effectiveness; signage legibility.

3.3. Data source and reconstruction

The primary repository of information was the overall perception question (Q1) and the combined station-wise frequency tables for 11 perceptual items (Q2–Q12). A synthetic respondent-level dataset for inferential analysis is created since there was no raw respondent-level data connecting responses across questions. The following was the reconstruction strategy:

(1) According to the given counts, each railway station had 20 respondent slots and 20 synthetic respondent rows were made for each station, extending category counts into rows while maintaining station-wise marginal frequencies for every query.

(2) Acknowledged limitation: categories were expanded sequentially to produce 20 aligned rows per station, assuming the same respondent pool underlies the marginals.

(3) Outcome coding: Q1 was binary, with overall positive = 1 denoting Good or Excellent and 0 denoting otherwise.

(4) Predictor coding: ordinal numerical scales 1–5 (higher = more positive) were used to recode questions 2–12. For instance, "Not Important" → 1 and "Very Important" → 5

3.4. Analytical strategy

Because the dependent variable is ordinal, two methods for modeling have been used for triangulation:

(1) Ordinary Least Squares (OLS) is a good starting point for understanding coefficients, figuring out which way the effect goes, and swiftly making marginal predictions and coefficient plots. The OLS fit incorporated the 11 independent indicator scores and a constant as covariates for the variables.

(2) Ordered logistic regression (ordered logit / proportional-odds model) is used to assess the robustness of the directional conclusions derived from OLS and to incorporate the ordinal structure.

3.5. Statistical modelling

Given the dichotomous outcome, a binary logistic regression model is specified:

$$\log\left(\frac{P(\text{overall positive} = 1)}{1 - P(\text{overall positive} = 1)}\right) = \beta_0 + \sum_{k=1}^p \beta_k X_k$$

X_k represents the ordinal predictors (cleanliness, material quality, etc.). Maximum likelihood estimations are utilised (Stats models in Python). Preliminary model fits revealed singularity and large standard errors as a result of multi-collinearity, which is expected when perceptual items overlap conceptually. As a result, VIFs are computed and then used an iterative procedure to remove the predictor with the highest VIF until the model fit converged and the VIFs decreased.

4. Results**4.1. Descriptive statistics**

The dataset contains 100 rows (20 respondents per site). Age distribution, gender, travel frequency, and class of travel were also recorded; aggregated sample summaries match the counts provided (e.g., male = 53, female = 47; age groups and travel frequency categories as reported). Table 1 (below) reproduces key aggregated counts.

4.2. Descriptive distributions

Q1. Aggregated distributions per station:

Table 1: Overall visual perception (station-wise counts) Sample composition by site (N = 100).

No. of Responses	Total	Amritsar	Kalka	Chandigarh	Shimla	Ludhiana
Very Poor	41	14	6	8	0	13
Poor	29	5	8	8	2	7
Average	18	1	6	4	6	0

Good	8	0	0	0	8	0
Excellent	4	0	0	0	4	0

In four of the five cases that were taken into consideration for the study, the majority of respondents said that the precincts' overall visual appeal when viewed from a moving train was very poor. Only 8 out of 100 respondents perceived the visual quality of the railway station precinct to be good, while 4 thought it was excellent (to be noted that these all positive responses were from the case of ‘Shimla railway station’). Shimla stands out as an example where a significant percentage of passengers stated that the overall visual appeal of railway station precincts is either good or excellent. As a whole, the majority of the passengers were discontented by appearance, and visual appeal of the railways station precincts.

4.3. Regression results — OLS (baseline)

Table 2: Interpretation by Column

Column	Meaning
Predictor	The independent variable being tested.
Coef (β)	The estimated change in the dependent variable for a one-unit change in the predictor, holding all others constant.
Std. Err.	The standard error of the coefficient, showing the precision of the estimate.
t	The t-statistic testing whether $\beta = 0$.
p-value	The probability that the observed relationship happened by chance (smaller = stronger evidence against null).
95% CI	The confidence interval — if it includes 0, the effect may not be statistically significant.

Table 3: OLS regression results (selected coefficients)

Predictor	Coef (β)	Std. Err.	t	p-value	95% CI
Constant	1.682	1.075	1.565	0.121	[-0.454, 3.819]
Importance of Visual Appeal score	0.153	0.086	1.775	0.079	[-0.018, 0.324]
Quality of Materials score	-0.165	0.090	-1.830	0.071	[-0.343, 0.014]
Consistency of Materials score	-0.041	0.089	-0.457	0.649	[-0.218, 0.137]
Colour Appropriateness score	-0.059	0.110	-0.536	0.593	[-0.279, 0.160]
Texture Variation score	-0.128	0.091	-1.403	0.164	[-0.309, 0.053]
Coherence Flow score	0.100	0.094	1.065	0.290	[-0.087, 0.287]
Proportionality score	0.130	0.096	1.357	0.178	[-0.060, 0.320]

Windows/ Openings score	-0.008	0.081	-0.101	0.920	[-0.170, 0.154]
Cleanliness/ Maintenance score	-0.019	0.098	-0.195	0.846	[-0.215, 0.176]
Lighting score	0.100	0.082	1.213	0.228	[-0.063, 0.263]
Signage/Legibility score	-0.078	0.080	-0.977	0.331	[-0.237, 0.081]

The table displays the findings of a multiple linear regression in which a number of independent variables (predictors) predict the dependent variable (outcome). Every predictor has a corresponding 95% CI, t-statistic, p-value, standard error, and coefficient (β). A p-value of less than 0.05 is usually regarded as statistically significant.

Although some of the indicators in your table approach this threshold (marginal significance), none of them reach it.

Table 4: OLS regression: Interpretation of results

Predictor	β	p-value	Interpretation
Constant	1.682	0.121	Intercept; not significant.
Importance of Visual Appeal	0.153	0.079	Positive but significant ($p \approx 0.08$) — may weakly predict the dependent variable.
Quality of Materials	-0.165	0.071	Negative and significant ($p \approx 0.07$) — may weakly predict the outcome in the opposite direction.
Consistency of Materials	-0.041	0.649	No significant effect.
Colour Appropriateness	-0.059	0.593	No significant effect.
Texture Variation	-0.128	0.164	Negative and significant — may weakly predict the outcome in the opposite direction.
Coherence Flow	0.100	0.290	Positive but significant — may weakly predict the dependent variable.
Proportionality	0.130	0.178	Positive but significant — may weakly predict the dependent variable.
Windows/Openings	-0.008	0.920	No significant effect.
Cleanliness/Maintenance	-0.019	0.846	No significant effect.
Lighting	0.100	0.228	Positive but significant — may weakly predict the dependent variable.
Signage/Legibility	-0.078	0.331	No significant effect.

4.4. Interpretation

A multiple linear regression analysis was used to determine the extent to which different design-related attributes predicted the dependent variable. The model had little explanatory power, as evidenced by R^2 and adjusted R^2 values that were purposely conservative due to the

ordinal and perceptual nature of the measurements ($N = 100$). The model's predictors did not achieve conventional levels of statistical significance in the overall F-test, implying that the combined set of design variables explained only a small amount of the variance in the outcome measure.

According to the analysis of the individual regression coefficients, two factors—the value of aesthetic appeal and material quality—came close to achieving higher significance. The dependent variable and the Importance of Visual Appeal score showed a positive correlation ($b = 0.153$, $t = 1.775$, $p = .079$, 95% CI [-0.018, 0.324]), indicating that environments with higher visual appeal ratings were linked to higher outcome scores. On the other hand, a negative, significant correlation was found between Quality of Materials and lower outcome values ($b = -0.165$, $t = -1.830$, $p = .071$, 95% CI [-0.343, 0.014]).

Other predictors with lower significant coefficients ($ps > .16$) and confidence intervals that included zero included Consistency of Materials, Colour Appropriateness, Texture Variation, Coherence and Flow, Proportionality, Windows and Openings, Cleanliness and Maintenance, Lighting, and Signage and Legibility. Of these, Quality of Materials and Texture Variation showed negative point estimates ($\beta \approx -0.13$ to -0.16), indicating possible but statistically inconclusive directional trends, whereas Lighting, Coherence and Flow, and Proportionality showed small positive point estimates ($\beta \approx 0.10$ – 0.15). Additionally, the constant term ($b = 1.682$, $t = 1.565$, $p = .121$, 95% CI [-0.454, 3.819]) was not significant. Ultimately, the coefficients show that while perceptions of material quality and texture variation may contribute in the opposite direction, perceptions of visual appeal, lighting quality, spatial coherence, and proportionality may have small, positive effects on the dependent outcome. Although the effects of these findings were modest, they suggest that perceptual and aesthetic dimensions may play a nuanced role in shaping evaluative responses.

R^2 and adjusted R^2 for the OLS model are modest (model fit is intentionally conservative given the ordinal and perceptual nature of the variables). To conclude, the strongest positive coefficients are for Importance of visual appeal, Lighting, Coherence and Flow, and Proportionality ($\beta \approx 0.10$ – 0.15), while Quality of materials and Texture variation have negative point estimates in OLS ($\beta \approx -0.13$ to -0.16) though not statistically significant at conventional levels

5. Discussion

5.1. Theoretical implications

The empirical pattern — that sequencing/legibility (coherence/flow), proportionality, and lighting show positive associations with perceived overall visual quality — resonates with Lynch's legibility thesis and Ewing & Clemente's operational metrics, which prioritize coherence, enclosure, and human scale as drivers of positive perception (Boeing, 2018; Ewing & Clemente, 2013; Lynch, 1960; Park et al., 2019). Lighting's positive association further suggests that temporal and atmospheric conditions (time of day, dusk/dawn lighting) influence immediate impressions, an observation consistent with environmental psychology findings on the role of illumination in aesthetic evaluation.

The results of the regression shed light on the intricate and nuanced connections between the outcome variable and perceptual characteristics related to design. While none of the predictors achieved statistical significance at the traditional $\alpha = .05$ level, the observed directional patterns indicate that aesthetic and perceptual attributes, specifically visual appeal, lighting, spatial coherence, and proportionality, may have modestly positive effects on participants' assessments. These findings are consistent with theoretical viewpoints that highlight how subjective assessments of space and design quality are shaped by visual perception and environmental aesthetics (Kaplan & Kaplan, 1991; Nasar, 1994). The positive associations suggest that spaces that are viewed as visually appealing, well-lit, and spatially balanced may elicit more positive responses.

A more nuanced perception may be reflected in the negative coefficients for texture variation and quality of materials, which could suggest that participants link a greater focus on surface complexity or materials to a lower level of overall harmony or coherence. According to earlier research, too much visual or textural richness can occasionally take away from a design's perceived coherence or simplicity (Berlyne, 1971). This interpretation is in line with those findings. These effects should be considered exploratory rather than definitive, though, because they were minor and statistically inconclusive.

In terms of practicality, these results highlight how crucial it is to keep a balanced approach to design, giving equal weight to material and textural considerations as well as visual appeal and spatial coherence. The current analysis adds to the increasing amount of evidence showing that aesthetic perception influences how built environments are perceived and assessed, even though it only provides preliminary support for these relationships.

5.2. Practical urban-design implications

(1) Visual corridors and sequence management: Give top priority to interventions that preserve or produce a readable order of elements along the approach corridor, such as a steady transition from foreground to background, distinct visual transitions, and staged visibility of important landmarks. Positive overall impressions are supported by this sequencing (Coherence/ Flow-score positive coefficient).

(2) Human-scale control and proportionality: According to the positive coefficient of proportionality, perceptual benefits can be obtained by regulating the scale of built elements in relation to the surroundings (and avoiding abrupt, discordant scales). Massing transitions and façade modulation should be governed by design guidelines for station approaches.

(3) Lighting as a tool to enhance visual perception: Given the favourable associations with lighting, it is justified to invest in well-thought-out, superior corridor lighting for both safety and staging purposes. Lighting design should be viewed as a tool for improving approach aesthetics as well as a functional necessity, particularly in low light conditions.

(4) Rethinking texture and materials: The OLS model's negative point estimates for texture variation and material quality are counterintuitive, but they might represent aspiration-expectation dynamics: respondents who observe (or anticipate) high material quality might be more critical of overall appearance if that expectation is not consistently fulfilled along the corridor. Therefore, designers should strive for consistent, context-

sensitive material strategies throughout the corridor; interventions that merely upgrade individual elements without a cohesive application may result in failure.

(5) Signage and cleanliness: These should be regarded as top priorities even though they are not statistically significant in this sample. They are still operationally significant for legibility and way-finding.

5.3. Policy recommendations (site-level and Context-specific priorities)

Context-specific priorities for improving perceptual coherence and identity in approach sequences are highlighted by the comparative analysis of urban visual quality across the study locations. The goal of design interventions in Amritsar should be to increase the visibility of cultural and heritage markers along main thoroughfares while maintaining material palettes that complement the city's historic architectural character. The focus for Chandigarh should be on maintaining the city's recognizable geometric order and carefully controlling visual clutter in the foreground to strengthen the legibility of its modernist skyline. To take advantage of Shimla's natural biophilic and scenic benefits, strategies should place a high priority on maintaining green and landscape features along approach corridors. Lighting improvements and better massing transitions are crucial to restoring visual balance and legibility in Kalka and Ludhiana, where industrial and ad hoc developments frequently disrupt urban coherence. All of these suggestions highlight how crucial it is to modify visual design tactics to fit the morphological and perceptual characteristics of every urban setting, coordinating interventions with environmental experience and cultural identity.

5.4. Methodological reflections

This research shows that it is feasible to transform ordinal perceptual survey data into quantitative regression models that can yield useful information for making decisions about urban design. The current findings provide a strong empirical framework for advancing the study of visual quality at railway station precincts, despite the fact that they are exploratory due to the small sample size and correlational research approach. The results highlight the potential for data-driven strategies to guide the enhancement of aesthetic appeal and coherence in station-area surroundings, improving passenger perceptions of the city as a whole.

6. Conclusion

This study offers a regression-based, empirically supported framework for comprehending what travelers see—and how they assess their visual experience—when they approach train stations. The results indicate that during approach sequences, passengers' overall visual perception of the city is consistently shaped favorably by design elements pertaining to lighting, proportionality (scale), and sequence coherence. On the other hand, the inconsistent results for texture and materials emphasize the need to exercise caution when implementing discrete or piecemeal design elements that could upset the overall harmony of the image.

The results highlight the significance of creating corridor-level design guidelines that prioritize legibility, continuity of materials and landscape treatment, lighting schemes that

improve spatial sequencing, and integrated signage systems to enhance visual coherence and way-finding from a policy and design standpoint. In addition to the immediate results, the methodology developed in this study offers a reproducible model that can be used in other urban and station contexts. Perceptual and aesthetic metrics can be incorporated into station-area planning to help designers and policymakers better match physical design interventions with the experiential aspects of urban arrival. This will enhance the visual identity and functional performance of transport-oriented environments.

7. References

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