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Developing Perception-Based Themes for Assessing Peri-Urban Landscape Elements

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Abstract

Peri-urban areas in developing countries are increasingly vulnerable to rapid development, which transforms their distinctive physical landscape elements. Identifying which elements are most exposed to change is essential for effective planning, management, and conservation. However, systematic and validated approaches for capturing these elements from community perspectives remain limited, particularly in peri-urban contexts. This study aimed to develop and validate a set of themes that could guide the construction of reliable questionnaires for assessing peri-urban landscape element changes within the context of Asia and Oceania. Drawing on the concepts of landscape character, land use change, and peri-urban development, a systematic literature review was conducted to identify relevant articles. Selected articles were coded and analyzed using Atlas.ti, producing eight initial themes and 42 sub-themes, which were subsequently refined through expert evaluation into five key themes: landforms, natural vegetation, water bodies, agriculture, and heritage. These validated themes serve as a robust conceptual foundation for questionnaire development, ensuring that subsequent instruments are both context-specific and methodologically sound. In doing so, the study not only advances the methodological basis for peri-urban research but also offers practical guidance for scholars and practitioners seeking to design evidence-based tools for planning and regional development.

1. Introduction

Peri-urban areas represent some of the most dynamic and contested landscapes in the world, shaped by rapid urban expansion, agricultural transformation, and weak planning controls (Silva, 2019). Situated at the interface between rural and urban systems, these transitional zones often embody the competing pressures of ecological integrity, economic development, and social adaptation (Imdad et al., 2023; Lawton & Morrison, 2022; Teklemariam & Cochrane, 2021). Their landscapes are marked by distinctive physical and cultural features ranging from agricultural land and forest remnants to water bodies and heritage sites that are increasingly vulnerable to change. In developing countries such as Malaysia, these areas have experienced accelerated transformations due to urban sprawl, infrastructural expansion, and intensive land conversion (Samat et al., 2014). Understanding which landscape elements are most exposed to these pressures is crucial for sustainable planning, conservation, and regional development.

Despite growing recognition of the importance of peri-urban landscapes, systematic approaches for capturing their defining elements remain limited. Much of the existing literature has focused on documenting land use and land cover (LULC) changes through remote sensing and spatial analyses (Antrop, 2000). While these approaches reveal the extent and trajectory of physical changes, they often overlook how such changes are perceived and valued by local communities. Yet, perception matters. Community views shape attachment to place, inform collective identity, and influence attitudes toward conservation and development. Without accounting for these perspectives, planning frameworks risk privileging technocratic assessments while neglecting the lived experiences and cultural significance embedded within landscapes.

The concept of landscape character provides an entry point for addressing this gap. Landscape characters refer to the distinct and recognizable pattern of elements within a landscape and the way people perceive and experience them (Pan et al., 2022; Swanwick, 2009). Scholars such as McHarg, Steinitz, and Marsh have long argued that landscape planning should integrate ecological, visual, and social considerations(Fabos, 1995). In response, structured frameworks such as Landscape Character Assessment (LCA) were developed in the 1990s, particularly in the UK and Europe, to classify and evaluate landscapes for planning purposes (Swanwick, 2002). While widely adopted, these approaches tend to emphasize visual quality and expert-driven categorization, offering limited scope for systematically integrating community perceptions. In Asia and Oceania, applications of LCA and related frameworks (G. Brown & Brabyn, 2012; K. H. Kim & Pauleit, 2007a) highlight their relevance but also underscore the need for adaptation to local contexts and social dimensions.

Complementing LCA, research on land use and land cover (LUC) change provides critical insights into how peri-urban landscapes evolve structurally and functionally. Studies in Malaysia and the broader Asian region consistently show that forests, agricultural land, wetlands, and traditional villages are increasingly replaced by urban areas, infrastructure, and commercial developments(Samat et al., 2014). These transformations alter not only ecological processes but also the cultural and visual identity of landscapes. Peri-urban planning models, such as McGee's Desakota framework (McGee, 2023) have further illuminated the hybrid nature of these spaces, where agricultural and non-agricultural activities overlap. Malaysian planning guidelines also emphasize the need to identify and conserve key features such as vegetation, biodiversity, heritage, and open spaces before development occurs (Yeo et al., 2023). Collectively, these studies and models underline the importance of recognizing both physical and cultural elements in peri-urban areas, but they still fall short in offering standardized, validated tools for capturing how communities perceive and prioritize these elements under conditions of rapid change.

Questionnaires are one of the most widely used tools in social and environmental research to capture attitudes, perceptions, and values. However, the reliability and usefulness of a questionnaire depend heavily on the rigor of its development process. Best practice frameworks emphasize systematic item generation, expert validation, and iterative refinement to ensure clarity, reliability, and construct validity (DeVellis, 2017). While perception-based surveys have been used in urban and environmental studies, few efforts have been made to develop validated questionnaires tailored to peri-urban landscape contexts. This lack of standardization hampers both cross-study comparisons and the integration of community perspectives into planning processes.

Addressing this methodological gap, the present study develops and validates a set of themes that form the conceptual foundation for constructing questionnaires on peri-urban landscape element changes. Drawing on the interconnected concepts of landscape character, land use change, and peri-urban planning (Figure 1), the study employs a systematic literature review combined with expert evaluation to generate, refine, and validate themes that capture the physical and cultural dimensions of peri-urban landscapes. This contribution is significant for two reasons. First, it establishes a transparent, replicable process for theme development that can guide future efforts to design questionnaires for peri-urban landscape research. By clarifying which elements are most meaningful and measurable, the validated themes provide a robust foundation for constructing instruments that capture community perceptions systematically. Second, by situating these themes within established theoretical frameworks and local planning contexts, the study ensures both methodological rigor and contextual relevance. The themes not only provide a bridge between ecological and socio-cultural dimensions but also offer a practical resource for policymakers, researchers, and practitioners seeking to design evidence-based tools for peri-urban planning.

This study presents the methodological basis for peri-urban research by offering validated themes for questionnaire development. Rather than presenting a finalized survey instrument, it emphasizes the process of identifying, refining, and validating the elements that matter most in peri-urban landscapes. In doing so, the study addresses the methodological gap in capturing community perceptions of peri-urban change, particularly within the Malaysian and wider Asia–Oceania context, where rapid development and fragmented planning pose distinct challenges. This approach helps overcome the limitations of perception studies that lack systematic validation and strengthens the integration of local perspectives into planning frameworks. Ultimately, the validated themes provide a foundation for future research and practical applications aimed at supporting sustainable, inclusive, and evidence-based peri-urban landscape management.

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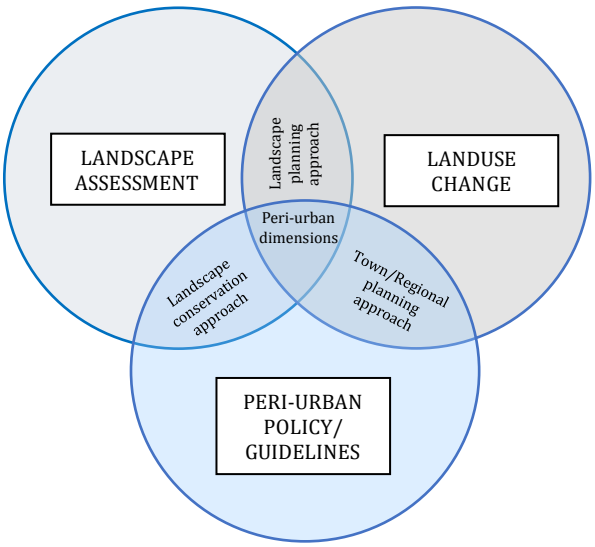

Fig. 1 *Conceptual framework showing the integration of landscape assessment, land use change, and peri-urban policy/guidelines as the basis for identifying and refining peri-urban dimensions*

2. Methodology

This study followed a multi-stage process for the development and validation of a questionnaire to assess peri-urban landscape element changes. The methodology consisted of three main steps: (1) literature review and data collection, (2) content analysis and extraction of themes and sub-themes, and (3) expert rating procedure.

2.1 Literature Review and Data Collection

A systematic literature review (SLR) was undertaken to identify studies on peri-urban landscape change and character assessment relevant to the Asia–Oceania context. The review aimed to establish a robust conceptual basis for generating questionnaire items by synthesizing prior research across multiple domains including landscape character assessment (LCA), land use and land cover (LULC) change, and peri-urban policy/guidelines. Searches were conducted in Scopus and Web of Science, as these databases provide comprehensive coverage of peer-reviewed publications. The search strategy employed combinations of keywords including *"landscape character"* OR *"land use change"* AND *"peri-urban"* AND *"suburban"* AND *"landscape planning"*. These terms were deliberately broad to capture both theoretical contributions and applied case studies that addressed landscape assessment in transitional rural–urban zones.

The initial search yielded 224 articles from Web of Science and 330 from Scopus, totaling 554 publications. To refine this pool, a three-step screening process was applied. First, duplicates were removed. Second, titles and abstracts were reviewed for relevance to peri-urban landscape contexts. Third, full texts were assessed against predefined inclusion criteria: (1) studies must be situated within Asia or Oceania to ensure regional comparability; (2) publications had to be available in digital format to allow systematic coding; and (3) methods must explicitly address one or more of landscape character, land use change, or peri-urban dynamics. After applying these criteria, 94 articles remained suitable for detailed review. All these 94 studies were integrated into the main literature review, forming the broader theoretical and empirical foundation for the study. From this refined pool, however, six publications were selected for focused synthesis because they were the most methodologically relevant to the development of questionnaire themes.

These six articles were not only contextually aligned with peri-urban landscape change but also contained explicitly defined landscape elements that could be operationalized as measurable items. In the ecological and spatial transformations driving peri-urban change, Abdullah & Nakagoshi, (2006) provided one of the earliest Malaysian cases, showing how agriculture, forests, and water bodies were reshaped by rapid urbanization in Selangor; similar concerns continue to be echoed in more recent Malaysian studies on land use change and fragmentation (Ma et al., 2024). (Deng et al., 2009) applied this ecological lens with spatio-temporal analysis in peri-urban China, offering a model for tracking agricultural conversion and settlement expansion, a method still widely used in contemporary urban growth studies (Zhou et al., 2021). (Kontgis et al., 2014) advanced this perspective in Vietnam, linking agriculture, water, and settlement dynamics, findings that remain highly relevant to more recent rural-urban monitoring efforts in Southeast Asia (Nông et al., 2021).

The remaining studies reinforced the socio-cultural and conceptual underpinnings of peri-urban research. (T. J. Brown & Itami, 1982) provided one of the earliest frameworks for landscape assessment, focusing on landforms, vegetation, and visual quality; its relevance has endured through later adaptations in China (Zhuang et al., 2022). (K. H. Kim & Pauleit, 2007b) added a socio-ecological dimension, integrating natural vegetation, heritage, and biodiversity into planning in South Korea, an approach that continues to shape current work on dimensions of regional ecosystem services within complex landscapes with land use changes (I. Kim et al., 2020). Finally, (Moench & Gyawali, 2008) Desakota model offered a conceptual lens to capture hybrid rural-urban systems characteristic of Asia, a framework still influential in recent analyses of urban-rural linkages and livelihoods (Leitner et al., 2023). Together, these six articles focus directly supports the aims of this study.

Two-tiered approach drawing widely from the full body of literature for conceptual grounding while narrowing to six core studies for theme extraction, ensured both breadth and depth. It provided a contextually relevant basis for identifying themes such as landforms, natural vegetation, water bodies, agriculture, and heritage as central components of peri-urban landscape character. Similar approaches are common in questionnaire development across fields, where literature review is combined with expert input or focused synthesis. For instance, Artino et al., (2014) describe a systematic process of literature-informed item generation and expert review in education research, Bai et al., (2018) used a comparable strategy to design a healthcare service quality instrument, and Ballouk et al., (2022) combined literature synthesis with focus group input in medical education. These examples illustrate that building on both broad evidence and focused thematic refinement is a practical and effective way to develop valid survey instruments.

Table 1 *Source papers and their contribution to questionnaire sections*

No.	Source	Geographic Context	Key Focus / Framework	Main Landscape Elements Identified	Questionnaire Sections Contribution
1	Abdullah & Nakagoshi, (2006)	Malaysia	Changes in landscape spatial patterns in peri-urban development	Forest, agriculture, built-up areas, water bodies	Perceived Changes; Causes of Change
2	T. J. Brown & Itami, (1982)	Australia	Landscape principles & procedures for assessment	Landform, vegetation patterns, visual quality	Landscape Experience; Conservation Priorities
3	Deng et al., (2009)	China	Spatio-temporal dynamics of land use change	Urban expansion, agricultural land conversion, water resources	Perceived Changes; Causes
4	K. H. Kim & Pauleit, (2007a)	South Korea	Landscape character, biodiversity, and land use planning	Natural vegetation, heritage sites, built-up areas	Cultural & Community Attachment; Conservation Priorities
5	Kontgis et al., (2014)	Vietnam	Monitoring peri-urbanisation	Agricultural land, water bodies, settlement growth	Perceived Changes; Awareness
6	Moench & Gyawali, (2008)	South/Southeast Asia	Desakota urban–rural continuum	Mixed land use, socio-cultural landscapes, livelihood patterns	Cultural & Community Attachment; Awareness

2.2 Content Analysis and Extraction of Themes and Sub-themes

The six selected articles, chosen for their methodological relevance to peri-urban landscape character assessment, were subjected to detailed document analysis. This process was aimed at forming a robust set of distinctive landscape character elements that could serve as the foundation for questionnaire development. Rather than relying solely on frequency counts of terms, which only capture how often an element is mentioned, this study

emphasized the contextual meaning and functional role of each element in relation to peri-urban landscape character.

The analysis was carried out using Atlas.ti software, where themes and sub-themes extracted from the articles were systematically coded. Importantly, the coding approach was a priori (deductive), meaning that the initial coding framework was established from concepts identified in the literature on peri-urban landscape change, rather than being discovered inductively through data exploration(Fereday & Muir-Cochrane, 2006). This ensured that the coding structure directly reflected theoretical constructs relevant to peri-urban landscape character while allowing refinement during the analysis process.

A coding system was applied to build a network of relationships between variables, followed by the generation of a comprehensive list of coded content. These findings were initially sorted by theme, definition, and sub-theme to improve readability and coherence. This first stage yielded 99 interrelated sub-themes. Recognizing the need for methodological rigor, the process incorporated multiple filtering and integration stages to enhance reliability and validity. Elements with overlapping meanings were merged, reducing redundancy while retaining distinctiveness. This integration refined the pool to 42 landscape elements across eight themes, namely: landforms, natural vegetation, water bodies, geology and minerals, wildlife, agriculture, built-up areas, and heritage. The final screening list of 42 elements before expert validation is presented in Table 2. These items were considered most representative of peri-urban landscape character and thus suitable for preliminary inclusion in the questionnaire.

Table 2 *Summary of expert rating based on items of the landscape elements*

Item	Themes	Sub-themes
1	Landform	Conservation of the height level of the earth.
2		Conservation of valley areas.
3		Conservation of hills or mountains.
4		Preservation of the appearance of natural earth forms for scenic beauty
5	Natural plants	Conservation of original plants of various species.
6		Preservation of planting networks in natural ecosystems.
7		Conservation of terrestrial forests.
8		Conservation of swampy forests.
9		Conservation of mangrove
10		Plant density at a given height and slope.
11		Conserved as the dominant element of the suburban zone.
12		The use of plants as food, filters pollution and reduces temperature.
13		Changes in forests for the development of agricultural and municipal areas.
14	Water bodies	Primary needs for people and wildlife.
15		Continuity of river networks from inside and outside the periphery zone.
16		The presence of natural water reservoir (lake/pond) areas.
17		Improvement of the quality of the scenery with the presence of elements of water.
18		Conservation of water bodies in the process of urban modification.
19		Controlling the quality and condition of the upstream system for water safety
20	Geology	Geological and/or mineral sources as landmark sources.
21		Preservation of geological and/or mineral resources identified as being exist by local communities.
22		Identification of the quality, quantity, and distribution of geological and/or mineral elements.
23	Wildlife	Dependence of wild animal species on habitable habitats.
24		The presence of wildlife such as bird and insect species.
25		The presence of well-connected networks/corridors for wildlife movement.
26		Retention of native habitats for the protection of wild animals.
27	Agriculture	Maintenance of production of traditional agricultural resources.
28		Agriculture dominates the suburban zone.
29		Production of non-woody crops such as rice.
30		Production of woody crops such as rubber, coconut, and palm oil.
31		Cultivation practices that have less risk and are safe for the environment.

Item	Themes	Sub-themes
32		Increasing the function of municipal land use, replacing agriculture.
33	Built-up	Built structures (such as buildings and residences) dominate the suburban zone.
34		Addition of new residential, commercial, industrial, and modern infrastructure.
35		Increase in the size of the built-up area.
36		Continuous development of built-up areas.
37	Heritage	Conservation of hereditary heritage areas known as cultural symbols.
38		The existence of traditional and historical elements.
39		Conservation of landmarks, heritage buildings, old towns, and traditional houses.
40		Maintenance of traditional settlement structures that are less compact than modern structures.
41		Conservation of a tourist town that has a history.
42		Conservation of traditional villages that have a sustainable environment with nature.

2.3 Expert Rating Procedure

Five experts representing ecology, urban planning, and landscape architecture were engaged to review the draft instrument for content validity. These experts were selected because of their disciplinary expertise and their direct experience with peri-urban landscape planning in Malaysia, ensuring that the assessment reflected both theoretical and applied perspectives. The validation process was conducted using a structured checklist where each item was rated on three criteria: clarity (ease of understanding), relevance (appropriateness for capturing peri-urban change), and representativeness (degree to which the item reflected the intended theme). Ratings were made using a five-point Likert scale, providing a quantitative measure of content validity.

In addition to numerical ratings, experts were asked to provide open-ended written feedback to capture qualitative insights, such as suggested rewording, missing dimensions, or redundancies between items. For example, one expert suggested including criteria for *"landscape structure such as area density, shape, and accessibility"* to improve how visual quality was assessed, while another emphasized that "*photo support may be necessary for perception-related items"* to avoid ambiguity. Some experts highlighted specific thematic refinements, such as clarifying distinctions between different forest types, strengthening references to sustainable agriculture, or ensuring that cultural heritage items accounted for the current condition of built structures.

To ensure reliability, inter-rater consistency was calculated using Fisher's method (Koo & Li, 2016), producing results that demonstrated strong agreement among the experts. The alignment between expert ratings and the results of the content analysis confirmed the robustness of the five selected themes. Feedback from the open-ended responses was also systematically reviewed, leading to refinements in wording, the removal of ambiguous items, and the consolidation of overlapping questions. This iterative process ensured that the final set of themes was both methodologically rigorous and practically applicable to peri-urban landscape contexts.

3. Findings

The findings present the outcome of the content analysis, expert evaluation, and subsequent refinement of the questionnaire structure. This stage was essential to establish which landscape elements were most representative of peri-urban character and to ensure that the instrument demonstrated clarity, consistency, and validity. The results are organized into two parts: (i) findings from expert rating and (ii) inter-rater reliability of expert ratings, and (iii) refining thematic dimensions for questionnaire development.

3.1 Findings From Expert Rating

A total of 42 sub-themes across 8 thematic themes were evaluated by 5 experts representing environmental science, town planning, and landscape architecture. The analysis revealed variation in scores, with several items consistently rated highly (≥4.0) across all experts, while others received lower consensus. Notably, items relating to heritage (Items 37–42), landform (Items 1–3), and water bodies (Items 14–19) achieved the highest agreement, indicating their strong relevance to peri-urban landscape character. Conversely, items under the built-up theme (Items 33–36) recorded notably low ratings, with mode values as low as 1.0–2.0, suggesting that these elements were not perceived as central to defining peri-urban character.

Table 3 *Summary of expert rating based on items of the landscape elements*

Item	Dimension	E1 ENV	E2 ENV	E3 TPR	E4 TPR	E5 LAR	MOD Value
1	Landform	4.00	4.00	5.00	5.00	4.00	4.00
2		4.00	5.00	5.00	5.00	4.00	5.00
3		5.00	5.00	5.00	5.00	4.00	5.00
4		3.00	5.00	5.00	5.00	5.00	5.00
5	Natural plants	4.00	4.00	4.00	5.00	3.00	4.00
6		5.00	5.00	4.00	5.00	3.00	5.00
7		5.00	4.00	4.00	4.00	3.00	4.00
8		5.00	4.00	4.00	4.00	3.00	4.00
9		5.00	5.00	4.00	4.00	3.00	4.00
10		5.00	5.00	4.00	4.00	4.00	4.00
11		3.00	4.00	4.00	3.00	2.00	3.00*
12		4.00	4.00	4.00	2.00	1.00	4.00
13		5.00	4.00	4.00	3.00	2.00	4.00
14	Water bodies	5.00	5.00	5.00	5.00	4.00	5.00
15		5.00	5.00	5.00	5.00	3.00	5.00
16		5.00	5.00	4.00	5.00	4.00	5.00
17		4.00	4.00	4.00	5.00	4.00	4.00
18		3.00	4.00	4.00	4.00	4.00	4.00
19		5.00	5.00	5.00	5.00	3.00	5.00
20	Geology	4.00	5.00	4.00	5.00	3.00	4.00
21		4.00	5.00	4.00	5.00	3.00	4.00
22		4.00	5.00	4.00	5.00	3.00	4.00
23	Wildlife	4.00	5.00	4.00	5.00	4.00	4.00
24		5.00	5.00	4.00	4.00	4.00	4.00
25		5.00	5.00	5.00	4.00	4.00	5.00
26		4.00	5.00	4.00	4.00	4.00	4.00
27	Agriculture	3.00	4.00	4.00	5.00	5.00	4.00
28		4.00	3.00	4.00	4.00	4.00	4.00
29		3.00	4.00	4.00	5.00	5.00	4.00
30		3.00	4.00	4.00	4.00	3.00	4.00
31		1.00	3.00	4.00	2.00	3.00	3.00*
32		4.00	4.00	4.00	4.00	4.00	4.00
33	Built-up	2.00	3.00	4.00	1.00	2.00	2.00*
34		2.00	2.00	4.00	1.00	2.00	2.00*
35		1.00	1.00	2.00	1.00	2.00	1.00*
36		1.00	3.00	2.00	1.00	1.00	1.00*
37	Heritage	5.00	4.00	5.00	5.00	5.00	5.00
38		5.00	4.00	4.00	5.00	5.00	5.00
39		5.00	4.00	5.00	5.00	5.00	5.00
40		5.00	4.00	4.00	5.00	5.00	5.00
41		5.00	4.00	4.00	5.00	5.00	5.00
42		5.00	4.00	4.00	5.00	5.00	5.00

Note. E=Expert, ENV=Environmentalist, URP=Urban Regional Planner, LAR=Landscape Architect

3.2 Inter-Rater Reliability of Expert Ratings

To statistically validate the level of agreement among experts, an Interclass Correlation Coefficient (ICC) analysis was conducted (Table 4). The results showed a single-measure ICC of 0.533 (95% CI = 0.392–0.675), indicating a moderate level of reliability when considering each expert individually. In contrast, the average-measure ICC was 0.851 (95% CI = 0.763–0.912), reflecting a good level of reliability when ratings were aggregated across the panel. According to (Koo & Li, 2016), ICC values above 0.75 denote good reliability, while values exceeding 0.90 represent excellent reliability. Thus, the average ICC confirms that the expert panel achieved a robust level of consensus, strengthening confidence in the retained landscape elements.

Table 4 *Interclass correlation coefficient*

Interclass Correlation Coefficient						
	Intraclass Correlation[b]	95% Confidence Interval		F Test with True Value 0		
		Lower Bound	Upper Bound	Value	df1	df2
Single Measures	.533[a]	.392	.675	7.361	41	164
Average Measures	.851[c]	.763	.912	7.361	41	164

3.3 Refining Thematic Dimensions for Questionnaire Development

A total of 42 sub-themes across eight initial dimensions were evaluated by five experts representing environmental science, town planning, and landscape architecture. The purpose of this stage was not only to validate individual items but also to refine the broader thematic dimensions underpinning the questionnaire. Table 1 summarizes the expert ratings for each item and highlights the level of consensus achieved. The analysis showed that dimensions related to heritage (Items 37–42), landforms (Items 1–3), and water bodies (Items 14–19) consistently received strong agreement, with mode values of 4.0 or higher across experts. These dimensions were therefore retained as central to peri-urban landscape character, providing a solid conceptual basis for questionnaire development. Similarly, natural vegetation and agriculture achieved acceptable levels of consensus, reinforcing their role in shaping community perceptions of peri-urban change. Together, these five themes were judged to represent both ecological and socio-cultural dimensions of peri-urban landscapes.

By contrast, themes such as geology/minerals and wildlife were considered less suitable for inclusion in a perception-based instrument. Experts noted that these dimensions, while scientifically important, were less directly observable to the public and therefore unlikely to yield consistent or meaningful responses. As one expert remarked, *"Respondents would likely find it difficult to assess geological processes or wildlife patterns in a meaningful way, which limits their applicability in capturing reliable perceptions."* Another emphasized that although geological features can serve as landmarks, their technical character and low visibility to everyday users make them less relevant for general community surveys.

The open-ended feedback provided by experts was particularly useful in refining the thematic scope. For example, one expert suggested expanding the scope of landform to include structural qualities such as area density, shape, and accessibility, as these factors influence both visual quality and perceived landscape character. Another highlighted the need for clearer framing of built-up area questions, stressing that the instrument should address how suburban development affects the continuity of agricultural land. Similarly, experts cautioned that questions on vegetation types and sustainable agriculture needed to be simplified to match the knowledge base of typical respondents. Comments on heritage further emphasized that items should distinguish between the current condition of structures and their cultural value, ensuring that respondents could meaningfully judge their state and significance.

Overall, the combination of numerical ratings and open-ended insights enabled a robust refinement process. Numerical scores helped identify dimensions with high consensus, while qualitative feedback guided the adjustment of content to improve clarity and respondent accessibility. Following this review, the final structure for the questionnaire development was narrowed to five validated themes and 40 sub-items, ensuring clarity and content validity. This restructuring ensured that each retained theme contributed meaningfully to the instrument, capturing both tangible ecological features and intangible cultural values of peri-urban landscapes. The final framework thus reflects a balance between scientific robustness, expert consensus, and practical observability, ensuring that further questionnaire development is methodologically sound and contextually relevant for community-based assessment.

4. Conclusion

This study sets out to address the lack of validated instruments for systematically capturing peri-urban landscape element changes from the perspective of local communities. Beginning with a systematic literature review, the research identified a wide pool of studies on landscape character, land use change, and peri-urban planning in the Asia-Oceania context. Through careful screening and coding using Atlas.ti, eight initial themes and forty-two sub-themes were generated. These were subsequently refined through expert evaluation, resulting in a validated framework of five principal themes: landforms, natural vegetation, water bodies, agriculture, and heritage. This process demonstrates not only the methodological rigor of combining document analysis with expert content validation but also the relevance of integrating both physical and socio-cultural dimensions into a single instrument.

The questionnaire development through this process offers a comprehensive and reliable tool for evaluating community perceptions of peri-urban change. The combination of quantitative ratings and qualitative expert feedback strengthened the clarity and representativeness of the items, underscoring the robustness of the final structure. By aligning empirical content analysis with professional expertise, the study establishes a model process that can be replicated in similar contexts. The implications of this research extend beyond methodological contribution. Practically, the questionnaire provides planners, policymakers, and researchers with an adaptable tool that can inform land use planning, environmental conservation, and peri-urban development strategies. Its thematic organization ensures that data collected reflects both the ecological and cultural significance of peri-urban landscapes, thereby enhancing the legitimacy of planning decisions. For researchers, the validated questionnaire also provides a foundation for comparative studies across regions, offering opportunities to examine how perceptions of change vary in different cultural, ecological, and planning contexts.

Nevertheless, as with any instrument, certain limitations should be noted. While the themes have been validated, the actual questionnaire items still require rewording to align with specific question types and may need minor alterations to suit the context of individual studies. The process presented here, however, provides a structured foundation that can guide such adaptations without undermining validity. Future comparative and longitudinal applications will be valuable for examining how community perceptions evolve over time, particularly in rapidly urbanizing peri-urban regions. Expanding validation to include stakeholders such as local authorities, NGOs, and industry representatives would also enhance the instrument's applicability and policy relevance.

In conclusion, this study contributes both a validated instrument and a methodological pathway for integrating community perceptions into peri-urban research. The process of deriving themes from systematic literature review, refining them through coding and expert validation, and translating them into clear and representative questionnaire items demonstrates a rigorous yet adaptable approach. Ultimately, the validated questionnaire enhances the capacity of planners and researchers to shape more inclusive, evidence-based, and sustainable approaches to peri-urban landscape planning. By situating local perceptions at the heart of landscape analysis, this work helps ensure that peri-urban transformations are understood, managed, and planned in ways that balance ecological resilience, cultural identity, and community needs.

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Conflict of Interest

Authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

All authors contributed to the development of the manuscript, reviewed the findings, and approved the final version for submission.

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