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Perspective

# Beyond translation: Rethinking soundscape emotion assessments from a cultural perspective

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https://doi.org/10.1016/j.ynexs.2025.100071

## BROADER CONTEXT

Cultural nuances play a vital role in shaping emotional responses to soundscapes, challenging the universal applicability of current standardized assessment tools. The Soundscape Attributes Translation Project has demonstrated significant cross-cultural differences in emotional responses, particularly in non-Western contexts like China. These findings expose limitations in existing frameworks, which often overlook the unique cultural dimensions of soundscape perception. By adopting a culturally tailored approach, researchers can enhance the accuracy of soundscape assessments, ensuring their relevance to diverse cultural contexts. Developing localized tools through emic, bottom-up approaches, such as field research and rigorous validation, is essential for addressing these disparities. Such tools will enable more precise and inclusive urban design strategies, accounting for regional cultural characteristics and promoting social well-being. Future research should focus on refining these culturally sensitive instruments and exploring their applications to ensure global equity in soundscape assessments.

## ABSTRACT

Understanding emotional responses to soundscapes is essential for designing urban spaces that promote well-being. However, current standardized assessment tools often fail to account for cultural nuances in soundscape perception, resulting in potential misinterpretations and generalizations. This perspective argues for a fundamental shift toward culturally tailored measurement instruments, emphasizing the need to address the cultural specificity inherent in soundscape evaluations. Evidence from the Soundscape Attributes Translation Project reveals that while standardized tools exhibit some cross-cultural applicability, they often overlook unique cultural expressions, particularly in non-Western contexts such as China. These discrepancies highlight the limitations of universal frameworks in capturing the complex interplay between cultural context and emotional experience. We propose a bottom-up, emic approach to develop localized tools that reflect diverse cultural environments. Such tools can enhance the validity of soundscape assessments, fostering inclusive urban design and policymaking. By rethinking soundscape emotion assessments through a cultural lens, we advocate for a more specific, equitable, and globally relevant framework for understanding how individuals interact with their auditory environments.

## INTRODUCTION

Hearing is a vital sense for gathering information and fully perceiving our surroundings. Soundscapes are key environmental elements with social and aesthetic aspects, and their quality greatly impacts individuals' physical and mental well-being. To measure and evaluate a person's emotional response to soundscapes, the International Organization for Standardization created a standardized soundscape affective quality (SAQ) assessment instrument. This instrument has been translated and validated for use in different languages. However, adapting these instruments to specific cultures and ensuring their accuracy still present challenges. Soundscape perception is deeply influenced by cultural and social contexts.[1] An evaluation system that ignores cultural differences may not accurately reflect how individuals in a particular culture perceive and experience soundscapes. This can lead to cultural stereotypes and hinder effective research and science-based policymaking. We recommend that cultural and social backgrounds be considered when developing and applying soundscape emotion measurement instruments. Additionally, testing and adjustments should be carried out with different cultural groups to ensure their effectiveness and relevance.

## ENVIRONMENTAL AFFECTIVE MEANING AND ITS MEASUREMENT

Different neural pathways in the brain process emotion and cognition.[2] Although they are functionally independent, they are closely connected and together influence people's judgment of the environment. When interacting with the environment, individuals gather various types of information through their senses, such as light, sound, and smell. Through complex perceptual, cognitive, and emotional processes, this information is gradually transformed into an individual's internal representation of the environment, or "giving meaning to the environment." When trying to understand and evaluate the environment, its meaning can be divided into affective meaning and cognitive meaning. Exploring the affective meaning of the environment usually relies on everyday natural language descriptions. The fuzzy and complex semantic field of folk emotion concepts is mapped to scientific constructs for a more systematic analysis and understanding of emotion. Using emotion forced-choice self-reports, we can establish the causal relationship between an individual's emotional changes and the perceived causes (people, places, events, objects, or situations) while considering individual and cultural differences.[3]

Russell's circumplex model of affect provides a structured approach to understanding emotional responses to environmental information. It emphasizes that emotion is essentially a neurophysiological state composed of two dimensions: valence (pleasantness-unpleasantness) and arousal (physiological activation associated with emotional experience)[4] (Figure 1A). These two dimensions combine to form core affect, which serves as the basis of emotional responses and represents a fundamental and intrinsic emotional experience. Since valence and arousal originate from independent neurophysiological systems and remain consistent across humans, different cultures may universally distinguish emotional states based on these dimensions. All affective states can be mapped as points within a two-dimensional space defined by valence and arousal and thus be interpreted as specific emotional concepts.

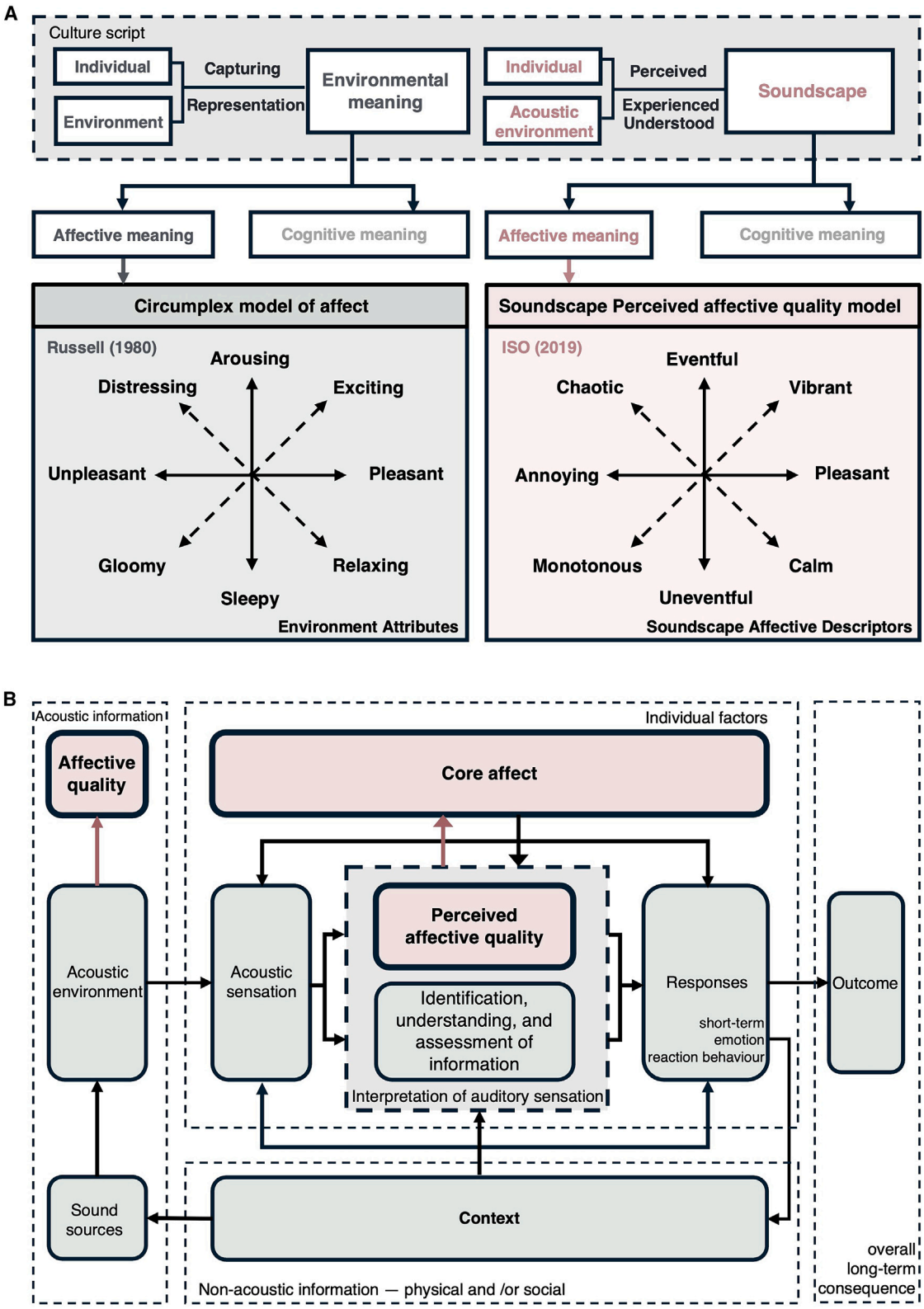


**Figure 1. Understanding and evaluating soundscape emotional experience**

(A) Frameworks of affective quality in different domains. The green framework represents the environmental affective quality framework and its constructed model, also known as the structure of core affect. The red framework represents the soundscape affective quality (SAQ) framework and its construction. (B) Soundscape emotional experience. The green framework denotes the original soundscape perception structure. In this framework, adjustments are made to the dashed "interpretation of auditory sensation" section, incorporating both emotional and cognitive processes.

This does not imply, however, that emotional experiences themselves are universal; their expression and perception are largely shaped by cultural contexts. The self-construal theory proposed by Markus and Kitayama[5] reveals the significant influence of culture on emotion within psychological processes. Natural language and cultural practices lead to variations in emotional states across cultures, which develop through naming, validation, and persuasion processes within cultural and social interactions. Such social construction processes assign specific social meanings to emotions, making them critical products of social life. Emotional experiences, similar to cognitive processes, are closely related to individual self-construal, and the nature of the self-system directly influences individual emotional responses. Although most emotions are considered universally experienced natural human phenomena, they are by no means determined solely by biological factors but rather represent complex cultural products.

## UNDERSTANDING AND ASSESSMENT OF THE AFFECTIVE QUALITY OF THE SOUNDSCAPE

Soundscape is defined as "acoustic environment as perceived or experienced and/or understood by a person or people, in context."[6] As an explicit manifestation of cultural cognitive patterns, soundscape encompasses not only measurable physical acoustic signals but also the underlying meanings of events, carrying a noticeable affective quality. Emotional evaluation of soundscape is a cognitive reconstruction in which cultural scripts are realized through meaning-giving in dynamic situations. From the perspective of self-construal theory, individuals with independent self-construal (ie, individualistic cultures) tend to interpret soundscapes through a binary opposition structure of "self-environment," whereas individuals with interdependent self-construal (ie, collectivist cultures) are more inclined to embed soundscapes within an intertwined system of "self-situation."

The core of emotion theory research lies in exploring the relationship between humans and their environment. Affective constructivism combined with "perceptual construction of soundscape" provides a theoretical framework (Figure 1B).[7] "Interpretation of auditory sensation" involves both unconscious and conscious processing of auditory signals, including the interactions between affect and cognition. These interactions together shape specific emotional responses. For example, in a comfortable and rich soundscape, such as a peaceful forest with diverse birdsongs, individuals may experience emotional responses of peace and satisfaction. In urban areas, soundscape constitutes a complex auditory environment composed of multiple sound sources, continuously changing over time. This environment contains intertwined emotional cues capable of eliciting various emotional experiences. The emotional impact of soundscape is not merely measured on a scale from "not at all annoyed" to "extremely annoyed"; instead, it is a multidimensional process involving different perceptual dimensions.[8,9] Researchers in soundscape studies have utilized the circumplex model of affect attributed to environments as a starting point,[10] providing an effective tool, the SAQ model, to identify and quantify emotional responses elicited by specific soundscapes. This model defines eight soundscape affective descriptors (SADs) within a two-dimensional circular space of pleasantness-eventfulness.[7,11,12] Figure 1A illustrates a comparison between the circumplex model of affect and the SAQ model. However, compared to the general circumplex model of affect, the emotion measurement instrument developed for specific domains (such as this one for urban soundscape studies) can more accurately capture the complex emotional experiences associated with particular stimuli. This approach has also been confirmed in the music and olfactory fields.[13,14]

## LOCALIZATION AND EVALUATION DIFFERENCES OF SOUNDSCAPE DESCRIPTORS

To describe how people experience soundscapes, an accurate and valid measurement scale composed of SADs is required. The Soundscape Attributes Translation Project (SATP), through international collaboration, aims to ensure semantic accuracy and universal applicability of SAD when translated into multiple languages across diverse cultural contexts. Soundscape research teams from around the world followed standardized protocols and materials, employing systematic methods to translate and adapt the SAD.[15–29] This strategy, known as the etic approach, assumes *a priori* that affective concepts conform to prototype categories (ie, fixed response categories) across cultures. Each team utilized a unified list of common soundscape stimuli to represent a globalized acoustic environment, thus avoiding cultural differences and unique contextual influences of sounds. To date, SADs have been developed in 18 different languages, and rigorous assessments of reliability and cross-cultural validity have been conducted using standardized soundscape emotion measurement tools in local language versions. The results show that most languages successfully retain the quasicircumplex structure of the original SAQ model. Among these, validation results for 13 languages, including Chinese, achieved a high confidence level (Figure 2A),[15,30] demonstrating strong cross-cultural validity. Meanwhile, Japanese, Malay, Portuguese, French, and Vietnamese exhibited moderate or low confidence levels (Figure 2B). Specifically, Koji Nagahata[25] examined the Japanese version of the standardized SAQ scale and suggested inaccuracies in results obtained within the Japanese context.

Among all languages with high confidence levels, results from eight European languages (from western, central, Mediterranean, and northern Europe) showed similar attribute distributions, whereas non-European regions exhibited different distribution characteristics. In particular, careful examination of the semantic spatial form in Chinese revealed an elliptical distribution at a 45° angle, and the two presumed dimensions are not sufficient to span the measured contents. Is this because Chinese people have a fixed bias in their emotional experience of soundscapes? Or is the common emotion measurement instrument unable to completely and accurately measure the emotional experiences of Chinese soundscapes? Regardless of the reasons, it is suggested that the common assessment instrument may overlook the uniqueness of Chinese culture and, as a result, fail to accurately measure the complex emotional responses of Chinese people to soundscapes. In fact, to date, no study has examined the consistency of the SAQ structure across different cultures from the ground up.

The SATP framework has certain limitations—its general applicability may be influenced by cultural differences,[30] as the manifestation of many psychological constructs may vary across cultures.[33] According to the constructionist model of emotion, emotional concepts are formed by human inferences about the meaning of basic physiological processes related to maintaining body homeostasis during social learning and reasoning.[34] Emotional concepts have different associative patterns across language families and carry different meanings in different languages, even though they are often considered equivalent in translation dictionaries.[35] Culture plays a key role in this process.[5] It not only defines emotional vocabulary but also encourages individuals, through language, to communicate and share meanings using common perceptual categories. This enables social groups to employ unified rules to identify every aspect of their environment.[36] For example, in individualistic cultures (such as those in Europe and North America), individuals are typically encouraged to express their emotions, which includes higher levels of emotional arousal and self-oriented emotional expression. In contrast, collectivist cultures (such as those in east Asia) place greater emphasis on emotions related to social harmony, and individual emotional expression is more restrained (for example, the Japanese culture of がまん), typically exhibiting lower levels of emotional arousal.[37] Of course, the influence of cultural differences on soundscape emotions cannot be simplified into a binary cultural opposition.[38,39] Although China and Japan both belong to collectivist cultures, the emotional perception of soundscapes in public spaces may differ due to the shaping influence of their respective cultural norms. This divergence stems not only from historical traditions but also from the ongoing reconfiguration through interactions between modern social behaviors and values. Behavioral norms in Chinese public spaces originate from the Confucian spatial ethics of ritual differentiation (礼辨异), following a dynamic balance of differential order pattern (差序格局). In the process of modernization, cultural scripts derived from traditional values continue to profoundly influence contemporary behavioral norms[40,41]; the demarcation of acoustic spaces not only upholds public order in specific settings but also accommodates moderate social needs. This contextualized model essentially addresses the structural tension

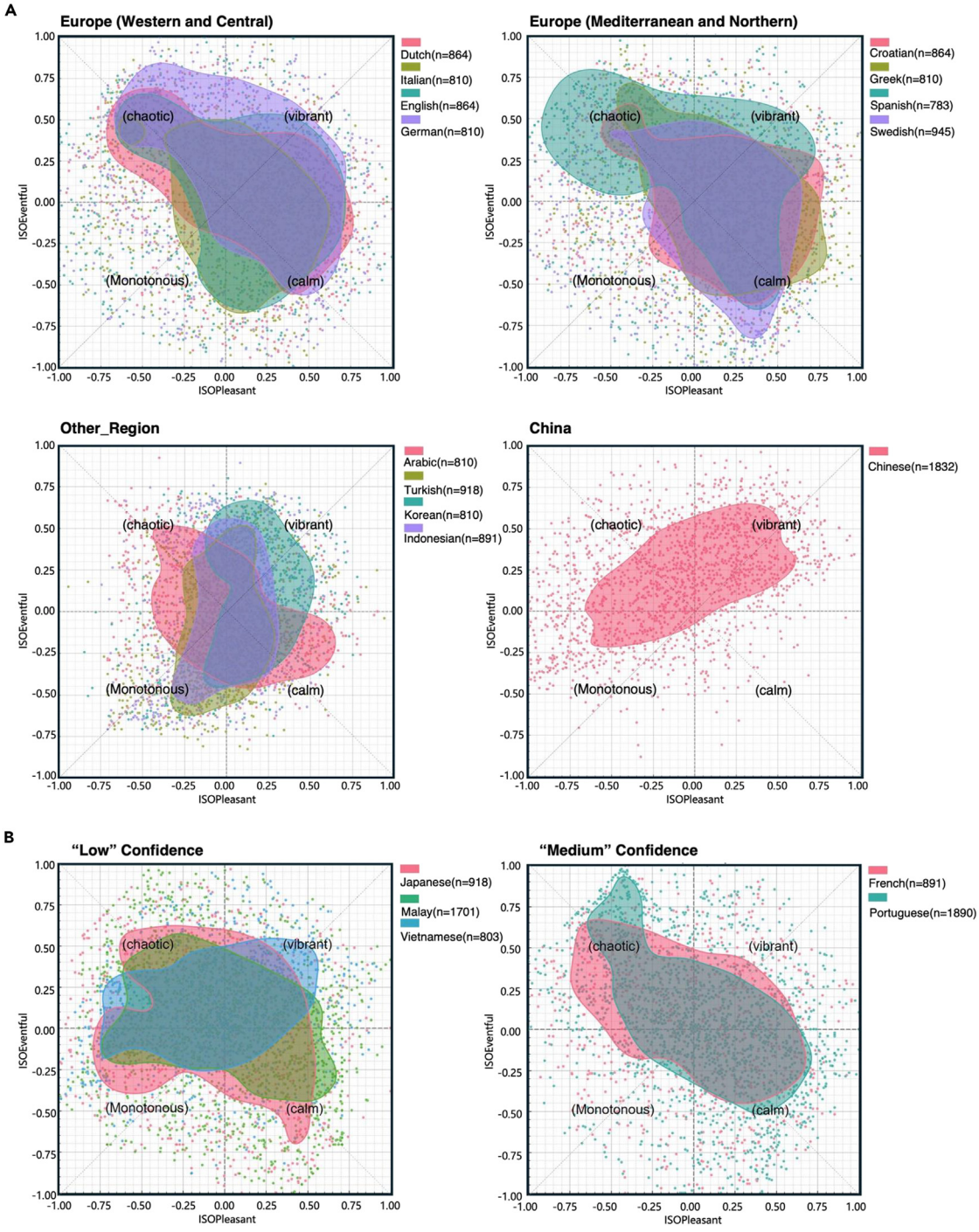


**Figure 2. SAQ assessment results of different languages**

(A) Thirteen languages that showed high confidence. (B) Five laguages that showed low and medium confidence. Each point represents a sample, and the shaded areas represent contours that enclose 50% samples.[7,31] It can be seen that European countries with close geographical proximities showed similar distributions. Data adapted from Oberman et al.[32]

between collectivism and individualization, establishing a fluid equilibrium between group orientation and individual assertiveness.[42] In comparison, Japan has developed public norms of homogenized silence, wherein silence and non-interference social etiquette are employed to maintain collective harmony. This behavioral code fosters an implicit spatial order characterized by negative space.[43] This implies that the structure of SAQ may differ significantly across cultures—emotions are like stars, with different cultural systems interpreting constellations differently. For example, constellations such as the Big Dipper, initially considered fundamental and powerful entities, are now understood as constructs observed from specific perspectives.

## THE NECESSITY OF ESTABLISHING CULTURALLY TAILORED MEASUREMENT INSTRUMENTS

Measurement of perception involves complex psychometric issues. When transferring specific soundscape measurement tools or theoretical frameworks from one cultural context to another, the imposed

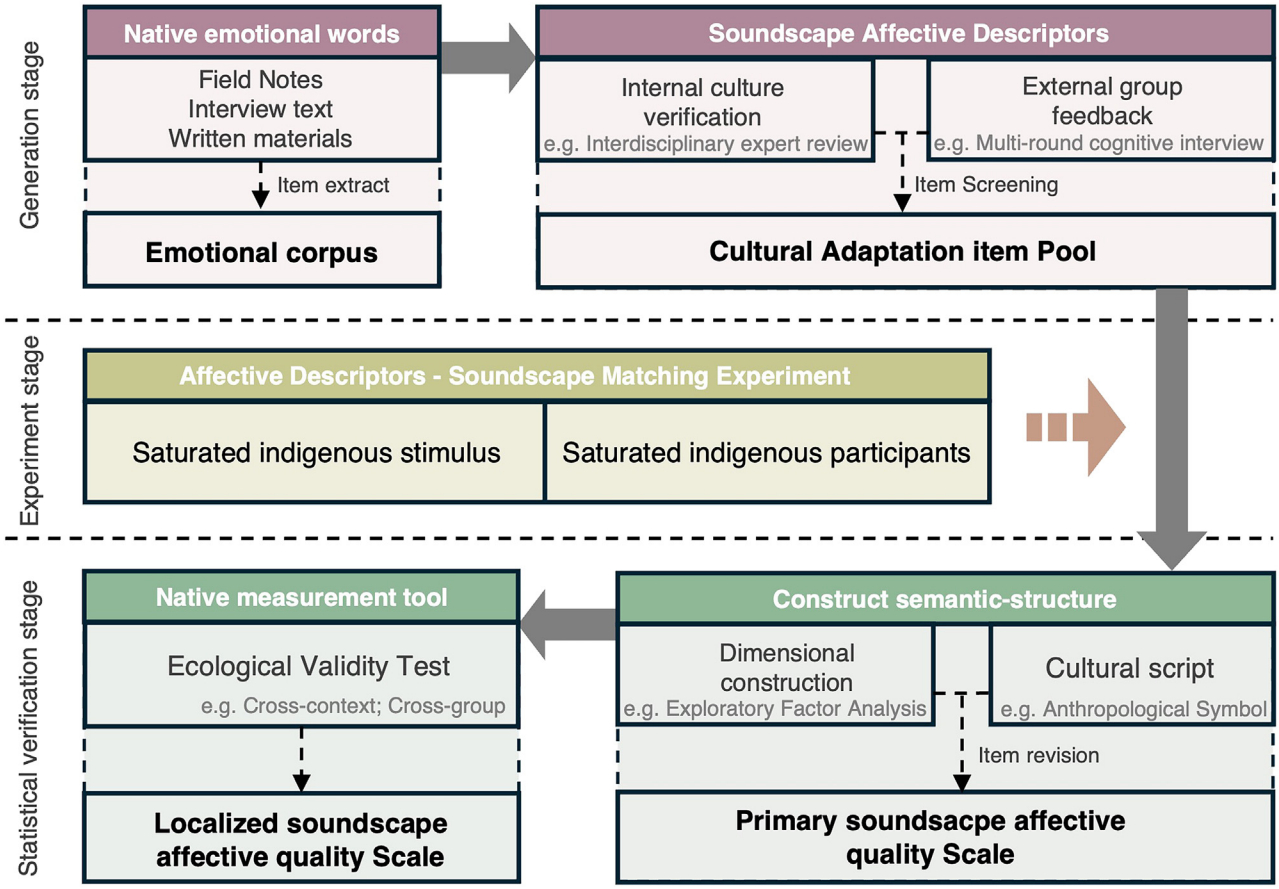


**Figure 3. Development flowchart of localized SAQ scale**
The scale is divided into three stages: the generation stage, the experimental stage, and the statistical verification stage.

etic approach must be considered carefully. This approach may unintentionally place excessive emphasis on Western characteristics and assumptions. In personality research, differences in personality structures across cultures indicate that directly transplanting measurement instruments may lead to measurement bias.[44] The observed discrepancies in existing soundscape perceived affective quality models when measuring emotional distributions across cultural soundscapes may precisely reflect such issues. Differences at structural, methodological, or item levels could lead to interpretive biases. When adopting imported instruments, emic aspects of the structure remain concealed.

To avoid this situation, different cultures should strive to develop their own culturally contextualized soundscape emotion measurement tools through an emic approach, thereby examining the applicability of imported instruments. That is, theories should be constructed from the bottom up based on local phenomena and culturally derived experiences within a specific cultural context, using emic concepts to interpret and organize data from that cultural group. Emic structures and measurements must demonstrate incremental validity beyond that provided by etic measurements, a point already established in the affective domain. Hamid and Cheng developed a localized Chinese affective scale based on descriptions of local emotional experiences.[45] Compared with the PANAS (Positive and Negative Affect Schedule) scale,[46] they found that the localized scale performed better in emotion-induction procedures, sensitivity to daily emotional fluctuations, and convergent validity, and exhibited significant advantages in discriminant validity. Indeed, Wu et al.[47] developed an indigenous Chinese soundscape perceived affective quality scale and, in comparison with an imported instrument,[15] found that the emic measurement captured a broader range of emotions, whereas the etic measurement overestimated positive affect and activation. Furthermore, the emic structure demonstrated stronger explanatory power through objective indicators in regression models. This suggests that culturally specific environmental affective scales can more accurately measure affective characteristics within a particular culture.

## NATIONAL STRATEGIES FOR CULTURALLY ADAPTED SOUNDSCAPE EMOTION MEASUREMENT

To effectively address the challenges in assessing the affective meaning of environments, the development of culturally localized SAQ scales requires standardized representative local samples and normative research procedures, with the core principle of discarding assumptions of cultural universality. Specifically, several key steps should be considered when developing localized measurement tools, as illustrated in Figure 3. In the generation phase, researchers should capture the subjective experiences and emotional expressions of the target cultural group (e.g., Chinese populations) toward soundscapes through textual investigations such as semi-structured interviews (including soundscape narratives and affective metaphor associations), in-depth interviews, field observation systems, and written materials (e.g., poetry, novels and academic literature). Particular attention should be paid to identifying indigenous emotional vocabulary and establishing a local affective corpus. Subsequently, internal cultural validation (focus groups involving experts in environmental affective domains collaborating with linguists, sociologists, and other relevant specialists) and external group feedback (multi-round interviews with stratified sampled groups) should be conducted based on the local affective corpus. By verifying the cultural sensitivity of emotional words items, SADs can be screened, resulting in an item pool suitable for describing the original cultural context. In the experimental phase, participants experience and evaluate soundscape stimuli to obtain matched data between soundscapes

and affective descriptors. The soundscape stimuli should be standardized recordings collected from diverse urban spaces, while the composition of participants should reach cultural information saturation. In the statistical validation phase, dimensional structures are constructed by integrating dual perspectives from cultural theory and psychometrics, and scale items are determined; on the one hand, latent dimensions are identified through exploratory factor analysis, and on the other hand, anthropological interpretations of the factor structure are conducted based on cultural scripts. The initial SAQ scale should undergo ecological validity testing across contexts and groups to verify the universal boundaries of its cultural explanatory power, ultimately yielding a culturally localized SAQ scale.

In the context of globalization and cultural diversity, soundscape emotion measurement tools should ensure adaptability across different cultures. Localized tools and universal tools are essentially complementary rather than contradictory. The former do not negate the latter; rather, they deepen and extend existing universal tools by embedding cultural elements (e.g., indigenous emotional vocabulary, environmental stimulus characteristics, participant attributes) to construct affective semantic spaces. Universal tools provide a unified theoretical framework, laying the foundation for soundscape affective research, while localized tools help reveal the specific influences of culture on soundscape affect, identifying culturally specific or culturally stable features within soundscape affective structures. Researchers should adopt dynamic strategies to address different situations. When localized tools and universal tools demonstrate consistency, universal tools can be adopted directly (situation 1); if any items show limitations in cultural adaptability, adjustments and optimization are required (situation 2); when significant culturally specific phenomena are identified, measurement tools developed through emic approaches must be employed (situation 3). Moving beyond the limitations of a single method, avoiding misunderstandings of soundscape affective characteristics due to tool misuse, is essential. Constructing a culturally sensitive measurement system that achieves integration and balance between universality and cultural specificity is a critical pathway for advancing soundscape affective research.

Promoting research paradigms that consider both global perspectives and cultural inclusivity contributes to enhancing the understanding and description of affective experiences within specific cultural contexts, supporting urban planners and managers in formulating sustainable development strategies consistent with regional cultural characteristics.[48] Additionally, intra-cultural diversity should be considered to clarify potential subcultural influences, such as urban-rural and intergenerational differences. Future research would benefit significantly from an interdisciplinary approach that combines insights from anthropology, sociology, urban planning, and acoustics to provide a comprehensive understanding of how cultural norms influence soundscape perception. Such collaborative efforts could bridge the gap between quantitative acoustic measurements and qualitative cultural interpretations, offering a more holistic framework for soundscape assessment. Furthermore, the development of environmental emotion measurement instruments for special groups should be prioritized to promote cultural respect and social inclusion. For example, soundscape assessment instruments specifically designed for individuals with autism, who are sensitive to auditory stimuli, can be created. These specialized instruments take into account their unique sensitivities and emotional responses, ensuring accurate and meaningful assessments. Embracing cultural diversity in soundscape emotion measurement will help create urban environments conducive to the well-being of all residents, promoting more harmonious and resilient communities.

## ACKNOWLEDGMENTS

Y.Z. and J.K. acknowledge the European Research Council Advanced Grant (no. 740696).

## AUTHOR CONTRIBUTIONS

J.K. and Y.Z. conceived the idea. D.W. performed the analysis and drafted the initial manuscript. Y.Z. and J.K. reviewed and modified the manuscript. All authors read and agreed to the final version of the manuscript and agree to the publication under the supervision of Y.Z. and J.K.

## DECLARATION OF INTERESTS

The authors declare no competing interests.

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