Chapter 4 / Capítulo 4

Habitability, territory, and sustainability: Interdisciplinary studies on housing, environment, and society in northwestern Mexico
ISBN: 978-9915-9966-6-0
DOI: 10.62486/978-9915-9966-6-0.Ch04
Pages: 45-57

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Odours, waste and urban landscape at the Pino Suárez Market: Olfactory and psychological habitability

Olores, Basura y Paisaje Urbano en el Mercado Pino Suárez: habitabilidad olfativa y psicológica

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ABSTRACT

Odour, waste and the state of the urban landscape shape the habitability of traditional public markets, yet they are rarely measured from the users' perspective. Using the preliminary data cut from the pilot survey of project FZ-HAB-0012 on the Factoriza UAS platform, this study described the initial behaviour of a fifteen-item scale with three dimensions, Odour annoyance, Urban landscape and Well-being, at the Pino Suárez Market in Mazatlán, Sinaloa, Mexico. With a cross-sectional design, 12 cases out of a target of 100 were analysed while data collection remained open. Descriptive statistics, Cronbach's alpha, McDonald's omega total and Spearman correlations between dimensions were estimated, and an exploratory factor analysis was attempted. Internal consistency was low for Odour annoyance (α = .397), where items R2 and R3 did not covary with the rest, acceptable for Urban landscape (α = .714), with item R8 running in the opposite direction, and moderate for Well-being (α = .659; ω = .702). The factor analysis was not interpretable because the correlation matrix was singular and the solution showed a Heywood case. Urban landscape and Well-being were positively associated (ρ = .795, 95% CI [.323, .950]); the other correlations had intervals that included zero. The findings do not yet provide structural validity evidence and point to revisions of the instrument, particularly of its odour dimension.

Keywords: smellscape; urban cleanliness; traditional market; psychometric evidence

RESUMEN

El olor, la basura y el estado del paisaje urbano condicionan la habitabilidad de los mercados públicos tradicionales, pero rara vez se miden desde la experiencia de sus usuarios. Este estudio describió, en el corte preliminar del levantamiento piloto del proyecto FZ-HAB-0012 de Factoriza UAS, el comportamiento inicial de una escala de quince reactivos con tres dimensiones: Molestia olfativa, Paisaje urbano y Bienestar en el Mercado Pino Suárez de Mazatlán, Sinaloa. Con diseño transversal, se analizaron 12 casos de una meta de 100, con el levantamiento abierto. Se estimaron descriptivos, alfa de Cronbach, omega total y correlaciones de Spearman entre dimensiones, y se intentó un análisis factorial exploratorio. La consistencia interna fue baja en Molestia olfativa (α = .397), donde R2 y R3 no covariaron con el resto, aceptable en Paisaje urbano (α = .714), con R8 en sentido contrario, y moderada en Bienestar (α = .659; ω = .702). El análisis factorial no fue interpretable porque la matriz de correlaciones resultó singular y la solución presentó un caso Heywood. Paisaje urbano y Bienestar se asociaron de forma positiva (ρ = .795, IC 95 % [.323, .950]); las demás correlaciones tuvieron intervalos que incluyen el cero. Los resultados no aportan todavía evidencias de validez estructural y orientan la revisión del instrumento, en especial de su dimensión olfativa.

Palabras clave: paisaje olfativo; limpieza urbana; mercado tradicional; evidencias psicométricas

INTRODUCTION

Traditional public markets are more than food supply facilities. In Mexican cities, they bring together the daily purchase of fresh food, the work of hundreds of stallholders, social encounters, and a recognizable part of urban memory. Their habitability, however, depends on conditions that are not always addressed in planning: ventilation, waste management, the cleanliness of surrounding streets, and the upkeep of the building.

Among these conditions, odor occupies a peculiar place. It is one of the first qualities perceived by anyone entering a market; it can be a source of identity and appetite or of rejection and avoidance, and it is rarely measured systematically.

Research on the olfactory landscape, or smellscape, has grown over the past decade and has shown that odors contribute to place identity, to memory, and to the emotional experience of the built environment, whereas odor pollution from waste, traffic, or food areas can impair quality of life and alter how people behave in the space (Xiao et al., 2021; Xiao et al., 2022).

Studies using multisensory assessments have also documented that odors and sounds interact in the evaluation of public spaces: food odors improved ratings of the acoustic environment of pedestrian streets, whereas pollution odors worsened them (Ba et al., 2023).

In traditional markets, Ling et al. (2022) applied smellwalk methods to zone the smellscape of a market in Kunming and to distinguish areas worth preserving from those requiring improvement.

Waste management is the other side of the problem. Studies on urban cleanliness show that commercial land uses tend to accumulate more litter than residential ones (Farzadkia et al., 2023), although cleanliness in commercial and tourist areas can reach high levels when the service is targeted at them (Guedes et al., 2026). They also show that perceived dirtiness of the surrounding area is associated with residents' negative assessments of the quality of their neighborhood (Giustiniani et al., 2024).

In food markets, the perceived hygiene conditions of facilities, products and food handlers are among the criteria on which consumer trust rests (Verdú et al., 2021).

The Pino Suárez Market, in the historic center of Mazatlán, brings these dimensions together. It is a metal-frame building inaugurated in 1899 and renamed in 1915 after Vice President José María Pino Suárez, and is among the historic buildings described on the city's historic center website (Centro Histórico Mazatlán, n.d.).

It functions as a supply market for the resident population and as an attraction for visitors, and commercial activity, the loading and unloading of goods, and waste generation are concentrated in its adjacent streets. Despite its relevance, no empirical studies were identified that assess the olfactory experience, the perception of the urban landscape, and the well-being of the people who use this market.

In Latin America, research on markets has favored historical, political and ethnographic approaches. In Mexico City, Tellez Contreras (2025) showed that the repair and maintenance of deteriorated public markets are negotiated among stallholders, officials and politicians, and that these practices preserve markets as socially valuable urban infrastructure while also reproducing clientelist relations.

In Acapulco, Leal-Martínez et al. (2026) documented that residents continue to use the market and other public spaces despite their material shortcomings, and that the meaning of these places is constructed in everyday life. These contributions highlight that the material quality of the market and people's attachment to it are distinct dimensions that should be measured separately.

Project FZ-HAB-0012 of the Factoriza UAS platform set out to study the olfactory and psychological habitability of the Pino Suárez Market using a fifteen-item scale organized into three dimensions: Olfactory Annoyance in the Market, Market Urban Landscape, and Well-being in the Market. This article reports the results of the first pilot survey, based on a very small preliminary data cut; its scope is therefore limited to the initial review of the instrument.

The overall objective was to describe the initial behavior of an olfactory and psychological habitability scale in the preliminary data cut of its pilot survey at the Pino Suárez Market in Mazatlán.

The specific objectives were, first, to describe the distribution of responses to each item; second, to estimate the internal consistency of each dimension using alpha and omega coefficients; third, to assess the feasibility of an internal structure analysis with the available sample size; and fourth, to explore the relationship between the scores on the three dimensions. The project did not state any hypotheses, so the study is descriptive and exploratory in scope.

https://doi.org/10.62486/978-9915-9966-6-0.Ch04

DEVELOPMENT

THE SMELLSCAPE AS A DIMENSION OF HABITABILITY

The concept of smellscape refers to the relationship between people, odours and the built environment. The review by Xiao et al. (2021) placed the field's challenges in three areas (methodological approaches, artistic design interventions and museum practices, and odour policy-making) and proposed odour archives, social justice in odour control and research on building materials as directions for future research.

In their introduction to a collection of papers on odors and well-being, Xiao et al. (2022) emphasized that odors give places their identity and can connect people emotionally to their surroundings, but that odor pollution from waste, traffic or food areas can compromise quality of life and lead to changes in behavior.

Empirical studies on the urban smellscape have been concentrated in China and have combined smellwalks, questionnaires and social media data.

In the old city centre of Guangzhou, Gao et al. (2022) classified urban odours into eleven categories and found that food odours were the most frequent and that unpleasant odours came mainly from domestic discharges, drains and construction works. They also associated areas with pleasant food and nature odours with more positive emotional scores.

In a park in Beijing, Wang et al. (2024) found that ratings of the visual, olfactory, and overall experience were strongly interrelated, indicating that the multisensory experience functions as a whole. In the Chinese-language literature, Li and Liu (2024) incorporated smell, together with the other senses, into a park design model aimed at psychological well-being.

In the instrument under study, the Olfactory Annoyance in the Market dimension captures this perspective from the negative pole: the presence of unpleasant odors (R1), the perception of the smell of garbage near the stalls (R2), the avoidance of areas because of their odor (R3), the perception that the air smells clean (R4, reverse-scored), and the loss of appetite due to odors (R5).

These items combine an affective evaluation, a source attribution, an avoidance behavior, and a physiological consequence, which the literature treats as related but distinguishable facets of olfactory experience.

LITTER, CLEANLINESS AND THE URBAN LANDSCAPE

The cleanliness of public space is a visible component of urban quality. Farzadkia et al. (2023) proposed a clean environment index to assess litter and found that commercial land use was classified as dirty and residential land use as clean.

In Porto, Guedes et al. (2026) found that commercial, tourist and riverside areas were the cleanest and that citizens' perception of the city's cleanliness was favorable, which suggests that the outcome depends on how the street-cleaning service is oriented. In Buenos Aires, Giustiniani et al. (2024) documented a predominantly negative perception of street cleanliness around a recycling center, attributed to litter scattered next to the containers, and found that it coincided with the lowest cleanliness indices.

The Market Urban Landscape dimension brings together aesthetic assessments of the building (R6), the cleanliness of the surrounding area (R7) and the accumulation of litter in nearby streets (R8, reverse-scored), along with the enjoyment of walking through the market (R9) and its value as a traditional place (R10). As with the olfactory dimension, its composition is heterogeneous: it combines judgments about the building itself, the condition of the surrounding public space and the heritage significance of the place, which could behave differently.

THE MARKET AS PLACE: EVERYDAY HERITAGE AND ATTACHMENT

Traditional markets have been studied as places of attachment and living heritage. Ledesma and Giusti (2021) analyzed Latino vendor markets in California and Texas from the perspective of place attachment. They found that these markets are living spaces where attachment and a sense of belonging are expressed, owing to the combination of economic activity, social interaction and physical setting.

In Dublin, Bonnin and Moore-Cherry (2023) proposed viewing traditional market trade as everyday heritage, worthy of protection against urban renewal that tends to instrumentalize built heritage. In their review of place attachment in urban settings, Kamani Fard and Paydar

https://doi.org/10.62486/978-9915-9966-6-0.Ch04

(2024) noted that social interaction and local characteristics expressing history and culture are associated with a stronger bond.

Item R10, which asks whether the market retains its value as a traditional place in the city, introduces this heritage dimension into the urban landscape scale. Its behavior relative to the cleanliness and aesthetics items will make it possible to assess whether the market's symbolic value holds regardless of its material condition, as suggested by studies that describe the continued use of public spaces despite their shortcomings (Leal-Martínez et al., 2026).

PSYCHOLOGICAL WELL-BEING IN FOOD SUPPLY SPACES

The third dimension of the instrument, Well-being at the market, refers to users' affective experience: feeling at ease while shopping (R11), the good mood the visit produces (R12), discomfort inside the market (R13, reverse-scored), enjoyment of spending time there (R14), and willingness to recommend it to a visitor (R15).

The literature on smellscapes and urban cleanliness suggests that these experiences are related to the sensory conditions of the place (Wang et al., 2024; Xiao et al., 2022). Research on markets indicates that consumer trust rests on the perceived hygiene of the facilities and products (Verdú et al., 2021). Given the cross-sectional design, any relationship between olfactory annoyance, urban landscape, and well-being should be understood as an association rather than a relationship of dependence.

METHODOLOGY

DESIGN

A quantitative, non-experimental, cross-sectional study with a descriptive and exploratory scope was conducted. The data correspond to survey LEV-0017, "Piloto Mercado Pino Suárez · Olores y paisaje," from project FZ-HAB-0012 on the Factoriza UAS platform, and to the frozen dataset DST-0019, with a data cut-off date of 9 October 2026. The survey is an independent sample and the only one in the project.

POPULATION, SAMPLE AND DATA CUT-OFF

The survey population was defined as individuals aged 18 years or older who visit or work at the Pino Suárez Market in Mazatlán. The study area comprises the market and its adjacent streets, and administration was organized according to the locations and time slots of an observation protocol. According to the Factoriza log, 22 individuals opened the questionnaire and 12 completed it; no cases were excluded on quality-control grounds, so 12 cases were analyzed (Table 2).

The analyzed data cut is preliminary: it comprises 12 cases out of a target of 100, and data collection was still open and in the field as of the cut-off date. With 12 cases for 15 items, the ratio is 0.8 cases per item, below what an analysis of internal structure requires; the adequacy of the data and the sample is the first condition that the methodological literature asks researchers to verify in item factor analysis (Ferrando et al., 2022; Goretzko et al., 2021). The population includes both visitors and people who work at the market, but the dataset does not distinguish between them.

INSTRUMENT

A fifteen-item scale was administered, with a five-point response format ranging from Strongly disagree (1) to Strongly agree (5). The items were organized into three dimensions of five items each: Olfactory Annoyance in the Market (R1 to R5), Urban Landscape of the Market (R6 to R10), and Well-Being in the Market (R11 to R15).

Three items are reverse-worded: R4 ("The air in the market smells clean"), R8 ("There is accumulated garbage in the streets near the market") and R13 ("I feel uncomfortable inside the market"); all three have already been recoded in the data matrix. After recoding, a higher score indicates greater olfactory annoyance, a more favorable assessment of the urban landscape and greater well-being, respectively. Table 1 presents the code, dimension, wording and direction of each item.

https://doi.org/10.62486/978-9915-9966-6-0.Ch04

Table 1. Structure of the instrument.

Code	Dimension	Item	Reverse
R1	Olfactory annoyance at the market	There are odors at the market that bother me	No
R2	Olfactory nuisance in the market	The smell of garbage is perceived near the stalls	No
R3	Olfactory annoyance at the market	I avoid certain areas of the market because of their odor	No
R4	Olfactory discomfort at the market	The air in the market smells clean	Yes
R5	Olfactory discomfort at the market	The smells from the market take away my appetite	No
R6	Urban landscape of the market	I find the market building attractive	No
R7	Urban landscape of the market	The surroundings of the market look clean	No
R8	Urban landscape of the market	There is accumulated garbage in the streets near the market	Yes
R9	Urban landscape of the market	I enjoy walking through the market	No
R10	Urban landscape of the market	The market retains its value as a traditional place in the city	No
R11	Well-being at the market	I feel comfortable while doing my shopping at the market	No
R12	Well-being at the market	Visiting the market puts me in a good mood	No
R13	Well-being in the market	I feel uncomfortable in the market	Yes
R14	Well-being at the market	I like spending time at the market	No
R15	Well-being at the market	I would recommend that a visitor get to know the market	No

Note. Five-point response scale (Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree). Reverse-scored items have already been recoded in the delivered data matrix. Source: Factoriza UAS, project FZ-HAB-0012, survey LEV-0017, dataset DST-0019.

PROCEDURE

Responses were collected through the survey questionnaire administered on Factoriza UAS, which records express online informed consent before the first item and does not collect identifying data. Factoriza froze the DST-0019 dataset with a cryptographic hash, generated the matrix with the reverse-scored items recoded, and produced the descriptive and internal-consistency analyses (runs RUN-00095 to RUN-00101). The supplementary analyses were run on the data file and item dictionary exported by the platform.

DATA ANALYSIS

In the first stage, Factoriza UAS calculated the mean, standard deviation, skewness, kurtosis, and percentages of responses at the extreme values for each item, as well as the internal consistency of each dimension using Cronbach's alpha (Cronbach, 1951), together with the corrected item-total correlation and alpha if item deleted.

In a second stage, the program analisis_psicometrico.py, version 1.0, was run in Python 3.13.16 (Python Software Foundation, 2026), with NumPy 2.5.3 (Harris et al., 2020), SciPy 1.18.1 (Virtanen et al., 2020), and pandas 3.0.5. The program applies fixed, explicitly stated procedures, with no manual intervention in the calculations.

The program estimated McDonald's omega total (McDonald, 1999/2013) for each dimension from a one-factor model, without reverse-scoring items; when any item correlates negatively with the rest of its dimension, the program does not report omega because the coefficient is no longer interpretable.

It also attempted an exploratory factor analysis of the fifteen items, preceded by the Kaiser-Meyer-Olkin measure of sampling adequacy (Kaiser, 1974), item-level sampling adequacy (Lorenzo-Seva and Ferrando, 2021) and Bartlett's test of sphericity (Bartlett, 1950), with the number of factors determined by parallel analysis, minimum residual extraction and oblimin rotation; the classical indices are cited in their original sources because they are the reference for each procedure.

Finally, it estimated the relationship between the mean dimension scores using Spearman's coefficient and its 95% confidence interval, via the Fisher transformation with the standard error proposed by Bonett and Wright (2000).

The reference values for interpreting the indices are treated as guidelines rather than decision rules (Ferrando et al., 2022). No items were removed; the program flags problematic items and leaves the decision to the authors. Confirmatory factor analysis was not performed and is proposed as future work.

https://doi.org/10.62486/978-9915-9966-6-0.Ch04

ETHICAL CONSIDERATIONS

Participation was voluntary and anonymous. Factoriza UAS records explicit informed consent online and does not collect names, email addresses or any other identifying data. Anonymity is particularly relevant for people who work in the market, because their opinions about cleanliness or odors could affect their relationship with the management or with other stallholders.

STATEMENT ON THE USE OF ARTIFICIAL INTELLIGENCE

The following tools were used in preparing this manuscript: the Factoriza UAS platform, for data management and descriptive and internal consistency analyses; a Python analysis program with fixed and validated procedures, for omega, exploratory factor analysis and correlations between dimensions; and the Claude Opus language model (Anthropic), for running that program, assisted literature searching, writing a draft and assembling the document from the results. The authors reviewed, corrected and approved the entire text, verified every reference and take full responsibility for the content of the article.

RESULTS

SAMPLE COMPOSITION

Table 2 summarizes the case flow. Of the 22 individuals who opened the questionnaire, 12 completed it and were analyzed, with no quality-control exclusions. The gap between questionnaires opened and completed indicates a high proportion of unfinished questionnaires, an issue that should be reviewed when designing the field administration. All analyzed cases answered all fifteen items.

Table 2. Sample composition.

Indicator	Value
People who opened the questionnaire	22
Completed questionnaires	12
Cases excluded by quality control	0
Cases analyzed	12
Items	15

Note. Survey “Piloto Mercado Pino Suárez · Olores y paisaje” [Pino Suárez Market Pilot · Smells and Landscape] (LEV-0017); population: people aged 18 years or older who visit or work at the Mercado Pino Suárez in Mazatlán; area: Mercado Pino Suárez and adjacent streets, Mazatlán, Sinaloa, at the locations and times specified in the observation protocol. Dataset DST-0019, fingerprint 6a6d54350df96142. Source: Factoriza UAS. Preliminary cutoff: n = 12 of a target of 100, with the survey still open.

DESCRIPTIVE STATISTICS

Table 3 and Figure 1 present the descriptive statistics. For Olfactory Annoyance, the highest mean was for R3, avoidance of certain areas of the market because of the odor (*M* = 4.08, *SD* = 1.00), followed by R1, the presence of annoying odors, and R2, the smell of garbage near the stalls, both with *M* = 3.67 (*SD* = 0.98 and 0.89, respectively).

The lowest mean in the dimension was for R4 (recoded), the perception that the air does not smell clean (*M* = 3.33, *SD* = 1.30). Overall, annoyance scores were above the midpoint of the scale.

In Urban Landscape, the highest mean was for R10, the value of the market as a traditional place (*M* = 3.33, *SD* = 0.98), and the lowest were for R7, the cleanliness of the surroundings (*M* = 2.42, *SD* = 1.00), and R9, the enjoyment of walking through the market (*M* = 2.50, *SD* = 0.90); R8, the accumulation of garbage in nearby streets (recoded), had *M* = 2.67 (*SD* = 0.89).

For Well-being, the highest mean was for R15, recommending the market to a visitor (*M* = 3.17, *SD* = 0.72), and the lowest was for R14, enjoying spending time at the market (*M* = 2.25, *SD* = 0.75). The distribution of R1 was markedly skewed and peaked (skewness = -1.93; kurtosis = 5.05), but with 12 cases, these indices are unstable.

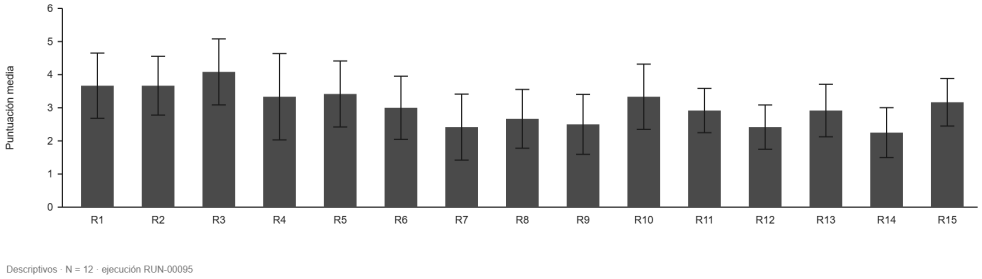
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Table 3. Descriptive statistics of the items.

Item	M	SD	Skewness	Kurtosis	Floor	Ceiling
R1	3.67	0.98	-1.93	5.05	8%	8%
R2	3.67	0.89	-0.14	-0.25	8%	17%
R3	4.08	1.00	-0.85	-0.01	8%	42%
R4	3.33	1.30	-0.15	-0.77	8%	25%
R5	3.42	1.00	0.27	-0.65	17%	17%
R6	3.00	0.95	-0.76	0.16	8%	33%
R7	2.42	1.00	0.27	-0.65	17%	17%
R8	2.67	0.89	-0.14	-0.25	8%	17%
R9	2.50	0.90	-0.44	-0.33	17%	8%
R10	3.33	0.98	-0.81	2.37	8%	8%
R11	2.92	0.67	0.09	-0.19	25%	17%
R12	2.42	0.67	-0.74	-0.19	8%	50%
R13	2.92	0.79	0.16	-1.26	33%	25%
R14	2.25	0.75	-0.48	-0.87	17%	42%
R15	3.17	0.72	-0.26	-0.69	17%	33%

Note.N = 12. Floor and ceiling indicate the percentage of responses at the minimum and maximum values. The item-total correlation column across the fifteen items is omitted because it combines three dimensions; the item-total correlation by dimension is presented in Table 4. Run RUN-00095 of Factoriza UAS. Preliminary data cut: n = 12 of a target of 100, with data collection still open.

Figure 1. Mean scores per item with error bars representing one standard deviation.



INTERNAL CONSISTENCY

Table 4 summarizes the item analysis by dimension computed with Factoriza, and Table 5 presents the coefficients from the complementary program. The alpha values were identical in both calculations. The Well-being in the market dimension had $\alpha = .659$ and $\omega = .702$.

For Urban Landscape of the Market, alpha was .714, but omega is not reported because R8 correlated negatively with the rest of the dimension. For Olfactory Nuisance in the Market, alpha was .397, and omega is likewise not reported because R2 and R3 correlated negatively with the rest of the dimension.

The item-level analysis pinpoints the problems. In Olfactory annoyance, R2 showed a corrected item-total correlation of -.111 and R3 one of -.003, so the perception of garbage odor near the stalls and the avoidance of areas because of their odor did not covary with the rest of the dimension; deleting R2 would raise alpha to .531.

Conversely, R4 had the highest correlation (.490), and its deletion would reduce alpha to .016, indicating that the low consistency of the dimension rests almost entirely on R4 and R5. In Urban landscape, R8 showed a correlation of -.065, and removing it would raise alpha to .843, whereas R6, R9, and R10 had correlations ranging from .686 to .699. In Well-being, R13 (recoded discomfort inside the market) was the least coherent item (.151), and its deletion would raise alpha to .732.

https://doi.org/10.62486/978-9915-9966-6-0.Ch04

Table 4. Item analysis by dimension.

Dimension	Item	Corrected item-total r	α if item deleted
Olfactory annoyance at the market	R1	.228	.325
Odor nuisance at the market	R2	-.111	.531
Odor nuisance at the market	R3	-.003	.485
Odor nuisance at the market	R4	.490	.016
Odor nuisance at the market	R5	.462	.131
Urban landscape of the market	R6	.686	.574
Urban landscape of the market	R7	.466	.670
Urban landscape of the market	R8	-.065	.843
Urban landscape of the market	R9	.693	.577
Urban landscape of the market	R10	.699	.565
Market welfare	R11	.551	.547
Market welfare	R12	.390	.618
Market welfare	R13	.151	.732
Well-being in the market	R14	.660	.477
Market welfare	R15	.384	.620

Note.N = 12. Scale from 1 to 5; reverse-scored items R4, R8 and R13 are shown recoded. Run RUN-00095 of Factoriza UAS. Preliminary cutoff: n = 12 out of a target of 100, with data collection still open.

Table 5. Internal consistency by dimension.

Dimension	Items	n	α	ω	Observation
Olfactory nuisance at the market	5	12	.397		Reverse-worded items: R2, R3; ω not interpretable
Urban landscape of the market	5	12	.714		Reverse-worded items: R8; ω not interpretable
Market well-being	5	12	.659	.702	

Note.N = 12. The corrected item-total correlation excludes the item itself from the total of its dimension. Cronbach's α for the full dimension, with 5 items each: Olfactory Nuisance in the Market = .397 (run RUN-00096); Urban Landscape of the Market = .714 (RUN-00098); Well-being in the Market = .659 (RUN-00100). Source: Factoriza UAS, Tables 4, 6, and 8 of the package, combined without modifying values. Preliminary cutoff: n = 12 out of a target of 100, with data collection still open.

INTERNAL STRUCTURE

The planned exploratory factor analysis could not be estimated in an interpretable way, and its results are not presented in tables. With 12 cases and 15 items, the correlation matrix is not invertible, so the Kaiser-Meyer-Olkin overall measure of sampling adequacy and the item-level sampling adequacy could not be computed.

Bartlett's test yielded a numerical value, but with a singular matrix the determinant is practically zero and the statistic has no meaningful interpretation. Parallel analysis suggested one factor, and the solution showed a communality greater than 1 for R9 (1.001), that is, a Heywood case indicating an improper solution. These results are reported in the reproducibility appendix, but they provide no evidence regarding the dimensionality of the instrument and should not be cited as such.

RELATIONSHIP BETWEEN THE DIMENSIONS

Table 6 presents the Spearman correlations between the mean scores of the three dimensions, based on 12 cases. The relationship between Urban landscape and Well-being in the market was positive and strong, ρ = .795, 95% CI [.323, .950], p = .002; it was the only one whose interval excluded zero.

The relationship between Odor annoyance and Well-being was negative and moderate, ρ = -.509, 95% CI [-.850, .132], p = .091. For Odor annoyance and Urban landscape, the relationship was negative and weak, ρ = -.238, 95% CI [-.719, .397], p = .457. Because the Odor annoyance and Urban

https://doi.org/10.62486/978-9915-9966-6-0.Ch04

landscape scores include items that do not covary with their dimension, these correlations should be interpreted with particular caution.

Table 6. Correlations between dimensions.

Dimension pair	n	ρ	IC 95 %	p
Olfactory annoyance in the market and Urban landscape of the market	12	-.238	[-.719, .397]	.457
Odor annoyance at the market and Well-being at the market	12	-.509	[-.850, .132]	.091
Market Urban Landscape and Market Well-being	12	.795	[.323, .950]	.002

Note.α = Cronbach's alpha; ω = McDonald's omega total from a one-factor minimum-residual model, without reverse-scoring items. Complete cases per dimension. Source: Own work using analisis_psicometrico.py 1.0 (Python 3.13.16), dataset DST-0019_FZ_HAB_0012. Preliminary cutoff: n = 12 of a target of 100, with data collection ongoing.

DISCUSSION OF RESULTS

The purpose of this study was to describe the initial behavior of an olfactory and psychological habitability scale at the Pino Suárez Market. The central finding is that the Olfactory Annoyance dimension, the core of the project, did not behave as a homogeneous scale in this wave: its alpha was low, two of its five items did not covary with the rest, and the consistency it did show depended on two items.

With 12 cases, this pattern may be due in part to sampling error, but it also offers substantive clues worth examining before data collection is closed. The simulation literature on alpha and omega coefficients is based on samples much larger than the one in this data wave (Malkewitz et al., 2023), so all coefficients should be read as provisional.

The lack of covariation of R2 and R3 with the rest of the olfactory dimension is consistent with the content heterogeneity noted in the theoretical framework. R2 describes the attribution of a source, namely the smell of garbage near the stalls, and R3 an avoidance behavior, whereas R1, R4 and R5 express an affective appraisal of the odor and its consequences. The fact that avoiding areas because of their odor had the highest mean in the set, without covarying with general annoyance, suggests that avoiding certain areas may be a habitual part of how the market is used, one that does not necessarily imply an overall negative appraisal.

The review by Xiao et al. (2021) and studies of market smellscapes (Ling et al., 2022) indicate that the odors in a market are not homogeneous and that their evaluation depends on the area. This supports using items that refer to specific areas or sources, not only to the market as a whole.

In the urban landscape dimension, the behavior of R8 warrants technical verification before any substantive interpretation. After recoding, a high score on R8 should indicate less accumulated litter and should therefore covary positively with the cleanliness of the surroundings (R7); its negative correlation with the rest of the dimension may be due to the difficulty of answering reverse-worded items, to incorrect recoding, or to a perception that litter accumulation in the streets is independent of the assessment of the building and its traditional value.

By contrast, the aesthetic and heritage items (R6, R9 and R10) showed high consistency, and the traditional value of the market had the highest mean in the dimension, in line with studies that conceive of markets as everyday heritage and places of attachment (Bonnin and Moore-Cherry, 2023; Ledesma and Giusti, 2021).

The strong association between urban landscape and well-being is the most robust finding in the cross-section, although its confidence interval is wide. It is consistent with evidence that visual, olfactory and overall evaluations of a space are closely interrelated (Wang et al., 2024) and with the perception of markets as places of social value whose appeal coexists with infrastructure shortcomings (Leal-Martínez et al., 2026; Tellez Contreras, 2025).

The negative relationship between odor annoyance and well-being points in the direction expected from the literature on odor pollution (Xiao et al., 2022), but its interval includes zero. In any case, the cross-sectional design precludes establishing the direction of these relationships.

Finally, response quality should be checked before the final analysis. In small samples, careless or invariant response patterns can markedly distort correlations (Ward and Meade, 2023). The mix of visitors and people who work at the market, which the dataset does not distinguish, is another possible source of heterogeneity, because everyday exposure to market odors could alter how these odors are rated.

https://doi.org/10.62486/978-9915-9966-6-0.Ch04

CONCLUSIONS

The study achieved its objective to the extent permitted by a preliminary data cut of 12 cases. In its pilot administration, the olfactory and psychological habitability scale of project FZ-HAB-0012 showed low internal consistency for Olfactory Annoyance (α = .397); acceptable consistency for Urban Landscape (α = .714), with one item running in the opposite direction; and moderate consistency for Well-being (α = .659; ω = .702).

The exploratory factor analysis could not be estimated in an interpretable way. The only relationship between dimensions whose interval excluded zero was the positive association between Urban landscape and Well-being. The results do not yet provide evidence of structural validity; their main use is to identify the items that should be revised.

The limitations are substantial. The sample of 12 cases, against a target of 100, with 0.8 cases per item, precludes estimation of the internal structure and renders the statistics unstable; data collection was still ongoing, and a high proportion of the people who opened the questionnaire did not complete it.

No information is available on the observation protocol, the sampling procedure, the proportion of visitors and workers, or the sociodemographic characteristics of the sample. The data matrix contains response patterns that require review. The cross-sectional design precludes establishing dependence relationships, and no confirmatory factor analysis was conducted.

These results point to several decisions for the authors.

The first is to revisit the Olfactory annoyance dimension, particularly R2 and R3, and to assess whether the affective evaluation of the odor, the attribution of sources, and avoidance behaviors should be separated. The second is to verify the recoding of R8 and, if it is correct, to revise its wording. The third is to revisit R13 in Well-being. The fourth is to record whether the respondent visits or works at the market, as well as the area of the market where the questionnaire is administered. None of these decisions were made in the present analysis, which retains the original fifteen items.

For future work, we propose completing data collection up to the planned target, repeating the exploratory factor analysis with the final dataset, and then evaluating the resulting structure through confirmatory factor analysis in an independent sample.

Measurement could be complemented with smell walks and observational cleanliness indices at the protocol points, such as those used in other urban studies, to contrast perception with the recorded conditions. An instrument with documented validity evidence would make it possible to monitor the habitability of the Mercado Pino Suárez and to inform its management, the cleaning of its adjacent streets, and the conservation of its heritage value.

https://doi.org/10.62486/978-9915-9966-6-0.Ch04

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