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Exploring Citizens' Perceptions of Urban Well-Being Through a Card-Based Game

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Abstract

Urban well-being (UWB) is increasingly recognized as a complex, multidimensional construct influenced by sociocultural and geographic contexts. Yet, existing approaches to assessing local perceptions of UWB often depend on standardized indicators, limiting sensitivity to context-specific priorities. This paper presents the Urban Well-Being Deck (UWBdeck), a participatory, card-based method designed to explore citizens' situated perception of UWB. We conducted eight workshops across multiple cities, engaging 140 participants and collecting 256 participant-generated proposals. A thematic analysis of collected data revealed 22 distinct themes of UWB, highlighting both cross-city variation and underrepresented dimensions in existing indexes. This work contributes a participatory method for context-sensitive user research and offers empirical insights that advance ongoing discussion on subjective and objective dimensions of UWB.

CCS Concepts

• **Human-centered computing** → Interaction design process and methods; **Participatory design**;

Keywords

Urban Well-being, Citizen Science, Participatory Methods, User Studies, Game Design

ACM Reference Format:

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1 Introduction

Urban Well-Being (UWB) has emerged as a critical concept in urban planning and policy in recent years [4]. Major international bodies emphasize measuring well-being [4, 8, 28, 34]. However, defining and measuring UWB in a standardized, quantitative way represents an open challenge. What constitutes UWB varies significantly across different cultural, social, and economic settings [4, 30]. The World Health Organization's definition of quality of life highlights that individuals' perceptions are rooted in the context of the culture and value systems in which they live [21]. Factors influencing UWB (e.g. safety, health, environment, social connectedness) are valued



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Figure 1: Pictures from UWBdeck workshops conducted for the study.

differently across geographies and cultural contexts [24]. Efforts to create “urban well-being indices” often wrestle with the tension between comparability and contextual sensitivity, as a one-size-fits-all index can fail to capture local priorities.

In this context, bottom-up, participatory approaches that allow local stakeholders to define and prioritize the factors that affect their perceived level of UWB could provide a richer understanding than top-down indicators alone [27]. In Human–Computer Interaction (HCI), card-based toolkits have been largely adopted as a tangible means of structuring participatory design. By summarizing methods and concepts in a concise, combinatorial form and encouraging participants to explore and discuss ideas that might otherwise remain abstract, these tools could represent a practical solution to exploring people’s perceptions of complex phenomena. To the best of our knowledge, no card-based toolkits has ever been applied to UWB studies.

The work presented in this paper tackles this gap by addressing the following research questions:

- **RQ1:** What patterns of UWB perception emerge across different cities when using a participatory, card-based method?
- **RQ2:** To what extent do citizen-generated UWB definitions align with established indices and taxonomies?

1.1 Contribution

We propose Urban Well-Being Deck (UWBdeck), a participatory method to investigate how people across geographies and cultural contexts define UWB. UWBdeck employs traditional card-game mechanics to engage participants in ideation of data-driven solutions to increase UWB in their city. In the game, different datasets are represented as data cards. Through participant-filled score-sheets, we capture context-specific definitions of UWB, and we elicit factors considered most relevant for impacting it. We ran workshops using UWBdeck in eight cities – Tokyo and Numazu, Japan; Amsterdam, Netherlands; Boston, USA; Abu Dhabi, UAE; Berlin, Germany; Rio

de Janeiro, Brazil; and Madeira, Portugal – engaging 140 participants across academia, government, and the general public (See Figure 1).

This paper makes two main contributions to the UWB and HCI literatures:

- It introduces a participatory method - UWBdeck - proving that a custom-designed card game can be embraced as an effective tool to elicit participants’ feelings and opinions towards a complex socio-technical domain such as UWB. Compared to survey-based approaches, UWBdeck invites participants to articulate their definitions of UWB while playfully engaging in co-creating UWB data-driven solutions (e.g. a service, an application, or a device). The workshop format yields richer, more situated data and illustrates the versatility of card-based toolkits for urban informatics and public engagement.
- Provide novel empirical evidence, gathered through the application of UWBdeck, of the context-sensitive nature of UWB. By synthesising quantitative patterns of card selections with qualitative analyses of UWB definitions and solutions, we provide cross-cultural evidence that UWB factors are perceived and valued differently across cities.

2 Related Works

Researchers have sought to measure UWB indirectly through composite indices. For example, the OECD’s Better Life Index (BLI) aggregates 24 indicators across 11 dimensions, normalising each and assigning equal weights to permit cross-country comparisons [5, 20]. BLI emphasises both objective (e.g., income, housing, environment) and subjective (life satisfaction) domains. However, most existing scales emphasise individual subjective well-being and overlook community-level and relational aspects, underscoring the need for measures that capture networks of relationships and place [13]. A recent comprehensive survey has attempted to systematize the

landscape of UWB indicators. Ghaffari et al. [7] conducted an extensive analysis of research papers, reports, and standards published, generating a taxonomy of factors contributing to UWB. Their taxonomy categorizes indicators alongside measurement methods and data sources, emphasizing that UWB is a multifaceted construct influenced by a combination of interconnected factors. Research on diverse communities also showed that citizens conceptualise well-being differently depending on their cultural background and life circumstances [31]. For example, Adedeji et al. [1] found that standard well-being measures often developed in Western contexts fail to resonate with African participants because they privilege individualistic, material indicators over communal relationships and spirituality. Such findings reinforce that UWB cannot be reduced to a universal set of indicators but rather, it is context-sensitive and culturally mediated. Although participatory adaptations of the BLI affirm that when citizens are invited to adjust indicator weights, the resulting rankings differ markedly from the official weights [27], these indices still rely on predetermined indicators and do not actively engage citizens in the construction or validation of the categories.

These top-down metrics could mask within-city inequalities and fail to capture local priorities. A co-created bottom-up perspectives assessment framework developed in a vulnerable neighbourhood of southern Europe, for example, found that residents prioritised issues such as noise, access to public toilets, and cultural heritage that were absent from national well-being schemes [14]. The authors argue that health and well-being assessments must combine top-down dimensions with bottom-up perspectives, advocating for participatory co-creation with residents to identify relevant indicators. The present work addresses this gap by proposing a participatory method that enables citizens to articulate their own definitions of UWB rather than responding to predetermined categories. Our bottom-up approach provides empirical evidence of cross-cultural variation in UWB perceptions that could complement existing index-based approaches.

2.1 Understanding Well-being through Participatory Approaches

The literature argues that understanding well-being requires participatory engagement and citizen-science initiatives [31]. Participatory methods allow people to define well-being according to local contexts and to capture intangible dimensions such as social relationships, security, and self-esteem [35]. This can also reveal gendered and cultural differences that are often invisible in top-down assessments. Röhrbein et al. [26] used an iterative participatory process to select indicators of health and well-being relevant to a pilot neighbourhood in Mannheim, Germany. In another study of park use in St. Louis, participants used a mobile app to collect geocoded photographs and narratives, met to identify themes, and presented their findings to stakeholders [22]. The method enabled participants to voice priorities such as improved restroom access and safety. Similarly, the “Our Voice” method [17] empowers adolescents to collect data on facilitators and barriers to well-being using mobile devices and to advocate for improvements. A review on citizen science methods for building healthier community environments observes that community members who collect and

analyse data are more likely to prioritise contextually relevant concerns and sustain interventions [10]. Yet the authors note that no common protocols exist for such citizen science approaches and call for standardised measures that also allow for local adaptation.

Despite the growing interest in participatory approaches in public health and urban planning, only a few studies explicitly apply such methods to UWB [31]. Co-created wellbeing assessments have largely focused on health or environmental quality in specific neighbourhoods, while cross-city comparisons remain rare. The lack of participatory UWB studies may stem from the complexity of synthesising subjective and objective factors across cultures and from the absence of scalable tools that can capture cross-city variations. Participatory methods contrast with the surveys typically used to evaluate well-being. Surveys assume a common taxonomy of factors and pre-define response categories, which can constrain participants' definitions. In contrast, participatory workshops can allow open-ended discussion and negotiation, enabling participants to introduce unanticipated factors and to weigh trade-offs between different priorities. The participatory approach presented in this paper addresses these gaps by offering a replicable, card-based workshop format that balances methodological consistency with sensitivity to context-specific priorities, enabling cross-city comparison.

2.2 Card-based toolkits and gamified approaches

Within human-computer interaction (HCI), design card decks represent simple, tangible tools for structuring early design stages. Multiple review of card decks shows that cards summarise creative inspiration, human insights, methodological prompts, domain knowledge, and values [11, 23, 25]. The tactile nature of cards encourages participants to manipulate, combine, and discuss concepts that might otherwise remain abstract [9]. These decks often provide structured prompts and playful constraints that stimulate ideation and aid in translating academic insights into design practice [19]. Card play may introduce game-like mechanics that support the playful exploration of design alternatives, while also fostering user empowerment and active engagement of multiple stakeholders [32, 33]. Card-based tools have been applied to domains such as privacy management, showing that cards stimulate creative thinking, enable free but focused discussion, and foster participatory collaboration and iterative exploration [16]. Smith et al. [29] propose an AI literacy toolkit for non-technical audiences that uses cards to improve AI literacy and increase collaboration, showing that card-based toolkits can empower non-experts to engage with complex topics. Ernstsen et al [6] developed Technology Cards, a design game that helps business managers explore how emerging technologies might shape future business scenarios. Participants use cards representing technologies to imagine synergies and discuss strategic implications, facilitating dialogue among stakeholders with varying expertise. Mora et al [18] created the Tiles Cards to engage non-experts in participatory ideation and critical reflection of Internet of Things products. Leveraging a board-game approach, *LocaLudo* [12] is a card-based tool that aims to explore the qualities, concerns, and values of local communities and families, allowing non-experts to actively take part in brainstorming sessions for developing interactive architecture.

Nevertheless, no existing card-based toolkit has been tailored specifically to the UWB context. This gap is notable given UWB's multidimensionality and the relevance of participatory tools for eliciting nuanced perspectives. Building on this, we adapted and repurposed a card game, Data Slots [15], as a participatory method to explore UWB across multiple cities. Originally developed to explore trade-offs between data-driven innovation and privacy, our adaptation harnesses the card game's playful, combinable format to encourage participants to articulate their own definitions of UWB. It thereby aligns with previous findings that cards can bridge academic frameworks and community knowledge. The following section introduces the original version of the Data Slots toolkit, while Section 3 explains how it was adapted for UWB.

2.3 Data Slots

Data Slots [15], originally developed by the *MIT Senseable City Lab*, is a card game that explores trade-offs between data-driven innovation and privacy concerns.

The game provides players with twelve *data cards*, each representing a specific dataset or data source. The aim of each player is to draw and swap cards in order to come up with the idea of a data-driven solution that creates benefits for one of three different scenarios: work, home, and public spaces. Part of the game requires all players to pitch their idea to other players, who rate them on the perceived benefits and privacy invasiveness. At the end of the game, participants allocate "investments" (chips) to the ideas they support the most, simulating a market for the best data-driven solutions. Through this process, Data Slots engages people in reflecting on the value of data for solving problems and the privacy risks involved, while indirectly capturing their preferences and concerns regarding data privacy.

3 Method

For this study, we adapted Data Slots to be used as a participatory method to investigate UWB. We conducted a total of eight Urban Well-Being Deck (UWBdeck) workshops between May 2024 and July 2025. The workshop was held in Tokyo, Amsterdam, Boston, Abu Dhabi, Numazu, Berlin, Rio, and Madeira as part of events arranged by the authors of this paper, standalone or co-located with existing events (e.g., a conference or a public event). The following sections detail the participants, materials, and procedures.

3.1 Participants

We recruited participants by advertising the workshop through collaborations with universities, companies, and local governments. In Abu Dhabi, Boston, and Amsterdam, the workshops were embedded within university courses or programmes and announced via internal channels. Additional sessions were organised in conjunction with academic conferences (Madeira), city-led public events (Berlin, Rio de Janeiro), and local schools (Numazu). The Tokyo workshop was coordinated with a professional market research company. Across all sites, participation remained voluntary.

In total, 140 unique participants took part in the study, for a total of 256 game rounds (i.e., two game rounds per participant except where time permitted only one). Table 1 summarises the

demographic composition of the sample by city. Overall, 78 participants identified as female, 60 as male, and two preferred not to say. Age was self-reported in ranges; the majority were under 35 years old, though a considerable portion of the Tokyo group were over 45. Roles varied across sites: 76 participants were students or researchers, 43 were citizens, and 21 were city officials.

3.2 Material

As shown in Figure 2, the UWBdeck toolkit is composed of 3 card decks, a set of 3D printed chips, and paper-based game sheets:

Scenario Cards. Three cards representing distinct urban contexts: home, workplace, and public spaces. These serve to frame the data-driven solutions to improve UWB that participants are asked to ideate.

Data Cards. A deck of 16 cards, each representing a specific dataset: #1 *Personal profile data*, #2 *Health data*, #3 *Dietary habits data*, #4 *Electronic transaction data*, #5 *Social networking data*, #6 *Human mobility data*, #7 *Animal mobility data*, #8 *Vehicle mobility data*, #9 *Utility data*, #10 *Environment data*, #11 *Public infrastructure data*, #12 *Greenery data*, #13 *Personality data*, #14 *Smart home data*, #15 *Local news and events data*, #16 *Public camera data*.

Each toolkit contains 2 sets of data cards. The two sets contain the same number and type of data cards and are easily distinguishable by the color of the back (dark gray and light gray).

Investment Chips. A set of 10 color-coded chips. The chip's color – orange, green, blue, or purple – also identifies the color of the participant, essential for the assessment and investment session of the game.

Game Sheets. A 3-page, paper-based game sheet used by each player to record the choices made during the game. The paper sheet is divided into sections that follow the game activities. Each player receives one game sheet at the beginning of each round of play. An example of a game sheet is available as supplement material.

3.2.1 Adaptation from original Data Slots game. To adopt Data Slots for UWB studies, we extended and customized the toolkit in two key ways. First, we expanded the set of twelve original data cards to include four new datasets directly relevant to UWB:

- #13 *Personality data* – Personality traits such as extraversion, conscientiousness, agreeableness, openness, and neuroticism. Types such as: empathy, values authority, values safety, hedonism, benevolence, values results, seeks stimulation, values tradition, is optimistic.
- #14 *Smart home data* – TV usage, speaker usage, lighting usage, air conditioner usage, air cleaner usage, toilet usage, electronic cooker usage, refrigerator usage information, doors opening and closing usage, intercom usage.
- #15 *Local news and events data* – Local events, current events, trends, commercial information (places to go and things to see, food/restaurants, limited time offers), public safety announcements.
- #16 *Public camera data* – Camera videos installed outdoors and indoors in the city, information obtained from video analysis (age groups, gender, human flow).

Secondly, we shifted the game goal, orienting participants toward thinking about UWB outcomes when designing their solutions. To do so, we added to the game sheet a specific question to collect

City	Participants	Roles	Gender	Age ranges*
Abu Dhabi	24	1 citizen, 23 academia	10 F, 14 M	20 (18–25), 4 (26–35), 0 (35–45), 0 (46–55), 0 (56+)
Amsterdam	20	2 citizens, 18 academia	8 F, 12 M	8 (18–25), 10 (26–35), 0 (35–45), 2 (46–55), 0 (56+)
Berlin	16	11 citizens, 4 academia, 1 city official	13 F, 3 M	2 (18–25), 9 (26–35), 5 (35–45), 0 (46–55), 0 (56+)
Boston	12	12 academia	7 F, 5 M	3 (18–25), 9 (26–35), 0 (35–45), 0 (46–55), 0 (56+)
Madeira	8	1 citizen, 7 academia	3 F, 5 M	3 (18–25), 2 (26–35), 1 (35–45), 2 (46–55), 0 (56+)
Numazu	12	8 citizens, 4 academia	11 F, 1 M	11 (18–25), 1 (26–35), 0 (35–45), 0 (46–55), 0 (56+)
Rio	16	2 academia, 14 city officials	11 F, 5 M	1 (18–25), 5 (26–35), 4 (35–45), 5 (46–55), 1 (56+)
Tokyo	32	20 citizens, 6 academia, 6 city officials	15 F, 15 M, 2 P	6 (18–25), 12 (26–35), 3 (35–45), 6 (46–55), 5 (56+)
Total	140	43 citizens, 76 academia, 21 city officials	78 F, 60 M, 2 P	54 (18–25), 52 (26–35), 13 (35–45), 15 (46–55), 6 (56+)

Table 1: Participant demographics and roles across cities. *Age ranges are given in the number of participants per group.

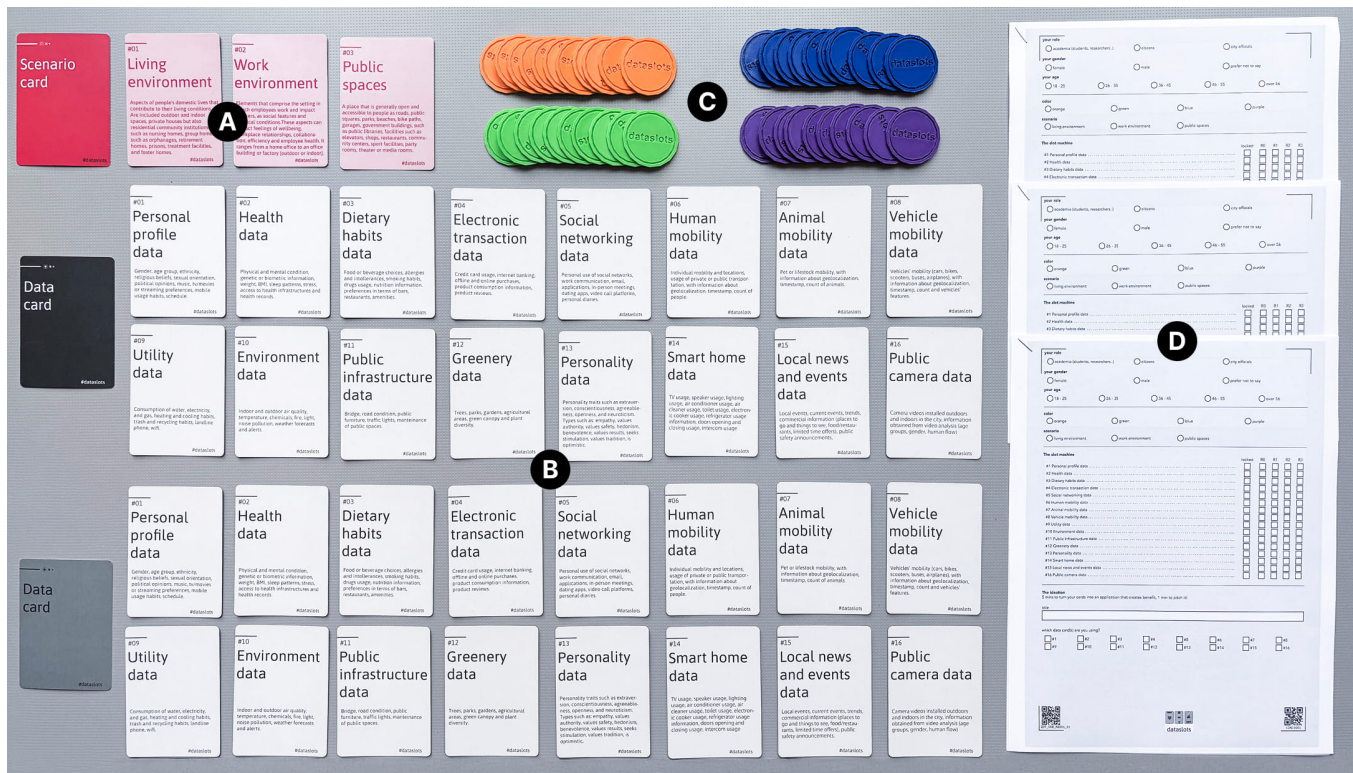


Figure 2: Complete UWDeck set: (A) Deck of Scenario Cards; (B) The two decks of Data Cards; (C) 3D printed investment chips; (D) A glimpse of paper-based game sheets.

players' definition of UWB: "How did you define urban well-being when creating your idea?"

3.3 Procedure

Each UWDeck workshop lasted approximately two hours and followed the same sequence of activities. Each workshop comprised two game rounds, time permitting. The two-round structure was designed to increase the breadth of participant contributions. Game mechanics ensured each round presented a different ideation context: out of the three cards composing the scenario deck, one was

randomly drawn at the start of the first round and discarded at its end, so that round two necessarily used a different scenario. This randomization, together with the data card trading mechanics that required participants to exchange cards between rounds, prompted distinct ideation pathways and reduced the likelihood of participants simply repeating prior ideas.

Sessions were run by a minimum of two researchers who acted as game masters and facilitators. At least one of the two researchers was fluent in the local language where the workshop took place. All the cards were available in the local language. Players were seated

at tables of four, with a maximum of 16 participants per workshop (See Figure 1).

At the start of each workshop, the game master introduced the purpose of the study and explained the UWBdeck game. It was made clear that no personal data would be collected, all data would be used solely for research purposes, and no data would be shared with third parties. Participants were informed of their right to withdraw from the study at any time. Approval to conduct the study was obtained from MIT IRB, and participants' verbal consent was obtained in all cities where workshops were held.

3.3.1 Gameplay. UWBdeck's session gameplay follows a four-phase structure. This structure replicates the original gameplay of Data Slots [15]. An essential difference is that each player begins with four data cards rather than three, as UWBdeck presents a deck of 16 data cards instead of 12.

At the beginning of the game, each participant receives 10 colored-chips and a copy of the game sheet and starts by filling in a short demographic questionnaire. Subsequently, a scenario card is selected at random. Each table has to pick that specific scenario card and place it at the center of the table. Participants then:

- (1) **Data Card Selection and Trading** – Each player received four data cards from the dark grey deck and “locked” one card. The “locked” card cannot be traded and conceptually reflects the dataset they consider most vital for the UWB application in the scenario. Four random data cards from the light grey deck are placed, uncovered, on the table. Over three successive trading rounds, players discarded and acquired new cards from the central pool or other players, ultimately retaining five cards.
- (2) **Ideation** – Using the collected five data cards as inspiration, players have five minutes to ideate a data-driven solution that creates benefit to UWB in the given scenario. To do so, they used the dedicated field of the game sheet to record a title, the list of cards used, a short description, and an explanation of how they define UWB.
- (3) **Assessment** – In a 1-minute pitch format, participants have to present their ideas to the other 3 players at the table. Using the dedicated space in the game sheet, players rated each idea – including their own – from the point of view of benefit and invasiveness.
- (4) **Investment** – Using the 10 coloured-chips, the player has to invest in one or more ideas. Chips could be distributed across multiple ideas or placed entirely on one. Players cannot invest in their own ideas. The total chips received determined the “best idea”. Simulating a return on investment, half of the received chips have to be given back to the investor. The winner of the game session is then the player with the higher amount of chips after the return on investment.

3.4 Data Collection

Data were collected through the game sheets that each participant completed during the UWBdeck sessions. To ensure consistent formatting, the *PaperSurvey.io*¹ platform was used to both generate

and scan the game sheets. A coded respondent identifier was assigned to each sheet, ensuring participant anonymization while allowing for linking multiple rounds by the same player.

At the end of each workshop, facilitators collected and scanned the compiled game sheets. The scans were uploaded into the PaperSurvey platform, which provided automated transcription of the multi-selection and handwritten fields. This process provided a dataset containing demographic information, card selections, participant ratings, investment allocations, and free-text responses for all 256 game rounds.

3.5 Data Analysis

A qualitative method was employed to analyze the collected data. The analysis centred on a thematic analysis of the 256 participant-generated proposals, and was complemented by descriptive quantitative summaries of card selections and themes. For each city, the frequency with which each of the 16 data cards was locked or discarded was calculated, interpreting the locked card as the one perceived as most valuable and the first-round discarded card as the least valuable. These frequencies were then converted into percentages to enable cross-city comparisons.

A thematic analysis was conducted on the transcribed handwritten responses, following Braun and Clarke's [2, 3] thematic analysis framework. Two authors independently examined all transcribed game sheets, comprising titles, short descriptions, and UWB definitions. This initial reading ensured both coders developed familiarity with the breadth and diversity of participant responses across the eight cities. Building on this initial familiarization, each coder then manually worked systematically through the entire dataset, assigning initial codes that capture the UWB-related aspects emerging from each proposal. Related codes were then sorted into potential themes, considering how different codes might combine to represent UWB dimensions. Candidate themes were then reviewed against the coded extracts to ensure internal coherence, and themes that lacked sufficient data or overlapped substantially were refined, merged, or discarded. Each coder then assigned each proposal to a single primary theme that best captured its main UWB focus.

Following independent coding and theme assignment, the two coders compared their results, reaching an initial inter-coder agreement of 79.9% (205 of 256 proposals). Disagreements—cases where coders had assigned different themes to the same proposal—were resolved through asynchronous discussion. During this process, coders revisited original codes and candidate themes, which led to some themes being merged or discarded to ensure internal coherence. Once consensus was reached on all theme assignments, the two coders jointly defined each theme's scope and content, and refined theme labels to be concise and clearly representative of the UWB dimension captured.

The number of proposals for each theme was then computed overall and by city. Results enable to response to RQ1 via cross-city comparisons of locked/discarded cards and themes prevalence, while RQ2 was addressed via a structured comparison between emerging UWB themes and literature available indexes and taxonomies. To enable cross-city comparison independently of sample size, each theme's distribution was standardized across cities using Z-scores. For each theme t , the mean (μ_t) and standard deviation

¹<https://www.papersurvey.io/>

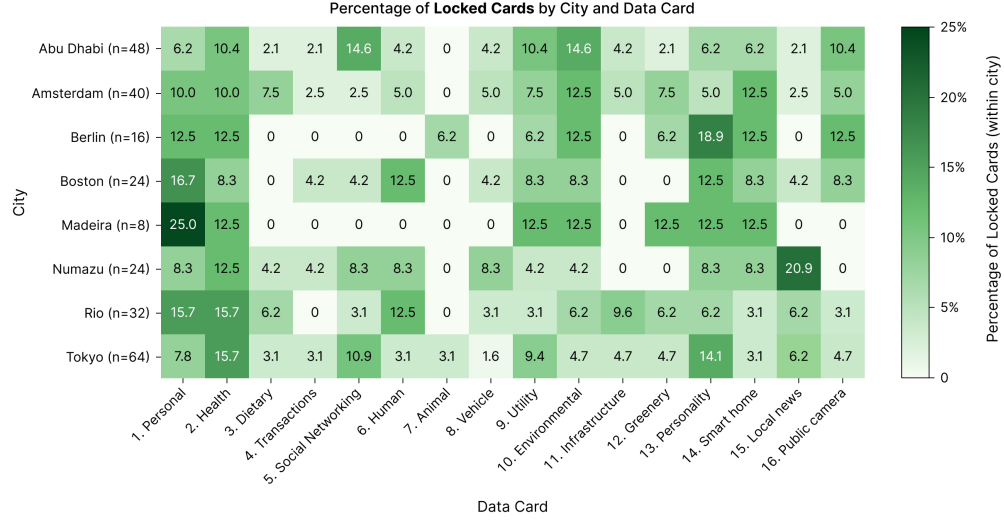


Figure 3: Heatmap showing the distribution (percentage) of locked cards by city.

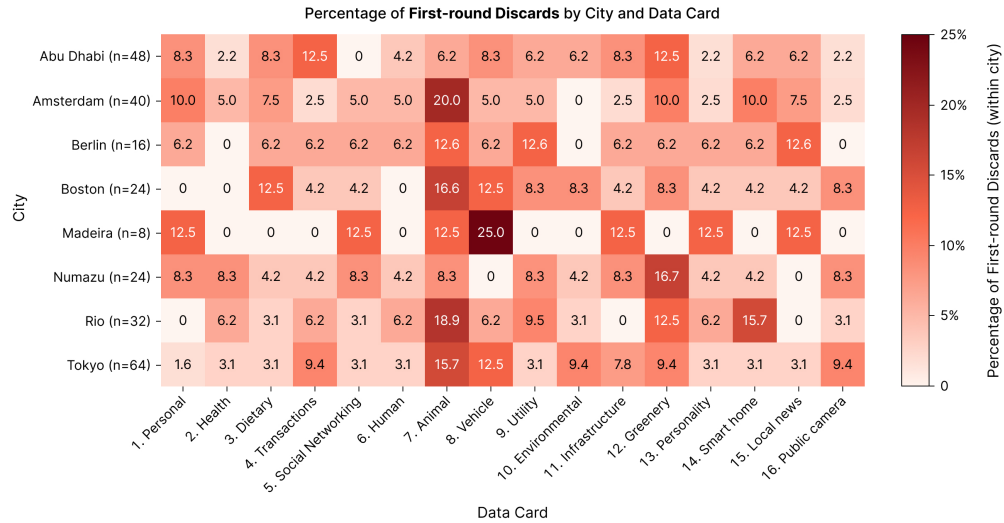


Figure 4: Heatmap showing the distribution (percentage) of discarded cards by city.

(σ_t) of that theme's percentage share across the eight cities were calculated. The Z-score for city c on theme t was then computed as:

$$z_{c,t} = \frac{p_{c,t} - \mu_t}{\sigma_t}$$

where $p_{c,t}$ denotes the percentage of proposals in city c assigned to theme t . A positive Z-score indicates that the city emphasizes that theme more than the cross-city average.

4 Results

The multi-city UWBdeck workshops yielded 256 participant-generated proposals and hundreds of data card selections, offering a lens into how citizens across diverse contexts define UWB. The random

picking of scenarios cards across rounds led to 108 rounds played with the living environment scenario, 36 with work environment scenario, and 112 with the public spaces scenario. While cultural, infrastructural, and social specificities shaped individual responses, recurring patterns emerged in the UWB factors that participants prioritized and their preferences toward dataset usage.

Data Cards selection and retention. Figure 3 summarizes the percentage of times each card was locked for each city. Overall, personal and health-related data were commonly picked across cities, with local preferences emerging. In Abu Dhabi, participants most frequently locked environmental and social-network data, with utility, health, and public camera data also featuring prominently. Amsterdam's participants often locked smart-home and

environmental data, while the most commonly locked cards were personality data in Berlin and personal profile data in Boston. In Numazu, the local news/events card was locked more often than any other. Rio's players predominantly locked personal and health data, while Tokyo's participants mostly locked health data and personality data.

Figure 4 displays the percentage of discarded cards after the first round. The pattern of early discards contrasts sharply with the locking behaviour. In Abu Dhabi, greenery and transaction data are discarded most frequently, whereas in Amsterdam, Tokyo, Rio, and Boston the animal data card constitutes the most commonly discarded option. In Rio, participants also frequently discard the smart home data card, while in Numazu greenery data emerge as the card most often tossed in the first round.

Emerging UWB Themes. Following the thematic analysis procedure described in Section 3.5, each of the 256 data-driven ideas was assigned to a theme based on the dimension of UWB it addressed. For example, if an idea proposed the use of mobility, personality, and health data to improve urban parks it was coded under the “improving park conditions” and “promoting access to green spaces” codes, reflecting the participant’s focus on urban greenery as a UWB factor. Each coder then grouped related codes into candidate themes. For instance, codes concerning parks and nature were grouped under a preliminary theme such as “Greenery and green spaces”. During the comparison and consensus phase, the two coders reconciled their independent theme structures. For instance, ideas originally assigned to themes such as “Connection to nature and animals”, “Biodiversity”, and “Greenery and green spaces” were consolidated into the final “Greenery and biodiversity” theme. A total of 22 themes emerged from this process. Table 2 presents the distribution of themes across all 256 proposals along with a summary description of the ideas coded under each theme.

Data shows that most ideas clustered around a few core domains. The category with the highest number of proposals was greenery and biodiversity ($n = 28$), followed by safety and security ($n = 26$), social events and community ($n = 25$), commuting and transport ($n = 22$), sustainability ($n = 20$), nutrition ($n = 18$), physical health ($n = 16$), and mental well-being and happiness ($n = 14$). Additional recurrent categories included data and information access ($n = 12$), infrastructure and public spaces conditions ($n = 10$), environmental comfort ($n = 9$), workplace wellness and stress ($n = 9$), economic and financial well-being ($n = 7$), work-life balance ($n = 6$), diversity and inclusion ($n = 5$). The remaining themes each received fewer than five proposals. A total of six ideas were classified as *undefined*, as both coders agreed the player input was not possible to classify within a UWB theme due to missing information or excessive general purpose.

Theme recurrence varies within each city (See Figure A.1 in the Appendix). In Abu Dhabi, the highest shares were observed for safety and security (14.6%), commuting and transport (12.5%), and data and information access (10.4%). Amsterdam presented a distribution across greenery and biodiversity (12.5%), social events and community (10%), sustainability (10%), and mental well-being and happiness (10%). Berlin was characterized by equal representation of greenery and biodiversity (18.8%) and social events and community (18.8%), followed by mental well-being and happiness (12.5%).

In Boston, the top thematic is sustainability (20.8%), followed by safety and security (16.7%). Madeira recorded its largest shares in greenery and biodiversity (25.0%), commuting and transport (25.0%) and nutrition (25.0%). Numazu was led by social event and community (16.7%), followed by nutrition (12.5%) and family and home support (12.5%). For Rio de Janeiro, the two leading categories were commuting and transport (18.8%) and greenery and biodiversity (15.6%). Tokyo showed its highest proportions in safety and security (12.5%), social events and community (10.9%), and work-life balance (9.4%).

Demographic Variations. To probe whether theme incidence was driven by demographic factors, we examined how participants’ proposals were distributed across themes by gender and age group (see Figure A.2 in the Appendix). To address the unbalanced gender and age compositions in some city samples, this analysis was conducted on the full dataset, collapsing across cities, to assess whether specific themes recur more frequently for certain gender and age groups overall.

Regarding gender, the three largest themes—greenery and biodiversity, safety and security, and social events and community—remain prominent across groups, but some nuanced differences emerge. Male participants’ ideas more frequently concern greenery and biodiversity (13.4% M, 9.3% F) and social events and community (12.5% M, 7.9% F). Female participants’ ideas, in turn, are more evenly distributed across themes but show a comparatively stronger focus on safety and security (8.9% M, 11.4% F). The “prefer not to say” group includes only four participants and was therefore not interpreted further.

For age groups, participants aged 18–25 primarily focused on social events and community (11.7%), safety and security (10.7%), and sustainability (10.7%). In the 26–35 group, stronger emphasis emerged on greenery and biodiversity (12.9%) and commuting and transport (12.9%), with a focus on safety and security (11.8%) comparable to that of the 18–25 group. In the over-36 group², most ideas were categorised under greenery and biodiversity (13.3%), with a recurrence comparable to the 26–35 group but significantly higher than in the 18–25 group. The over-36 group also shows a higher proportion of ideas related to nutrition (10.0%) and mental well-being and happiness (10.0%).

Cross-city Variations. To investigate cross-city variation independently of participant volume, we standardized each theme’s within-theme distribution across cities. We then visualized positive-only Z-scores (See Figure 5).

This combination of standardized deviation and per-theme counts provides a balanced basis for cross-city comparison, highlighting where priorities converge and where they diverge. Results reveal a heterogeneous landscape, with some themes broadly distributed and others distinctly city-specific. Abu Dhabi shows marked over-prevalence of economic and financial well-being ($Z = 2.3$), data and information access ($Z = 2.2$), and productivity ($Z = 2.1$) themes. For Amsterdam infrastructure and public spaces conditions ($Z = 2.1$) and mental well-being and happiness ($Z = 1.5$) themes emerged. Amsterdam also presents a high relevance for the impact and participation on city development ($Z = 2.6$) theme. However, this should

²The over-36 group combines the 36–45, 46–55, and 56+ age ranges.

UWB Themes	Count	Description
Greenery and biodiversity	28	Increase and maintain parks and green spaces promoting biodiversity in the city, integrate animals into city life, encourage everyday contact with nature, adapt green areas to diverse needs.
Safety and security	26	Enhance feelings of safety in public spaces and improve disaster preparedness and rapid emergency response, prevent accidents and crime through surveillance and alert systems.
Social events and community	25	Facilitate community gatherings, provide information about local events and hidden attractions, encourage social interaction and collaboration.
Commuting and transport	22	Reduce congestion and time waste in everyday commuting, optimise routes and traffic flow, promote shared and alternative mobility options, and mitigate the stress, cost, and environmental impact associated with daily travel.
Sustainability	20	Enhance energy efficiency and conservation, promoting renewable energy sources and motivating sustainable living.
Nutrition	18	Make healthy eating engaging and accessible and fight food desert issues, make it easy to get essential nutrients, increase access to healthy food and clean water, improve food freshness and supply of local food.
Physical health	16	Monitor and manage health conditions, provide tailored health advice and reduce harmful behaviours.
Mental well-being and happiness	14	Simplify daily life and ensure people are happy around public spaces, integrate mental health information into city services, ensuring joy and an emotionally balanced everyday life.
Data and information access	12	Centralise and personalise information via apps, deliver real-time data and timely recommendations on the environment, health and community to enhance lifestyle and enable people to make informed decisions.
Infrastructure and public spaces conditions	10	Provide citizens with dedicated spaces to go, ensure well-maintained and organised public spaces, and report spaces in need of renovation.
Environmental comfort	9	Monitor and control temperature, humidity, air quality and noise, create relaxing urban refuges and adaptive homes that adjust to comfort needs.
Workplace wellness and stress	9	Predict and reduce workplace stress, tailor working conditions to individual needs and improve communication and rapport between staff and management, creating comfortable, supportive work environments.
Economic and financial well-being	7	Help households manage finances, reduce expenses, forecast real-estate trends and promote cost efficiency.
Work-life balance	6	Enable flexible and remote work, simplify leave and rest procedures, and provide family-friendly facilities at workplaces.
<i>Undefined</i>	6	–
Diversity and inclusion	5	Emphasise respect for individual differences, reduce discrimination, ensure equal opportunities and provide personalised services for people with special needs.
Elderly and aging	4	Improve quality of life for older adults, design age-friendly cities and support caregivers and care facilities.
Family and home support	4	Encourage youth engagement and family cohesion, build community within homes, and use technology to reduce family stress.
Fitness and sport	4	Offer personalised exercise suggestions and create opportunities for sports in public spaces.
Productivity	4	Design environments and tools that enhance focus, productivity and efficiency.
Economic resilience/Local businesses	3	Strengthen local economies by supporting local industries and farmers and helping businesses find optimal locations.
Fragile and marginalised community support	3	Improve and ensure access to services for vulnerable groups, enhance living conditions in low-income communities and support rehabilitation and reintegration into society.
Impact and participation on city development	1	Enable citizens to learn from emerging trends and have a voice in shaping their city's development.

Table 2: Distribution of UWB themes across the 256 participant-generated proposals. The *Undefined* category ($n = 6$) includes ideas that could not be classified due to missing information or overly general scope.

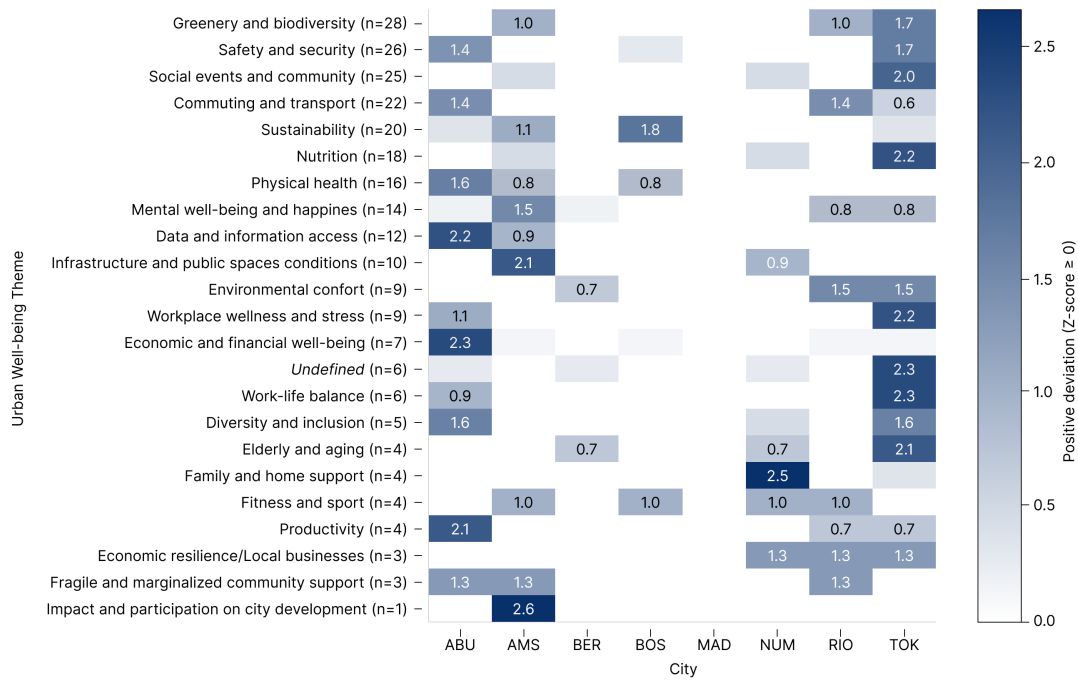


Figure 5: Z-score heatmap of theme prevalence by city (row-standardized). For each theme, cells show how many standard deviations a city’s share lies above the cross-city mean for that theme (0 = mean). Only positive deviations ($z \geq 0$) are displayed to highlight above-average emphasis; white denotes values at or near the mean, while darker blue indicates larger positive deviations.

not be conflated with overall prevalence, as this theme appears only once in the dataset. Reading Z-scores together with the per-theme counts prevents misinterpretations. Berlin shows a comparatively even profile, with only mild above-mean pockets across themes. Boston shows a peak in sustainability ($Z = 1.8$) while Madeira, reflecting the smaller sample, shows few above-mean theme. Numazu presents a peak in family and home support ($Z = 2.6$), themes that, however, only appear four times in the dataset. Rio de Janeiro participant leans toward environmental comfort ($Z = 1.5$) and commuting and transport ($Z = 1.4$). Tokyo concentrates multiple strong deviations across work-life balance ($Z = 2.3$), workplace wellness and stress ($Z = 2.2$), and nutrition ($Z = 2.2$).

5 Discussion

Our multi-city deployment of UWBdeck provides empirical insights into the contextual and multidimensional nature of UWB, highlighting both shared priorities and distinct local variations. The results contribute to the vision of UWB not as a universal or static construct; rather, as a variable response to cultural, economic, infrastructural, and social factors in each context. Below, we discuss key insights from these results, compare them to established frameworks and indexes, and reflect on the value of participatory methods mixed with gamified mechanisms as a complement to classic survey-based methods.

5.1 Cross-city variation in UWB definitions (RQ1)

Recent literature argues that UWB is shaped by local cultural and social contexts rather than being a universal construct [1, 26, 30]. The result of our study contributes to this hypothesis. Across the eight cities, specific themes (e.g., health, safety, greenery) appeared universally, but each city exhibited distinct polarizations. This suggests that certain dimensions may not be globally dominant but can nevertheless be critical in specific contexts and communities. In Abu Dhabi, for example, we observe above-mean representation for economic and financial well-being and data and information access, while in Rio de Janeiro, participants leaned on commuting and transport and environmental comfort. These cross-city differences in UWB themes contribute to the perspective of UWB as a multidimensional and context-dependent construct, requiring an integrated, holistic assessment rather than single-indicator comparisons.

Furthermore, the Tokyo–Numazu comparison reveals an interesting pattern in how UWB priorities can vary by city size. Despite sharing the same national context, these two Japanese cities exhibited different UWB priorities. Tokyo, as a major metropolitan area, showed distinctive emphasis on work-life balance ($Z = 2.3$), workplace wellness and stress ($Z = 2.2$), and nutrition ($Z = 2.2$). In contrast, Numazu, a smaller coastal city, demonstrated different priorities. While work-life balance was among Tokyo’s top concerns,

it did not appear at all in Numazu's proposals, with participants there seem to emphasize infrastructure and public spaces conditions ($Z = 0.9$). This within-country variation suggests that UWB perception could also be influenced by urban scale. Tokyo's emerging themes could reflect the pressures of metropolitan life, where long commutes, extended work hours, and limited time for personal care are prevalent concerns. Numazu's pattern, on the other hand, could suggest that in smaller cities, community cohesion and local infrastructure quality take precedence over work-related stress factors. Although our data are not sufficient to demonstrate a definitive effect of city scale on UWB perceptions, this emerging evidence reinforces the view of UWB as a context-sensitive construct shaped by local values and conditions.

Furthermore, we can argue that data related to locked and discarded cards further strengthens the reliability of these emerging local variations. As shown in Tables 3 and 4, card-usage results indicate a clear preference for specific data sets. This observation is critical because polarized card selections indicate non-random, prior preferences about impactful data types, which plausibly steer idea generation, revealing pre-decisional salience of data categories. In this context, the cards function as indicators of which forms of data are intuitively recognized as useful. For example, a participant who blocks a card related to health data is not necessarily equating UWB solely with health. Instead, the action signals that such data are perceived as potentially useful inputs for addressing UWB more broadly. This adds an additional layer of robustness to the method, as it not only captures the ideas themselves but also makes visible the underlying reasoning and implicit priorities that lead to their formulation.

5.1.1 Demographic Influence. Our demographic analysis suggests that gender and age shape, to some extent, how participants perceived priorities associated with UWB. Female participants placed relatively greater emphasis on themes such as safety, environmental comfort, and family and home support, whereas male participants contributed a proportionally larger share of ideas related to social events, mental well-being, greenery, and nutrition. Similarly, age-related patterns emerged: younger participants (18–25) tended to prioritize sociality and sustainability, those in the 26–35 cohort placed stronger emphasis on commuting and transport, and older participants (over 36) devoted comparatively more attention to nutrition and mental well-being.

To evaluate whether demographic composition alone could account for the observed cross-city variation in theme distribution, we conducted pairwise comparisons between cities with similar gender or age profiles. For example, both Numazu and Berlin hosted workshops with predominantly female attendance (91.7% and 81.2%, respectively). Despite this demographic similarity, their thematic profiles diverged substantially. While focus on social events and community appears in both city, participants in Numazu also concentrated on family and home support, and nutrition, whereas those in Berlin most frequently proposed ideas related to greenery and biodiversity. Furthermore, while in Berlin we can observe a focus on environmental comfort and mental well-being and happiness, no idea related to these two themes were proposed by any of the Numazu participants. A similar pattern emerges when performing age-based comparisons. The workshops in Abu Dhabi and Numazu

were both predominantly attended by young adults (83.3% and 91.7% of participants aged 18–25), yet their UWB priorities differed. Participants in Abu Dhabi focused on safety and security, commuting and transport, and data and information access, while those in Numazu, as previously mentioned, emphasized social events and community, family and home support, and nutrition.

These findings suggest that, while gender and age shape participant perceptions of UWB and should not be disregarded as factors, their influence is insufficient to justify the observed cross-city variation. If demographic characteristics were the primary drivers of theme differences, cities with comparable demographic compositions would be expected to exhibit similar priority patterns. Instead, these comparisons suggest that local context and city-specific factors may play a role in shaping how participants perceive UWB, beyond demographic characteristics alone.

5.2 Alignment with indices and frameworks (RQ2)

By supporting 140 participants from different cities to come up with their own definition of UWB, we collected 256 unique responses, leading to 22 UWB themes. In order to assess the reliability of our UWBdeck results, we compared our inductively derived themes with existing frameworks and taxonomies of UWB indicators proposed by recent studies. This comparison highlights similarities but also unexpected differences that enable us to further discuss the reliability of the UWBdeck method. For example, a broad index frequently mentioned in previous work, such as the OECD Better Life Index (BLI) [20], covers domains like housing, safety, health, and civic engagement. In case we had tried to categorize our participants' UWB ideas within BLI categories, nearly all ideas would have clustered into a few broad buckets. Adopting BLI dimensions as a primary coding scheme would have compressed the nuance emerging from the workshops, as diverse BLI dimensions could subsume multiple distinct UWBdeck themes (See Table 3). By contrast, inductive coding of UWBdeck outputs yielded 22 distinct, fine-grained themes. This finer granularity enabled us to surface subtleties that BLI dimensions would obscure. For instance, nutrition emerged as a distinct theme in our data, yet under BLI it would be absorbed into the broad "Health" dimension alongside our physical health, fitness and sport, and elderly and aging themes, obscuring the specific emphasis participants placed on nutrition as a distinct UWB concern. Similarly, the data and information access theme would be subsumed under BLI's "Knowledge and skills" dimension, thus losing the theme's distinct focus on real-time urban information for everyday decision-making. Other themes, like commuting and transport, would have suffered the opposite problem, being fragmented across BLI's "Housing", "Safety", and "Work-life balance", diluting its coherence as a unified UWB concern. A complete mapping between UWBdeck themes and BLI dimensions is provided in Appendix Table A.1.

Recent studies, such as Ghaffari et al. [7], propose a more complete and granular taxonomy of UWB indicators. When we compared our results, we found that our themes are indeed comparable and align with those identified by other comprehensive studies. This alignment validates the reliability of the UWBdeck method. Although it employs a game-based, participatory approach rather

BLI dimension	UWBdeck theme
Health	Nutrition; Physical health; Elderly and aging; Fitness and sport
Environmental quality	Greenery and biodiversity; Sustainability; Environmental comfort; Infrastructure and public spaces conditions
Civic engagement	Social events and community; Sustainability; Diversity and inclusion; Fragile and marginalized community support; Impact and participation on city development

Table 3: Examples of OECD Better Life Index (BLI) [20] dimensions that would absorb multiple distinct UWBdeck themes, illustrating the loss of granularity that a BLI-based coding scheme would entail.

than a traditional survey, it produces thematically consistent results that align with established findings.

At the same time, this comparison also highlights differences that can contribute to comprehensive taxonomies of UWB factors. As already emerged with the comparison with BLI, some recurrent themes that emerge in our studies would have been absorbed in larger categories, masking diffuse or local necessities. The same pattern can be observed by comparing our results with the fine-level taxonomy proposed by Ghaffari et al. [7]. For example, nutrition results between the most recurrent themes in our studies ($n = 18$). Current taxonomy presents nutrition-related aspects only indirectly, either under the personal habits & health state (e.g., obesity rates; lifestyle factors) or within infrastructure & services availability (e.g., access to restaurants/food venues). In our study, however, nutrition emerged as a top-six theme. Participants across multiple cities not only explicitly linked dietary factors to UWB, but also envisioned systems to improve the freshness and affordability of food, support local food stores and supply chains, and reduce the everyday stress of deciding what to eat. For example, a participant in Boston defined UWB as “*access to healthy food and clean water*”, proposing a digital system to identify food deserts—areas where residents lack access to fresh produce—and enable targeted interventions such as new grocery stores or community food halls. A participant in Rio de Janeiro framed UWB as “*greater supply of local food and food education*”, envisioning smart public gardens connected to schools where restaurants could dispose of organic waste for composting, promoting local food supply and community-based nutrition awareness. Taken together, these proposals elevate nutrition to a salient, participant-driven dimension that may warrant greater prominence in urban UWB mappings.

Another theme that does not match current taxonomies is data and information access ($n = 12$). The prominence of this theme seems to suggest that participants conceptualize access to data and information less as a technical consideration and more as a foundational prerequisite for increasing UWB. Participants envisioned city-wide platforms that aggregate real-time information on environmental conditions, mobility disruptions, public services, and local events, delivering it in personalized, comprehensible ways to

support everyday decision-making. For example, a participant in Amsterdam defined UWB as “*access to local information, reliable and all in one spot*”, proposing public digital information hubs that deliver guidelines, news, event listings, and emergency alerts in an accessible format to ensure information reaches citizens. A participant in Abu Dhabi explicitly defined UWB as “*staying connected and having all the information needed at your fingertips*”, envisioning an app that consolidates real-time data on resource consumption, local events, and personalized recommendations. These proposals frame timely and intelligible information as a core component of UWB in its own right, rather than merely as an infrastructural input to other UWB dimensions. Yet current taxonomies seem to lack this dimension, which is barely mentioned even as a sub-category. Our results instead indicated that this is a theme emerging in more than one city, suggesting that, like nutrition, data and information access may play a more important role in UWB evaluations than what the literature currently suggests.

These similarities and divergences in our results suggest that participatory, bottom-up methods such as UWBdeck can elevate the salience of dimensions underrepresented in current taxonomies. A key distinction of UWBdeck is that it serves as both a data collection tool and a medium for ideation. Unlike surveys, which restrict participants to responding to predefined questions, UWBdeck encourages participants to select, combine, and reinterpret data categories to design new UWB applications. In this sense, UWBdeck results do not compete with current frameworks; rather, it serve as a complementary method to conventional surveys and indices. Surveys offer representativeness and comparability at scale; UWBdeck offers situated insight and participatory engagement, particularly valuable in exploratory or cross-cultural contexts. As such, UWBdeck can act as a front-end probe, surfacing local priorities that can then be validated and integrated into broader frameworks.

Furthermore, the results from the UWBdeck workshops confirm that card-based toolkits can be extended beyond their traditional role as design ideation tools to serve as participatory research methods for tackling complex, subjective, and context-dependent constructs—particularly when predefined surveys risk imposing top-down barriers on participants. HCI researchers seeking alternatives to survey-based approaches can adopt and adapt UWBdeck’s format, using game mechanics and structured data collection (through game sheets), to elicit situated perspectives and community knowledge while maintaining methodological consistency across cultural contexts. For instance, the data-oriented gameplay proposed by UWBdeck could be employed by HCI researchers investigating perceptions of AI safety or trustworthiness, adapting the toolkit to explore how non-experts perceive the trade-off between data privacy and benefits when interacting with AI-based systems. In this context, the replicable workshop format at the core of UWBdeck would enable cross-city comparison of user-generated AI solutions while simultaneously eliciting participants’ perceptions of AI trustworthiness.

5.3 Limitations

Some limitations should be acknowledged in interpreting the findings of this study. First, all UWBdeck workshops were open to the general public, with participation entirely voluntary. This openness,

while beneficial for inclusivity, resulted in uneven participation across cities. Consequently, both the number and demographic composition of participants varied by location. Although efforts were made to mitigate biases in data interpretation arising from these differences, the findings may still not be representative of the broader populations of the respective cities. A further limitation concerns the over-representation of academic participants in our sample. While our analyses of theme distributions by gender and age suggest that these factors alone do not account for the observed cross-city variation, the uneven distribution of roles in our sample prevented us from conducting a comparable analysis by participant role. This limitation is compounded by the fact that the most prominent role—academia—may include individuals with limited long-term ties to the city, such as recent arrivals or temporary residents, potentially affecting their perception of UWB in ways that our current data cannot disentangle. Future deployments of UWBdeck should adopt more targeted recruitment strategies, extend the demographic information collected for each participant (e.g., residential status and length of residence) while preserving anonymity, and consider compensating participants for their time to support broader and more balanced participation.

Additionally, the UWBdeck methodology relies on a predefined set of data cards to scaffold ideation. While the dataset was curated to reflect a comprehensive range of data sources relevant to contemporary domestic and urban contexts, the constraint of a finite set may have limited the thematic diversity of the design outcomes. Future implementations could consider supporting participant-suggested card creation to allow for more emergent and context-specific exploration.

6 Conclusion

UWBdeck was designed as a participatory card-based method aimed at exploring the subjective perception of UWB. The variability in participant outputs across contexts highlights the limitations of top-down UWB indices. These differences align with current research directions and contribute to the understanding of UWB not as a universally fixed construct, but rather a context-sensitive framework shaped by local values, perceived challenges, and cultural norms. Furthermore, emerging UWB themes reveal recurrent dimensions currently under-represented in the latest taxonomies, underscoring the value of bottom-up, citizen-driven participatory approaches complementing traditional well-being indices.

Building on these results, future deployments of the UWBdeck will target a broader range of cities to produce a larger and more balanced dataset. To address the aforementioned limitations related to participant roles, the demographic section of the game sheet will be extended with additional questions about participants' relationships to the city. Collecting such information will make it possible to distinguish more clearly between newcomers and long-term residents, and to investigate how participants' residential status shapes perceptions of UWB factors. Additionally, as the dataset grows and the use of scenario cards becomes more balanced, we plan to investigate whether the relative salience of specific UWB themes shifts across living, work, and public-space scenarios. This will enable us to understand not only how different cities prioritize

UWB factors, but also how these priorities vary across everyday settings where urban life actually unfolds.

Additionally, building on the observed Tokyo–Numazu differences, future deployments could strategically include city dyads within the same country to further investigate the influence of urban scale on UWB perceptions. A systematic comparison between metropolitan areas and smaller cities within the same country could reveal the extent to which urbanization scale influences UWB perceptions, providing more nuanced insights into the role of city characteristics in shaping citizens' UWB priorities.

Through these steps, our future work will focus on identifying which aspects are universally recognized as essential to UWB, contributing to the development of more comprehensive frameworks and indices for quantifying UWB on a global scale.

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A Additional Figures

A.1 Distribution of themes by city

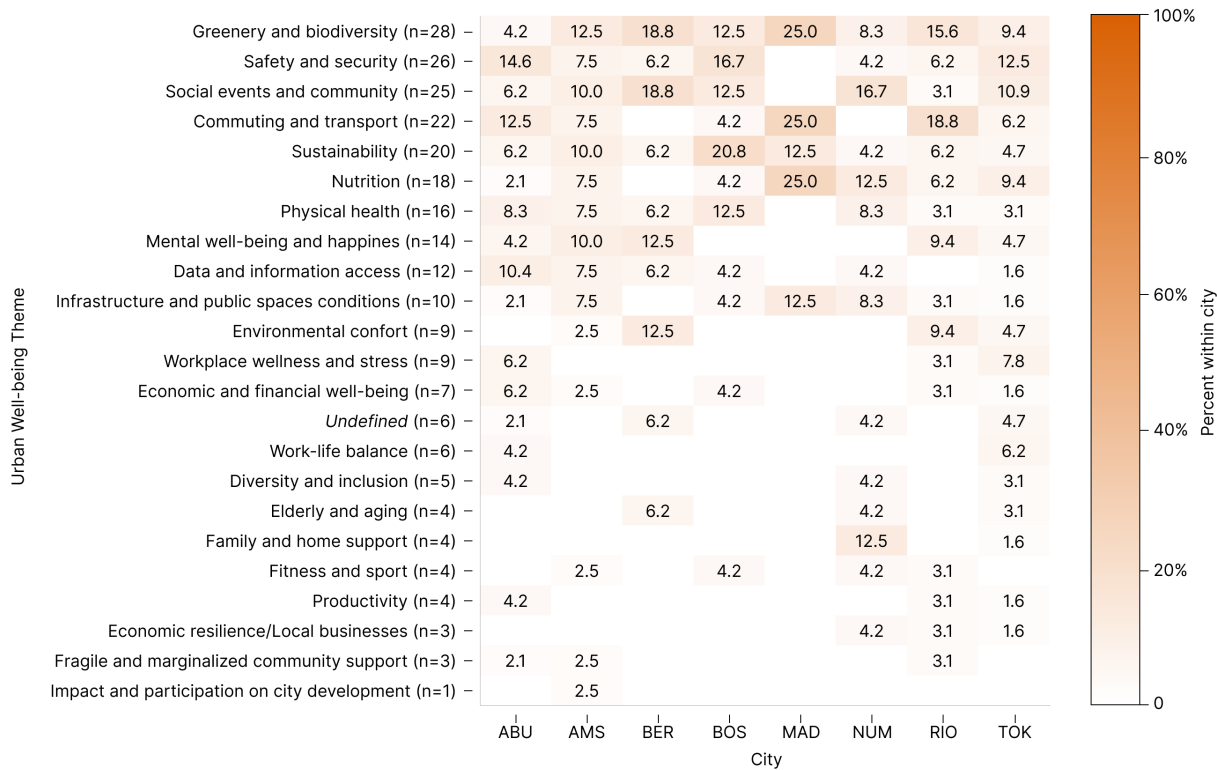


Figure A.1: Heatmap showing the distribution (percentage) of emerging themes by city. City names are abbreviated to three letter codes: ABU (Abu Dhabi), AMS (Amsterdam), BER (Berlin), BOS (Boston), MAD (Madeira), NUM (Numazu), RIO (Rio de Janeiro), and TOK (Tokyo). Empty cells indicate that no proposals in that category were recorded for that city.

A.2 Distribution of themes by gender and age

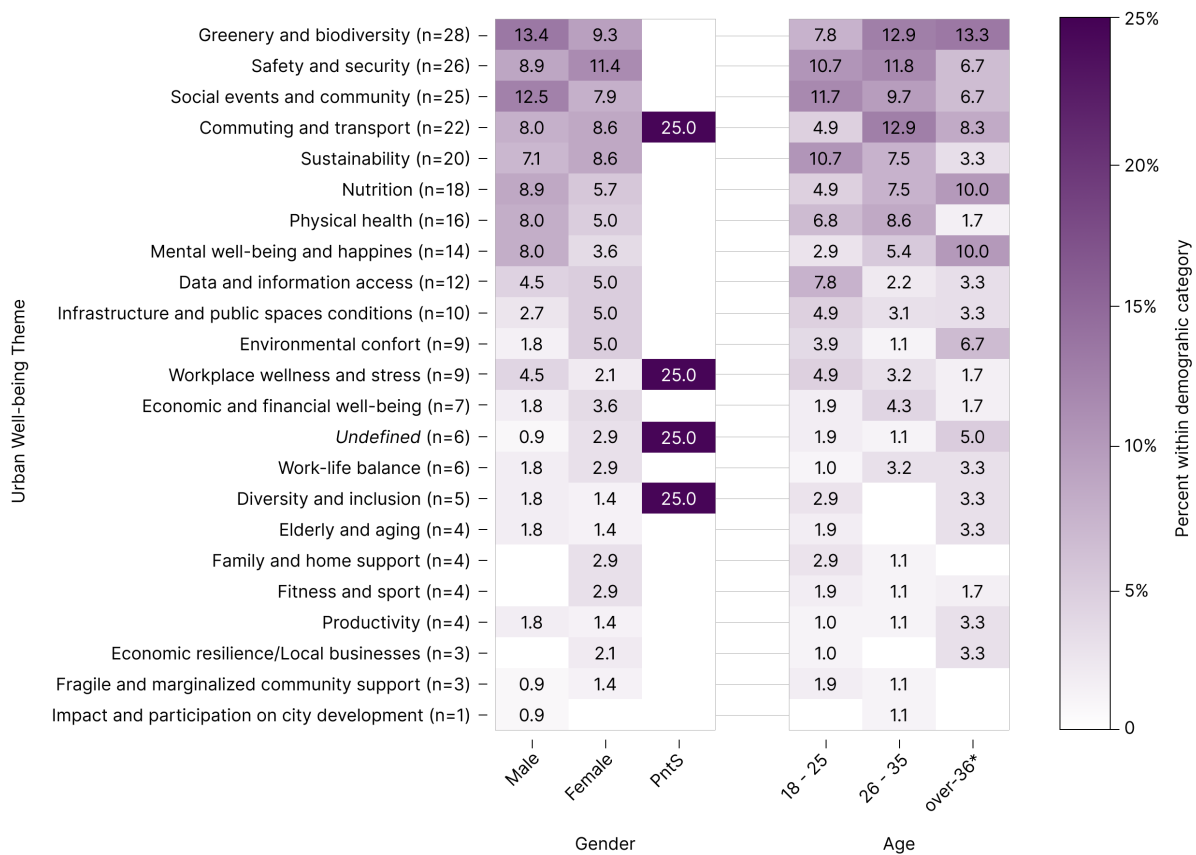


Figure A.2: Heatmap showing the distribution (percentage) of emerging themes by gender and age. “Pnts” indicates participants who preferred not to disclose their gender. *Age ranges 36–45, 46–55, and 56+ have been aggregated under the “over-36” category to ensure comparable group sizes.

A.3 Mapping of UWBdeck themes to BLI dimensions

UWBdeck Theme	BLI Dimensions									
	Housing	Income and wealth	Work and job quality	Social connections	Knowledge and skills	Environmental quality	Civic Engagement	Health	Subjective well-being	Safety
Greenery & biodiversity						•				
Safety & security										•
Social events & community				•			•			
Commuting & transport	•									•
Sustainability						•	•			
Nutrition								•		
Physical health								•		
Mental well-being & happiness									•	
Data & information access					•					
Environmental comfort						•				
Workplace wellness & stress			•							
Economic & financial well-being		•								
Infrastructure & public spaces cond.	•					•				
Work-life balance										•
Diversity & inclusion							•		•	•
Elderly & aging	•							•		
Fitness & sport								•		
Productivity	•		•							
Economic resilience / Local business		•	•							
Family & home support	•			•						•
Fragile & marginalized support							•		•	
Impact & participation in city dev.							•			

Table A.1: Matrix mapping UWBdeck themes (rows) onto OECD Better Life Index (BLI) dimensions (columns). Each mark indicates that a theme relates to a given BLI dimension. Multiple marks in a row show cross-cutting themes; multiple marks in a column indicate a BLI dimension that would aggregate diverse UWBdeck themes.