

Nomenclature

f	Dimensional temperature
F	Fluid (pure water)
V	Non-dimensional velocity component in the Y-direction
X	Non-dimensional X-coordinate
Y	Non-dimensional Y-coordinate

Abbreviations

av	Average
h	Hot solid
w	Wall

Moreover, the literature often overlooks the unique challenges and opportunities presented by rapidly growing cities in the Global South, where urbanization rates are among the highest globally [29, 30]. Therefore, there is a pressing need for research that investigates the dynamics of street development and management in densely populated urban areas. A gap in the literature exists regarding how to promote inclusivity, sustainability, and user-friendliness within the context of a “people-oriented” development approach and identify the most efficient methods and tools for measuring those dynamics [31]. Addressing these gaps can provide valuable insights into urban planning practices and policies to enhance the quality of urban life and public spaces. The research problem revolves around the predominant focus on accommodating vehicles and drivers in urban street development in certain cities of the Global South, which often overlooks the needs of pedestrians and other users. There is a growing awareness that high-quality development should be valued over rapid development. This approach creates several issues, including unsafe road conditions, the exclusion of specific user groups, and the promotion of a car-centric environment. Addressing this problem requires generating more literature to identify the essential factors and the framework needed to adopt a people-oriented approach to urban street development. By seeking answers within the discourse of urban studies, these questions can facilitate an exploration of the shift from traditional approaches to developing urban streets to more people-oriented design. Through this investigation, valuable insights into urban planning practices can be uncovered, shedding light on the transition towards people-oriented development. This review paper explores the factors influencing the development of urban streets, with a focus on prioritizing people-oriented design. Given that people are the primary users of urban streets, examining their role in street development is crucial to ensuring their needs are given precedence during design and planning. This study examines urban planning and design research that adopts and implements people-oriented design factors and indicators. The results shed light on how these design factors can be adapted in cities of the Global South. This study used a scoping review to examine journal articles indexed in the Scopus database, with Google Scholar as a supplementary database. To identify the factors driving the development of urban streets toward a people-oriented approach, a rigorous, systematic strategy is required. This study followed the scoping review phases, including identifying the research questions and aim, identifying relevant studies, selecting studies using inclusion and exclusion criteria, and extracting all relevant data. Then we chart the data using statistical and narrative methods to synthesize the results. The final step is to summarize all the results and report in the discussion section. The contribution of this study lies in its focus on examining the transition from traditional approaches to developing urban streets to more people-oriented design principles. While previous research has explored various aspects of urban planning and design, the literature lacks a clear understanding of the specific factors driving this paradigm shift and its implications for urban development, particularly in rapidly growing cities in the Global South. This study addresses this gap by conducting a systematic review of existing literature, thereby providing valuable insights into how cities can prioritize people’s needs in street development. By synthesizing findings from diverse sources, this study offers a comprehensive understanding of the challenges and opportunities of adopting people-oriented development in urban street design, ultimately advancing urban planning practices and policies.

2. Methods and materials

This study utilized a scoping review to identify and analyze key factors influencing the planning and design of urban streets within the framework of urban studies [32]. Scoping reviews were selected to analyze emergent, complex, or unexplored topics and are often used as a precursor to more focused systematic reviews [33–35]. This scoping review aimed to provide a comprehensive overview qualitatively of existing evidence, identify knowledge gaps, and synthesize key themes to inform the development of a conceptual urban policy framework for people-oriented street design [36]. Our objective in utilizing a scoping review was to examine and evaluate existing methodologies in urban studies that incorporate people-oriented approaches. As the first phase of scoping review in this manuscript, identifying research questions as follows:

- What factors and indicators addressed in the literature of urban studies

influence the design and planning of urban streets in a people-oriented development approach?

- What methods are utilized in the literature to measure these factors and indicators within the context of people-oriented development in urban streets?

Our scoping review attempted to (1) identify the research questions, (2) identify relevant studies, (3) select studies through systematic screening, (4) chart and extract the data, and (5) collate, summarize, and report the results. Unlike other types of literature reviews, such as systematic literature and PRISMA [34, 37, 38], the scoping review conducted here was designed to collect qualitative insights. The following two subsections explain the search strategy, inclusion, and exclusion criteria.

2.1 Search strategy

Data mining began in January 2024, using the Scopus database as the primary database and Google Scholar as a supplementary database to identify peer-reviewed documents on this review topic. Google Scholar was used to minimize database bias. Due to Google Scholar’s relevance-based ranking and limited filtering options, only the first 50 results were screened, as recommended in the scoping review. After scanning the results from Google Scholar, 16 documents were identified as eligible and added to the review process. The documents used covered the period 2013–2023 to include the most recent publications in the review process. Because the database search was not time-restricted initially, we found that publications on people-oriented, human-oriented, or socially oriented urban streets were few before 2012. This aligns with the evolution of the concept in literature. Therefore, the cutoff date of 2012 reflects a methodological decision grounded in the field’s historical development, rather than an arbitrary exclusion. A preliminary unrestricted search confirmed that only one relevant article appeared before 2012 using the defined search terms. A structured search strategy was developed based on search terms and their synonyms, derived from keywords on people-oriented street design and mobility [39]. In Scopus, ‘author keywords’ and ‘index keywords’ were identified during the initial search. We used Boolean operations to identify relevant articles [38, 40]. This process ensured that all relevant variations, such as ‘people-oriented’, ‘human-centered’, ‘pedestrian-friendly’, ‘urban streets development factors’, and related terms, were included in the search strategy. This approach involves developing a model/framework to drive the development of urban streets towards a people-oriented approach. A three-step approach was used to select the records in this review. The first step was to identify all potentially relevant manuscripts that addressed a people-oriented approach to planning and designing urban streets, and their role in their development. Second, pertinent sources were gathered from the Scopus database for a more thorough assessment, which involved examining their titles, abstracts, and content through keyword searches as mentioned before. Third, a few studies were excluded from the systematic review based on inclusion and exclusion criteria. This allowed researchers to discover the factors influencing the development of urban streets towards a people-oriented approach and the terminology used in the approach. Data mining was performed on the article title, abstract, and keywords. We utilized the following keywords: (‘people-oriented’ AND ‘urban’ AND ‘streets’) OR (‘Human-oriented’ AND ‘urban’ AND ‘streets’) OR (‘social-oriented’ AND ‘urban streets’) OR (‘Human-centered’ AND ‘urban’ AND ‘streets’) as terms similar to ‘people-oriented’. The Scopus database search elicited sixty-nine documents published between 2013 and 2023. In addition, snowballing was conducted using the Google Scholar database, with keywords such as ‘people-oriented streets AND ‘criteria’ or ‘Human-oriented urban streets’ AND ‘development’ AND ‘criteria’ as a separate data source. The search terms and their synonyms were developed using keywords commonly used in prior studies on people-oriented street design and urban mobility, Scopus ‘Author Keywords’ and ‘Index Keywords’ identified during the initial search, and recommendations from systematic review search guidelines, which emphasize the use of related terms and Boolean synonyms to maximize coverage [36, 41]. This process ensured that all relevant variations, such as ‘people-oriented’, ‘human-centered’, ‘pedestrian-friendly’, ‘urban streets development factors’, and related terms were included in the search strategy.

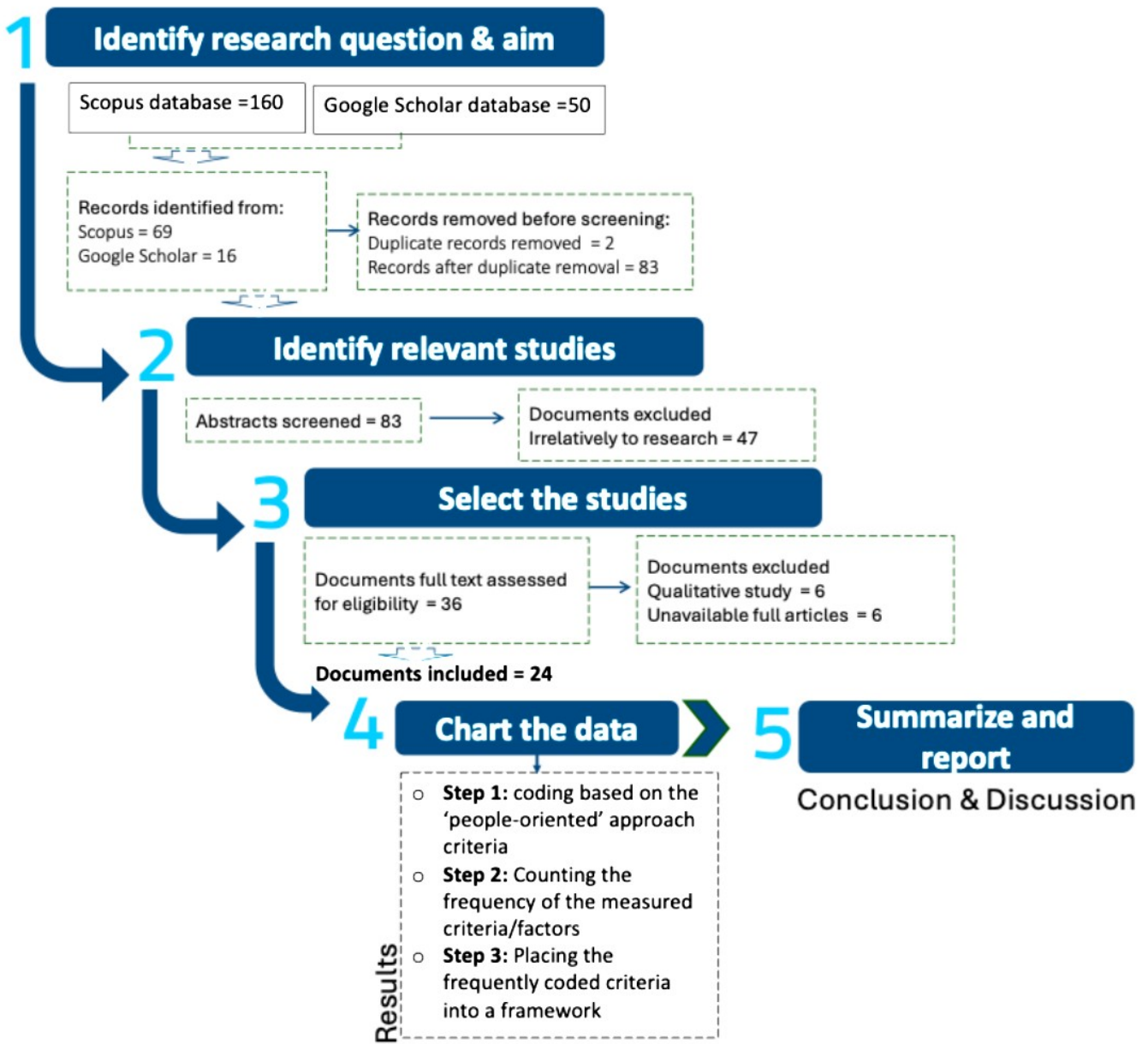


Figure 1. Scoping review flow diagram. Source by the authors.

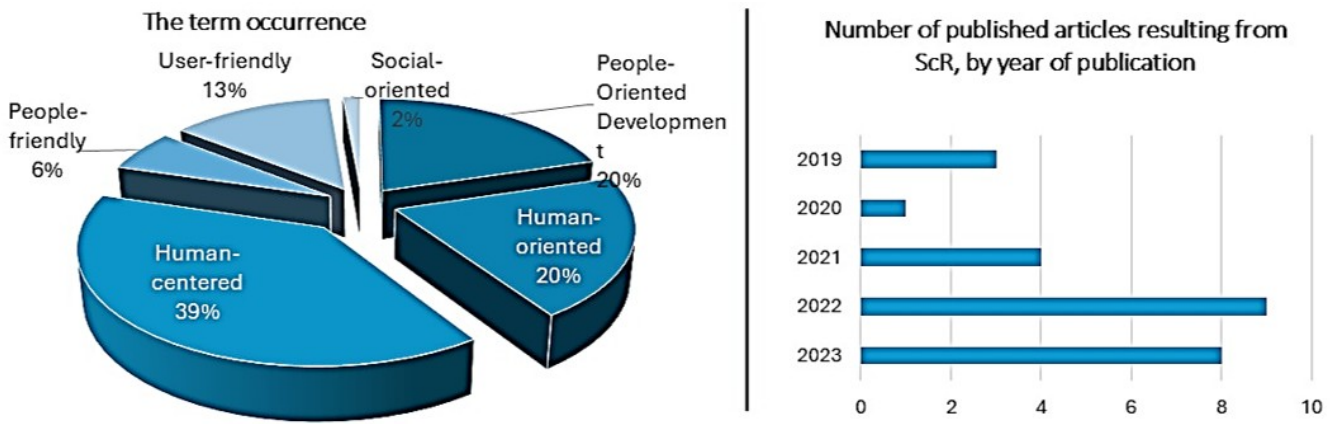


Figure 2. Year of publication and word occurrence.

The most remarkable method employed was the use of multiple data sources

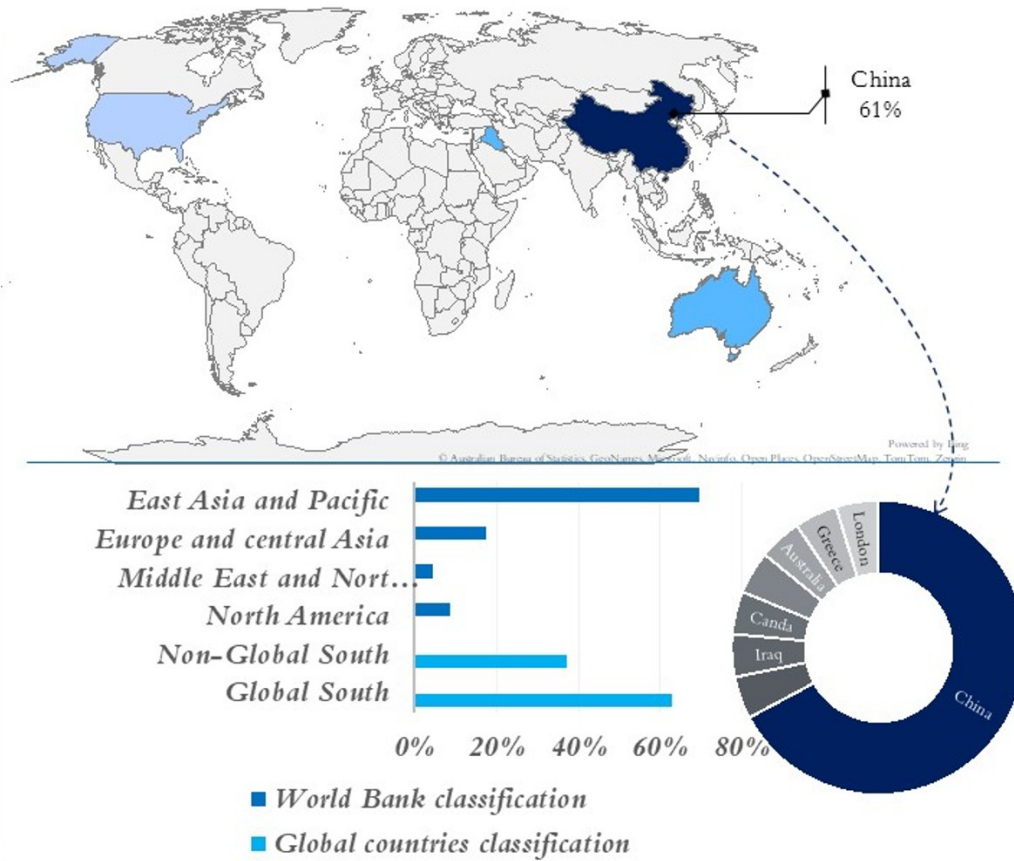


Figure 3. Geographic distribution of the manuscripts included in our scoping review. Source: The authors and the map were drawn based on Australian Bureau of Statistics, GeoNames, Microsoft, Navinfo, Open Places, OpenStreetMap, TomTom, Zenrin Powered by Bing.

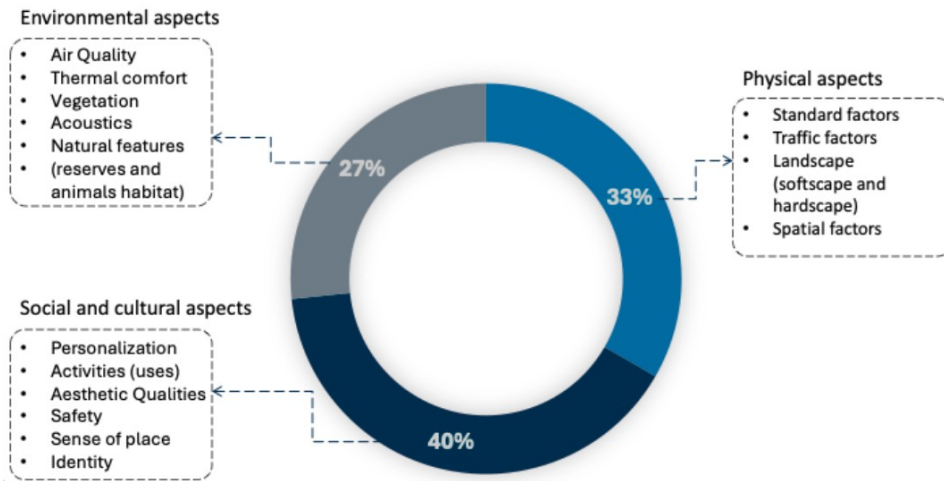


Figure 4. The percentages of different aspects and the resulting factors that were discussed in the reviewed articles. Source: The authors.

rather than a single one to analyze qualitative data numerically. To analyze qualitative data, the traditional approach was to use a questionnaire, which was not very accurate.

3.3 Approaches, analysis methods, and tools

However, more recently, researchers have used a variety of analytical models (a multi-method approach), including deep learning and regression models for statistical data, along with many satellite street-view images to be analyzed and evaluated using those models. Additionally, using trackers and analysis using AI (artificial intelligence) programs to monitor pedestrian flow, traffic, and other characteristics is becoming increasingly popular. In this review, the case studies from the empirical reviewed articles were organized into three categories: street scale, street network scale, and the district/city center scale

Fig. 6. Most of the reviewed articles focused on the district scale, selecting the city center as the main case study. Figure 7 shows the relationship between the adopted approaches in the reviewed articles and the methods and tools used to analyze case studies, along with the corresponding percentages of frequent distribution. Notably, while social factors were typically evaluated using one or two data sources, our analysis indicates that a multi-source approach is the most reliable for comprehensive assessment.

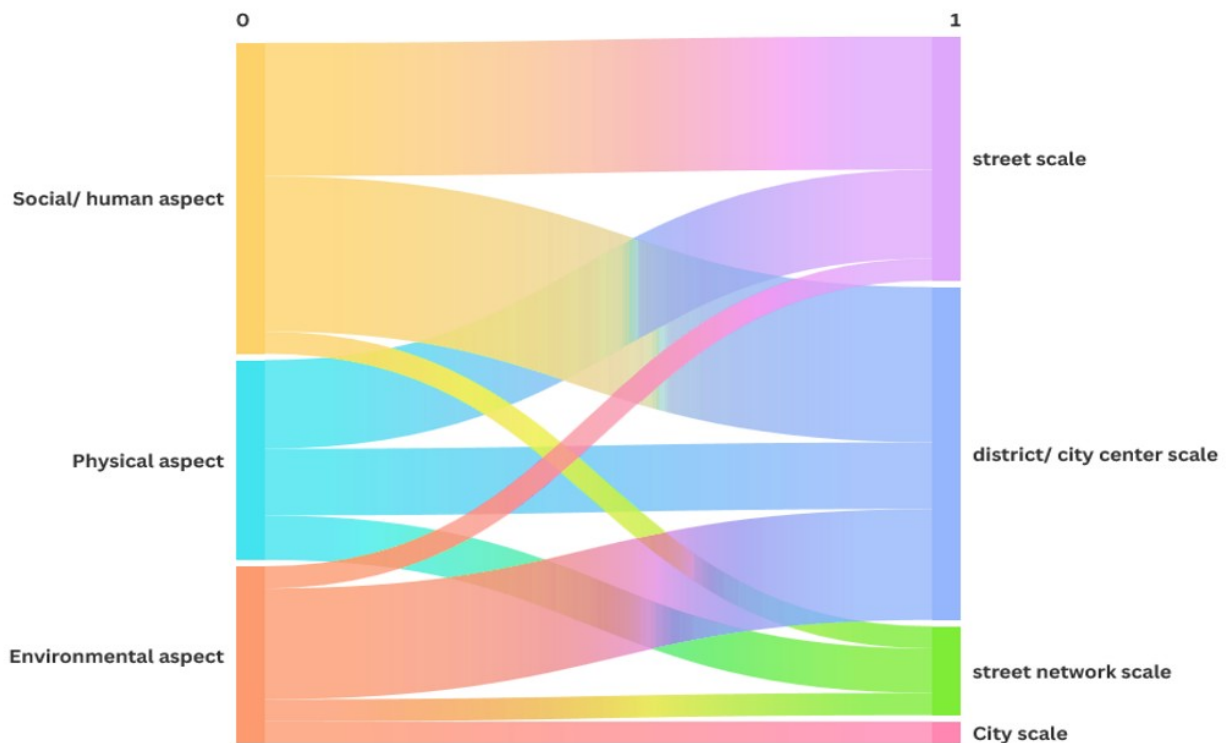
4. Discussion

The discussion section of this study presents the identified factors, the best methods and models used to measure them, and the qualitative data supporting them. This study also examined the contributions of the ‘people-oriented’

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Table 2. Adopted methods and tools retrieved from data analysis. Source: The authors.

Uses	Methods, tools and models	Sources
Street-View map	1. The Convolutional Neural Network model (CNN)	[50]
Visual quality of street-view images extraction with it.	2. Deep-learning algorithm model 3. Human-machine deep learning model	[[26]]
Explainable AI techniques	4. Random Forest model (RF); 5. The Shapley Additive Explanation (SHAP) method	[50]
Segmentation model	6. The Pyramid Scene Parsing Network (PSPNet) 7. Geographic Information System (GIS) 8. The Internet of Things (IoT)	[50] [51, 52] [53]
A human-oriented indicator to evaluate the quantity of greenery viewed by human eyes in daily life	9. The Green View Index (GVI)	[19]
Indicator of greenery	10. The Normalized Difference Vegetation Index (NDVI)	[19]
Accessibility metrics	11. Network science	[29]
Human-oriented planning tool evaluation method	12. A Multicriteria Criteria Analysis process (MCA) 13. REGIME method 14. Multi-Criteria Decision Aiding (MCDA), Multi-Criteria Decision Making (MCDM)	[54] [27]
Portray the geometric spatial structure and visual surface elements for the streetscapes	15. The skeleton and skin indices 16. Improved ridge regression model 17. Least Square Regression 18. The Geographically Weighted Regression (GWR) model	[17] [55]
Human-centered perspective of the city scale assessment, highlighting the situation of urban tree shade provision.	19. Eye-level Street panorama images community profiles	
Innovative comparisons methods	20. Cognitive (or image) mapping	[56]
quantitative methodology of questionnaires	21. Statistical Package for Social Sciences and Space Syntax (SPSS) 22. Delphi method	[57]
Using surveys digitalization and parsing methods	23. Road alignment generation method 24. Shadow processing method	[27]

**Figure 5.** The analysis connected the aspects identified across the reviewed studies with the various scales at which they were applied. Source: The authors.

development approach to urban streets and identified areas for future research to support it. The findings of this review also offer deeper theoretical insights into how people-oriented development can be operationalized in urban street design. In addressing the research questions, the review demonstrates that an interconnected set of social, spatial, environmental, and mobility factors shapes people-oriented development. While previous studies tended to examine these dimensions independently, this review shows that they must be understood as a unified system in which street design decisions directly influ-

ence community satisfaction, walkability, safety, and social interaction. The analysis also responds to the methodological research question by revealing significant variation in the tools used to evaluate people-oriented development. The identification of twenty-four distinct methodological approaches clarifies the fragmented nature of current scholarship and demonstrates the need for more integrated assessment frameworks. By synthesizing these methods into a five-step action plan, this review provides a clearer operational pathway for researchers and practitioners, which was previously missing in the literature.

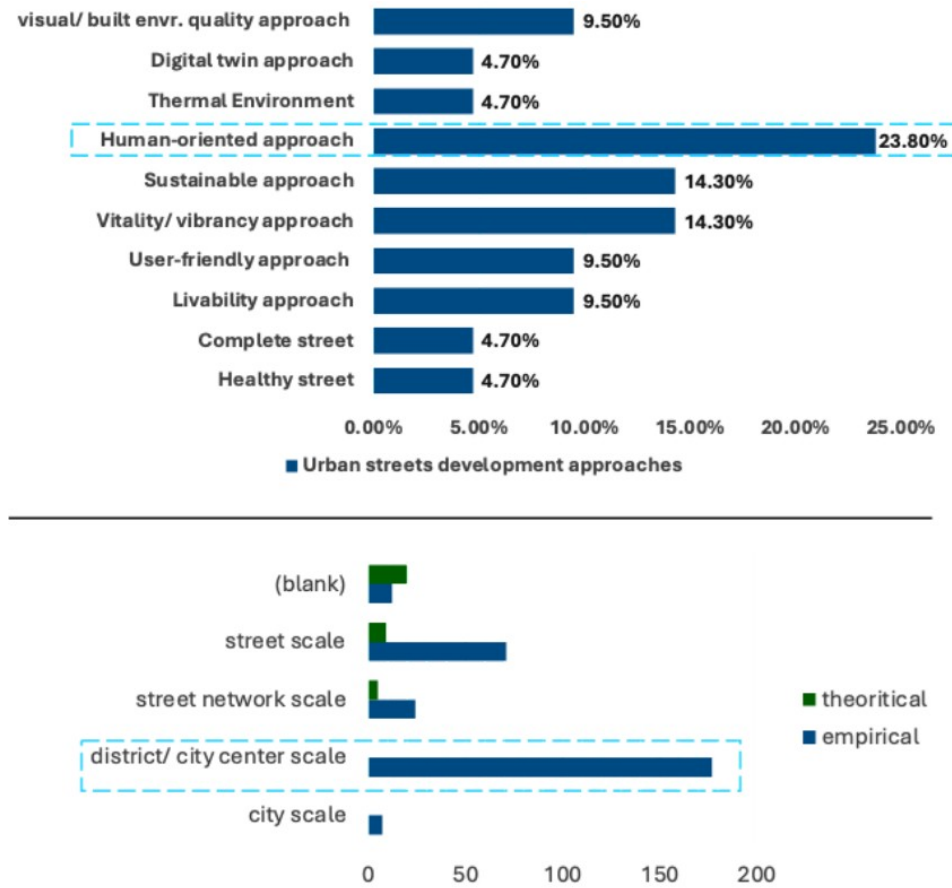


Figure 6. Urban streets development approaches in the empirical reviewed articles. Source: The authors.

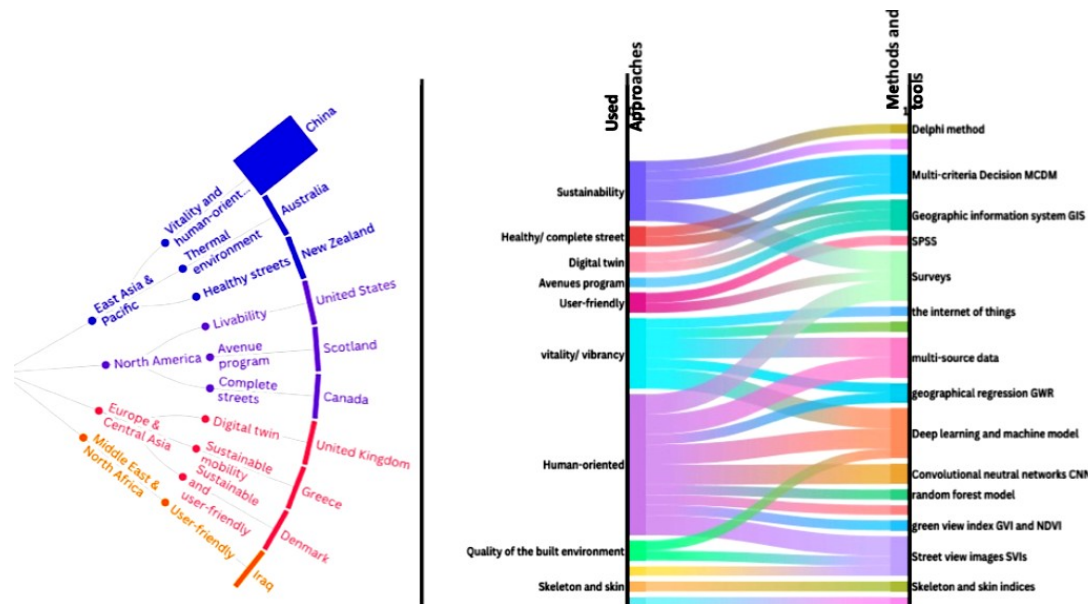


Figure 7. Radial graph of the geographical location (left). The frequency distribution of approaches on different methods and tools (right). Source: The authors.

Connecting back to the research questions, the review confirms that people-oriented street design consistently improves user experience and community well-being. However, it also shows persistent gaps in empirical measurement, particularly regarding long-term behavioral impacts, social equity outcomes, and multisource data integration. These gaps mark essential directions for future research. The discussion advances theoretical understanding by integrating scattered evidence into a cohesive interpretation of people-oriented development and by offering a structured methodological framework that can

support more holistic, evidence-based urban street design. There are many factors affecting urban streets development and orient streets towards specific aspects, such as car-oriented sustainability or even this paper’s topic, to be people-oriented. In order to discuss them first, there are three key dimensions that include many factors with indicators to be measured. Those elements are the same in other development approaches, except that in this people-oriented approach, it focuses on specific factors more than others to consider people in urban street design or development. This study concludes by classifying those

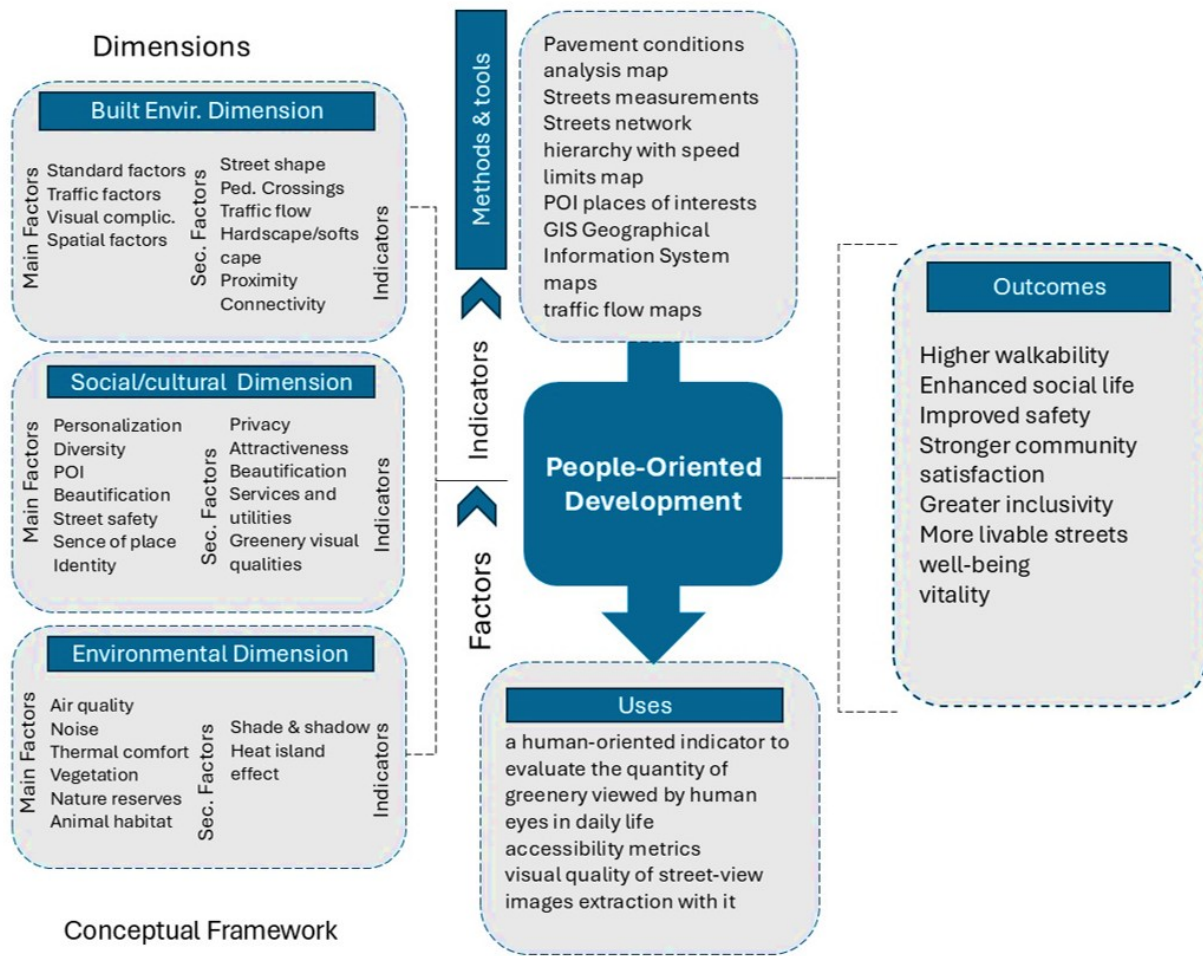


Figure 8. People-Oriented Development conceptual framework. Source: The authors.

factors, grouping them into three main aspects to be included in an action plan as a result of achieving the people-oriented approach to developing urban streets. Physical/built environmental characteristics (street form), social and cultural characteristics/human-oriented factors (activities and uses/ diversity/ land use analysis), and ecological factors (health, street microclimate), Fig. 8. Many of the reviewed studies focused on the physical aspect of the built environment, whether landscape-related (specialized in greenery), spatial-related (specialized in connectivity and accessibility), or traffic-related (specialized in safety standards). Overall, it can be divided into three categories: standard, spatial, and traffic factors. Standard factors include street size and width relative to its hierarchy, landscape features (hardscape and street furniture, lighting, and disabled facilities), and softscape and green spaces. Some of the reviewed articles focused more on a new classification of urban street hierarchy based on their adopted approach. In contrast, others focused on the greenery part using indicators to measure those factors. Spatial factors, including Connectivity, can be measured through some variables such as link (streets-streets, street-nodes or node-streets, nodes-nodes), accessibility, least-angle, and centrality. Also, pedestrian connectivity can be measured by both distance and route directness. Distance is computed using the concept of pedestrian catchment areas (PCAs), while directness is measured using pedestrian route directness. Findings from many studies show that the lower the road hierarchy, the more connected it is to users. Factors that achieve connectivity are path continuity, accessibility, and an integrated network of paths. Continuity is one of the most critical factors affecting the path's efficiency, as it ensures there are no obstacles that interrupt pedestrian movement along the route [10]. Factors that ensure road continuity include a smooth, level, and clear sidewalk free of obstructions to prevent trips and falls, and one that is accessible to all—traffic factors, such as congestion, traffic flow, and street hierarchy (limited speed). Many factors affect the environment on urban streets, including the urban heat island, which impacts the thermal comfort of different users, especially pedestrians. Thermal comfort is the subjective satisfaction with the thermal environment and is assessed by subjective and objective factors, such as air velocity, relative humidity, and air

temperature. There are other factors related to many environmental aspects, such as climate comfort, visual comfort, acoustic comfort, and a sense of safety along the path, which can be enhanced by using water elements and trees and can also affect health. This aspect is the primary dimension of this study to find out the factors affecting this aspect, such as pedestrian flow and pedestrian safety, that can be presented in activities and uses such as restaurants and similar establishments that support and help sidewalks stay active during the day and into the evening, keeping eyes on the street. Factors that contribute to safe roads are visible police presence, people walking, cycling, and waiting at bus stops. Privacy is considered in personal spaces, which are affected by factors such as distances between buildings, noise, and the use of trees for insulation. Attractiveness is about attracting people to places such as parks, events, shopping, museums, and theaters. One of the factors behind the place's success is the availability of supportive pedestrian uses accessible to all segments of society. Transparency refers to the degree to which people can see or perceive what lies beyond the edge of a street or other public space, and, more specifically, the degree to which they can see or sense human activity beyond that edge. Factors that achieve transparency are the proportion of windows, street walls, active uses, and the number of businesses. The integration of the built environment on both sides of a street is based on height and character. Integration factors are consistency and harmony in materials, colors, buildings, size, window openings, and their details, entrances, and facade details. One way to foster participation between users and their surrounding environment is to provide a set of characteristics and vocabulary that give it an independent personality. People feel its distinctiveness and uniqueness, strengthening a sense of belonging. This study identified and collected all the factors from the literature that can affect the development of urban streets towards a people-oriented approach. They were also classified and linked to the indicators and tools in the (Density) and diversity. What is meant by diversity is not just the mixing of different sensations within space, but also the formation of a homogeneous structure that harmonizes with the various activities and functions, thereby increasing the space's visual beauty.

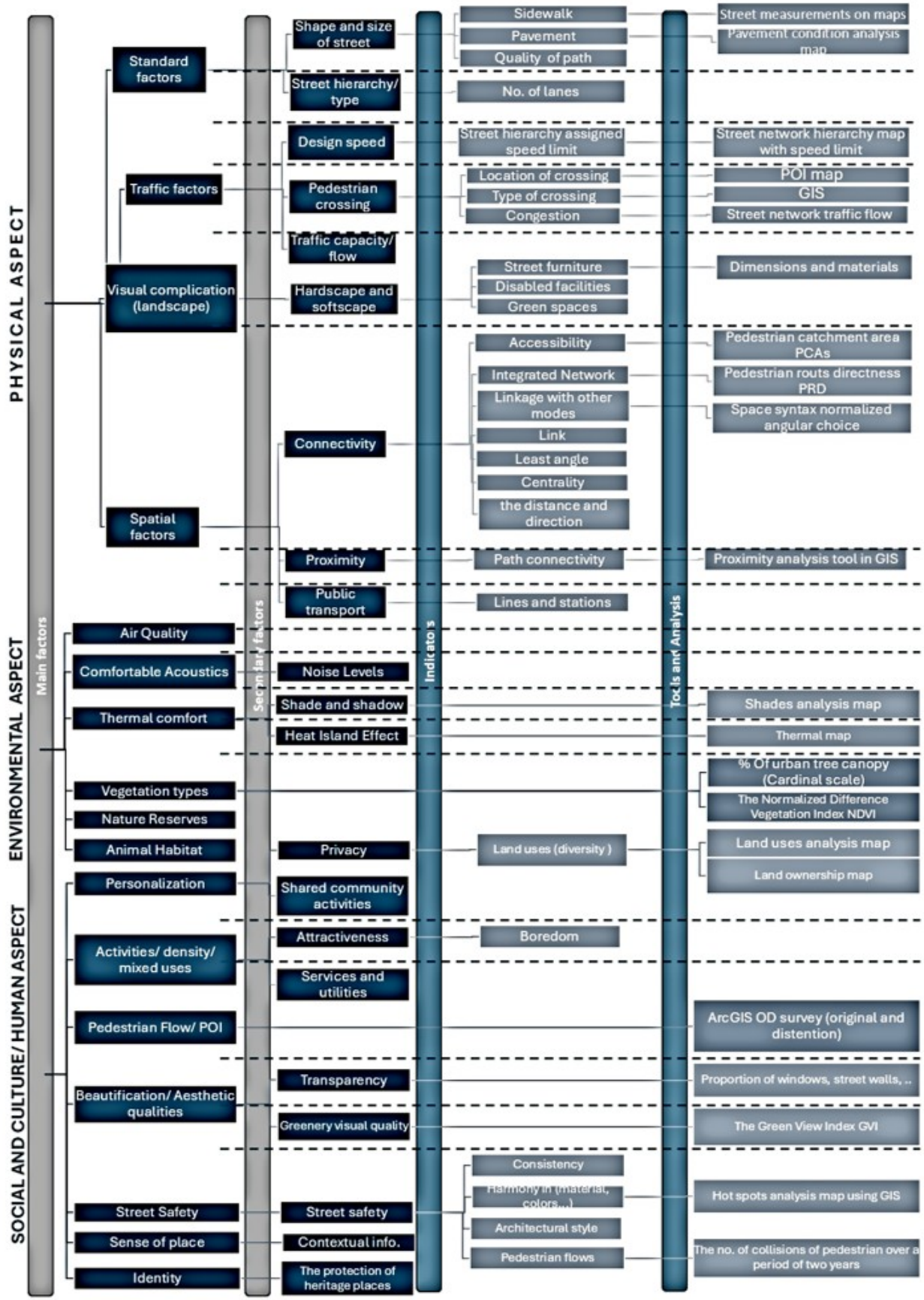


Figure 9. People-oriented development factors, indicators, and tools in the physical environmental aspect. Source: The authors.

Figure 9 shows the boundaries of the functional zones of urban street space. Although it shows the urban street areas, such as street zones, which represent the space between the two sidewalks, can be designed to carry various modes of transportation and their ancillary facilities, and sidewalks, which are dedicated spaces with clear walking paths and universal access, are used for a variety of activities and functions. In real-life streets, this is not always the case [56, 58]. As concluded from the literature review, the factors of urban street

development are. They are divided into main factors and secondary factors. The factors affecting urban street development should be people-oriented, prioritizing the main users and the most vulnerable pedestrians. The findings from the reviewed articles are that the factors affecting urban street development should be collected using a human-oriented approach. This review developed an action plan to follow the essential steps Fig. 10.

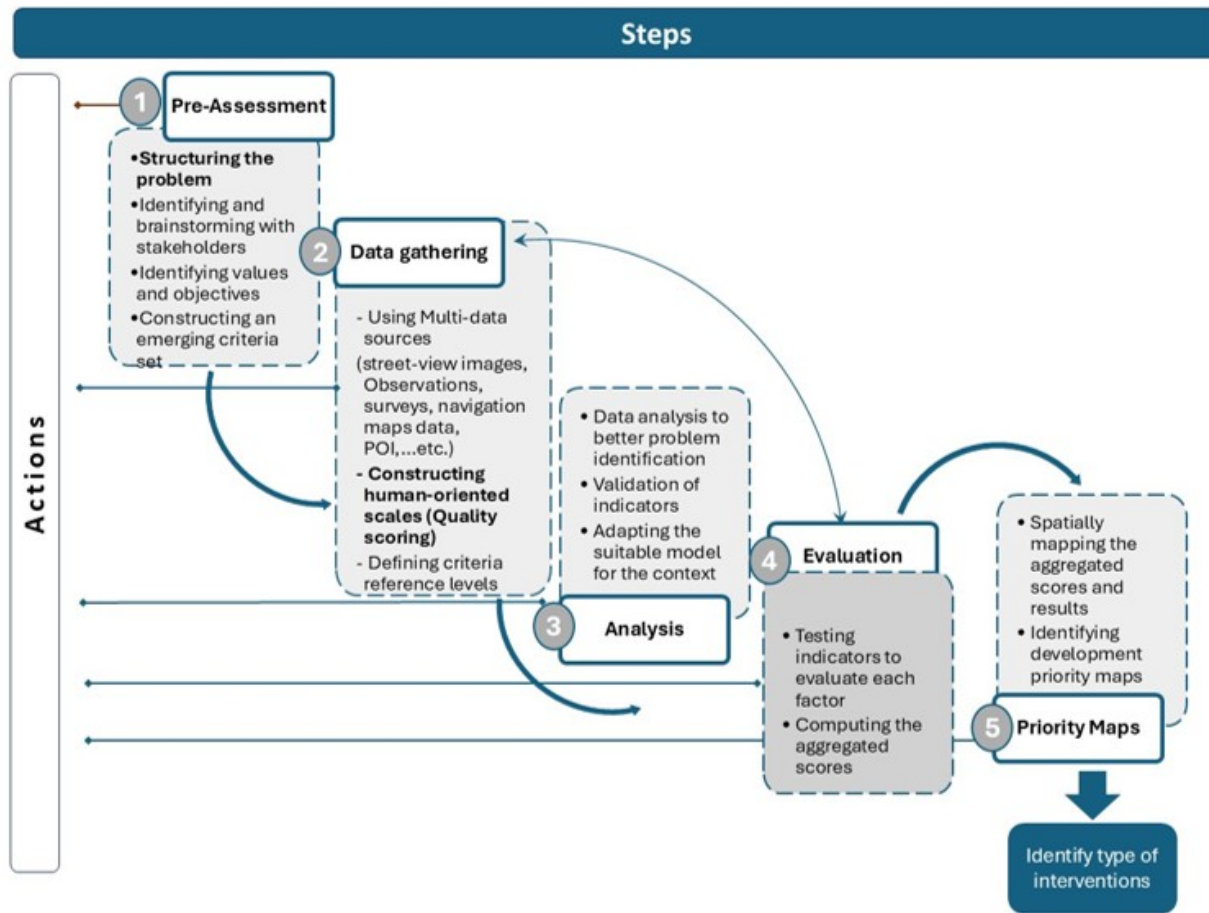


Figure 10. An action plan with steps and actions for reaching people-oriented development in urban streets. Source: The authors.

Several scholars have noted that people-oriented development research lacks a unified theoretical framework and that existing studies address factors and indicators in a fragmented manner [1, 8, 59, 60]. This review contributes to addressing that gap through three main insights. First, the analysis showed that research on people-oriented street development remains geographically limited, with most studies originating from a few countries. This confirms the observations of Mehta (2014) [8] and Gehl (2010) [1], who highlighted the dominance of Global North contexts despite the urgent need for people-centered approaches in rapidly urbanizing regions. Our findings emphasize the persistent scarcity of empirical studies from the Global South, where data limitations continue to constrain research efforts [1, 8]. Second, the review revealed the growing use of multisource datasets—such as street networks, satellite imagery, POIs, trip data, and location-based services—to assess street conditions. This aligns with recent advances in urban analytics [19, 52, 53], which stress integrating spatial and digital data for a more complete understanding of human-centered environments. Our findings extend this by showing that multisource data not only improves analytical precision but also enriches interpretations of social dimensions such as walkability, vibrancy, and comfort [26, 29]. Third, the synthesis identified a broad but scattered set of factors shaping people-oriented street development. While earlier studies tend to examine these dimensions separately, such as social interaction (Gehl, 2020) [1, 13, 61], perceived safety [3, 56], accessibility [23], and comfort [22]. Our review combines them into a structured, integrated framework. This directly responds to

calls by Gehl (2010) [1] and Mehta (2014) [8] for a more coherent theoretical model of people-oriented development. Our study reinforces previous findings that effective street design must incorporate social, behavioral, and environmental considerations to support human-centered development [13, 61–63]. Earlier research shows that walkable, socially supportive, and community-responsive streets enhance public satisfaction and urban well-being [16, 64]. Our results align with these observations, showing a clear relationship between people-oriented street characteristics and a more positive community experience [7, 19, 26]. Moreover, while previous work has identified a wide array of tools and indicators used in people-oriented development assessment [52, 65], our review article advances the field by synthesizing 24 methodological approaches into a coherent five-step action framework. This contribution provides planners and policymakers with a practical, evidence-based pathway for implementing inclusive, people-oriented street design, thereby strengthening both the theoretical and applied dimensions of the field.

5. Conclusion

This study reviewed selected documents on the people-oriented approach yielded from our scoping review. The results investigated the influencing factors in the development of urban streets, using the scoping review method. Addressing two main queries about the factors affecting urban street development towards a people-oriented approach, and the adopted methodology and tools used to

measure them. The review revealed that these models were predominantly concentrated in a few countries, despite the potential need in other regions. This concentration might be attributed to the scarcity of data in these other regions. The evaluation of urban streets in a people-oriented development approach relied on several datasets from various sources. These datasets included street network maps, street-view satellite images, people-oriented development points of interest, street trip numbers, and location-based service data. The review contributes new knowledge by offering a consolidated, structured synthesis of the factors shaping people-oriented street development, integrating findings previously fragmented across disciplinary studies. Unlike earlier reviews of types of literature review, this study classifies the methodological tools and demonstrates how different approaches can be applied to evaluate people-centered street conditions. Based on the synthesis, a practical five-step urban action plan is proposed to guide planners and policymakers in applying evidence-based strategies. The analysis reveals that using multisource data generates more accurate and holistic insights into the social dimensions of street design. By explicitly linking street interventions to community satisfaction, social interaction, and overall well-being, this study advances theoretical and practical understanding of people-oriented development. It provides a clear pathway for its implementation in urban policy and practice. The analytical approach in these studies highlights the significance of understanding factors influencing people-oriented urban street development. However, it is imperative to acknowledge several limitations within the research. First, the study used only two databases, Scopus and Google Scholar, and excluded others due to accessibility issues. The results might not cover the entire topic due to the study's size. Furthermore, the study was limited by the number of publications available for the scoping review guideline, which affected the thoroughness of the findings. Despite these drawbacks, the current study adds valuable insights to the literature on the human-oriented approach to urban street development. A more thorough grasp of the subject might be possible with more extensive research using a larger dataset. Another research limitation is that this study depends only on one primary database (Scopus) and Google Scholar as a supplementary database. Therefore, in future research, we may need to expand our study to include additional databases, such as Web of Science. Additionally, urban planners and designers need to thoroughly evaluate the quality of the studies included in our analysis.

A. Appendix

A.1 Categorized summary of included studies

This appendix presents a structured summary of the 24 studies included in the scoping review. The studies are organized according to multiple analytical dimensions, including key aspects such as problem, limitations, objectives, and discussed factors, as well as additional attributes like geographic location, study scale, title, journal, and other relevant characteristics. This categorization underpins the content analysis conducted and supports the extraction of key themes and insights that inform the results presented in the article. The structured summary can be found [here](#).

Authors' contribution

All authors contributed equally to the preparation of this article.

Declaration of competing interest

The authors declare no conflicts of interest.

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Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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