PROXIMITY- AND TRANSIT-BASED ACCESSIBILITY OF PUBLIC CATERING FACILITIES IN TASHKENT: INTEGRATING 15-MINUTE CITY METRICS WITH PUBLIC-SPACE QUALITY ASSESSMENT

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Abstract. The location of public catering facilities is closely related to everyday mobility, public-space quality and neighborhood accessibility. In Tashkent, where urban growth, metro expansion, bus-corridor development and new public-space standards are shaping the future city, food-related services should be planned as part of a multimodal accessibility system. This article proposes a proximity- and transit-based accessibility model for public catering facilities. The method integrates the 15-minute city logic with public-space assessment indicators and differentiates between daily, periodic and city-level gastronomic demand. Three catchment scales are used: 400 m for immediate pedestrian access, 800 m for neighborhood walk-bike access and 1200 m for transit-linked access. The proposed Public Catering Accessibility Index combines walkability, public-transport connectivity, demand intensity, public-space quality, functional compatibility and seasonal adaptability. A pilot scenario demonstrates how different urban prototypes require different facility formats: central station areas are suitable for compact food courts and food streets; residential metro-adjacent neighborhoods require daily cafes and canteens; peripheral bus nodes need modular and phased formats; park edges require seasonal terraces and removable pavilions; and market streets support traditional and image-sensitive food clusters. The article contributes a decision matrix that translates accessibility indicators into architectural-planning recommendations. The model can be used by planners, architects and municipal authorities to avoid both undersupply in residential areas and excessive concentration in already congested central streets. Its practical value lies in supporting a balanced network of public catering facilities within the evolving Tashkent metropolitan system.

Keywords: 15-minute city; accessibility; public catering; Tashkent; public transport; walkability; public-space quality; urban planning

Highlights

- A multimodal accessibility model is proposed for locating public catering facilities around walkable neighborhoods and transit nodes.
- The framework combines 400 m, 800 m and 1200 m catchments with public-space quality and demand intensity indicators.
- The model links facility size and format to pedestrian flow, transit access, public-space capacity and seasonal usability.
- The approach supports district-level planning for Tashkent and can be integrated into the IRPA Navigator tool.

1. Introduction

Accessibility has become a central criterion in contemporary urban planning. The quality of everyday urban life depends not only on the presence of services, but also on the time, comfort and safety required to reach them. Public catering facilities are part of this everyday service network because they serve lunch breaks, family gatherings, social interaction, tourism, recreation and transit-based consumption. Their placement therefore influences both urban mobility and public-space vitality.

The 15-minute city concept argues that essential services should be reachable within short walking or cycling time. Although the concept is often associated with schools, healthcare, retail and parks, it is equally relevant to food-related services. A neighborhood without accessible cafes, canteens or affordable daily food options may be spatially complete on a map but socially incomplete in everyday practice. Conversely, an overconcentration of restaurants in central areas may intensify traffic, waste, noise and price pressure.

Tashkent is a useful case for developing an accessibility model because the city combines historic neighborhood patterns, Soviet-era microrayons, metro corridors, bazaars, parks, new commercial developments and rapid metropolitan expansion. Recent planning documents indicate a long-term orientation toward balanced development, transport infrastructure, public environment standards and green-space improvement. This creates an opportunity to formulate public catering placement as part of an integrated accessibility and public-space strategy.

The research problem is the absence of a clear methodological link between accessibility catchments and typological decisions in public catering planning. In practice, distance to a road or commercial visibility may dominate location decisions, while pedestrian comfort, transit transfer, seasonal microclimate and public-space carrying capacity are considered later. This article argues that such factors should be included from the beginning of the location-selection process.

The aim of the article is to propose a proximity- and transit-based accessibility model for public catering facilities in Tashkent. The objectives are to define catchment scales, formulate a composite accessibility index, demonstrate a pilot decision matrix and identify typological recommendations for major urban prototypes.

2. Literature Review

The literature on accessibility distinguishes between distance, travel time, network connectivity and perceived comfort. A 500 m Euclidean radius may not be equivalent to a 500 m pedestrian route if street crossings, barriers, climate and safety are poor. Therefore, accessibility assessment should account for the real pedestrian network and for qualitative conditions of public space.

The 15-minute city concept has stimulated extensive debate about proximity, social equity and decentralization of services. Studies emphasize that accessibility is uneven within cities and that proximity-based planning must be combined with public transport, especially in large metropolitan areas where not all functions can be evenly distributed at walking distance.

Public catering facilities are especially suitable for a multiscale interpretation: daily meal services should be close to residences and workplaces, while destination gastronomic clusters can be connected through high-quality transit.

Public-space assessment literature adds a qualitative layer to accessibility. UN-Habitat's public-space toolkits emphasize distribution, accessibility, quantity, quality, safety and inclusion. For catering facilities, this means that a well-located site is not simply close to users; it should also have adequate frontage, pedestrian visibility, outdoor seating potential, shade, waste-management capacity and compatibility with surrounding uses.

Transport-oriented development studies also show that transit nodes can concentrate commercial activity, but only when pedestrian flows are managed and land-use conflicts are controlled. A metro entrance, bus stop or interchange may provide high demand, yet poor spatial design can produce congestion rather than quality urban life. Thus, transit-based catering placement requires a balance between intensity and spatial capacity.

3. Materials and Methods

3.1. Study Logic and Catchment Scales

The proposed model uses three nested catchment scales. The 400 m catchment represents immediate pedestrian access, approximately corresponding to a 5-minute walk under comfortable conditions. The 800 m catchment represents a neighborhood walk-bike range and can be used for daily and periodic services. The 1200 m catchment represents a transit-linked range where the facility is connected to a metro station, bus corridor or major transfer node. The distances are planning thresholds and should be converted into network-based travel time in detailed GIS application.

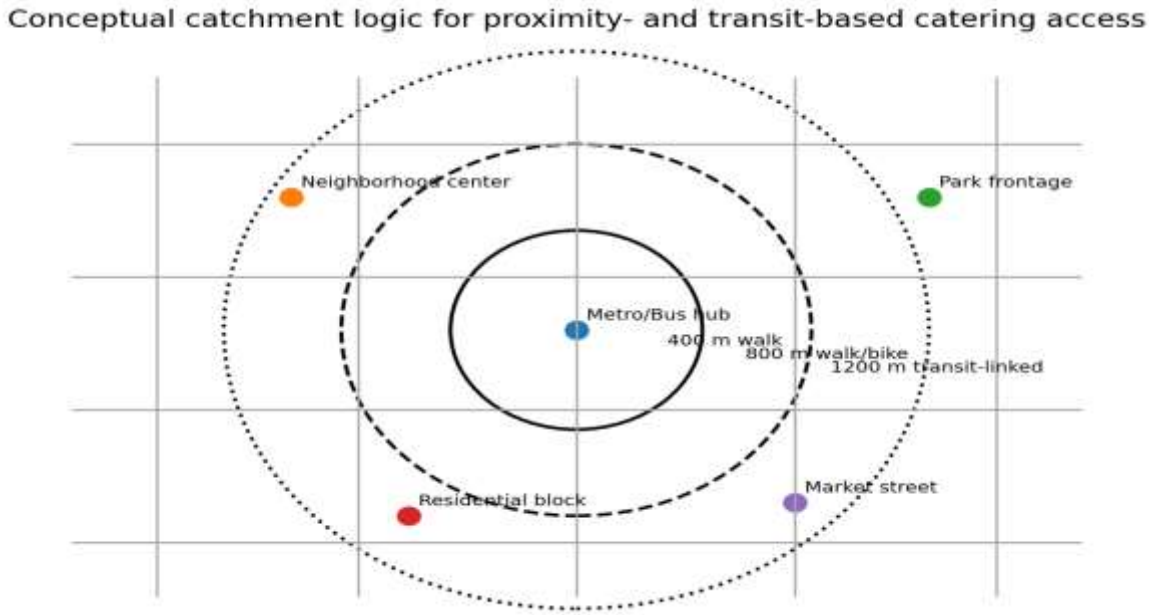

Figure 1. Conceptual catchment logic for proximity- and transit-based public catering access.

3.2. Public Catering Accessibility Index

The Public Catering Accessibility Index (PCAI) is designed as a composite score. It can be calculated for a block, street segment, transit catchment or district. The general formula is: PCAI = 0.20W + 0.20T + 0.18D + 0.17P + 0.13F + 0.12S, where W is walkability, T is transit connectivity, D is demand intensity, P is public-space quality, F is functional compatibility and S is seasonal adaptability. The weights are preliminary and should be calibrated by expert evaluation or analytic hierarchy process.

Symbol	Indicator	Operational meaning	Measurement examples
W	Walkability	Quality and continuity of pedestrian access	network distance, sidewalk width, crossing safety, barrier index
T	Transit connectivity	Access to metro, bus corridors and interchanges	distance to stations, transfer intensity, service frequency
D	Demand intensity	Potential number and diversity of users	population, employment, students, tourists, event flows
P	Public-space quality	Capacity of space to support safe and comfortable use	frontage activation, shade, seating, lighting, visibility
F	Functional compatibility	Degree of fit with surrounding land uses	residential conflict, office demand, market synergy, heritage sensitivity
S	Seasonal adaptability	Ability to function in summer/winter and different time periods	terraces, modular shading, heating, wind protection, night-time control

3.3. Typological Translation Rules

After PCAI calculation, the model translates the score into typological and architectural recommendations. High PCAI with high public-space quality supports food streets, cafe clusters and destination formats. High PCAI with low public-space capacity requires compact, queue-managed and indoor formats. Moderate PCAI in residential areas suggests everyday cafes, canteens and small tea-houses. Low PCAI with strategic future growth suggests mobile or phased temporary formats until demand and infrastructure increase.

PCAI range	Urban meaning	Recommended formats	Planning caution
0.80-1.00	Very high accessibility and demand	Food street, mixed gastronomic hub, compact food court	Control congestion, noise, waste and facade quality

PCAI range	Urban meaning	Recommended formats	Planning caution
0.65-0.79	High accessibility	Cafe cluster, neighborhood restaurant, transit cafe	Balance intensity with pedestrian capacity
0.50-0.64	Moderate accessibility	Small cafe, canteen, tea-house, seasonal terrace	Improve walkability and public-space quality
0.35-0.49	Emerging accessibility	Mobile unit, kiosk, pilot pavilion	Use temporary formats and monitor demand
Below 0.35	Weak accessibility	Basic local service only or defer investment	Prioritize infrastructure before intensive development

4. Results

4.1. Pilot Composite Accessibility Profiles

The pilot profiles show that different urban prototypes may achieve similar overall accessibility through different components. A central station area has high walkability, transit connectivity and demand, while a park edge may have strong public-space quality and seasonality but weaker daily demand. This difference is important because facility type should respond to component structure, not only to the final score.

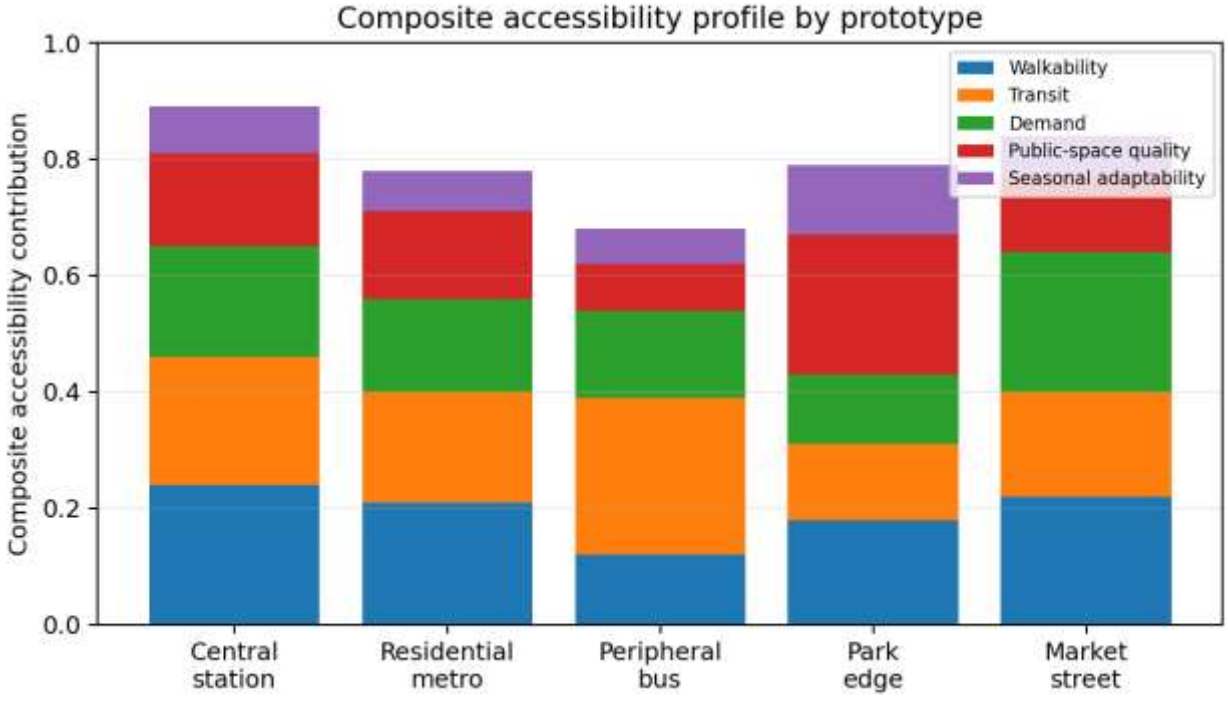

Figure 2. Composite accessibility contribution by urban prototype.

Prototype	W	T	D	P	F	S	PCAI	Best-fit recommendation
Central station area	0.92	0.95	0.88	0.76	0.70	0.61	0.82	Compact food court + controlled food street
Residential metro neighborhood	0.78	0.82	0.70	0.68	0.82	0.58	0.73	Daily cafe, canteen and family restaurant
Peripheral bus node	0.46	0.78	0.55	0.42	0.60	0.45	0.55	Modular kiosk and phased rapid-service cafe
Park edge	0.64	0.50	0.48	0.90	0.70	0.88	0.68	Seasonal terrace and removable pavilion
Market street	0.86	0.74	0.91	0.60	0.76	0.52	0.78	Traditional food cluster and image-sensitive cafe line

4.2. Accessibility-Led Decision Matrix

The decision matrix demonstrates how facility intensity should depend on both accessibility and demand. A central food street is justified only when multimodal access and demand are both high and when public-space pressure can be managed. A transit food court may be appropriate when demand is high but outdoor public-space capacity is limited. A mobile seasonal unit is more appropriate where accessibility is emerging but investment risk is high.

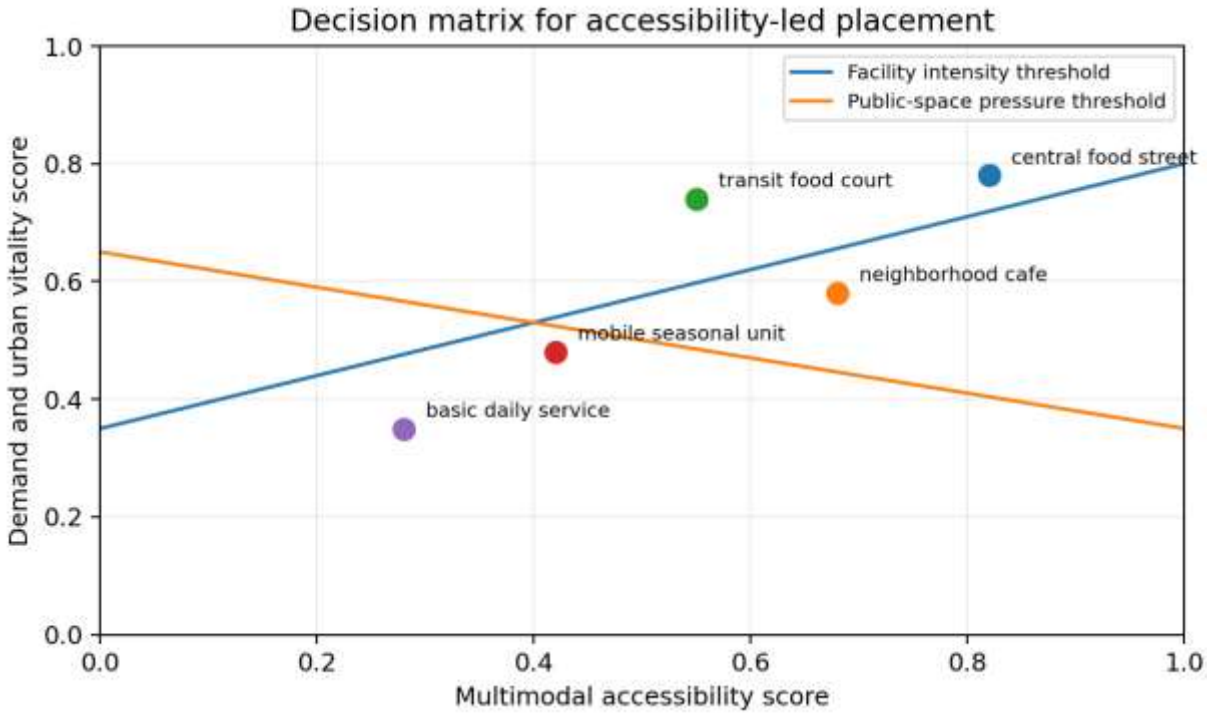

Figure 3. Decision matrix for accessibility-led placement of public catering facilities.

Spatial situation	Accessibility problem	Recommended intervention	Architectural-spatial requirement
Metro exit with overcrowded sidewalk	High demand, low public-space capacity	Indoor food court with clear queue zones	Separate entry/exit, transparent circulation, delivery back-of-house
Residential district beyond 800 m from active center	Daily need, weak local food service	Small daily cafe/canteen	Ground-floor integration, family-friendly interior, low noise
Park frontage with seasonal peaks	Variable demand and landscape sensitivity	Removable terrace/pavilion	Lightweight structures, shade, permeable surfaces
Peripheral bus interchange	Transit dependency and uncertain demand	Pilot modular units	Phased expansion, waste collection, weather protection
Historic/market street	High identity value and visitor demand	Traditional gastronomic cluster	Facade control, signage regulation, pedestrian priority

5. Discussion

The proposed PCAI model supports a shift from object-based planning to network-based planning. A public catering facility should not be approved only because a site is commercially visible; it should also strengthen a balanced system of daily services, transit access and public-space quality. For Tashkent, this is especially important because the city's long-term growth will intensify pressure on transport, housing and public infrastructure.

The model also shows why the 15-minute city concept should not be applied mechanically. Some food-related services must be available at the neighborhood scale, but larger gastronomic destinations require transit integration and city-level identity. The challenge is therefore not to place every typology everywhere, but to create a hierarchy of formats: daily local services, periodic neighborhood clusters and destination-level gastronomic zones.

A second implication concerns equity. If high-quality public catering is concentrated only in central commercial areas, peripheral residential districts remain dependent on long trips and informal or low-quality service formats. A proximity- and transit-based model can identify underserved areas and guide phased investment, especially around metro stations, bus corridors and new district centers.

The third implication concerns architectural design. Accessibility indicators should be translated into design requirements. High transit scores demand circulation clarity and compact service logic. High public-space scores support outdoor seating and transparent frontages. High seasonal adaptability supports transformable terraces, shade systems and modular winterization. Thus, the model directly connects urban analysis with architectural programming.

6. Conclusion

This article proposed a proximity- and transit-based accessibility model for public catering facilities in Tashkent. The PCAI index combines walkability, transit connectivity, demand intensity, public-space quality, functional compatibility and seasonal adaptability. The model uses nested 400 m, 800 m and 1200 m catchments and translates accessibility profiles into typological recommendations.

The main contribution is an operational bridge between the 15-minute city concept and the architectural-urban planning of public catering systems. The framework can prevent both overconcentration in central streets and undersupply in residential or peripheral districts. It can also support the dissertation's broader IRPA Navigator model by providing an accessibility module for spatial evaluation and facility selection.

Future work should apply the model to geocoded catering objects, street-network data, transit-service frequencies, district population density and pedestrian-flow measurements. The output should be a digital accessibility map of Tashkent's public catering system and a set of district-specific design guidelines.

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