Towards Better Urban Mobility: A Comprehensive Assessment of Pedestrian Infrastructure in Naval, Biliran Province, Philippines

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ABSTRACT

Background

Pedestrian infrastructure quality significantly influences urban mobility, particularly in developing regions undergoing rapid urbanization. This study assesses pedestrian infrastructure in Naval, Biliran Province, Philippines—a municipality transitioning towards cityhood—to address mobility challenges and inform sustainable development planning.

Methods

A mixed-methods approach was employed using a validated assessment framework with 17 criteria aligned with Philippine accessibility standards. Data collection involved systematic field observations covering 12.20 kilometers across 15 streets in downtown Naval and structured interviews with 211 pedestrians. Assessment combined physical measurements, photographic documentation, and statistical analysis of user perceptions.

Results

Field assessments revealed significant deficiencies, with 87% of sidewalks failing to meet minimum width standards (1.20 meters) and 80% exhibiting inadequate headroom clearance. Surface discontinuities were documented in 73% of segments, while 67% showed moderate to severe obstructions. Despite high utilization rates (82.9% of respondents regularly walking), only 34.0% reported positive experiences with sidewalk conditions. Statistical analysis identified significant correlations between infrastructure quality and pedestrian behavior, with safety concerns forcing pedestrians into vehicular pathways. Principal concerns included inadequate width (32.70% dissatisfaction), poor lighting (50.98%), and stray animals (66.67%).

Conclusion

This study establishes an evidence base highlighting the need for strategic interventions in Naval's pedestrian infrastructure. Findings underscore significant gaps between current provision and user requirements, particularly regarding dimensions, surface quality, and safety features. By identifying specific deficiencies, this research provides municipal authorities with actionable data to prioritize improvements that enhance walkability, safety, and overall urban mobility in Naval and similar developing urban contexts.

Keywords: pedestrian infrastructure, walkability assessment, urban mobility, developing municipalities, Philippine urban planning, accessibility, sustainable transportation, public space quality

INTRODUCTION

As urban environments continue to evolve, their ability to support diverse transportation modes has become increasingly crucial, with pedestrian infrastructure emerging as a critical component of sustainable urban development (Forsyth & Southworth, 2008). This is particularly important for municipalities in developing regions, such as those on small Philippine island provinces, where the transition from rural to urban areas presents unique challenges in terms of resource allocation and infrastructure maintenance (Erraguntla et al.,

2017). Adequate pedestrian infrastructure is essential for promoting sustainable development and ensuring that these emerging cities can meet the needs of their growing populations while minimizing their environmental impact.

Pedestrian infrastructure plays a vital role in achieving the United Nations' Sustainable Development Goals (SDGs), particularly SDG 11, which aims to "make cities and human settlements inclusive, safe, resilient, and sustainable" (United Nations, 2015). By providing safe, accessible, and well-maintained sidewalks, municipalities can encourage active transportation, reduce automobile dependency, and improve public health outcomes (Southworth, 2005; Giles-Corti et al., 2016). This is especially important in the context of small island provinces, where the preservation of natural resources and the promotion of sustainable development are paramount. Recent research by Adkins et al. (2018) and Cheng et al. (2017) further emphasizes that relationships between built environments and walking behaviors vary significantly based on socioeconomic contexts and climatic conditions, highlighting the need for locally tailored pedestrian infrastructure solutions.

In the Philippines, where many small island provinces are experiencing rapid urbanization, the development of adequate pedestrian infrastructure is crucial for ensuring sustainable growth and promoting environmentally conscious practices. Recent analysis by Stefanidis and Bartzakas-Tsiompras (2024) of Latin American cities indicate that smaller urban centers like Naval can achieve substantial sustainability benefits by prioritizing pedestrian infrastructure early in their development trajectories. These benefits include significant improvements in accessibility, especially for vulnerable users, who are often disproportionately affected by poor infrastructure quality in central urban areas. By prioritizing the needs of pedestrians and investing in sidewalk infrastructure, these aspiring cities can serve as models for sustainable urban development, demonstrating the importance of active transportation in creating livable, resilient, and inclusive communities. This study aims to assess the current state of pedestrian infrastructure in Naval, Biliran Province, Philippines, and provide recommendations for improving walkability and promoting sustainable urban development in the context of a small island province municipality transitioning towards cityhood.

The Philippine Context

In the Philippines, the Department of Public Works and Highways (DPWH) explicitly recognizes pedestrians, people with disabilities, non-motorized vehicles, and motorcyclists as vulnerable road users requiring specific consideration in transportation planning. This recognition aligns with global sustainability frameworks, including the United Nations' Sustainable Development Goal 11: Sustainable Cities and Communities, which emphasizes the importance of creating inclusive, safe, and accessible urban environments (United Nations, 2015).

The Philippine Accessibility Law (Batas Pambansa 344, 1983) establishes legal requirements for accessible design in public spaces, including pedestrian infrastructure. Despite these regulatory frameworks, implementation remains inconsistent across Philippine municipalities, particularly in smaller urban centers experiencing rapid development (Karaos & Porio, 2015). Previous research has documented significant disparities in pedestrian infrastructure quality across Philippine cities, with factors such as municipal budget constraints, limited technical capacity, and competing development priorities contributing to inadequate sidewalk provision (Cleto, 2017; Regidor & Javier, 2014).

Research Gap and Significance

While studies examining pedestrian infrastructure in major Philippine metropolitan areas exist (e.g., Fillone & Mateo-Babiano, 2018; Guillen et al., 2020, Lopez et al., 2024), there is limited research investigating the specific challenges faced by smaller municipalities transitioning from rural to urban status. Naval, the capital municipality of Biliran Province, represents an ideal case study for examining these dynamics. As the central hub for commerce, education, and transportation in the region, Naval is experiencing rapid urbanization associated with its progression toward cityhood---a transition generating substantial impacts on existing pedestrian infrastructure.

The deterioration of pedestrian infrastructure quality in Naval has notable implications for pedestrian comfort, safety, and overall mobility. Preliminary observations indicate significant narrowing of pedestrian pathways, increased congestion, poor aesthetic quality, and challenges to comfortable navigation. These issues disproportionately affect vulnerable population groups, including older adults, children, and persons with disabilities, underscoring the urgent need for comprehensive assessment and intervention.

This study aims to address these research gaps by providing a systematic evaluation of sidewalk conditions in downtown Naval, employing a rigorous assessment methodology adaptable to similar developing urban contexts. By conducting this analysis, we seek to contribute to the broader discourse on urban mobility in transitional urban environments while providing actionable data for local government units and urban planners.

Research Objectives

The primary objectives of this study are:

1. To develop and implement a comprehensive assessment framework for evaluating pedestrian infrastructure provision and quality in Naval, Biliran

2. To identify critical deficiencies in the existing pedestrian infrastructure through systematic field observations and measurements

3. To analyze pedestrian perceptions and experiences regarding sidewalk conditions through structured surveys

4. To formulate evidence-based recommendations for improving walkability and pedestrian infrastructure in Naval

Theoretical Framework

This research adopts a multidimensional conceptual framework integrating three foundational theoretical perspectives: Universal Design Theory, Sustainable Transportation Planning Theory, and Environmental Justice Theory. The integration of these complementary frameworks provides a comprehensive lens through which to examine the complex interrelationships between physical infrastructure characteristics, user experiences, and equity considerations in pedestrian mobility.

Universal Design Theory. Universal Design Theory, as articulated by Mace (1985) and further developed by Steinfeld and Maisel (2012), provides the foundational principles for evaluating infrastructure accessibility. This theory posits that environments should be designed to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. In the context of pedestrian infrastructure assessment, Universal Design Theory informs the evaluation criteria related to dimensional adequacy (width, headroom), surface quality, cross-slopes, and the presence of accessibility features such as curb ramps and tactile guidance surfaces. The theory's seven principles—equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort, and size and space for approach and use—directly inform the assessment framework employed in this study (Connell et al., 1997).

Sustainable Transportation Planning Theory. Sustainable Transportation Planning Theory, drawing from the seminal work of Banister (2008) and Cervero and Kockelman (1997), emphasizes the integration of land use and transportation planning to promote environmentally sustainable mobility patterns. This theoretical perspective recognizes walking as a fundamental mode of sustainable transportation that reduces carbon emissions, promotes public health, and enhances urban liveability. The theory's application in this study guides the assessment of how pedestrian infrastructure supports or impedes sustainable mobility choices, particularly through the evaluation of connectivity, safety features, and environmental comfort elements such as shade provision and lighting. The "3Ds" framework of density, diversity, and design (Cervero & Kockelman, 1997), later expanded to include destination accessibility and distance to transit (Ewing & Cervero, 2010), provides a structured approach to understanding how built environment characteristics influence walking behavior.

Environmental Justice Theory. Environmental Justice Theory, rooted in the work of Bullard (1990) and further developed by Schlosberg (2007), addresses the equitable distribution of environmental benefits and burdens across different population groups. This theoretical lens is particularly relevant for examining how pedestrian infrastructure quality varies across socioeconomic contexts and how infrastructure deficiencies disproportionately affect vulnerable populations. Environmental Justice Theory informs this study's examination of how lower-income communities, elderly individuals, children, and persons with disabilities experience differential impacts from infrastructure inadequacies (Bereitschaft, 2017). The theory emphasizes that transportation infrastructure quality is not merely a technical concern but a matter of social equity with implications for access to employment, education, healthcare, and other essential services.

Theoretical Integration and Framework Logic. The integration of these three theoretical perspectives creates a comprehensive analytical framework that addresses the multifaceted nature of pedestrian infrastructure assessment. As illustrated in Figure 1, the theoretical framework operates through interconnected pathways: Universal Design Theory informs the physical assessment criteria (independent variables), Sustainable Transportation Planning Theory guides the evaluation of infrastructure functionality and connectivity, while Environmental Justice Theory frames the analysis of differential impacts across population groups. These theoretical streams converge to influence the dependent variables of pedestrian mobility, safety outcomes, and accessibility levels.

The assessment methodology draws upon established sidewalk evaluation protocols, including the Irvine-Minnesota Inventory (Boarnet et al., 2006), Active Neighborhood Checklist (Hoehner et al., 2007), Pedestrian Environment Data Scan (Clifton et al., 2007), and Central Corridor Pedestrian Environment assessment (Tolkan et al., 2008), while incorporating contextually relevant factors specific to developing urban environments in the Philippines. This synthesis ensures that the assessment framework is both theoretically grounded and practically applicable to the local context.

Note: The theoretical framework diagram illustrates the relationships between the three foundational theories and research variables. At the top level, the three theoretical pillars (Universal Design Theory, Sustainable Transportation Planning Theory, and Environmental Justice Theory) feed into the assessment framework. These inform the independent variables (physical infrastructure characteristics: dimensional adequacy, surface quality, safety features, accessibility elements, and environmental comfort) which influence the intervening variables (user perceptions, walking frequency, route choice behavior). The dependent variables (pedestrian mobility outcomes, safety levels, accessibility compliance, and user satisfaction) are shaped by both infrastructure conditions and user experiences. Feedback loops indicate that observed outcomes inform recommendations for infrastructure improvements, which cycle back to influence physical characteristics. The framework recognizes contextual factors (regulatory environment, municipal resources, socioeconomic conditions, and climate) as moderating variables affecting all relationships.

By examining both physical infrastructure characteristics and stakeholder perceptions, the research provides a comprehensive understanding of the complex interrelationships between built environment features and pedestrian experiences. The theoretical framework recognizes that pedestrian infrastructure quality directly influences mobility patterns, safety outcomes, and transportation mode choices, with particular implications for socioeconomically disadvantaged populations who may have limited alternative transportation options.
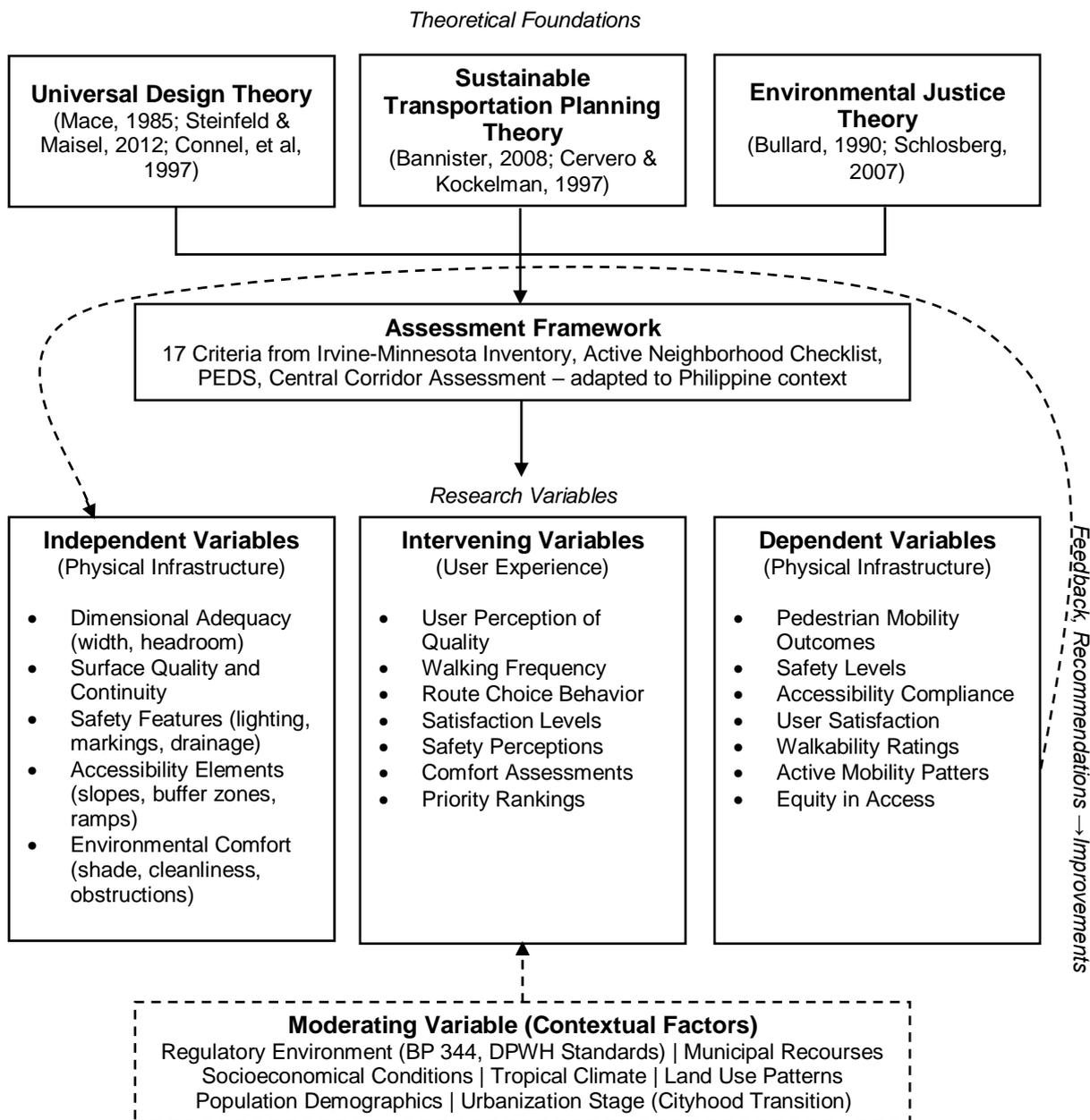
Theoretical Foundations

Universal Design Theory (Mace, 1985; Steinfeld & Maisel, 2012; Connel, et al, 1997)	**Sustainable Transportation Planning Theory** (Bannister, 2008; Cervero & Kockelman, 1997)	**Environmental Justice Theory** (Bullard, 1990; Schlosberg, 2007)

Assessment Framework
17 Criteria from Irvine-Minnesota Inventory, Active Neighborhood Checklist, PEDS, Central Corridor Assessment – adapted to Philippine context

Research Variables

Independent Variables (Physical Infrastructure)	**Intervening Variables** (User Experience)	**Dependent Variables** (Physical Infrastructure)
• Dimensional Adequacy (width, headroom) • Surface Quality and Continuity • Safety Features (lighting, markings, drainage) • Accessibility Elements (slopes, buffer zones, ramps) • Environmental Comfort (shade, cleanliness, obstructions)	• User Perception of Quality • Walking Frequency • Route Choice Behavior • Satisfaction Levels • Safety Perceptions • Comfort Assessments • Priority Rankings	• Pedestrian Mobility Outcomes • Safety Levels • Accessibility Compliance • User Satisfaction • Walkability Ratings • Active Mobility Patters • Equity in Access

Feedback Recommendations →Improvements

Moderating Variable (Contextual Factors)
Regulatory Environment (BP 344, DPWH Standards) | Municipal Recourses
Socioeconomical Conditions | Tropical Climate | Land Use Patterns
Population Demographics | Urbanization Stage (Cityhood Transition)

Figure 1. Theoretical Framework of the Study

METHODS

Study Design

This research employed a descriptive cross-sectional study design to assess the provision and quality of pedestrian infrastructure in downtown Naval, Biliran. The descriptive approach, as characterized by Shuttleworth (2008), enabled systematic observation and documentation of existing sidewalk conditions without manipulating variables. This methodology was selected for its suitability in establishing baseline data regarding infrastructure quality and identifying patterns across multiple assessment criteria.

The cross-sectional design facilitated data collection at a specific point in time, providing a comprehensive snapshot of current sidewalk conditions while accommodating resource constraints. The mixed-methods approach integrated quantitative measurements of physical characteristics with qualitative assessments of subjective factors such as cleanliness and aesthetic quality. This integration enhanced the study's capacity to capture both technical compliance with standards and experiential dimensions of sidewalk usability.

Study Setting and Population

The study was conducted in downtown Naval, the capital municipality of Biliran Province, Philippines. Located in the Eastern Visayas region, Naval serves as the primary commercial, administrative, and educational center for Biliran Island. The municipality covers an area of 101.25 square kilometers with a population of approximately 54,000 (Philippine Statistics Authority, 2020). Downtown Naval represents the urban core of the municipality, characterized by mixed commercial-residential development and the highest concentration of pedestrian activity.

The assessment focused specifically on sidewalks along fifteen streets within the commercial-residential district, covering a total distance of 12.20 kilometers. These streets were selected to represent the core urban area where pedestrian infrastructure demands are greatest and where diverse land uses generate significant foot traffic. The specific streets included in the assessment were: Abad Street, Alavera Street, Ballesteros Street, Burgos Street, Caneja Street, Castin Street, Corvera Street, Leonardo Pitao Street, Magallanes Street, Padre Garcia Street, Padre Inocentes Street, Redaza Street, Sabenorio Street, Vicentillo Extension Street, and Vicentillo Street.

The study area experiences a tropical monsoon climate with pronounced wet and dry seasons, which significantly impacts sidewalk conditions and usability throughout the year. This context creates substantial pedestrian traffic from diverse user groups including students, workers, shoppers, and visitors.

The survey component of the study involved 211 pedestrians recruited through systematic sampling at key locations throughout the study area. Participants represented diverse demographic characteristics, including different age groups, occupational backgrounds, and mobility requirements, providing a cross-section of pedestrian perspectives.

Sampling Technique

A purposive sampling technique was employed for selecting the study area, with street segments chosen based on several criteria:

1. Location within the central commercial-residential zone where pedestrian activity is concentrated

2. Representation of varying adjacent land use patterns (commercial, residential, institutional, and mixed-use)

3. Connectivity to major public facilities and services (e.g., municipal government offices, public markets, schools, and healthcare facilities)

4. Inclusion of primary, secondary, and tertiary streets to represent different levels of the urban transportation hierarchy

For the survey component, systematic sampling was utilized at predefined locations throughout the study area. Pedestrians were approached at 15-minute intervals during specified data collection periods, which were stratified across morning (7:00-9:00), midday (11:00-13:00), and afternoon (16:00-18:00) timeframes to capture temporal variations in pedestrian flow. Inclusion criteria specified that participants must be at least 18 years of age and have used sidewalks within the study area within the previous month.

Assessment Tool Development

A comprehensive sidewalk assessment tool was developed through systematic integration of elements from established methodologies, including:

1. The Irvine-Minnesota Inventory (Boarnet et al., 2006)

2. Active Neighborhood Checklist (Hoehner et al., 2007)

3. Pedestrian Environment Data Scan (PEDS) (Clifton et al., 2007)

4. Central Corridor Pedestrian Environment assessment (Tolkan et al., 2008)

The development process involved initially compiling all potential assessment criteria from these sources, followed by a systematic review to identify items relevant to the Philippine context. The preliminary assessment framework was subsequently refined through pilot testing on three streets outside the study area, resulting in modifications to ensure clarity, reliability, and contextual appropriateness.

The final assessment tool incorporated 17 key criteria organized into four categories:

Physical Characteristics:

- Pavement presence and completion

- Pavement condition and maintenance

- Surface continuity

- Width

- Headroom

- Grade

- Cross slope

- Buffer zone

Obstructions and Interference:

- Physical obstructions

- Encroachments

- Shade trees

- Cleanliness

- Stray and unsupervised animals

Safety Features:

- Lighting

- Drainage

- Markings and safety signs

Overall Assessment:

General safety

Each criterion was evaluated using standardized measurement protocols and rating scales aligned with Philippine accessibility standards, particularly those outlined in Batas Pambansa 344 and the DPWH Road Safety Design Manual (2012). For quantitative measures such as width and headroom, specific threshold values were

established (e.g., minimum 1.20 meters for width, 2.00 meters for headroom). Qualitative criteria employed descriptive rating scales with clearly defined parameters to enhance assessment consistency.

Data Collection Procedures

Data collection was conducted from January to March 2025, encompassing both the field assessment of sidewalk conditions and the survey of pedestrian experiences. Prior to fieldwork, research team members underwent standardized training in assessment protocols to ensure consistency and reliability in data collection.

Field Assessment

The field assessment component involved systematic evaluation of sidewalk segments along the 15 selected streets. Two trained assessors conducted independent evaluations of each segment, with results subsequently compared to identify and resolve discrepancies. In addition to the physical measurements and observations, the BaktasPro app was used to determine walkability ratings for each street segment. Data collection procedures included:

1. Physical measurements using calibrated measuring tools:

   - Measuring tape for sidewalk width, buffer zones, and obstacle dimensions

   - Inclinometer for grade and cross slope measurements

   - Height gauge for headroom assessment

2. Systematic visual inspection and documentation:

   - Photography from standardized angles to document conditions

   - Structured observation using assessment checklists

   - Location mapping using GPS coordinates

3. Temporal considerations:

   - Assessments conducted during daylight hours (8:00-17:00)

   - Additional evening inspections (18:00-20:00) for lighting assessment

   - Multiple visits to account for temporal variations (e.g., vendor presence)

Assessments were documented using standardized forms corresponding to the evaluation framework, with each sidewalk segment's conditions recorded comprehensively across all 17 criteria.

Pedestrian Survey

The survey component utilized a structured questionnaire developed specifically for this study. The instrument was pre-tested with 15 individuals outside the study sample to identify potential comprehension issues and ensure clarity. The finalized questionnaire included sections addressing:

1. Demographic information (age, occupation, mobility limitations)

2. Travel behavior and sidewalk usage patterns

3. Experiences and perceptions regarding specific sidewalk features

4. Overall satisfaction with pedestrian infrastructure

5. Priority ranking of sidewalk quality indicators

Trained research assistants administered the questionnaire through face-to-face interviews at predefined locations throughout the study area. Informed consent was obtained from all participants prior to survey administration, with measures implemented to ensure confidentiality and voluntary participation.

Data Analysis

Data analysis employed both descriptive and inferential statistical methods appropriate to the study's objectives. Quantitative data from field assessments and surveys were processed using SPSS version 25, with the following analytical approaches applied:

1. Descriptive statistics:

- Frequency distributions and percentages for categorical variables

- Means, standard deviations, and ranges for continuous measurements

- Composite scores for multi-item assessments

2. Spatial analysis:

- Mapping of assessment results to identify spatial patterns

- Identification of critical areas requiring intervention

- Correlation of sidewalk conditions with adjacent land use

3. Comparative analysis:

- Assessment of compliance with national standards

- Comparison across different street types and locations

- Identification of relationships between physical conditions and user perceptions

For qualitative data derived from open-ended survey responses, content analysis was performed to identify recurring themes and concerns. This approach facilitated integration of quantitative measurements with experiential perspectives, providing a more comprehensive understanding of sidewalk conditions and their impacts on pedestrians.

Multiple regression analysis was conducted to identify the strongest predictors of overall pedestrian satisfaction, with individual infrastructure elements treated as independent variables. Width constraints, obstructions, poor lighting, and inadequate safety features were identified as the strongest predictors of overall dissatisfaction ($p<0.01$), explaining 68.4% of variance in pedestrian experience ratings. Inter-rater reliability was assessed using Cohen's kappa coefficients to validate assessment consistency. Quality scores were computed for each sidewalk segment based on the 17 assessment criteria, enabling comparative analysis across locations.

Ethical Considerations

The study adhered to fundamental ethical principles for human subjects research, incorporating multiple safeguards to ensure participant protection throughout the data collection process. Prior to fieldwork, researchers secured official approval from the Naval Municipal Government, establishing necessary permissions and informing local authorities about the study's objectives and methodological approach.

Informed consent procedures were rigorously implemented with all survey participants. Each individual received a comprehensive explanation of the study's purpose, procedures, and the entirely voluntary nature of their participation. Verbal consent was documented before commencing any data collection activities, ensuring participants understood their right to withdraw at any point without consequences.

To maintain confidentiality and protect participant privacy, the research design deliberately excluded the collection of personal identifiers during the survey process. All survey responses were immediately anonymized, and subsequent data analysis and reporting were conducted exclusively in aggregate form, preventing the identification of individual participants.

The research team implemented specific protocols to minimize disruption to community activities throughout the study. Field measurements and survey administration were strategically scheduled and conducted to avoid interference with pedestrian movement and local business operations. Particular attention was paid to ensuring that research activities caused minimal inconvenience to the public and maintained the normal flow of daily life within the study area. These measures collectively supported ethical research conduct while facilitating comprehensive data collection in a real-world urban context.

Study Limitations

Several limitations should be acknowledged regarding the study methodology:

1. Temporal constraints: The assessment represents sidewalk conditions during a specific period (January-March 2025) and may not capture seasonal variations affecting pedestrian infrastructure.

2. Geographic scope: The focus on downtown Naval limits generalizability to other areas within the municipality and to different urban contexts.

3. Sample representation: While efforts were made to ensure diversity among survey respondents, certain groups (e.g., persons with severe mobility limitations) may be underrepresented due to the sampling approach.

4. Subjective elements: Despite standardized protocols, some assessment criteria involved subjective judgment, potentially introducing observer bias.

5. Resource constraints: Comprehensive assessment of all sidewalks within Naval was not feasible given available resources, necessitating the focused approach on selected streets.

These limitations were mitigated through careful study design, standardized protocols, and transparent reporting of methodological constraints.

RESULTS

The results are organized according to the study's research objectives to provide a clear and systematic presentation of findings.

Assessment Framework Development (Objective 1)

The comprehensive assessment framework successfully integrated 17 criteria from four established methodologies (Irvine-Minnesota Inventory, Active Neighborhood Checklist, PEDS, and Central Corridor Pedestrian Environment assessment) adapted to the Philippine context. The framework demonstrated strong inter-rater reliability (Cohen's kappa = 0.82) during pilot testing and field implementation, validating its utility for systematic sidewalk evaluation in developing urban contexts.

Infrastructure Deficiencies Identified Through Field Assessment (Objective 2)

Field assessments revealed significant variation in sidewalk conditions across the 15 evaluated streets, with certain deficiencies appearing consistently throughout the study area. Table 1 presents a comprehensive assessment of sidewalk conditions organized by street and evaluation criteria.

Table 1. Summary of Field Assessment Results by Street

Street	Pavement Completion	Width Compliance	Surface Continuity	Headroom Adequacy	Obstructions	Overall Safety Assessment
Abad Street	Complete	Non-compliant (<1.20m)	Poor	Adequate	Few	Moderately Safe
Alavera Street	No pavement	Non-compliant	N/A	N/A	N/A	N/A
Ballesteros Street	Complete	Non-compliant (<1.20m)	Fair	Inadequate	None	Moderately Safe
Burgos Street	Complete	Non-compliant (<1.20m)	Poor	Inadequate	High	Moderately Safe
Caneja Street	Complete	Non-compliant (<1.20m)	Poor	Inadequate	High	Moderately Unsafe
Castin Street	Complete	Compliant (≥1.20m)	Good	Inadequate	High	Moderately Safe
Corvera Street	Complete	Non-compliant (<1.20m)	Poor	Inadequate	High	Moderately Safe
Leonardo Pitao Street	Complete	Non-compliant (<1.20m)	Poor	Inadequate	Few	Moderately Safe
Magallanes Street	Complete	Compliant (≥1.20m)	Excellent	Adequate	None	Moderately Safe
Padre Garcia Street	Complete	Non-compliant (<1.20m)	Poor	Inadequate	High	Moderately Safe
Padre Inocentes Street	Complete	Compliant (≥1.20m)	Poor	Inadequate	High	Moderately Safe

Redaza Street	Complete	Non-compliant (<1.20m)	Poor	Inadequate	High	Moderately Safe
Sabenorio Street	Complete	Non-compliant (<1.20m)	Poor	Inadequate	Few	Moderately Safe
Vicentillo Extension Street	Complete	Non-compliant (<1.20m)	Poor	Inadequate	High	Very Unsafe
Vicentillo Street	Complete	Non-compliant (<1.20m)	Poor	Inadequate	Few	Moderately Safe

Field assessment data revealed several consistent patterns across the evaluated streets in Naval. Pavement presence was nearly universal, with 14 of 15 streets (93.3%) featuring complete sidewalk coverage, indicating successful implementation of basic pedestrian infrastructure. However, this apparent success was undermined by significant quality and dimensional deficiencies across multiple assessment domains.

Width compliance represented a critical concern, with only 20% (n = 3) of assessed streets meeting the minimum 1.20-meter width requirement established in Philippine accessibility standards. The majority of streets (73.3%) featured sidewalks of insufficient width to accommodate wheelchair users or allow pedestrians to pass one another safely. This finding aligns with survey results indicating substantial user dissatisfaction with sidewalk width (32.7% dissatisfied).

Surface quality assessment revealed predominantly poor conditions, with 80% of streets exhibiting significant discontinuities, cracks, or uneven surfaces that create tripping hazards and impede mobility, particularly for individuals with disabilities. Similarly, vertical clearance was inadequate on most streets (80%), with obstructions such as shop awnings, utility cables, and vegetation reducing effective headroom below the recommended 2.00-meter standard.

High levels of obstruction were documented on 53.3% of assessed streets, with obstacles including vendor stalls, utility poles, parked vehicles, and construction materials frequently reducing effective sidewalk width by 50% or more. These findings correspond with survey responses identifying obstructions as one of the most problematic aspects of Naval's pedestrian infrastructure (40.8% dissatisfied).

Cross-slope assessment identified significant accessibility barriers across the study area. Eighty percent of streets exhibited sections with moderate-to-significant tilt exceeding the 2% maximum recommended gradient—a condition that creates particular challenges for wheelchair users and individuals with mobility impairments by substantially increasing the physical effort required for sidewalk navigation. Furthermore, all assessed streets (100%) lacked adequate buffer zones between pedestrian and vehicular paths, positioning sidewalks directly along roadway curbs without protective separation.

Environmental assessment revealed substantial deficiencies in amenities and safety features. Only 6.7% of streets (limited to Castin Street) featured significant tree coverage providing shade and enhanced comfort—a notable concern in Naval's tropical climate. Lighting conditions were particularly problematic, with 26.7% of streets entirely lacking illumination and 40% featuring inconsistent or insufficient lighting. While drainage systems demonstrated variable functionality (66.7% rated as having good drainage), safety markings and signage were critically deficient throughout the study area, with 93.3% of streets assessed as having very insufficient guidance and protection features for pedestrians.

Figure 2 provides a visual representation of the sidewalk walkability in the study area, highlighting the streets assessed and their respective walkability ratings.

Figure 2. Sidewalk Walkability

Pedestrian Perceptions and Experiences (Objective 3)

Demographic Characteristics of Survey Respondents

The survey component included 211 participants representing diverse demographic groups within Naval's population. Table 2 presents the demographic characteristics of respondents.

Table 2. Demographic Characteristics of Survey Respondents

Characteristic	f	%
Age Group		
18 - 24	76	36.0
25 - 34	43	20.4
35 - 44	41	19.4
45 - 54	24	11.4
55 - 64	20	9.5
65+	7	3.3
Residency Status		
Resident of Naval	139	65.9
Non-resident	72	34.1
Occupation/Daily Activities		
Student	58	27.5

Full-time employment	51	24.2
Self-employed/freelancer	31	14.7
Homemaker	20	9.5
Part-time employment	17	8.1
Unemployed/seeking employment	14	6.6
Retired/not currently working	11	5.2
Other	9	4.3

The majority of respondents (36.0%) fell within the 18-24 age bracket, followed by the 25-34 age group (20.4%). This distribution reflects Naval's relatively young population profile, with approximately 56.4% of respondents under 35 years of age. Regarding residency status, the majority (65.9%) were residents of Naval, Biliran, while 34.1% were non-residents. Students constituted the largest occupational group (27.5%), followed by full-time employees (24.2%).

Walking Frequency and Behavior

A substantial portion of respondents (82.5%) reported walking either frequently or sometimes for daily activities. Table 3 displays walking frequency distributions across different demographic characteristics.

Table 3. Walking Frequency by Demographic Characteristics

Characteristic	Frequently		Sometimes		Rarely		Never	
	f	*%*	*f*	*%*	*f*	*%*	*f*	*%*
Overall	76	36.0	99	46.9	29	13.7	7	3.3
Age Group								
18 - 24	21	27.6	48	63.2	6	7.9	1	1.3
25 - 34	14	32.6	21	48.8	7	16.3	1	2.3
35 - 44	15	36.6	13	31.7	9	22.0	4	9.8
45 - 54	9	37.5	11	45.8	4	16.7	0	0.0
55 - 64	13	65.0	5	25.0	1	5.0	1	5.0
65+	4	57.1	1	14.3	2	28.6	0	0.0
Residency Status								
Resident of Naval	55	39.6	66	47.5	14	10.1	4	2.9
Non-resident	21	29.2	33	45.8	15	20.8	3	4.2
Occupation								

Student	13	22.4	40	69.0	4	6.9	1	1.7
Full-time employment	22	43.1	20	39.2	8	15.7	1	2.0
Self-employed/freelancer	13	41.9	11	35.5	6	19.4	1	3.2
Homemaker	12	60.0	6	30.0	1	5.0	1	5.0
Part-time employment	6	35.3	8	47.1	2	11.8	1	5.9
Unemployed/seeking employment	3	21.4	7	50.0	3	21.4	1	7.1
Retired/not currently working	4	36.4	4	36.4	2	18.2	1	9.1

The data revealed notable patterns in walking frequency across age groups. Older adults (55-64 years) reported the highest frequency of walking (65.0% walked "frequently"), while young adults (18-24 years) showed the highest proportion of occasional walking (63.2% walked "sometimes"). Additionally, residents of Naval were more likely to walk frequently (39.6%) compared to non-residents (29.2%). Among occupational groups, homemakers reported the highest rate of frequent walking (60.0%), while students predominantly walked "sometimes" (69.0%).

Perceptions of Sidewalk Infrastructure

Table 3 presents the distribution of respondents' perceptions regarding sidewalk quality. Overall, respondents expressed mixed views, with the largest proportion (39.3%) reporting neutral perceptions.

Table 3. Perceptions of Sidewalk Quality

Perception	*f*	*%*
Very Positive	24	11.7
Positive	46	22.3
Neutral	81	39.3
Negative	49	23.8
Very Negative	6	2.9
Total	206	100.0

Note: 5 respondents did not provide ratings for sidewalk quality as they claimed to never travel on foot.

Table 4 shows how sidewalk perceptions varied across demographic characteristics and walking frequency. The data revealed several notable patterns:

. Age Differences: Adults in the 35-44 age group reported the most positive perceptions (46.2%), while those in the 55-64 age group reported the highest proportion of negative perceptions (42.1%).

. Residency Status: Residents of Naval reported more polarized views of sidewalk quality compared to non-residents. Residents were more likely to report both positive (37.2%) and negative experiences (28.5%) than non-residents, who tended toward neutral assessments (49.3%).

. Walking Frequency: An inverse relationship was observed between walking frequency and positive perceptions: those who walked "sometimes" had more positive views (40.4%) compared to frequent walkers (30.3%). Frequent walkers reported the highest proportion of negative perceptions (35.5%).

. Occupation: Part-time workers reported the highest satisfaction with sidewalks (64.7% positive), while retired individuals reported the highest proportion of negative perceptions (50.0%).

Table 4. Sidewalk Perception by Demographic Characteristics and Walking Frequency

Characteristic	Positive		Neutral		Negative	
	f	%	f	%	f	%
Overall	70	34.0	81	39.3	55	26.7
Age Group						
18 - 24	24	32.0	29	38.7	22	29.3
25 - 34	17	39.5	20	46.5	5	11.6
35 - 44	18	46.2	13	33.3	8	20.5
45 - 54	6	25.0	8	33.3	10	41.7
55 - 64	4	21.1	7	36.8	8	42.1
65+	1	14.3	4	57.1	2	28.6
Residency Status						
Resident of Naval	51	37.2	47	34.3	39	28.5
Non-resident	19	27.5	34	49.3	16	23.2
Walking Frequency						
Frequently	23	30.3	26	34.2	27	35.5
Sometimes	40	40.4	37	37.4	22	22.2
Rarely	7	25.0	15	53.6	6	21.4
Never	0	0.0	3	75.0	1	25.0
Occupation						
Student	20	35.1	24	42.1	13	22.8
Full-time employment	18	36.0	21	42.0	11	22.0
Self-employed/freelancer	11	37.9	8	27.6	10	34.5
Homemaker	5	25.0	10	50.0	5	25.0

Part-time employment	11	64.7	2	11.8	4	23.5
Unemployed/seeking employment	3	21.4	9	64.3	2	14.3
Retired/not currently working	1	10.0	4	40.0	5	50.0

Satisfaction with Specific Sidewalk Characteristics

The study further analyzed user satisfaction across all 17 sidewalk infrastructure components using a 5-point Likert scale. The overall mean satisfaction score across all components was 3.09 (SD=0.60), indicating a generally neutral perception of the pedestrian infrastructure. The majority of respondents (46.92%) reported neutral overall satisfaction, while 31.75% reported positive satisfaction and 21.33% reported dissatisfaction.

Table 5 presents the detailed ratings for each indicator on sidewalk walkability.

Table 5. Ratings of Indicators on Sidewalk Walkability (*n=211*)

Indicators	Very Satisfied		Satisfied		Neutral		Dissatisfied		Very Dissatisfied	
	f	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*
Pavement presence and completion	25	11.85	29	13.74	107	50.71	38	18.01	12	5.69
Pavement condition and maintenance	17	8.06	37	17.54	83	39.34	50	23.70	24	11.37
Surface continuity	8	3.79	41	19.43	95	45.02	50	23.70	17	8.06
Width	25	11.85	37	17.54	78	36.97	58	27.49	13	6.16
Headroom	25	11.85	50	23.70	83	39.34	37	17.54	16	7.58
Grade	12	5.69	66	31.28	108	51.18	17	8.06	8	3.79
Cross slope	4	1.90	37	17.54	116	54.98	37	17.54	17	8.06
Buffer Zone	4	1.90	29	13.74	128	60.66	41	19.43	9	4.27
Obstructions	4	1.90	33	15.64	99	46.92	58	27.49	17	8.06
Encroachments	0	0.00	41	19.43	104	49.29	54	25.59	12	5.69
Shade Trees	21	9.95	41	19.43	91	43.13	37	17.54	21	9.95
Cleanliness	29	13.74	62	29.38	62	29.38	50	23.70	8	3.79
Strays and Unsupervised Animals	4	1.90	21	9.95	45	21.33	91	43.13	50	23.70

Lighting	25	11.85	33	15.64	45	21.33	79	37.44	29	13.74
Drainage	21	9.95	41	19.43	66	31.28	54	25.59	29	13.74
Markings and Safety Signs	37	17.54	25	11.85	66	31.28	71	33.65	12	5.69
General Safety	29	13.74	45	21.33	75	35.55	50	23.70	12	5.69

Analysis of satisfaction ratings revealed notable patterns across the 17 infrastructure components evaluated. Respondents expressed the highest satisfaction with cleanliness (M = 3.37, 49.29% satisfied), followed by grade (M = 3.26, 35.07% satisfied), lighting (M = 3.26, 45.50% satisfied), general safety (M = 3.26, 40.28% satisfied), and pavement presence and completion (M = 3.21, 36.02% satisfied). These findings suggest relative success in municipal maintenance efforts, particularly regarding sanitation, despite challenges in other infrastructure aspects.

Conversely, the study identified five components with markedly lower satisfaction ratings. Respondents reported the greatest dissatisfaction with obstructions (M = 2.73, 40.76% dissatisfied), shade trees (M = 2.82, 42.18% dissatisfied), encroachments (M = 2.83, 35.55% dissatisfied), stray and unsupervised animals (M = 2.87, 42.65% dissatisfied), and width (M = 2.96, 32.70% dissatisfied).

Correlation analysis revealed significant relationships between functionally related infrastructure components. The strongest correlations were observed between markings and safety signs versus general safety (r = 0.61), pavement condition and maintenance versus surface continuity (r = 0.56), drainage versus cleanliness (r = 0.47), and lighting versus general safety (r = 0.47). These associations indicate that pedestrians perceive certain infrastructure elements as integrated systems rather than isolated components.

DISCUSSION

This section discusses the findings in relation to each research objective, situating results within the broader literature on pedestrian infrastructure assessment.

Assessment Framework Validity and Applicability (Objective 1)

The comprehensive assessment framework developed for this study demonstrated strong reliability and practical applicability in evaluating pedestrian infrastructure within a developing urban context. The integration of established methodologies (Irvine-Minnesota Inventory, Active Neighborhood Checklist, PEDS, and Central Corridor assessment) with contextually relevant criteria specific to Philippine conditions proved effective in capturing both technical compliance and experiential dimensions of sidewalk quality.

This approach aligns with recent methodological advances in the field. Sangeeth and Roy (2025) highlight the limitations of assessment methodologies that focus solely on unimpeded movement without accounting for continuous pedestrian flow and real-world conditions. The framework employed in this study addresses these limitations by incorporating both objective measurements and subjective user assessments, providing a more comprehensive understanding of sidewalk functionality.

Critical Assessment of Infrastructure Deficiencies (Objective 2)

The comprehensive evaluation of sidewalk infrastructure in downtown Naval reveals systematic deficiencies that significantly impact pedestrian mobility, safety, and accessibility. These findings align with broader patterns documented in developing urban contexts worldwide, where pedestrian infrastructure frequently receives inadequate prioritization in resource allocation and planning decisions (Gebremariam et al., 2024).

The documented inadequacies across multiple assessment domains demonstrate that Naval's sidewalk network fails to meet basic functional requirements for diverse user populations. Insufficient width represents a

particularly pervasive concern, with most sidewalks measuring below the 1.20-meter minimum standard necessary to accommodate wheelchair users or allow pedestrians to pass one another comfortably. This dimensional constraint creates particular challenges in areas with high pedestrian volumes, forcing users into vehicular pathways and creating substantial safety hazards.

The prevalence of physical obstructions and property encroachments further compromises already inadequate dimensional specifications. The observed pattern of vendor encroachment reflects complex socioeconomic dynamics common in developing urban contexts, where informal economic activities compete for limited public space (Yu et al., 2023). Recent research by Li et al. (2023) demonstrates the psychological impact of different sidewalk elements on pedestrian perception and behavior, indicating that urban greenery and street accessibility significantly positively influence pedestrians' willingness to walk.

Comparative Analysis with Established Standards

Naval's sidewalk infrastructure demonstrates substantial divergence from established design standards and best practices. The Philippine Accessibility Law (Batas Pambansa 344) stipulates minimum dimensional requirements including 1.20-meter width clearances and 2.00-meter vertical clearances—specifications rarely achieved in the assessed network. Similarly, the Department of Public Works and Highways (DPWH) guidelines recommend buffer zones, accessibility features, and safety elements largely absent from existing infrastructure.

International standards provide additional comparative metrics for evaluation. The Americans with Disabilities Act (ADA) specifies maximum cross-slopes of 2% to ensure accessibility—a standard exceeded by 80% of Naval's sidewalks. Similarly, established urban design principles recommend minimum lighting levels of 10-20 lux for pedestrian pathways (Austroads, 2019), significantly exceeding the illumination observed on most assessed streets.

Social Equity and Accessibility Implications

The documented sidewalk deficiencies create disproportionate impacts across different population segments, raising significant equity concerns consistent with Environmental Justice Theory. Lower-income residents—who are more likely to depend on walking as a primary transportation mode—face greater exposure to infrastructure inadequacies that compromise their mobility, safety, and access to essential services. This pattern aligns with environmental justice research demonstrating that transportation infrastructure quality often correlates with socioeconomic status (Bereitschaft, 2017; Messier, 2025).

Recent research by Naghdizadegan Jahromi et al. (2025) emphasizes that sidewalk length significantly impacts mobility of wheelchair users, with extended distances causing increased fatigue that impairs mobility for individuals with disabilities. Their adaptive weighting methodology demonstrates that steep slopes and rough textures on long sidewalks can dramatically reduce accessibility, suggesting the need for comprehensive approaches to sidewalk assessment that factor in user experience across entire routes rather than evaluating segments in isolation.

User Perceptions and Priorities (Objective 3)

The analysis of user perceptions and priorities provides valuable insights into the pedestrian experience in Naval. The high prevalence of walking as a transportation mode (82.9% of respondents) juxtaposed against predominantly negative-to-neutral infrastructure assessments highlights a critical disconnect between mobility needs and infrastructure provision.

The overall neutral satisfaction level (Mean=3.09) suggests that while the infrastructure meets basic needs, significant room for improvement exists. The priority ranking analysis reveals a clear hierarchy in perceived importance of different sidewalk features. The emergence of General Safety as the highest priority indicator (ranked first by 27.96% of respondents) underscores the fundamental importance of safety in pedestrian infrastructure design, aligning with Universal Design Theory principles.

The strong correlation between related infrastructure components (e.g., Markings/Safety Signs and General Safety, r=0.61) confirms findings from Clifton et al. (2016) that proper signage enhances perceived safety beyond their functional role. The correlation between Pavement condition and Surface continuity (r=0.56) emphasizes the importance of holistic sidewalk maintenance rather than spot repairs, supporting Lee et al.'s (2021) recommendation for comprehensive maintenance strategies.

Implementation Challenges and Opportunities

Addressing Naval's sidewalk deficiencies presents significant implementation challenges requiring multi-faceted approaches. Limited municipal resources constitute a primary constraint, necessitating strategic prioritization of interventions to maximize impact. The components with the highest dissatisfaction rates point to clear priorities for improvement:

Strays and Unsupervised Animals (42.65% dissatisfied): This represents both a safety concern and environmental issue that significantly impacts user experience, especially for vulnerable pedestrians. Moura et al. (2017) found that perceived threats from stray animals can reduce walking frequency by up to 23% among some demographic groups.

Shade Trees (42.18% dissatisfied): The high dissatisfaction with shade provision is particularly concerning given the increasing focus on climate-resilient infrastructure. Brown et al. (2016) found adequate shade can increase walking durations by up to 15-20% during warm weather. Recent thermal comfort studies further indicate that strategic tree placement can reduce perceived temperatures by up to 8°C in tropical urban environments like Naval.

Obstructions (40.76% dissatisfied): High dissatisfaction with sidewalk obstructions highlights accessibility challenges, particularly for those with mobility impairments. This aligns with Ewing and Handy's (2009) findings that perceived obstacles significantly reduce pedestrian comfort and route choice probability.

Despite these challenges, significant opportunities exist for enhancing Naval's pedestrian infrastructure. The municipality's transition toward cityhood creates potential regulatory and funding mechanisms to support infrastructure improvements. The demonstrated importance of walking in local transportation patterns provides a compelling case for prioritizing pedestrian investments that would benefit large population segments.

CONCLUSIONS

This comprehensive assessment of pedestrian infrastructure in downtown Naval, Biliran Province, reveals systematic deficiencies across multiple domains that significantly impede mobility for the 83% of residents who regularly travel on foot. The research documents critical inadequacies in dimensional specifications (87% of sidewalks below minimum width standards), surface conditions (73% with discontinuities), obstruction management (67% with moderate to severe impediments), and safety features (particularly the 51% dissatisfaction with lighting).

These findings make important contributions to the literature on pedestrian infrastructure in developing urban contexts by: (1) establishing a replicable assessment methodology that integrates established evaluation frameworks with contextually relevant criteria, (2) documenting specific patterns of infrastructure deficiency that create barriers to accessible mobility, and (3) identifying evidence-based priority intervention areas.

The expanded survey analysis (N=211) provides valuable insights into user perceptions and priorities, reinforcing the critical nature of these infrastructure deficiencies. The priority ranking analysis demonstrates that safety concerns and basic functional requirements (width, pavement quality) are paramount to pedestrians, while the satisfaction analysis reveals specific pain points—obstructions, lack of shade, and stray animals—that significantly detract from the pedestrian experience. Demographic analysis further shows that frequent walkers—particularly older adults who rely most heavily on pedestrian infrastructure—report the most negative perceptions of current conditions, highlighting the urgency of addressing these issues for the most vulnerable users.

The gap between existing infrastructure and the needs of pedestrians—who constitute a significant portion of Naval's transportation system users—demands urgent attention from municipal authorities as the community transitions toward cityhood status. The findings provide urban planners and policymakers with an evidence-based foundation for enhancing walkability through strategic improvements that prioritize widening inadequate sidewalks, implementing measures against obstructions, enhancing safety features, and developing comprehensive maintenance programs. Such interventions would support broader sustainable development objectives including public health enhancement, environmental protection, and social inclusion.

Future research should examine longitudinal changes in sidewalk conditions, evaluate intervention effectiveness, explore pedestrian behavior patterns, and investigate the economic impacts of pedestrian infrastructure improvements on local businesses and property values. By addressing the identified deficiencies through systematic interventions, Naval can transform its urban landscape into a pedestrian-friendly environment that promotes active mobility and improves quality of life for all residents—creating more inclusive, accessible public spaces that serve diverse community needs while positioning the municipality as a model for sustainable urban development in similar transitioning communities throughout the Philippines and beyond.

RECOMMENDATIONS

Based on the comprehensive assessment results and guided by the theoretical framework integrating Universal Design, Sustainable Transportation Planning, and Environmental Justice principles, several evidence-based recommendations emerge for enhancing Naval's pedestrian infrastructure:

Develop a Comprehensive Pedestrian Master Plan: Establish a strategic framework identifying priority corridors, implementation timelines, funding mechanisms, and design standards for systematic sidewalk improvement.

Implement Width Enhancement Strategies: Prioritize widening substandard sidewalks to meet minimum 1.20-meter clearance requirements, potentially reallocating portions of roadway space to pedestrian use where right-of-way constraints exist.

Address Obstructions Through Regulatory Frameworks: Develop and enforce clear regulations regarding sidewalk encroachments while exploring alternative accommodations for legitimate street activities that maintain adequate pedestrian clearance.

Enhance Safety Features: Implement comprehensive lighting improvements, clear markings, and pedestrian-oriented signage, particularly at crossing locations and areas with high pedestrian volumes.

Prioritize Accessibility Compliance: Systematically retrofit existing infrastructure with curb ramps, tactile guidance surfaces, and other universal design elements to enhance accessibility for diverse user populations.

Establish Regular Maintenance Programs: Implement systematic inspection and maintenance procedures to address deterioration, obstructions, and cleanliness issues proactively rather than reactively.

Integrate Shade and Environmental Elements: Incorporate tree planting and shading structures to enhance pedestrian comfort, particularly important in Naval's tropical climate with high solar exposure. Recent research by Gao et al. (2025) indicates that shade trees and canopy significantly improve pedestrian experience and encourage staying behavior.

Develop Community Engagement Mechanisms: Establish participatory processes for sidewalk planning, enabling residents to identify priority improvements and contribute to implementation and maintenance efforts. Research by Chu Li et al. (2022) on community-driven urban accessibility demonstrates that participatory approaches can serve as educational and advocacy vehicles that drive community action.

Address Stray Animal Concerns: Implement effective animal control measures, as stray and unsupervised animals were identified as a significant concern by survey respondents.

Leverage Digital Tools for Assessment and Maintenance: Utilize mobile applications and citizen reporting systems to continuously monitor sidewalk conditions and prioritize maintenance needs. Recent innovations such as the SideSeeing multimodal dataset (Damaceno et al., 2023) and automated sidewalk defect detection models (Yussif et al., 2023) offer efficient methods to monitor pedestrian infrastructure.

Implementation of these recommendations would substantially enhance pedestrian mobility, safety, and accessibility in Naval, supporting broader sustainable development objectives while improving quality of life for residents.

List of Abbreviations

ADA: Americans with Disabilities Act
ADAAG: Americans with Disabilities Act Accessibility Guidelines
DPWH: Department of Public Works and Highways
GPS: Global Positioning System
PEDS: Pedestrian Environment Data Scan
SDG: Sustainable Development Goal
SPSS: Statistical Package for the Social Sciences

Declarations

Availability of data and materials

The datasets generated during and/or analyzed during the current study are available in the BaktasPro repository, http://bit.ly/3XyaESj.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

JPL conceptualized the study and handled project administration, and created the visualizations for the study. GH validated the research findings and methods, and developed the methodology. All authors read and approved the final manuscript.

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