

Through the Lens of Child-Friendly Space: Understanding the Physical Realities of Government Primary School in Dhaka

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ABSTRACT

In Dhaka city, Government primary schools face mounting infrastructural and service deficits that undermine safe and inclusive learning. This study evaluates the physical environment of Government primary schools against Child-Friendly Space (CFS) standards. Structured field observations were conducted using synthesized CFS indicators. From a total of 342 Schools across 12 education zones, twelve (12) schools were carefully chosen to represent a variety of infrastructural circumstances. Data collection was conducted using a mixed qualitative technique from January 2024 to April 2025. School documents were reviewed, and interviews were conducted with principals, classroom instructors, and support staff. Quantitative measures (e.g., classroom area per student, opening-to-floor ratios) were used to assess built-form attributes. Findings were triangulated across data sources. Results show that most Schools fall short of CFS benchmarks. Only two schools had generally very good building conditions, while four exhibited hazardous conditions; five schools met the minimum classroom area standard ($\geq 1 \text{ m}^2$ per student); six schools had functioning playgrounds; and only one school provided universal access (entry ramp). WASH facilities and gender-sensitive sanitation were notably deficient. Interview data highlighted underfunding and weak communication among stakeholders as preliminary barriers to maintenance and upgradation. The study recommends prioritising monetary allocation for maintenance and WASH, focusing on inclusive access, and strengthening stakeholder coordination mechanisms. Future research should include children's and guardians' perspectives and larger, longitudinal samples to monitor the impacts of interventions.

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1. INTRODUCTION

Following independence in 1971, diverse initiatives and interventions were implemented to realize Universal Primary Education (UPE). The fervor for this goal is explicitly articulated in Article 17 of the Constitution of the People's Republic of Bangladesh, which advocates for the provision of free and accessible primary education for all children (Yesmin et al., 2024). In the wake of independence, Bangladesh has undertaken multiple strategies to enhance its primary education system, resulting in commendable progress in terms of expanded access and improved gender equality. However, despite these advancements, the domain of quality education still presents challenges, particularly in students' learning environments and the persistent issue of dropout rates, which have yet to witness substantial improvement in Bangladesh (Gupta, 2024). In the dense urban setting of the capital, Dhaka, a total of 342 primary schools operate across 12 educational divisions, each facing

analogous multidimensional challenges (DPE, 2019).

Owing to substandard educational conditions, inadequate sanitation facilities, and a shortage of basic educational resources, educational institutions experience a decline in student enrollment. Additionally, these schools face challenges due to insufficient security measures and inadequate maintenance. Guardians are also unwilling to send their children due to shortcomings (The Daily Star, 2023). Schools should be supported by an environment that is both child-friendly and safe, which can lead to better academic outcomes. The essential components of children's well-being include the overall condition of the physical environment, classrooms, and play areas (Ambarasari & Harun, 2019). Thermal and Air Quality, Lighting Quality, Spatial Quality, and Maintenance and General Building Conditions directly influence children's physical and mental condition (Earthman & Lemasters, 1997). Child-Friendly Spaces (CFS) are designed to ensure the realization of

children's rights by creating safe, inclusive, and supportive learning environments. Although applied in diverse contexts, the core principles of CFS remain consistent globally-aimed at enhancing educational quality and safeguarding child well-being. UNICEF has developed a universal set of CFS standards to guide the design of learning spaces and school facilities. As noted by Clair & Miske, these standards are being adopted internationally as a framework for improving school environments (Pada et al., 2021).

Available research resources show that there is a shortage of research addressing the impact of poor building conditions on regular students in the context of Bangladesh (Masoom & Siddik, 2024). However, empirical data and survey results indicate a significantly higher dropout rate from these schools. This underscores the inadequacy of schools in meeting the fundamental requirements of an educational institution and raises the question of the safety and security of the students (Ahmed, 2021).

The objective of this research is to identify the shortcomings compared to the parameters of CFS standards. Identifying the specific shortcomings might open the door to future development. Given the current condition of the educational buildings, which may affect student dropout rates, it is necessary to identify the specific problems using a structured methodology. To achieve the outcome, this research has been conducted using a descriptive case study approach, including semi-structured interviews with primary stakeholders and direct observation. An elaborated description, with charts comparing CFS standards and existing conditions, might be an expected outcome of the research.

2. CONTEXT

Primary education in Dhaka city faces significant challenges in providing a conducive learning environment. Recent reports indicate declining student enrollment in government primary schools, largely attributed to inadequate infrastructure (Alamgir, 2018). These shortcomings include poor building conditions, insufficient user-friendly facilities, and inadequate sanitation. Such conditions deter parents from enrolling their children and negatively impact student attendance (Hossain, 2021).

A Child-Friendly Space environment, as emphasized by UNICEF, is crucial for student well-being and should encompass safety, inclusivity, and the provision of essential resources. This includes a healthy environment with safe water and sanitation, and a secure physical space that meets children's basic needs (UNICEF, 2009). However, many primary schools in Dhaka struggle to meet these standards, with issues including the lack of playgrounds, sanitation problems, poor building quality, inadequate classrooms, limited lighting, and waterlogging. Furthermore, a lack of supporting resources, such as security guards and cleaning staff, exacerbates these challenges (Karim, 2024).

The Child-Friendly Space (CFS) model, initially developed by UNESCO for emergency contexts, offers a valuable framework for creating safe and protective learning spaces (Tripathi, 2020). While questions exist about the

applicability of CFS to primary schools, examining schools through the CFS lens can help reveal and address infrastructural shortcomings (UNICEF, 2009).

UNICEF (2009) proposes holistic child development by outlining essential principles, including inclusivity, safety, gender sensitivity, adequate water and sanitation, and participatory governance. Infrastructure parameters like lighting, air flow, classroom density, and maintenance were identified by Barrett et al. (2019) which directly impact learning outcomes. Recently, Karasel et al. (2025) has mentioned playgrounds as a fundamental CFS criterion as they ensure health and social interactions.

An integration of standards from various organizations provides us with a matrix (Table 03) comprising five key infrastructural parameters aligned with the study's objectives.

1. Building condition (ranging from “very good”, “Good”, “Average”, “Bad” and “very bad”),
2. Presence of Playground
3. Universal accessibility
4. Classroom density (Classroom to student ratio)
5. Sanitation facilities (ranging from “very good”, “Good”, “Average”, “Bad” and “very bad”)

Only the five chosen parameters were used in this study, as they are most closely related to the theoretical framework and research goal. Previous research has consistently shown that these five parameters have a significant impact on the phenomenon under study. The goal of the study was to produce a clear and understandable analysis; adding more factors might have diluted the emphasis and complicated the analysis. The study ensures methodological clarity while maintaining relevance and rigor in answering the research questions by focusing on these five factors. Adapting the CFS framework to Dhaka's dense, resource-limited urban context presents both challenges and opportunities for improving school infrastructure. This study evaluates existing schools against CFS standards to identify gaps and propose actionable recommendations.

3. METHODOLOGY

A descriptive case study method allows for a detailed, context-specific exploration of infrastructural conditions in their real-world settings. It provides nuanced insights into complex social and physical environments where multiple variables interact (Yin, 2014). Previous studies have demonstrated that case studies are effective for identifying infrastructural deficiencies and their implications for learning outcomes (Barrett et al., 2019; Stake, 1995). As this research aimed to capture contextual understandings rather than produce statistical trends, the descriptive case study approach was most appropriate. It allowed flexibility in exploring real conditions while ensuring rigor through triangulating multiple data sources to reveal key infrastructural gaps against Child-Friendly Space (CFS) standards.

3.1. Selection of Schools

Dhaka Metropolitan has 12 Zones (education thana) that include 342 schools (Table 1).

Table 1: List of education zones and school numbers

SL	Education Zone	School Nos.
1	Ramna	09
2	Dhanmandi	11
3	Mirpur	42
4	Gulshan	38
5	Senanibash	13
6	Tejgaon	10
7	Lalbagh	43
8	Motijheel	23
9	Sutrapur	48
10	Demra	50
11	Mohammadpur	23
12	Kotwali	32
Total		342

After determining the objective of the study, twelve (12) government primary schools were purposively selected from a total of 342 schools in Dhaka city, ensuring representation from each of the twelve education zones. The selection was guided by the goal of capturing a diverse range of infrastructural and contextual conditions that reflect varying degrees of child-friendliness in school environments. This study primarily focuses on the physical conditions within school premises rather than broader neighbourhood profiling. This strategic selection approach (Table 1) ensured that the final sample included schools with well-maintained infrastructure as well as those struggling with basic facility provision. The objective of this diverse selection was not statistical generalization, but rather contextual depth to enable a comprehensive and nuanced understanding of the infrastructural realities of Dhaka's primary schools when evaluated against Child-Friendly Space (CFS) standards. For instance, schools such as Motijheel Govt. primary school (Motijheel zone) demonstrated very good building conditions and full accessibility, while Chalaband Govt. primary school (Gulshan zone) faced multiple challenges, including poor building quality, lack of a playground, and limited accessibility. By capturing this spectrum of conditions, the study seeks to construct a vivid, evidence-based narrative of the infrastructural disparities within the primary education system in Dhaka.

3.2. Data Collection

To comprehensively assess the infrastructural conditions of the selected schools, the researcher adopted a mixed-methods approach combining structured site observations, secondary data collection, and semi-structured interviews with key stakeholders. Data collection was conducted between January 2024 and April 2025, covering all 12 purposively selected government primary schools representing each educational zone of Dhaka city.

3.2.1. Site Visit and Physical Observation

Site visits were conducted to document each school's physical infrastructure. The focus of the visit was on indoor, outdoor and WASH facilities. The preliminary observational

framework was standardized around five pre-determined parameters. The researcher observed building condition, playground availability, accessibility, student-to-classroom ratio, and sanitation facilities. The observation was detailed, including classroom size and usable floor area per student. To understand lighting and ventilation, the number, size, and placement of doors and windows were observed. The building condition was determined with structural issues (Cracks, water damage, lack of maintenance). Access features (ramps, entries for children with disabilities), an outdoor play area (green surface, safety), and the availability of hygiene facilities (toilets, drinking water) were also scrutinized during the visit.

3.2.2. Collection of Institutional Data

Supplementary data were obtained from school records and administrative sources to provide a broader contextual understanding. The following quantitative and descriptive information was collected:

- Total number of enrolled students
- Enrollment and attendance rates over the past three years
- Building age, renovation history, and maintenance practices
- Availability of human resources, such as teachers, janitors, and security personnel
- Number of classrooms and functional space per student

Where possible, this data was cross-referenced with information from the Local Government Engineering Department (LGED) and the Directorate of Primary Education (DPE).

3.2.3. Stakeholder Interview

In-person semi-structured interviews were conducted with selected school key stakeholders (head teachers, classroom teachers, and support staff), which enriched the observational and institutional data. Twelve headmasters, 24 class teachers, and 12 staff members were interviewed. Each interview lasted approximately 20 minutes and was semi-structured with prompts around infrastructure, maintenance, and safety. Through these interviews, qualitative insights were shared about various infrastructure challenges and the safety and hygiene issues being faced. Moreover, there are limitations to creating a child-friendly environment because the questions allowed observers to provide contextual experiences or statements.

3.2.4. Data Triangulation

To ensure methodological rigor and validity, this study performed data triangulation, combining three complementary sources of evidence. Data triangulation allowed cross-verification of findings and reduced potential bias by analyzing the scenario from multiple perspectives. Table 04 presents an integrated triangulation framework that illustrates how these data streams interact to validate the overall assessment.

3.3. CFS Standards

The CFS standards were originally developed by UNICEF in 2009 and later refined and implemented by various institutions and scholars. This provides a comprehensive set of standards to develop a safe, inclusive, and conducive learning environment. From a set of parameters, the researcher has identified the required standards that only complement the built environment. The standards used in this study are a synthesis of multiple literature sources. It includes international guidelines, academic studies and contextual adaptations. After synthesising from Davis & Iltus (2008), Karasel et al. (2025), Barrett et al. (2019), Seyedehzahra et al. (2013) and UNICEF. The researcher has developed three broad categories, each containing multiple subcategories (Table 2). The standards associated with the built environment have been summarised in a table that shows the interconnectivity between categories.

Table 2: List of CFS standards criteria

	Criteria	Standard indicators
Indoor	Classroom size	1m ² area per student
	Lighting & Ventilation	15%-20% opening of floor area per room
		North South (NS) Orientation
	Function	Medical room
		Multipurpose space
		Storage for learning and play equipment
Outdoor	Accessibility	Entry Ramp
		Access road
		Corridor
	Outdoor activities	Open playground
		Shaded area
	Safety	Specific boundary
		Designated entrance
WASH	Water	Drinking water
	Sanitation	Toilet
		Handwash

The synthesized Child-Friendly Space (CFS) criteria used in this study encompass 8 measurable indicators across 3 key domains. The “Indoor” domain evaluates classroom adequacy, lighting and ventilation quality, and the presence of supportive functional and utilitarian spaces such as storage, multipurpose, or medical rooms. The “Outdoor” domain focuses on accessibility, safety, and opportunities for recreation through playgrounds and shaded outdoor activity zones. The “WASH” domain examines hygiene infrastructure, including access to potable water, gender-segregated sanitation, and functional handwashing stations. By operationalizing these criteria, the study ensured a transparent and replicable framework for assessing infrastructural compliance with CFS standards.

4. FINDINGS

The researcher found that the study’s findings span a wide range of infrastructural conditions. This chapter reflects the existing condition of schools across three broad categories:

Indoor, Outdoor, and WASH facilities. The broad categories were further subdivided into specific criteria to meet the CFS standards. Table 3-5 presents the compiled data from 12 schools.

4.1. Nidhu Smrity Govt. Primary School

- **Indoor Environment:** The school maintains a very good physical condition, with classrooms meeting the standard area of 1 m² per student. Adequate natural lighting and ventilation are ensured through 14 m² of window openings per classroom with a north-south orientation. However, medical and multipurpose rooms are absent. Storage spaces are available and used for teaching materials.
- **Outdoor Environment:** The school lacks a designated playground, which limits outdoor activities. Access roads and circulation corridors are sufficient, but no entry ramp is provided for universal accessibility. Boundary walls and a designated entrance are in place, ensuring basic safety.
- **WASH Facilities:** The school maintains average sanitation standards. Gender-specific toilets and drinking water facilities are available, though handwashing stations lack regular maintenance.
- **Summary:** Overall, Nidhu Smrity Government Primary School partially meets CFS indoor and WASH criteria but fails in outdoor play and accessibility provisions.

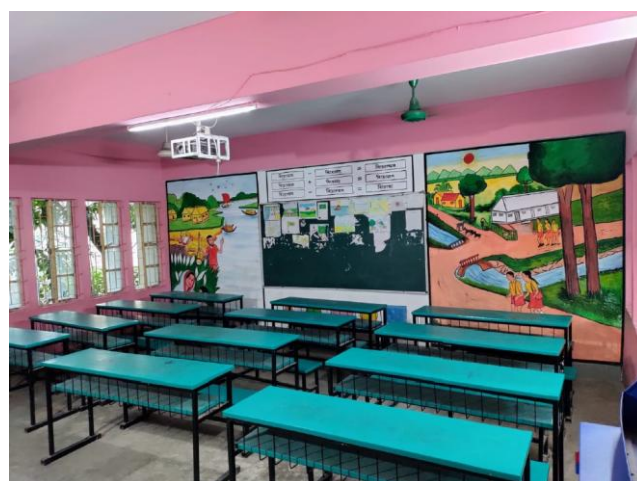


Figure 1: Inside a classroom showing the lighting conditions

4.2. Dhanmondi No. 1 Govt. Primary School

- **Indoor Environment:** This school meets the standard classroom size (≥ 1 m² per student) and has a North-South orientation. However, the ventilation, with 12 m² of openings, is slightly below the standard, and it lacks major functional spaces, including medical, multipurpose, and storage rooms.
- **Outdoor Environment:** An outdoor playground is available. While access roads and corridors are present, universal accessibility is compromised. Safety features, such as designated boundaries and entrances, are in place.

- **WASH Facilities:** WASH conditions are very poor. Despite the availability of drinking water, sanitation is inadequate, and there are no handwashing facilities.
- **Summary:** Dhanmondi No. 1 Govt. primary school partially meets indoor size and outdoor criteria but severely fails in providing required functional spaces and maintaining WASH facilities.



Figure 2: View of the school from the playground

4.3. Diabari Govt. Primary School

- **Indoor Environment:** The school lacks the standard classroom size for its student-to-class ratio (1:55). It ensures proper ventilation (14 m² of openings) and North-South orientation. Storage is available, but all other essential functional rooms are absent.
- **Outdoor Environment:** Outdoor facilities, including a shared playground and shaded areas under trees, are present. Access roads and corridors are available. Safety features such as specific boundaries or designated entrances are missing.
- **WASH Facilities:** WASH facilities are comparatively better. Drinking water, gender-specific toilets, and handwashing services are functional.
- **Summary:** Diabari Govt. primary school performs well in WASH and provides outdoor play/shaded areas, but struggles significantly with classroom size and safety/security features.



Figure 3: View of the school from the playground

4.4. Chalaband Govt. Primary School

- **Indoor Environment:** The school meets the standard classroom size and has a North-South orientation. However, it has an inadequate opening size (12 m²) and lacks all indoor functional support rooms, including storage.
- **Outdoor Environment:** The school has a functional playground. However, it has very poor accessibility (no entry ramp; no access road) and lacks significant safety features.
- **WASH Facilities:** WASH facilities are in very poor condition. The facilities are inadequate, with no provision for drinking water, toilets, or handwashing.
- **Summary:** Chalaband Govt. primary school struggles across multiple indicators, including safety, accessibility, and severely deficient WASH facilities, though it meets the minimum classroom area standard. The school has experienced severe student dropout due to waterlogging and building issues.



Figure 4: Waterlogging condition at the entrance

4.5. Faydabad Govt. Primary School

- **Indoor Environment:** Faydabad Govt. primary school is one of the schools found to meet the proper standard for classroom size (≥ 1 m² per student). Despite its East-West orientation, it has 14 m² of openings for lighting/ventilation. It includes storage space but lacks medical and multipurpose rooms.
- **Outdoor Environment:** The school has a big playground, proper access roads, and corridors. It has a proper entry ramp for universal accessibility. Safety features are adequate.
- **WASH Facilities:** Sanitation facilities are in average condition. Gender-specific toilets, drinking water, and handwashing stations are available.
- **Summary:** Faydabad Govt. primary school is a relatively better-performing school, meeting classroom size standards, having a playground, and ensuring universal accessibility.

4.6. BG Press Govt. Primary School

- **Indoor Environment:** The school ensures classroom adequacy (≥ 1 m² per student). However, it has an East-West

orientation, 12 m² of openings, and lacks storage, medical, and multipurpose spaces.

- **Outdoor Environment:** It has a shared open area. Access roads are limited, but safety measures are adequate with designated entrances and boundary walls.
- **WASH Facilities:** WASH facilities are inadequate. Drinking water is available, but there are no gender-designated toilets or handwashing stations.



Figure 5: View from the main entrance of the compound

- **Summary:** BG Press Govt. Primary schools struggle with indoor functionality, outdoor play areas, and sanitation facilities, despite meeting the minimum classroom area standard.



Figure 6: View from the main entrance of the compound

4.7. Azimpur Adorsho Govt. Primary School

- **Indoor Environment:** Azimpur Adorsho Govt. primary school fails to meet student-classroom ratio standards (1:65 ratio) but maintains proper ventilation (12 m² of openings) and North-South orientation. It lacks the majority of indoor function spaces, including medical, multipurpose, and storage.
- **Outdoor Environment:** Outdoor facilities are very limited, with no open playground or shaded area. Accessibility

features, such as an entry ramp, are absent, but safety measures (boundaries and designated entrances) are adequate.

- **WASH Facilities:** Sanitation is insufficient. While adequate drinking water is available, handwashing facilities are absent. Moreover, gender-specific washrooms are absent. Students use the alternate floor toilets for gender separation.
- **Summary:** This school faces severe challenges across the board, particularly in classroom density, lack of outdoor play, and non-existent sanitation and handwashing facilities.



Figure 7: View from the street of the building

4.8. Motijheel Govt. Primary School

- **Indoor Environment:** This school has a better physical environment, offering good classroom size (1:45 ratio) and proper North-South orientation with 14 m² of ventilation openings. It provides proper storage and sufficient space, but lacks medical and multipurpose functional spaces.
- **Outdoor Environment:** The school is fully accessible from the main road (Access Road and corridor are present) and includes a big open playground. However, it lacks a shaded outdoor space and an entry ramp for universal access. Safety conditions are satisfactory.
- **WASH Facilities:** WASH conditions are also in considerable condition. With satisfactory provisions for drinking water, gender-specific toilets, and handwashing stations, it is among the best-performing institutions.
- **Summary:** Motijheel Govt. primary school is the best performing school surveyed, meeting most indoor and outdoor standards and excelling in WASH provisions. However, it lacks functional support rooms and universal accessibility.

4.9. Vojo Hori Street Govt. Primary School

- **Indoor Environment:** The school lacks an adequate student-classroom ratio (1:50 ratio) but offers proper North-South orientation and ventilation (12 m² of openings). It has no provision for other functional rooms or storage.
- **Outdoor Environment:** Outdoor access facilities (access road and corridor) and safety infrastructure are satisfactory.

However, universal accessibility and an open playground are absent.



Figure 8: View from the playground of the building

- **WASH Facilities:** WASH conditions are weak and rated as bad. While drinking water is available, there is no functional sanitation or handwashing provision.
- **Summary:** The Vojo Hori street Govt. primary school suffers from overcrowding, a lack of an outdoor play area, and poor sanitation facilities.



Figure 9: View from the entrance and corridor

4.10. Manik Nagar Govt. Primary School

- **Indoor Environment:** Manik Nagar Govt. primary school struggles with classrooms, with the highest student-to-class ratio (1:105) among the surveyed schools, and fails the size standard. Though it has a North-South orientation, 12 m² of openings, and provides storage, all other functional spaces are absent.
- **Outdoor Environment:** The school lacks an open playground and ramp. Access roads and corridors are satisfactory, and safety features are adequate.
- **WASH Facilities:** Sanitation facilities are rated as very poor. Drinking water is available, but toilet and handwashing facilities are insufficient.

- **Summary:** This school is overcrowded, has poor building conditions, lacks a playground, and has critically poor sanitation facilities.



Figure 10: Building and settling condition

4.11. Agargaon Govt. Primary School

- **Indoor Environment:** The school does not meet classroom size standards (1:50 ratio). It has a North-South orientation, 12 m² of openings, and includes storage, but lacks functional rooms.
- **Outdoor Environment:** There is no open playground or shaded area. Accessibility is severely limited by a very narrow 1.5m access road. Safety provisions (boundary and designated entrance) are not met.
- **WASH Facilities:** WASH facilities are rated as bad. While drinking water is available, sanitation and handwashing facilities are severely inadequate.
- **Summary:** Agargaon struggles across most CFS criteria, especially in classroom adequacy, accessibility (narrow road), safety, and hygiene



Figure 11: Narrow access road towards school

4.12. IET Govt. Primary School

- **Indoor Environment:** This school does not meet classroom size standards (1:60 ratio) and has poor East-West orientation. It has 12 m² of openings, offers storage, but lacks all other indoor functional rooms.
- **Outdoor Environment:** Outdoor access is decent with a proper road and corridor network. However, it lacks

playgrounds and shaded areas. Safety provisions (boundary and entrance) are partially met.

- WASH Facilities: WASH facilities are rated as average. Drinking water is present,

but toilets and handwashing facilities remain inadequate.

- Summary: IET is challenged by overcrowding, a lack of outdoor play space, and partially met safety and WASH standards.

Table 3: List of schools with selection criteria

SL	School name	Education Zone	Building condition	Playground	Accessibility	Classroom Density	Sanitation Facilities
1	Nidhu Smrity Govt. Primary School	Ramna	Very good	No	Yes	1:45	Average
2	Dhanmondi No. 1 Govt. Primary School	Dhanmandi	Very bad	Yes	No	1:28	Very bad
3	Diabari Govt. Primary School	Mirpur	Average	Yes	Yes	1:55	Good
4	Chalaband Govt. Primary School	Gulshan	Very bad	No	No	1:30	Very bad
5	Faydabad Govt. Primary School	Senanibash	Average	Yes	Yes	1:35	Average
6	BG Press Govt. Primary School	Tejgaon	Very bad	Yes	No	1:19	Very bad
7	Azimpur Adorsho Govt. Primary School	Lalbagh	Bad	No	Yes	1:65	Bad
8	Motijheel Govt. Primary School	Motijheel	Very good	Yes	Yes	1:45	Very good
9	Vojo hori street Govt. Primary School	Sutrapur	Bad	No	Yes	1:50	Bad
10	Manik nagar Govt. Primary School	Demra	Very bad	No	Yes	1:105	Very bad
11	Agargaon Govt. Primary School	Mohammadpur	Bad	No	No	1:50	Bad
12	IET Govt. Primary School	Kotwali	Good	No	Yes	1:60	Average

Table 4: Data triangulation

Parameter	Field visit	Stakeholder interview	Secondary data	Triangulated insight
Building condition	Structural cracks, water leakage observed in 7/12 schools	Teachers & headmasters reported unsafe classrooms	LGED reports confirm poor building condition	Some schools have confirmed risky building condition
Classroom density	Some classrooms exceed the capacity (1m ² per student)	Teachers confirm the overcrowded classrooms	Enrolment data confirms the scenario	Overcrowding is a major as it affects teaching quality
Playground	6/12 schools lack dedicated playgrounds	Some schools shared playground with high school	Digital land survey data showed land scarcity	Confirms lack of outdoor space
Accessibility	Only 1 school has ramp and very narrow road in 2	Staffs confirm the difficulties of students with disabilities	Guidelines show universal accessibility is mandated	Inclusive access standards are barely implemented
WASH	7 schools had poor toilets; female toilets were often absent	Girls do not prefer to use toilet due to poor cleanliness	Media reports highlight sanitation issues	Confirms sanitation negligence, especially for girls
Safety	Lack of a secured entrance or boundary wall in 3 schools	Headmaster confirms poor safety measures	-	Safety overlooked
Maintenance	Evidence of neglected maintenance	The headmaster reported insufficient funds	Maintenance funds are allocated, but not sufficient	Confirms low budget allocation

Table 5: Compilation of existing data for 12 schools

Facilities	Criteria	Standard indicators	Nidhu Smrity	Dhanmondi No. 1	Diabari	Chalaband	Faydabad	BG Press	Azimpur Adorsho	Motijheel	Vojo Hori Street	Manik nagar	Agargaon	IET
Indoor	Classroom size	1m ² area per student	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No	No	No	No
	Lighting & Ventilation	Opening (sqm) per classroom (approx.)	14	12	14	12	14	12	12	14	12	12	12	12
		North South (NS) Orientation	NS	NS	NS	NS	EW	EW	NS	EW	NS	NS	NS	EW
	Function	Medical room	No	No	No	No	No	No	No	No	No	No	No	No
		Multipurpose space	No	No	No	No	No	No	No	No	No	No	No	No
		Storage	Yes	No	Yes	No	Yes	No	No	Yes	No	Yes	Yes	Yes
Outdoor	Accessibility	Entry Ramp	No	No	No	No	Yes	No	No	No	No	No	No	No
		Access road	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	Yes
		Corridor	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Outdoor activities	Open playground	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	No	No
		Shaded area	No	No	Yes	No	No	No	No	No	No	No	No	No
	Safety	Specific boundary	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Designated entrance		Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	
WASH	Water	Drinking water	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Sanitation	Gender specific toilet with maintenance	Yes	No	Yes	No	Yes	No	No	Yes	No	Yes	No	No
		Handwashing with maintenance	Yes	No	Yes	No	Yes	No	No	Yes	No	Yes	No	No

5. DISCUSSION

This assessment revealed a significant disparity in the built environment among schools. The most common observation was the regular maintenance of the building and sanitary facilities. Most schools lack the budget to meet the maintenance needs. Also, some schools face land encroachment by locals or by adjacent high schools. 4 schools are continuing classes under very hazardous building conditions, 6 schools have average conditions, and only 2 schools are operating under very good conditions.

In the indoor environment segment, only five schools, Nidhu Smrity Govt. primary school, Dhanmondi No. 1 Govt. primary school, Chalaband Govt. primary school, Faydabad Govt. primary school and BG Press Govt. primary school were found to have classrooms meeting the proper standard of 1 m² per student. Due to space constraints, restrooms are not standard, which may limit student capacity. The ventilation conditions were, for the most part, similar. Each classroom has between 12 m² and 14 m² of openings; however, only a few schools achieve the ideal 14 m², crucial for providing natural light and air. As almost every classroom has 42 m² of floor area, 14 m² of opening is 33.33% of the opening area; per standard, 15%-20% is required for lighting and ventilation. Half of the schools are

north-south oriented, which is important for thermal comfort. Due to site constraints, the remaining schools are east-west oriented, which means overheating is possible during peak daylight hours and in less-than-optimal daylight conditions. None of the surveyed schools, in practice, contained medical or multi-purpose rooms. The overall unavailability of such spaces indicates negligence towards students' safety, health and alternative learning. Storage availability varied across schools. Seven schools had designated storage. This helped improve the organization of the learning and play equipment. None of the schools meets the CFS standards for indoor environments.

In the outdoor environment, access for students with physical disabilities remains significantly limited, with only the Faydabad Govt. primary school offering an entry ramp. In universal accessibility, 11 schools fail to meet the standard. While access roads and circulation paths were typically available, Agargaon significantly lacks proper navigability due to its 1.5m access road. Opportunities for outdoor play are not consistently available: of the 12 schools, only 6 have open playgrounds, and just 1 (Diabari) offers shaded spaces for outdoor activities or learning. These results highlight a missed opportunity to enhance comprehensive child development through physical activity and interaction with outdoor settings. Three schools lack

designated boundaries and specific entry points, compromising students' safety standards. This discussion also leads to the decision to set unsatisfactory CFS standards for the outdoor environment.

WASH infrastructure remains a varied issue across schools. Though none of the schools has a water treatment facility, clean drinking water was provided in 11 out of 12 schools, indicating adequate availability. Schools are using available RO water filters for maintaining potability. This ensures safety from water-based diseases. Nonetheless, sanitation and hygiene standards were significantly lacking. Just five schools offered gender-designated toilets with consistent maintenance, and the same number had adequate handwashing facilities. Moreover, Female students are uncomfortable using the toilets as their toilets are in the same zone as the male toilets. This creates conditions that could lead to health risks and student dropouts, especially among girls, due to inefficient sanitation.

As a cross-comparative observation, Motijheel Govt. primary school emerged as the relatively best-performing institution, meeting most indoor and outdoor standards and excelling in WASH provisions. In contrast, primary schools like Chalaband, Agargaon, IET, and Azimpur Adorsho struggled across multiple indicators, especially in building condition, classroom adequacy, accessibility, safety, and hygiene.

These discrepancies reflect systemic infrastructural inequality across schools within the same administrative network. Schools in better-maintained areas with administrative support (e.g., Motijheel) perform better and have better maintenance facilities, while those in peripheral or densely populated zones of the city face neglect. The absence of medical rooms and multipurpose spaces in all 12 schools points to a fundamental planning-level gap that must be addressed to align with contemporary standards for child-friendly learning environments.

6. RECOMMENDATION

The Ministry of Primary Education (MoPE) has already initiated a project to develop the infrastructure of 342 primary schools in Dhaka city. As the primary objective of this project is to ensure 100% student enrolment, mental development, and a child-friendly learning environment, this study can play a pivotal role in the design and planning stages.

6.1 Improvement of Classroom Space and Environment Quality

Adherence to the minimum of 1 m² per student in the classroom area should be prioritized. Specifically, overcrowded catchment areas should have special consideration of vertical extension. New technologies should be adopted to ensure smooth vertical circulation and emergency evacuation. New construction or retrofitting should comply with the standards for classrooms and other service functions. Larger windows should be provided, along with a North-South orientation, to maintain proper lighting and ventilation across the classroom.

6.2. Integration Of Supportive Functions

The integration of multipurpose, medical, and storage facilities is essential for optimal school use. The multipurpose hall supports community learning, cultural programs, large events, and emergency shelters. This diversified usability can enrich the connection with the user groups. A medical facility is essential for up-to-date student checkups and for responding to medical emergencies.

6.3. Inclusive Accessibility and Outdoor Activity

To promote inclusive education, universal accessibility should be ensured with standard protocols. Schools should have a minimum outdoor playground to support students' physical and mental development. In case of land constraints, the ground floor can be opened to be used as a playground and provide shading during the monsoon.

6.4. Safety Infrastructure

Schools should provide necessary demarcation of the school compound, designated entrances, and boundary walls to restrict unauthorized access and ensure the children's safety. The authority should also develop an emergency evacuation plan and conduct safety drills.

6.5. Wash Facility and Maintenance

A proper gender-specific ratio should be maintained while designing a WASH facility. Upon availability of spaces, male and female toilet zones should be separated. Otherwise, a separate toilet on alternate floors is suggested. Regular maintenance and supply of hand-washing equipment are necessary. Soap, liquid hand wash, hand sanitizer, and water supply should be maintained. Maintaining regular cleanliness is obligatory.

Moreover, the authority should develop an infrastructure maintenance audit system to maintain seamless quality. The school management committee (SMC), local government, and other stakeholders can jointly undertake minor maintenance, cleanliness, and functional upgrades.

7. LIMITATIONS

Several limitations of this study need to be considered before interpreting its results. The study included twelve (12) Govt primary schools covering a minor fraction of the 342 in Dhaka. Accordingly, the findings may not be completely representative of the wider range of infrastructural and operational conditions across all Schools. The short duration of the study limits the range of field research. For example, field monitoring, which could have been used to gather a full picture of 'state of the schools' and of maintenance practices over time.

Although semi-structured interviews provided rich qualitative data, the perceptions of all stakeholders, including parents and community members, were not well represented. This exclusion prevents the development of a comprehensive understanding of the socio-cultural and community factors that shape school infrastructure and its use. These conclusions are the result of a close focus across a wide range of observation methods and interviews. Specific data on maintenance practices, budget, and financial planning terms were not available. These data could help understand

operational challenges and focus on the identified infrastructural deficits.

Despite these limitations, the study offers critical insights into the infrastructural challenges faced by primary schools in Dhaka. It provides a foundational framework for future research and policy initiatives to address these inadequacies and foster a more inclusive and supportive educational environment.

8. CONCLUSION

The research shows that most Government primary schools in Dhaka fall short of the Child-Friendly Space (CFS) standards. Serious gaps appear in indoor classrooms, play areas, and basic WASH services. Rooms that are too small for student numbers, with few spaces for active learning, and with universal accessibility that barely exists, reveal a clear need for smarter, more inclusive design. Moreover, the lack of sanitation facilities and surveillance is also not up to the mark.

Meeting these problems requires more standardized budget allocation, broader community collaboration, and creative plans that fit the dense urban fabric of Dhaka. First, schools must hit the bare CFS benchmarks so children feel safe, included, and able to learn. After that, steady maintenance checks, clearer policy, and local collaboration in every step will help keep progress alive.

This research also discovers the need for broader investigation. Future studies should include children's and guardians' perspectives to understand user experience, expand beyond Dhaka to capture regional variations, and employ longitudinal research to assess the long-term impact of infrastructural improvements.

By aligning Government primary schools with the CFS framework, policymakers and education planners can significantly enhance students' learning environments, contributing to better academic outcomes and overall well-being. This study serves as a foundational step toward achieving these goals, offering actionable recommendations and a basis for further research.

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DATA AVAILABILITY STATEMENT

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ETHICS APPROVAL

This study is an engineering experimental investigation. The MIJST Research Ethics Committee has confirmed that formal ethical approval was not required.

ETHICS, CONSENT TO PARTICIPATE, AND CONSENT TO PUBLISH

Not applicable.

COMPETING INTERESTS

The authors declare that they have no competing interests.

AUTHOR CONTRIBUTIONS

Author 1: Conducted research design, data management, writing, analysis.

Author 2: Data collection and synthesis, photography, writing.

ARTIFICIAL INTELLIGENCE ASSISTANCE STATEMENT

Portions of this manuscript were assisted by an artificial intelligence language model (ChatGPT, OpenAI). The tool was used solely for language editing, text refinement, and improving clarity. All content, data interpretation, analysis, conclusions, and final decisions were produced, verified, and approved by the authors. The authors take full responsibility for the accuracy and integrity of the manuscript.

CONFLICT OF INTEREST DECLARATION

The authors declare that they have no conflicts of interest.

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