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Investigating the Invisible: Children as Place-Makers in Bangladesh's Urban Polycrisis

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Abstract

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This study investigates children's spatial agency across three crisis geographies in Bangladesh—hyper-dense informal settlements, climate-eroded peripheries, and Rohingya camps. Addressing the historical underrepresentation of children from Global South urban planning and climate adaptation discourse, this research utilizes a multi-sited qualitative design. Drawing on a six-month study with 36 children and community-based participatory research in three Dhaka settlements, reflexive thematic analysis with three-point triangulation reveals four convergent patterns of spatial intelligence: material innovation, spatial claiming, environmental narration, and cognitive mastery. These patterns, consistent across geographies sharing no physical, cultural, or institutional overlap, constitute what this paper terms vernacular design intelligence (VDI)—embodied spatial knowledge forged through constraint. The academic contribution of this study lies in challenging dominant deficit-based planning models, arguing instead that children actively out-design professionals under severe spatial compression. A four-layer child-informed urban design framework is proposed, with operational proof of concept from three pilot models. The paper concludes with low-cost, scalable policy interventions, including temporal zoning and municipal material redirection—designed for resource-constrained Global South municipalities.

Keywords: Vernacular Design Intelligence; Spatial Agency; Spatial Justice; Child-informed Design; Urban Polycrisis; Sustainable Urbanism; Bangladesh.

1. Introduction

The concept of polycrisis (Tooze, 2022) describes a condition in which multiple shocks interact, each amplifying the others. Bangladesh is an acute case. Climate displacement accelerates urbanization. Urbanization deepens spatial inequality. Inequality compounds the toll on children. The feedback loops are the crisis. This feedback architecture positions Bangladesh's polycrisis as a complex adaptive system (Meadows, 2008) in which children are not passive elements but active agents whose spatial behaviours constitute emergent responses to systemic constraints.

For children, this polycrisis produces three forms of spatial violence. In Dhaka's informal settlements, this spatial violence takes the form of extreme compression. Population densities here exceed 77,000 people per square kilometre (Islam & Ahmed, 2020). International standards recommend a minimum of 9 square metres of green space per person. However, in settlements like Korail, this figure approaches zero. Only a fraction of Dhaka's children access formal parks (Rigolon, 2016). In climate-eroded peripheries—eg. the flood-shifting Padma river of Manikganj, the heat-intense tea gardens of Habiganj, the drought-cracked fields of Naogaon, it is elemental instability. In the Rohingya camps, where families of five to seven occupy bamboo-and-tarpaulin shelters of approximately 18 square metres per international humanitarian standards and formal building materials are prohibited by authorities ((ISCG, 2025; Sphere Association, 2018), it is immobility: over half a million children confined within fenced perimeters.

The literature treats these as separate domains. Children do not. They experience them as a single spatial condition. Approximately 19.4 million Bangladeshi children face severe climate risks (UNICEF, 2023), yet only 2–3% of humanitarian funding reaches young children's programmes ((Ponguta et al., 2020). Play established as the primary mechanism of cognitive, social, and emotional development (Lester & Russell, 2010; Vygotsky, 1978)—functions in these contexts not as leisure but as spatial intelligence: a way of making place where place itself is unstable. In the Global South, the Western distinction between play and work collapses (Katz, 2004). When a four-year-old in a Rohingya camp enacts a “medicine shop” with injections and saline, he is not playing doctor. He is processing a system that frightens him. This intelligence remains invisible to the disciplines that design children's environments. The present study makes it visible. It asks:

RQ1: How do children appropriate, reimagine, and transform constrained spaces through play across three crisis geographies?

RQ2: What forms of vernacular design intelligence emerge, and how can they inform scalable urban design in the Global South?

1.1 Theoretical Framework: Three Lenses, One Concept

The analysis integrates three traditions at nested scales. Soja's (2010) spatial justice diagnoses why play spaces are denied - a question of distributive, procedural, and recognitional injustice (Rigolon, 2016). Lefebvre's (1991) production of space illuminates how children claim territory no formal process has allocated. Awan, Schneider, and Till's (2011) spatial agency describes what children actually do: intentional, transformative, materially innovative acts performed without professional training.

This paper's conceptual contribution sits at their convergence. Vernacular design intelligence (VDI) is embodied, culturally situated spatial knowledge forged through constraint, not instruction. It is not a romantic label for coping. It is a precise analytical term for the systematic, repeatable, cross-contextual spatial strategies that children deploy when formal systems fail them. VDI advances Global South urbanism by repositioning children from passive beneficiaries of design to co-producers of urban knowledge, knowledge that professional practice should learn from, not replace. This paper analyses play practices through the lens of urban design, spatial justice, and systems thinking, thereby, producing a design framework and scalable policy interventions.

1.2 Literature Review: Spatial Agency and Play in the Global South

To firmly contextualize the originality of VDI, it is necessary to examine how spatial justice and child-friendly urbanism are currently theorized, particularly within the Global South. The dominant frameworks for child-friendly cities typically prioritize formal, adult-planned interventions such as designated parks, fenced playgrounds, and traffic-calming measures (Cordero-Vinueza et al., 2025). While these are critical for ensuring safety, they implicitly assume a stable urban environment. They fail to account for informal settlements or refugee camps where formal land allocation for play is impossible due to extreme density and tenure insecurity (Islam & Ahmed, 2020). Consequently, children living in marginalized geographies are frequently rendered invisible in mainstream urban planning discourse.

Furthermore, a growing body of recent literature explores the intersections of climate change and childhood resilience. Scholars note that extreme weather events severely disrupt essential, structured play environments (Carleton et al., 2021; Faulkner & Gardy, 2022). Unstructured nature play is recognized as a vital mechanism for building self-efficacy and ecological empathy (Dankiw et al., 2020; Ernst, 2020; Chawla, 2015; Wells & Lekies, 2006). Allowing children to navigate manageable risks in these environments further bolsters cognitive development (Brussoni et al., 2015; Zosh et al., 2017). However, the "nature" discussed in these studies is predominantly the benign, managed nature of the Global North. Emerging research emphasizes that children in volatile environments engage in early forms of "weather witnessing," actively responding to and shaping their atmospheric conditions through sensory encounters (Rooney, 2025).

To bridge this gap in the urban design literature, this study utilizes Gibson's (1979) affordance theory, extended to children by Heft (1988) and Kytä (2004). Affordance theory posits that environments offer possibilities for action. In highly volatile or constrained environments, children develop actualized affordances from non-traditional materials—debris, mud, changing water levels—demonstrating a form of environmental competence that designed playgrounds rarely require (Carr et al., 2017). By integrating these perspectives, this study highlights that informal play acts as a primary vehicle for claiming spatial justice when formal planning systems are absent (Severcan, 2012).

2. Materials and Methods: A Multi-Sited Design Across Three Geographies of the Polycrisis

This study employs a multi-sited, mixed-qualitative design across three equal geographies of the polycrisis: Dhaka's hyper-dense informal settlements, the climate-eroded rural peripheries of Bangladesh, and the Rohingya refugee camps of Cox's Bazar. Each geography exposes a distinct face of the same systemic crisis. All three contexts function as analytical pillars—each independently capable of evidencing children's spatial intelligence, and collectively confirming that vernacular design intelligence is a structural feature of the polycrisis rather than a site-specific anomaly.

Urban research in the polycrisis requires a methodology capable of operating across temporally different scales. Climate peripheries are settlements that persist across generations; their spatial practices are sedimented over decades. Dhaka's informal settlements operate at a different temporal logic—households relocate seasonally, community composition shifts, and any spatial knowledge that is not transient is lost. Refugee camps occupy a third temporal register: a present held in indefinite suspension. No single research instrument captures all three. This study, therefore, combines two complementary qualitative methodologies, each calibrated to its temporal context, and triangulates between them to produce a unified analytical output.

Across the climate peripheries (Manikganj, Habiganj, Naogaon) and the Rohingya camps (Cox's Bazar), a six-month-long study tracked 36 children (ages 3–7, 9 per site, balanced by age and gender). Methods included Drawing as Dialogue, Story Stems, and naturalistic observation conducted twice weekly from January to June 2024 by seventeen trained local data collectors. In Cox's Bazar, data collectors who are fluent in the Rohingya language and trained as para-counsellors, spent six months building rapport through silent observation before initiating drawing sessions. This component captures the multi-generational depth of spatial practice in stable settings.

To systematically capture spatial interactions without imposing adult narratives, the "Story Stems" methodology was adapted from the MacArthur Story Stem Battery (Bretherton, Ridgeway, & Cassidy, 1990). Facilitators provided the

opening of a story regarding an environmental stressor (e.g., "It is very hot outside, what do you do?"), and the child completed it using dolls and props. Concurrently, "Drawing as Dialogue" asked children to map their everyday spatial realities, with facilitators encouraging continuous narration to transform visual artifacts into contextualised spatial datasets (Gowers, Jones, & Mannay, 2023).

In Dhaka's Korail, Bhashantek, and Kallyanpur, the BRAC Community Playscape Project hosted open community art sessions, inviting children to draw their everyday spatial realities. The sessions were complemented by transect walks with mothers and children, focus group discussions with parents, elders, and community leaders, and architectural surveys of children's appropriated play infrastructure. Operating under a "Learning through Discovery" philosophy, this design captures the transient, rapid spatial knowledge characteristic of hyper-dense informal settlements—where rigid purposive sampling fails because the sample dissolves before the study concludes. This community-based participatory research (CBPR) is a well-established methodology in urban informality research precisely because it surfaces community-embedded spatial knowledge that extractive sampling cannot reach.

Across both components, every finding was verified through three independent data streams: (1) the drawings produced by children themselves, (2) the children's verbatim narratives (transcribed, back-translated, and reviewed for fidelity), and (3) the direct ethnographic observation notes of trained data collectors. No interpretation was admitted into the analysis unless corroborated by at least two of these three sources.

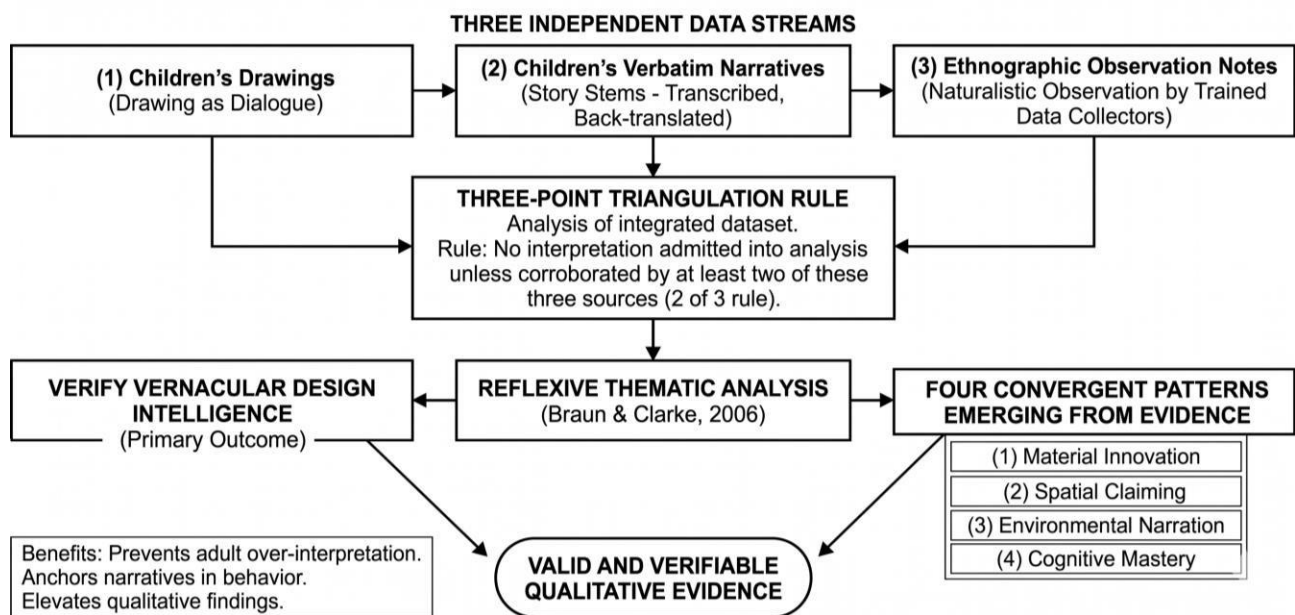


Figure 1. Methodological framework illustrating the three-point triangulation of naturalistic observation, story stems, and drawing as dialogue converging to verify Vernacular Design Intelligence.

This three-point triangulation (Figure 1) is the methodological backbone of the study. It prevents adult over-interpretation of children's drawings. It anchors evocative narratives in observed behaviour. It elevates the qualitative findings from descriptive to verifiable. Reflexive thematic analysis (Braun & Clarke, 2006) was applied across the integrated dataset, with four convergent patterns emerging from the triangulated evidence: material innovation, spatial claiming, environmental narration, and cognitive mastery. The convergence of these patterns across two epistemically different research designs—one six months long, one transient—and across three structurally distinct geographies constitutes the strongest available form of qualitative evidence in mixed-context urban research.

Informed consent was obtained from parents and caregivers; children's assent was obtained at each session. All names used in this paper are pseudonyms. On positionality: the authors have worked with the Rohingya community since 2019 and led design teams across all three geographies, which provides deep contextual access and sustained community trust. This proximity was addressed through collaborative analysis with international partners and reflexive journaling throughout data collection. The six-month-long dataset described here is analyzed comprehensively in a companion paper (Fateha et al., forthcoming) from a developmental perspective; the present paper applies an independent urban design and spatial agency analysis, integrated with the Dhaka CBPR dataset, to produce findings and frameworks not addressed by the developmental analysis.

3. Results: Four Convergent Patterns of Spatial Intelligence

The triangulated analysis revealed four convergent patterns of spatial intelligence. To demonstrate the consistency of these patterns across different crisis conditions, each thematic section first details the primary findings from Dhaka's informal settlements. These findings are subsequently corroborated with evidence from the climate-eroded peripheries and refugee camps, illustrating how Vernacular Design Intelligence operates across distinct geographies.

3.1 Material Innovation Under Scarcity: Engineering Play From Nothing

In Kallyanpur, Dhaka, children salvaged broken chair axles and discarded vegetable crates to build a working go-kart and turning a hostile concrete alley into a play network. Children converted a broken-down rickshaw and car into a functional

jungle gym by dismantling it, testing its structural properties, and repurposing it as climbing infrastructure. Girls crafted miniature kitchenware from wet mud, using crushed flower petals as spices. These acts share a consistent design sequence: need identification, material sourcing, structural testing, and iterative refinement.

The same architectural process appeared independently in the climate peripheries. In Manikganj, Abiha (age 3) conducted what amounts to a tactile interrogation of vernacular earth architecture. She scratched the clay walls of her home, testing their cohesion. She spread sand on a brick and rolled it flat, simulating the production of ruti (a soft flat bread)—a culturally embedded construction analogue. She broke off patkhori (jute sticks) from the exterior wall of a house, dismantling the very components from which her settlement is built. Across multiple observation sessions, she progressed from random clay shapes to named objects. This is an iterative prototyping cycle documented over weeks. These are not random acts. They are early structural investigations: a three-year-old testing how the materials of her built environment behave under stress, deformation, and reassembly. Furthermore, observers recorded Abiha filling a toy truck with dirt using a spoon, audibly counting "one three one three" to calibrate her payload, and then independently cutting banana stems with a ruler—synthesizing raw material manipulation with early mathematical and vehicular simulation.

In the Rohingya camps, where formal materials are prohibited, the same architectural pattern emerged through structural replication and scavenging. Saher (age 2) sneaked out to observe the bamboo fence (bera) construction on the road. When the builder left, Saher and a friend attempted to replicate the fence themselves—an act of structural replication appropriated from adult construction practice. Saher then assembled a cargo car from sticks, a broken piece from a torchlight, and a chips packet—scavenging electronic waste for urban mobility infrastructure. He filled the car with sand and drove it. He later made playing cards from discarded packets. Arafat (age 6–7) constructed a rice-processing machine from a bottle, mosquito net, sand, and rubber. This was a four-component assembly with filtration, structural support, and mechanical output. When asked who taught them, the children said they had observed adults. The convergence is unambiguous: across a hyper-dense settlement, a riverbank village, and a stateless camp, children independently performed material innovation under the same systematic design logic.

3.2 Spatial Claiming Under Compression, Erosion, and Confinement

Where space is denied, children claim it vertically, temporally, or through portable spatial production. In Korail, where open space approaches zero, children mapped vertical escape routes. A boy executed a daily sequence: running jump from bricks to the tin roof edge, rapid climb, descent via sloped awning, silent landing. This was the settlement's geometry learned through bodily repetition. In Kallyanpur, a community water pump was spontaneously repurposed as a splash park. Six-year-old Arobi, asked to draw her happiest place, drew herself standing tightly next to her mother at their door. That narrow threshold, perhaps half a square metre of safe ground, was her entire world. Her spatial claiming is not whimsy. It is an arithmetic of survival.

In the climate peripheries, spatial claiming took architectural and fluid forms. In Habiganj, Srabon (age 6) draped a long scarf (orna) over an umbrella and constructed a tent. He sat under it. Then he lifted it over his head and walked across the courtyard. This is mobile thermal architecture: a portable shade structure built from two non-architectural objects, deployed as both static shelter and ambulatory cooling device. The same child operates as both engineer and inhabitant of his own design. Play geography in Manikganj expanded and contracted with the Padma's seasonal level—children reading the hydrology and adjusting their spatial range accordingly. Abiha (age 3) was observed taking a baby goat by its rope to the riverbank. The goat tugged. Abiha tumbled on the eroding bank. She got up, adjusted the rope, and continued. Similarly, in Naogaon, Meghla (age 6) was documented appropriating a stationary van's driver seat to make "bho bho" sounds, temporarily claiming an adult economic vehicle as a bounded play territory.

In the Rohingya camps, spatial claiming operated within the most constrained perimeter of all three geographies. Arafat (age 6–7) laid leaves from his house in a circle over slippery mud after rain, converting hazardous post-monsoon terrain into a stable play surface through ground-level material engineering. Children in the camps appropriated the narrow lanes between bamboo-and-tarpaulin shelters for elaborate group games, transforming circulation corridors into temporary play infrastructure. Spatial claiming in these contexts operates on unstable terrain, alongside animals, near open water, within fenced perimeters, and consistently produces new spatial configurations from whatever materials are available.

3.3 Environmental Narration: Children as Spatial Witnesses

In Dhaka, children functioned as unfiltered narrators of spatial realities that formal assessments routinely miss. An adolescent girl drew entirely separate play worlds for boys and girls— a spatial documentation of gendered exclusion that structured adult interviews often fail to capture. The drawing was not a description; it was a planning datum often overlooked. Mothers confirmed that their own childhood freedom far exceeded their daughters' current range—intergenerational spatial testimony documenting the shrinking radius of female mobility within informal settlements. Arobi's doorstep drawing documented the precise boundary of her safe zone, providing a child-scaled cartography of perceived risk in Korail's dense alley network. These are not narratives. They are spatial datasets generated by children that household surveys or stakeholder consultations often miss out.

This pattern of spatial witnessing was confirmed across non-urban contexts. In Naogaon, Chaiti (age 6) was handed a stick and tasked with guarding drying rice from chickens. When a chicken scattered the grain, she collected the rice, chased it, and resumed her post—a six-year-old performing agricultural yield protection within the rural production system. In Manikganj, children read the Padma's seasonal level and documented its impact on play geography through their own changing routines. In Cox's Bazar, a six-year-old drew garbage-filled drains and spiderweb-infested washrooms adjacent to his play space—providing environmental testimony with an immediacy that formal camp infrastructure audits rarely achieve. A four-year-old's "sweets shop" included cockroaches that "want to eat the sweets and the soil." In his lived reality, the desirable and the hazardous occupy the same spatial coordinates. Children are not merely observing their environments. They are operating

within them as functional spatial agents, producing testimony that exceeds what conventional planning processes can collect.

3.4 Cognitive Mastery: Processing Systems Through Play

Children operated as analysts of the systems governing their lives, deconstructing complex urban and infrastructural processes through material simulation. In Dhaka's settlements, cognitive mastery manifested as engineered solutions to urban problems. The go-kart was a navigational response to alleys too narrow for formal vehicles— a circulation system designed by children for children. The splash park was a hydrological intervention: a group of children collectively repurposing the only water source available into a cooling infrastructure. The broken-down vehicle, dismantled and reassembled as a jungle gym, represented structural analysis: testing of load-bearing components, joint stability, and recreational affordance. Children's wall-climbing across Korail, Bhashantek, and Kallyanpur produced a working analysis of vertical surface affordances eg. identifying which textures, gradients, and reinforcement points could bear weight, and which could not. The settlement's walls became, in effect, a continuous structural testing ground operated by children.

In the climate peripheries, cognitive mastery emerged through material simulation of domestic and agricultural systems. In Manikganj, Abiha (age 3) spread sand on a brick and declared "Ami ruti beli" (I am rolling bread)—converting a structural element into a culinary substrate through procedural simulation. In Naogaon, Chaiti (age 6) used three plastic bottles with a perforated cap to drip water into a glass, declaring she was "getting milk from a cow." This is a fluid-dynamics simulation: the cap's perforation calibrates the flow rate, the glass receives the output, and the system repeats when the supply runs out. A six-year-old has constructed a working hydraulic analogue of livestock production. Further observation in Habiganj documented Ripon (age 6) enacting an elaborate meat shop (*mangsher dokan*). He utilized banana leaves (*kolapata*) for packaging and cut banana stems (*kolar thor*) to represent specific inventory like goat, chicken, rabbit, and pigeon meat. This demonstrates a sophisticated capacity to reassign material properties and simulate complex economic transactions. In Naogaon, children also drew alpona, a Bengali decorative motif tradition using fingers and twigs to inscribe intricate patterns across drought-cracked fields, transforming climate scars into a structured cultural surface.

In the Rohingya camps, cognitive mastery extended to operational simulation of commercial and healthcare systems. Rozina (age 2) and her sister operated a shop simulation, calling out prices— *Ayo ayo, deksi patil thala bason loile ayo, 10 tiya!*—and producing paper money. A four-year-old assembled a medicine shop with injections, saline, and inventory operating a healthcare distribution model that mapped the system around him. These are functional simulations, constructed by children to render visible the infrastructural systems within which they navigate. The most spatially complex finding emerged in Cox's Bazar. A six-year-old girl drew a "camp house" directly connected to a "Myanmar house"—a place she has never seen:

"These are houses. One is a camp house, and another one is a Myanmar house. I play with my friends. We also have a drain here. There is soil and water in the drain." (Girl, age 6, Cox's Bazar)

This is psychological architecture—a dual spatial geography constructed across borders that remain physically closed. The drawing is a cognitive map holding two settlements in a single composition: one present, one inherited, both occupied simultaneously through spatial representation. When asked what play means, Saher (age 6–7, Cox's Bazar) offered an analysis of the system, terminating it:

"Small children play; as they grow up, they go to school and study, and they won't play anymore." (Saher, age 6–7, Cox's Bazar)

Saher's statement is a six-year-old's systems analysis of the educational infrastructure that will extinguish his current spatial practice.

4. Discussion: From Pattern to Policy

4.1 Vernacular Design Intelligence: Definition, Evidence, and Limitations

The empirical findings can be read through the theoretical framework's three nested lenses, transforming what would otherwise be parallel references into a coherent analytical model. Soja's spatial justice illuminates the structural condition: Arobi's half-square-metre threshold against the international 9-square-metre standard is distributive injustice; the absence of any consultation process that produced her safe zone is procedural injustice; the invisibility of her spatial intelligence to formal planning is recognitional injustice. The same three dimensions apply across all three geographies—the denial of play space, the exclusion of children from spatial decision-making, and the failure to recognize their existing spatial knowledge. Lefebvre's distinction between conceived space (the space planners imagine) and lived space (the space inhabitants actually create) frames what children produce in response: the go-kart, the splash park, the dual-home drawing, the broken vehicle reassembled as a jungle gym—each is lived space overwriting conceived space, a child's spatial production where no planner anticipated one. Awan, Schneider, and Till's three criteria for spatial agency—intentional, transformative, materially innovative—are met by every observation documented in this study. The convergent four patterns are not merely descriptive themes. They are evidence that children, across three crisis geographies, perform what these three frameworks predict in theory but rarely observe in concert in a single empirical case.

The convergence of four patterns across three geographies constitutes this paper's central finding. Material innovation appeared as vehicular repurposing in Dhaka, clay modelling in Manikganj, and engineering from prohibited materials in the camps. Spatial claiming appeared as vertical appropriation in Dhaka, hydrological navigation in Manikganj, and narrow-lane play in Cox's Bazar. Environmental narration took the form of gendered documentation in Dhaka, thermal mapping in Habiganj, and hazard auditing in the camps. Cognitive mastery emerged through systems simulation—commercial, healthcare, agricultural, hydrological—across all sites. These patterns are too consistent across contexts

sharing nothing but the polycrisis to be explained by local factors alone—a hallmark of emergent behaviour in complex adaptive systems (Meadows, 2008; Capra & Luisi, 2014).

From an urban anthropological perspective, VDI reveals children as agents of spatial heritage—the dual-home drawing is architectural memory across closed borders; the alpona on cracked earth is patterned surface inscription on a degraded substrate; Chon Hodda persists in the camps as embodied spatial practice surviving displacement. From an urban design perspective, VDI challenges the expert-layperson binary—when children convert broken vehicles into a jungle gym, they prototype with contextual sensitivity that procurement-constrained formal processes cannot match. From a planning perspective, VDI demands that children be consulted directly—they articulate spatial realities (gendered exclusion zones, thermal discomfort, hazard adjacencies) that structured adult interviews consistently miss. From eight years of designing play environments across these contexts, the authors observe a consistent pattern: the most effective interventions begin with observation of children's existing spatial practices, not imposition of external design.

It is essential to state what this paper does not argue. A go-kart from a vegetable crate demonstrates ingenuity—and evidences a dangerous absence of safe play spaces. Mobile shades highlight severe heat exposure. Dual-home drawings represent resilience yet a deep sadness. VDI is not a substitute for spatial justice. The conditions are unacceptable. Recognizing VDI redirects intervention; it does not diminish its urgency.

4.2 The Risk and the Ethics of Informal Play

This paper would be dishonest if it did not address what VDI costs. A boy jumping across tin roofs in Korail shows extraordinary spatial mastery. It is also a severe injury waiting to happen. A go-kart in a concrete alley is grassroots engineering. It is also a traffic hazard. The rice machine built from a bottle in Cox's Bazar deploys design thinking. It also involves a child handling sharp-edged materials unsupervised. Abiha's tumble on the eroding Manikganj riverbank—documented in Section 3.2—exemplifies how spatial claiming operates on the razor's edge of physical harm. The children in this study are not performing in controlled environments. They are performing in garbage-clogged drains, alongside open sewers, on unstable roofing, in alleys shared with rickshaws.

This reality is precisely why intervention is urgent and why the form of intervention matters. The answer is not to eliminate informal play, which would eliminate the spatial intelligence with it. The answer is to reduce the hazard gradient: to create conditions where the same spatial claiming, material innovation, and cognitive mastery can occur without the adjacent risks of traffic, falls, contamination, and fire. This is the design challenge the following framework addresses.

4.3 A Child-Informed Urban Design Framework for the Global South

The framework comprises four operational layers.

Layer 1 — Diagnostic: Map children's existing spatial practices using context-adaptive methods. Identify which VDI patterns are present. Document the site-specific spatial violence. This establishes what children already know.

Layer 2 — Translation: Derive design principles from observed VDI. Where children claim vertical space, design vertical play. Where they build shade, design for thermal response. Where they draw dual homes, design for cultural identity. Design follows intelligence.

Layer 3 — Process: Position children and caregivers as primary stakeholders. Deploy context-adaptive engagement—cohort tracking in stable settings, open sessions where transience demands flexibility. Establish iterative feedback loops. Layer 4 — Implementation: Three pilot models provide operational evidence:

BRAC Community Playscape (dense urban): Before this intervention, girls' play in Korail was confined to narrow thresholds at doorways—Arobi's tin door was typical. By converting unused linear metres of settlement walls into interactive surfaces, the project generated functional play infrastructure with zero land acquisition cost—critical in settlements where land tenure is contested and horizontal space does not exist. The design intent was to transform the surfaces children already claimed into safe, developmentally enriching play elements—enabling the spatial claiming documented in this study to occur without the adjacent risks of falls and traffic.

Khelar Baari (climate-vulnerable): Adaptive play courtyards built with local, resilient materials, designed in response to children's thermal mapping and nature-based play patterns, providing safe emotional anchors amidst extreme weather. Children's observed migration between thermal sanctuaries directly informed courtyard placement and vegetation planning.

BRAC Humanitarian Play Lab (refugee): Rohingya cultural motifs wall paintings and Samiyana (ceiling drapes)—incorporated into shelter structures to honour dual-home identities. Children's detailed drawings guided interior spatial decisions. The design intent is to provide a spatial environment where the systems simulation documented in this study—commercial, healthcare, domestic—can unfold safely and with cultural continuity, extending children's existing spatial intelligence rather than replacing it with imported alternatives.

4.4 Scaling Without Budgets: Low-Cost Policy for Resource-Constrained Cities

The question is not whether VDI-informed design works. Three pilots demonstrate that it does. The question is whether it can scale without donor dependency. Global South municipalities are constantly struggling with funds. Humanitarian funding is shrinking. If this framework requires expensive NGO funding, it will die as a pilot. The following interventions require near-zero capital expenditure.

Temporal zoning. Do not build new parks. Rezone existing micro-spaces. Close specific settlement alleys to rickshaw traffic between 4:00 PM and 6:00 PM daily for safe play. This requires zero infrastructure budget—only community enforcement and municipal signage. Children already play in these alleys; the intervention merely removes the hazard (traffic) without removing the intelligence (spatial claiming). Dhaka North City Corporation (DNCC) could pilot this in Korail within its existing regulatory authority.

Municipal material redirection. Mandate that a fixed percentage of municipal road repair waste—broken bricks, concrete rubble, discarded pipes—be redirected to community-led playscapes rather than landfill. The cost is transport only. Children in Kallyanpur already build with found materials; providing a safer, more diverse material stream amplifies their existing VDI rather than replacing it.

WASH budget reallocation. Do not ask for new money. Demand a 1% reallocation of existing municipal WASH (Water, Sanitation, and Hygiene) or infrastructure maintenance budgets to procure loose parts from local by-products—bamboo offcuts from construction sites, rope remnants from fishing markets, fabric waste from garment factories, sand from river dredging. These materials already exist in the urban metabolism. The reallocation requires no new funding line—only a policy instruction that redirects existing procurement. Distributed through community health worker networks already operating in settlements and camps, these loose-parts kits extend children’s material innovation without imposing manufactured alternatives.

These interventions share a common logic: reduce the hazard gradient while preserving the spatial intelligence. In systems thinking terms, they are leverage points (Meadows, 2008)—low-cost changes to rules and flows that produce disproportionate systemic impact. Temporal zoning changes a rule (who can use an alley and when). WASH reallocation changes a flow (where existing money goes). Material redirection changes a flow (where waste goes). They are adaptive (temporal zoning shifts with community rhythms), community-co-created (enforcement is local, materials are familiar), and climate-responsive (loose parts accommodate seasonal change). They constitute this paper’s central policy recommendation. This study used purposive samples in camps and peripheries and open engagement in Dhaka; findings are illustrative, not statistically generalizable. The CBPR approach traded statistical rigour for ecological validity. Risks of over-interpretation were mitigated through three-point triangulation and peer debriefing. Future research should employ longitudinal designs and mixed methods, triangulating participatory data with environmental monitoring and injury surveillance.

5. Conclusions

This study investigated how children negotiate the severe spatial constraints of Bangladesh’s urban polycrisis, addressing the urgent need for scalable, child-informed urban design in the Global South. Regarding the first research question (RQ1), the findings unequivocally demonstrate that children in hyper-dense settlements, climate-eroded peripheries, and refugee camps are not passive victims of spatial marginalization. Instead, they actively appropriate and transform constrained spaces through four convergent mechanisms: material innovation from scavenged waste, spatial claiming on vertical and temporal thresholds, environmental narration of systemic hazards, and the cognitive mastery of infrastructural systems.

Addressing the second research question (RQ2), this study introduces and defines these convergent patterns as Vernacular Design Intelligence (VDI). The originality of this research lies in establishing VDI as a rigorous, actionable form of urban design intelligence rather than merely a psychological coping mechanism. By proving that children consistently out-design professional interventions under severe constraints, this study challenges top-down, WEIRD-dominated paradigms of urban planning. The academic contribution bridges the gap between theories of spatial agency and practical urban design frameworks.

The Child-Informed Urban Design Framework proposed here translates that intelligence into design through four layers—diagnostic, translation, process, implementation—with proof of concept from three operational pilots. Low-cost scaling mechanisms—temporal zoning, material redirection, WASH budget reallocation—make the approach viable without new funding.

The evidence is unambiguous. Children are out-designing professionals under impossible constraints. The mandate is no longer to design “for” vulnerable children. It is to build the institutional architecture—in municipal planning codes, in humanitarian coordination protocols, in climate adaptation budgets—necessary to scale the intelligence they already deploy. Every wall a child climbs is a design brief. Every drawing a child makes is a spatial dataset. Every piece of waste a child repurposes is a procurement strategy. The institutions that continue to ignore this intelligence are not merely failing children. They are failing design itself.

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Conflicts of Interest

The first author is employed by BRAC IED, which implements the programmes described in this paper. The “Mapping Invisible Geographies: Spatial Narratives of Playful Learning in Climate-Vulnerable Bangladesh” research dataset is analyzed comprehensively from a developmental perspective in a companion paper (Fateha et al., forthcoming) with a different theoretical framework, and a different analytical contribution. The present paper applies an independent urban

design analysis to a subset of that data and integrates it with new data from Dhaka's informal settlements not included in the companion study.

Data Availability Statement

Restricted due to the sensitive nature of research involving displaced children.

Institutional Review Board Statement

Approved by BRAC University IRB. All names are pseudonyms.

CRedit Author Statement

Hamidah Ashrafi Fateha: Conceptualization, Investigation, Data Curation, Formal Analysis, Writing—Original Draft, Writing—Review & Editing. Anonnya Islam: Conceptualization, Methodology, Formal Analysis, Writing—Review & Editing.

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