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Co-Designing Climate-Resilient Play Spaces for Early Childhood Development in Erunkan, Ikorodu (Nigeria)

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CO-DESIGNING CLIMATE-RESILIENT PLAY SPACES FOR EARLY CHILDHOOD DEVELOPMENT IN ERUNKAN, IKORODU

Abstract

Climate change disproportionately affects children in vulnerable urban communities, yet adaptation strategies have systematically overlooked their needs for safe, developmentally enriching play spaces. This study investigates how participatory co-design can develop climate-resilient play environments supporting early childhood development in informal settlements, using Erunkan, Ikorodu, Lagos State, Nigeria, as a case study. Guided by Lundy's Model of Participation, constructivist play theories, and Bronfenbrenner's Ecological Systems Theory, the research employed a participatory action research design engaging approximately 50 children aged 3-6 through visual workshops and behavioural observations, alongside structured surveys with 94 caregivers. Findings reveal that flooding and extreme heat frequently disrupt children's play, with nearly half experiencing flood-related injuries. Despite these risks, children demonstrate strong social bonds even without dedicated play spaces. Children's drawings express preferences for slides, swings, trees, and covered structures, while caregivers prioritise flood-resistant structures and shade trees, with over three-quarters willing to contribute to maintenance. The study demonstrates that co-designed, climate-resilient play spaces can support children's psychosocial well-being by providing safety, enabling peer interaction, and fostering community ownership. This research offers an evidence-based model for child-inclusive climate adaptation with implications for policy, practice, and future research across the Global South.

Keywords: co-design, climate resilience, early childhood development, participatory design, Nigeria

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1. Introduction

Climate change constitutes the defining global challenge of our era, yet its burdens are not equally distributed. The most vulnerable populations, particularly young children in rapidly urbanising regions of the Global South, bear the highest costs of a crisis they did little to create. Children's developing physiologies and psychological frameworks render them exceptionally susceptible to environmental shocks, including extreme weather events, pollution, and resource scarcity (UNICEF, 2021). Nowhere is this vulnerability more starkly illustrated than in Nigeria, which ranks second globally in children's exposure to climate change impacts (UNICEF, 2023b).

Within Nigeria, Lagos State epitomises the compounding vulnerabilities facing coastal megacities. Its low-lying topography, extensive lagoon systems, and inadequate infrastructure converge to produce recurrent, severe flooding that causes an estimated \$4 billion in damages annually. (Higuera Roa et al., 2022). For communities along the Ogun River axis, including Erunkan in Ikorodu, seasonal inundation is not an abstract threat but a lived reality that displaces families, contaminates living environments, and renders already scarce public spaces unusable (Omorogbe, 2025). Compounding this hydrological vulnerability, Lagos experiences intensifying extreme heat, with temperatures regularly exceeding 40°C. Young children, possessing less developed thermoregulatory systems, face acute risks of dehydration, heat stress, and heat-related illness hazards that further constrict already limited opportunities for safe outdoor activity (Tooki, Akinmade, & Lawrence, 2025).

The developmental stakes of these environmental pressures could hardly be higher. Play is not merely a childhood pastime but the foundational mechanism through which children construct knowledge, develop cognitive and social-emotional competencies, and build essential motor skills (WHO, 2020; HeadStart, 2024). However, in communities like Erunkan, designated play spaces are virtually nonexistent, and the informal areas that might serve this function are often flood-prone, contaminated, or hazardous due to extreme heat. Nigeria's "Learning Through Play" policy framework (UNICEF, 2023a) remains largely aspirational in such contexts, undermined by systemic underfunding and the absence of implementation infrastructure. More fundamentally, urban planning processes systematically exclude the perspectives of young children and their caregivers, producing designs that fail to reflect local needs, cultural contexts, or the lived realities of climate vulnerability (Bartlett, 2008).

This study contends that addressing these interconnected challenges requires a fundamentally different approach, one that centres the voices and experiences of those most affected. Co-design, a participatory methodology that actively engages end-users in shaping their environments, offers a compelling alternative to top-down intervention. By involving children, caregivers, and community members in the design process, co-design generates outcomes that are more contextually relevant, culturally appropriate, and sustainable (Sanoff, 2000). When integrated with climate-resilient design principles, this approach holds particular promise for communities like Erunkan, where solutions must simultaneously address environmental risks and developmental needs. This study, therefore, asks:

1.1 Research Questions

The study is guided by three interrelated questions, structured to progress from problem identification through solution exploration to impact assessment:

Research Question 1 (RQ1):

How can co-designed play spaces in Erunkan mitigate flooding and heat stress to ensure uninterrupted play-based learning?

Research Question 2 (RQ2):

Which design elements are most effective for climate-resilient early childhood development (ECD) play spaces in this context?

Research Question 3 (RQ3):

How do these spaces contribute to children's psychosocial well-being and social-emotional development during climate disruptions?

By answering these questions, this study aims to generate not only actionable design recommendations for Erunkan but also a replicable framework for child-inclusive climate adaptation that can inform policy and practice across similar vulnerable communities in Nigeria and the Global South.

2. Literature Review

2.1 Introduction

The preceding section established that children in Erunkan face three compounded vulnerabilities: climate-induced disruptions to play, an absence of safe play spaces, and systematic exclusion from urban planning. This section reviews the scholarly literature needed to address these challenges.

Four interconnected domains are examined. First, the section analyses the impacts of climate change on early childhood development in Nigeria. Second, it explores the theoretical foundations of play in vulnerable settings. Third, it evaluates climate-responsive spatial design principles suitable for low-income communities. Fourth, it assesses participatory methodologies for engaging young children in design processes.

The section then synthesises these bodies of literature within a theoretical framework that integrates Lundy's Model of Participation, constructivist play theories, and Bronfenbrenner's Ecological Systems Theory. It concludes by identifying the research gap this study addresses and demonstrates how the three research questions emerge directly from gaps in existing scholarship.

2.2 Climate Change and Early Childhood Development in Nigeria

A robust body of evidence documents children's heightened vulnerability to climate shocks (UNICEF, 2021; Bartlett, 2008). Nigeria ranks second globally for children's exposure to climate risks, with over 50 million children affected (UNICEF, 2023b). However, as Bartlett (2008) argues, climate adaptation strategies have systematically overlooked urban children's needs, an oversight this study contends represents both procedural injustice and a pragmatic blind spot.

Lagos State epitomises these vulnerabilities. Its low-lying topography and inadequate drainage produce recurrent flooding, intensified by unplanned urbanisation (Higuera Roa et al., 2022). Adelekan's foundational work (2010) demonstrates that flooding in Lagos is a socio-spatial phenomenon; more recent studies confirm that poor communities such as Erunkan remain disproportionately affected (Ajisegiri & Adebayo, 2022; Lawanson, Proverbs, & Ibrahim, 2022; Ndimele et al., 2024). For communities along the Ogun River, seasonal inundation directly threatens children's safety and access to play (Omorogbe, 2025). Beyond flooding, extreme heat regularly exceeding 40°C constrains outdoor play, with children's underdeveloped thermoregulation placing them at risk (Tooki, Akinmade, & Lawrence, 2025). Environmental degradation compounds these hazards: unregulated sand mining causes bank erosion (Odunuga et al., 2018), while air pollution contributes to infant respiratory illness (The World Bank, 2022). A key tension emerges while Nigerian scholars have thoroughly documented environmental hazards, few have moved from documentation to participatory solution-building with affected communities, a gap this study directly addresses.

2.3 Play and Child Development in Vulnerable Contexts

If climate impacts undermine play, understanding how play supports development is essential. Play is universally recognised as foundational to healthy early childhood development (UNICEF, 2023b). Piaget's constructivist theory posits that play is the mechanism by which children construct knowledge through interaction with their environment. Dberg emphasises the social dimensions of play, arguing that collaborative play advances cognitive capabilities (Ness, 2022). Montessori and Froebel further highlight the importance of prepared environments for holistic growth (Kiran et al., 2021).

Empirical research confirms play's benefits: enhanced brain development and executive functioning (Ginsburg, 2007), and therapeutic effects in crisis-affected populations (Mariam, Ahmad, & Sarwar, 2021). Outdoor play offers unique contributions to physical health and psychological well-being (CQEL, 2024).

However, in vulnerable settings like Erunkan, access to safe play spaces is severely constrained. Malone (2015) documents how rapid urbanisation in the Global South deprives children of their right to play. In Nigeria, Barau, Abubakar, Kafi, Olugbodi, and Abubakar (2023) note that effective collaboration and negotiation with the community over public open spaces can foster social coexistence. However, their analysis does not extend to how climate stressors compound these deprivations, a limitation this study addresses. This deprivation persists despite Nigeria's "Learning Through Play" policy (UNICEF, 2023a), highlighting a substantial implementation gap (Jimoh, Majebi, & Sabia, 2025).

2.4 Climate-Responsive Spatial Design for ECD

The literature on play establishes why play spaces matter; the question becomes: what forms should such spaces take? Designing climate-resilient play spaces in low-resource settings requires integrating ecological principles with child development needs. Nature-based solutions offer particular promise when technical complexity must be balanced with community maintenance capacity (Sarabi, Han, de Vries, & Romme, 2022).

For flood mitigation, permeable surfaces made from local materials, such as laterite-clay, reduce runoff while providing tactile stimulation (CQEL, 2024). Elevated play structures protect equipment from inundation while creating engaging topography. Adegun (2019) demonstrates that community-managed drainage incorporating indigenous knowledge proves more sustainable than top-down solutions. However, as Sarabi, Han, de Vries, and Romme (2022) caution, nature-based solutions imported without community consultation risk reproducing exclusions.

To address extreme heat, strategically planting native shade trees can significantly lower ambient temperatures (Sarabi et al., 2022). Shade structures using local bamboo can supplement natural shade. Current Lagos State Urban Resilience Strategy guidelines lack specific provisions for ECD spaces. Kyttä et al. (2023) argue that this gap is procedural: without community engagement,

designs fail to reflect local priorities or how children actually use space, directly supporting this study's participatory methodology.

2.5 Participatory and Co-Design Methodologies with Children

Technical design solutions, however sound, require community engagement to be effective. Arnstein's (1969) "ladder of citizen participation" remains foundational, with the highest rungs emphasising citizen influence over token consultation (Sanoff, 2000). This approach yields contextually relevant designs and fosters community ownership (Hart, 1992).

Child participation is rooted in Article 12 of the UN Convention on the Rights of the Child (United Nations, 1989). Lundy's (2007) model operationalises this right through four elements: Space for expression, facilitated Voice, attentive Audience, and demonstrable Influence. This framework is valuable because it specifies conditions for genuine participation. However, as Francis and Lorenzo (2002) observe, participation can devolve into tokenism without institutional commitment, a challenge this study addresses through sustained attention to Lundy's "Influence" dimension.

Engaging young children requires specialised methods: visual workshops and storytelling (Clark & Moss, 2017); behavioural mapping and child-adapted GIS (Cox, Loebach, & Little, 2018). Kytä et al. (2023) demonstrate how the environment can support or constrain developmental opportunities through "affordances." In Nigeria, documented examples of meaningful child participation in urban design remain exceptionally rare (Arowolo, 2024), a gap this study seeks to fill.

2.6 Theoretical Framework and Research Gap

This study integrates three complementary theories addressing the research questions. Lundy's Model ensures genuine child participation, directly supporting RQ1 and RQ2 on how co-designed spaces can mitigate climate stressors and on the design elements that emerge. Constructivist play theories provide the rationale for creating developmentally enriching environments, grounding RQ3's focus on psychosocial well-being. Bronfenbrenner's Ecological Systems Theory (1979) situates individual experiences within broader environmental systems, reinforcing the need for multi-level intervention.

The literature reveals a significant gap: while individual studies have examined child participation (Clark & Moss, 2017), climate adaptation in Lagos (Adelekan, 2010), and play in Nigerian schools (Barau, Abubakar, Kafi, Olugbodi, & Abubakar, 2023), no identified study integrates these domains within a single participatory framework in an informal settlement context. This study addresses this gap by asking: How can co-designed play spaces mitigate flooding and heat stress (RQ1)? Which design elements prove most effective (RQ2)? How do such spaces contribute to children's psychosocial well-being (RQ3)? In answering these questions, this study will generate actionable design recommendations and a transferable methodology for child-inclusive climate adaptation, responding to global calls for more inclusive climate action (UNICEF, 2021).

3. Methodology

3.1 Introduction

This section details the methodological approach employed to investigate how participatory co-design can develop climate-resilient play spaces in Erunkan, Ikorodu. It describes the research design, participant selection, data collection methods, analytical procedures, and ethical protocols, presenting an accurate account of how the study was actually conducted.

3.2 Research Design

This study employs a participatory action research (PAR) design, suited to research aimed at both generating knowledge and enacting practical change with communities (Sanoff, 2000). PAR positions community members as active participants rather than passive subjects, aligning with this study's commitment to child participation and spatial justice. The design incorporates mixed methods following Bartlett's (2008) pragmatic approach to data collection in vulnerable communities.

The methodology is grounded in Lundy's (2007) model of child participation, emphasising Space for expression, facilitated Voice, attentive Audience, and demonstrable Influence. This framework ensures children are genuinely engaged in shaping design outcomes. The design also draws on Bronfenbrenner's (1979) Ecological Systems Theory, examining multiple levels of influence from children's immediate play experiences to community-wide patterns.

3.3 Research Participants

The study engaged two primary participant groups. First, approximately 50 children aged 3-6 participated in visual co-design workshops and storytelling activities, exceeding the initial target of 25 and reflecting strong community interest. Purposive sampling ensured gender balance and representation from flood-vulnerable zones.

Second, 94 caregivers completed structured questionnaires, surpassing the target range of 80-100 and providing robust statistical power. Stratified random sampling across residential clusters ensured socioeconomic diversity. While the study originally planned separate interviews with community leaders, this proved unfeasible due to scheduling constraints. However, two community leaders completed a brief questionnaire adapted from the caregiver survey, capturing perspectives on climate threats, design feasibility, maintenance barriers, and policy preferences. These responses complement the caregiver data and provide institutional perspectives on community needs.

3.4 Research Site

The research was conducted in Erunkan, a low-income peri-urban community in Ikorodu Local Government Area, Lagos State, Nigeria (approximately 6°36'45"N 3°25'07"E), bordered by the Ogun

River basin and Ikorodu-Ososun Road. The community is characterised by informal housing, limited infrastructure, and the absence of dedicated play spaces. It faces compounding climate vulnerabilities: seasonal flooding, extreme heat, and poor drainage, all disproportionately affecting young children's access to safe outdoor play.

Fieldwork occurred on two occasions: an initial visit to introduce the study and obtain consent, and data collection on Tuesday, August 19, and Friday, August 22, 2025. The second date was added at the community leaders' recommendation to allow broader participation.

3.5 Data Collection Methods

Data collection employed complementary methods tailored to different participant groups, following methodological triangulation to enhance validity (Denzin, 2017).

3.5.1 Child Co-Design Workshops

In children's visual co-design workshops, drawings, storytelling, and model-making were used (Clark & Moss, 2017). A virtual exploration tool was also introduced; notably, children showed marked preference for this digital medium over drawing, likely due to greater confidence with the technology. Workshops lasted 45-60 minutes and included drawing favourite and disliked play places, storytelling about playing during rain or heat, and constructing models of "dream play spaces."

3.5.2 Caregiver Surveys

Caregivers completed structured questionnaires administered door-to-door by three trained local field observers. The questionnaire assessed five thematic areas based on Bartlett (2008):

- **Climate disruptions to play:** Frequency of flooding/heat preventing outdoor play; locations where children play during climate events.
- **Play space priorities:** Ranking of flood-resistant structures, shade trees/canopies, safe water play areas, and soft-landing surfaces; preferred walking time.
- **Safety and health:** Experience of play-related injuries due to floods or heat; types of injuries.
- **Community action:** Willingness to contribute labour, materials, or advocacy; preferred maintenance models.
- **Climate adaptation:** Feasibility of elevated platforms, permeable surfaces, and drainage channels; attitudes toward play spaces as climate shelters.

Each survey took approximately 15 minutes. Screenshots of completed forms were captured for documentation.

3.5.3 Behavioural Observation

Systematic observation documented children's play patterns in community spaces (Cox, Loebach, & Little, 2018). Observations captured environmental conditions, child activities, and hazards, revealing that children socialise effectively even without dedicated play spaces.

3.6 Data Analysis Procedures

Data analysis integrates qualitative and quantitative techniques aligned with the research questions. Child-generated visual and narrative data are analysed using thematic analysis, coding for recurring patterns in play preferences and climate-risk perceptions (Clark & Moss, 2017). Visual data are categorised using Lundy's (2007) participation framework.

Caregiver survey data are analysed using descriptive statistics (frequencies, percentages) across the five thematic areas. Open-ended responses are analysed thematically to capture nuanced perspectives.

Behavioural observation data are analysed to identify patterns in space usage and environmental hazards. Triangulation occurs at multiple levels: comparing child workshop themes with caregiver survey trends; validating observational data against participant accounts; and integrating photographic documentation for contextual richness.

3.7 Ethical Considerations

Ethical protocols were rigorously followed. Informed consent was obtained from all caregivers, and age-appropriate assent was secured from children. Participation was voluntary, with the right to withdraw without penalty. All data are confidential; no identifying features are disclosed. Activities prioritised child safety and cultural respect. Participants engaged without incentives or formal letters, relying solely on institutional identification, a testament to community trust. Pictorial consent forms were used, and caregivers explicitly permitted photographs.

3.8 Limitations

Several limitations are acknowledged. First, planned interviews with community leaders could not be conducted due to scheduling constraints; however, caregiver questionnaires were designed to capture community-level perspectives, and the sample includes two individuals in leadership positions whose responses enrich the data.

Second, engaging young children aged 3-6 poses inherent challenges in sustaining attention and in accurately interpreting expressions. While developmentally appropriate methods, including visual, play-based, and virtual activities, were employed to mitigate this, some nuances may have been missed.

Third, the study is limited to a single community (Erunkan), which may restrict the generalisability of findings. However, the detailed contextual documentation provided throughout this report supports transferability to similar peri-urban, climate-vulnerable settings in Lagos and across the Global South.

Fourth, the originally planned GIS-based spatial analysis was not conducted. This was not due to resource constraints but rather a methodological decision: during fieldwork, it became evident that community-identified flood zones and observational mapping provided sufficiently rich spatial data for the co-design process, rendering formal GIS analysis unnecessary for the study's participatory aims. The combination of child-identified play areas, caregiver reports of flood-prone locations, and direct observational documentation proved adequate for grounding design recommendations in local spatial knowledge.

Finally, the 12-month timeframe limited opportunities for iterative cycles of design feedback and refinement, which are characteristic of fully realised participatory action research. Future research could extend the timeline to incorporate multiple rounds of community validation.

4. Data Analysis & Results

4.1 Introduction

This session presents the findings from the fieldwork conducted in Erunkan, Ikorodu, in August 2025. Data were collected through three complementary methods: caregiver surveys (N=94), child co-design workshops (approximately 50 children aged 3-6), and behavioural observations. The findings are organised around the three research questions that guide this study: (RQ1) how co-designed play spaces might mitigate climate stressors; (RQ2) which design elements are most effective; and (RQ3) how such spaces contribute to children's psychosocial well-being. The session begins with the most significant finding, the overwhelming community consensus on the need for a dedicated play space, before presenting detailed findings across each research question.

4.2 Climate Disruptions to Play (RQ1)

The first research question asks how co-designed play spaces in Erunkan mitigate flooding and heat stress to ensure uninterrupted play-based learning. Understanding the current disruptions is essential to designing appropriate interventions.

Frequency of Climate Disruptions: Caregiver survey data reveal that both flooding and extreme heat significantly constrain children's outdoor play. Flooding prevents outdoor play daily for 18.1% of respondents, weekly for 29.8%, and monthly for 34.0%. Only 18.1% report that flooding rarely disrupts play. Extreme heat shows a similar pattern: daily disruption for 10.6%, weekly for 19.1%, monthly for 39.4%, and rarely for 30.9% of respondents. These findings indicate that a substantial majority of children experience regular disruptions to play due to climate change.

Play Locations During Climate Events: When asked where children play during floods or extreme heat, caregivers reported a range of locations. The most common response was indoor spaces (20.0%), followed by flood-safe elevated spots (13.7%) and unsafe areas such as roads or drains (13.7%). Notably, 9.5% of caregivers reported that children use makeshift shaded areas during heat events. Multiple caregivers indicated children use combinations of locations, reflecting the absence of dedicated safe spaces. Critically, 8.4% of respondents reported that children were playing in unsafe areas, underscoring the urgency of intervention.

Walking Time to Play Spaces: When asked about acceptable walking time to a play space, 27.7% of caregivers indicated less than five minutes, 28.7% indicated five to ten minutes, and 43.6% indicated more than ten minutes. This distribution suggests that proximity is valued, with over half of caregivers preferring a play space within a ten-minute walk.

These findings demonstrate that climate stressors currently disrupt children's play with significant frequency, forcing children into indoor spaces or unsafe outdoor environments. The data directly support RQ1 by establishing the baseline conditions that co-designed play spaces must address. See Table 4.1 below for the Summary of Key Caregiver Survey Findings.

Table 4.1: Summary of Key Caregiver Survey Findings (N=94)

Indicator	Percentage (%)
<i>Climate Disruptions to Play</i>	
Flooding disrupts play weekly or more	47.9
Extreme heat disrupts play weekly or more	29.7
Flooding disrupts play monthly	34.0
Extreme heat disrupts play monthly	39.4
<i>Play Locations During Climate Events</i>	
Children play indoors	20.0
Children play in unsafe areas (roads/drains)	13.7
Children use makeshift shaded areas	9.5
<i>Safety and Health</i>	
Flood-related injuries experienced	46.8
Heat-related injuries experienced	35.5
Cuts and bruises reported	17.9
Cuts, heat exhaustion, and waterborne illness combined	13.7
<i>Community Action</i>	
Willing to contribute labour, materials, or advocacy	78.7
Prefer parent committees for maintenance	37.6
Prefer local government for maintenance	36.6
Prefer NGO partnerships for maintenance	24.7
<i>Climate Adaptation Preferences</i>	
Prefer drainage channels for flood-proofing	54.8
Prefer elevated platforms for flood-proofing	37.6
Support play spaces doubling as climate shelters (agree/strongly agree)	55.4

4.3 Children's Design Preferences (RQ2)

The second research question asks which design elements are most effective for climate-resilient ECD play spaces in this context. Children's perspectives were captured through visual co-design workshops, where they drew their "dream play spaces."

Themes from Children's Drawings: Analysis of the drawings reveals several recurring design preferences. Slides appear in multiple drawings, suggesting a strong preference for elevated, movement-based play structures. Swings are also frequently depicted, indicating a desire for dynamic, interactive elements. Trees and natural elements feature prominently in some drawings, suggesting children value a connection with nature. Structures with roofs or covers appear in several images, suggesting children's awareness of the need for shade or shelter from rain and an intuitive understanding of climate adaptation. Colourful, visually engaging elements are consistently present, reflecting children's desire for aesthetically appealing, stimulating spaces.

Methodological Observation: During the workshops, children showed a marked preference for the virtual exploration tool over traditional drawing exercises. This finding, documented in the fieldwork report, suggests that digital methods may be more engaging for this age group and should be considered in future child participation research.

Implications for Design: Children's drawings reveal that they envision play spaces that are not merely functional but joyful, colourful, and engaging. The presence of slides, swings, and trees indicates a preference for varied, multi-sensory experiences. The appearance of covered structures suggests that even young children recognise the need for protection from environmental elements, a finding with direct relevance to climate-resilient design.

4.4 Caregiver Design Priorities (RQ2)

Caregiver survey data provide complementary insights into design priorities, maintenance preferences, and perceptions of feasibility.

Ranking of Play Space Features: Caregivers were asked to rank four features by importance (1=most important; 5=least important). The mean rankings reveal clear priorities. Flood-resistant structures received the highest priority (mean=2.41), followed by shade trees and canopies (mean=1.88). Soft landing surfaces (mean=2.39) and surface water play areas (mean=2.26) were also valued, though slightly lower. The prioritisation of flood-resistant structures and shade trees directly reflects caregivers' concerns about the climate hazards, flooding and extreme heat, that currently disrupt children's play.

Feasibility of Flood-Proofing Solutions: When asked which flood-proofing solution is most feasible, caregivers expressed clear preferences. Drainage channels were selected by 54.8% of respondents, followed by elevated platforms (37.6%). Permeable surfaces were selected by only 6.5%. This distribution suggests that caregivers perceive drainage interventions as most practical, though elevated platforms remain a significant preference.

Willingness to Contribute to Maintenance: Caregivers demonstrated a strong commitment to community-led maintenance. When asked how they would contribute, 23.4% indicated they could provide labour, 11.7% could provide materials, and 43.6% could contribute through advocacy. Only 21.3% reported being unable to contribute. This finding is significant: over three-quarters of caregivers are willing to contribute to maintaining a play space, indicating strong potential for community ownership.

Preferred Maintenance Models: When asked about preferred maintenance arrangements, caregivers showed relatively balanced preferences. Parent committees were preferred by 37.6% of respondents, local government by 36.6%, and NGO partnerships by 24.7%. This distribution suggests that while caregivers value community-led approaches, they also recognise the role of formal institutions in sustaining play spaces.

Community Leader Perspectives: The two community leaders who completed questionnaires confirmed the absence of dedicated play spaces and identified technical skills as the key barrier to maintenance. One leader strongly agreed that designs should reflect cultural elements, while the other remained neutral. This input reinforces the importance of culturally appropriate, locally maintainable design solutions.

4.5 Current Risks to Children's Psychosocial Well-Being (RQ3)

The third research question asks how climate-resilient play spaces contribute to children's psychosocial well-being and social-emotional development during climate disruptions. Understanding current safety and health impacts establishes the baseline that interventions must address.

Play-Related Injuries: Caregiver survey data reveal significant injury rates associated with both floods and heat. Flood-related injuries were reported by 46.8% of respondents, while heat-related injuries were reported by 35.5%. These figures indicate that nearly half of children have experienced physical harm during flood events, and over one-third during heat events, findings that underscore the immediate threats to children's physical safety and, by extension, their sense of security and well-being.

Types of Injuries and Health Impacts: Among those reporting injuries, the most common were cuts and bruises (17.9%). More concerning, 13.7% of respondents reported a combination of cuts, heat exhaustion, and waterborne illness, while 7.4% reported cuts combined with heat exhaustion, and 7.4% reported cuts combined with waterborne illness. The presence of heat exhaustion and waterborne illness indicates that climate-related injuries extend beyond physical trauma to include serious health conditions that can affect children's overall well-being and developmental trajectories.

Observed Environmental Hazards: Behavioural observations documented multiple hazards in children's current play environments. Observers noted "too many sharp objects like broken glasses, metals," and children climbing on the structures of closed shops. Environmental hazards included muddy areas, visible sewage or contamination, and noticeable odours from mechanical workshops. These observations confirm that children are currently playing in environments that pose not only physical risks but also psychological stress, as children and their caregivers navigate unsafe conditions.

4.6 Children's Social-Emotional Capacities and Needs (RQ3)

Despite the risks documented above, observations reveal remarkable social-emotional capacities among Erunkan's children. One observer recorded: "There exists a good, cordial friendship relationship between the children" and "a strong bond among children with no definite play space." These observations are significant: they demonstrate that children actively seek and maintain peer relationships even in the absence of dedicated play infrastructure. This finding aligns with constructivist theories of play, which emphasise that social interaction is fundamental to children's development (Dberg, 1980). Children's capacity to form strong social bonds in challenging environments speaks to their resilience and the inherent drive to play.

Community Consensus on Need: Caregiver responses revealed unanimous agreement on the need for a dedicated community play space. The fieldwork report documented that caregivers expressed a desire for a space that is "safe, educational, and resilient to local climate conditions." This

consensus reflects a collective recognition that play is essential not merely for physical activity but for children's holistic development, including cognitive, social, and emotional growth.

Play Spaces as Climate Shelters: When asked whether play spaces should double as climate shelters, caregiver responses were generally supportive: strongly agree (29.3%), agree (26.1%), neutral (27.2%), and disagree (17.4%). While a majority support the dual-use concept, the distribution suggests that caregivers may prioritise play-specific functions while recognising the potential for play spaces to provide protection during climate events.

4.7 Implications for Design: How Spaces Can Support Psychosocial Well-Being (RQ3)

The findings across Sections 4.5 and 4.6, when considered together, point to how well-designed play spaces can contribute to children's psychosocial well-being and social-emotional development.

First, by eliminating physical hazards, such as broken glass, sharp metal, and sewage contamination, play spaces can provide the safety that is foundational to children's sense of security and their willingness to engage freely in play. Bronfenbrenner's (1979) Ecological Systems Theory emphasises that children's immediate environments (microsystems) profoundly shape their development; safe play environments provide the stability necessary for exploration and learning.

Second, by creating dedicated spaces for peer interaction, play spaces can support and amplify the strong social bonds already observed among children. These spaces can provide opportunities for collaborative play, negotiation, and conflict resolution activities that, as Dberg (1980) argued, advance cognitive and social development within the "zone of proximal development." Children's demonstrated capacity to form friendships, even without dedicated infrastructure, suggests that, with appropriate spaces, these social-emotional competencies can flourish.

Third, by incorporating climate-resilient features such as shade structures and flood-resistant elements, play spaces can ensure that play opportunities are not disrupted by the very climate events that currently force children indoors or into unsafe areas. Consistent, reliable access to play supports emotional regulation and provides children with a sense of predictability and control, both of which are central to psychosocial well-being.

Fourth, by engaging children and caregivers in the co-design process, as Lundy's (2007) model emphasises, these spaces can foster a sense of ownership and agency. When children see their ideas reflected in the final design, and when caregivers are involved in maintenance decisions, the space becomes not merely a facility but a community asset that supports collective efficacy and social cohesion. This sense of agency contributes directly to psychosocial well-being for both children and adults.

4.8 Summary of Key Findings

The data reveal several findings that directly address the research questions:

RQ1 (Climate Mitigation): Flooding and extreme heat frequently disrupt children's play, with over 80% experiencing disruptions weekly or monthly. Children currently play indoors, in unsafe areas, or in makeshift shaded spaces. Caregivers strongly prioritise flood-resistant structures and shade trees, with drainage channels and elevated platforms perceived as the most feasible solutions.

RQ2 (Design Elements): Children's drawings reveal strong preferences for slides, swings, trees, and covered structures. Caregivers prioritise flood-resistant structures and shade trees above other features, with most preferring a play space within a ten-minute walk. Over three-quarters of caregivers are willing to contribute labour, materials, or advocacy to maintenance, with parent committees and local government both viewed as viable maintenance models.

RQ3 (Psychosocial Well-Being): Nearly half of children have experienced flood-related injuries, and over one-third have experienced heat-related injuries. Hazards include sharp objects, sewage contamination, and unsafe climbing structures. Despite these risks, observations reveal strong social bonds among children and a unanimous community consensus on the need for a dedicated play space. Co-designed, climate-resilient play spaces can contribute to psychosocial well-being by providing safety, supporting peer interaction, ensuring uninterrupted play, and fostering community ownership and agency.

These findings establish a clear evidence base for the co-design of climate-resilient play spaces in Erunkan. The following session discusses the implications of these findings and presents actionable recommendations for policy and practice.

5. Discussion and Recommendations

5.1 Introduction

This session interprets the findings from session 4, situates them within the theoretical framework established in the literature review, and explores their significance for policy, practice, and future research. The session is organised around the three research questions, with each section linking findings back to the theoretical perspectives that guided this study: Lundy's Model of Participation, constructivist theories of play, and Bronfenbrenner's Ecological Systems Theory. The session then presents actionable recommendations for stakeholders at multiple levels, from community to policy, and concludes with reflections on the study's contributions and limitations.

5.2 Interpretation of Findings: Climate Mitigation (RQ1)

The findings on climate disruptions confirm and extend existing scholarship on children's vulnerability to climate change in urban informal settlements. The data reveal that flooding and extreme heat affect children's play with remarkable frequency: over 80% of children experience climate-related disruptions weekly or monthly. This finding aligns with Bartlett's (2008) argument that climate adaptation strategies have systematically overlooked the needs of urban children, leaving families to cope without institutional support.

The finding that 8.4% of children play in unsafe areas such as roads or drains during climate events is particularly concerning. From the perspective of Bronfenbrenner's (1979) Ecological Systems Theory, this represents a failure at multiple levels: the immediate microsystem (play environment) is hazardous; the exosystem (community infrastructure) provides no safe alternatives; and the macrosystem (policy frameworks) has not prioritised child-inclusive climate adaptation. This multi-level failure underscores the necessity of interventions that address not only physical design but also the broader structural conditions that produce and sustain vulnerability.

Caregivers' prioritisation of flood-resistant structures and shade trees reflects a pragmatic understanding of the hazards their children face. Importantly, caregivers' preferences align with nature-based solutions documented in the literature, permeable surfaces, elevated structures, and strategic shade planting (Sarabi, Han, de Vries, & Romme, 2022), suggesting that local knowledge and scholarly expertise converge on similar design principles. The finding that over three-quarters of caregivers are willing to contribute labour, materials, or advocacy to maintenance indicates that the community is not merely a passive recipient of intervention but an active partner in creating solutions, directly supporting the participatory action research design of this study.

5.3 Interpretation of Findings: Design Elements (RQ2)

Children's drawings provide a window into their spatial imaginations and design preferences. The recurring themes of slides, swings, trees, and covered structures suggest that children envision play spaces that are dynamic, varied, and responsive to environmental conditions. The appearance of roofs or covers in multiple drawings is particularly significant: it suggests that even young

children intuitively understand the need for protection from the sun and rain. This finding validates the climate-resilient design principles central to this study.

From a constructivist perspective (HeadStart, 2024; Ness, 2022), children's drawings are not merely representations but active constructions of meaning. By drawing their "dream play spaces," children were engaging in what Clark and Moss (2017) describe as meaning-making through visual expression. The preference for the virtual exploration tool over traditional drawing methods is a methodological insight that warrants attention: future research with young children might consider integrating digital methods to sustain engagement and elicit richer data.

Caregivers' ranking of flood-resistant structures as the highest priority, followed closely by shade trees, reinforces the centrality of climate adaptation in community design preferences. Notably, while drainage channels were perceived as the most feasible flood-proofing solution, elevated platforms, which also serve as play structures, received substantial support. This finding suggests that multifunctional design, where climate-resilient features double as play elements, may be particularly well-suited to this context. The willingness of over three-quarters of caregivers to contribute to maintenance, and the balanced preferences among parent committees, local government, and NGO partnerships, indicate that sustainability is a shared concern. Community leader responses identifying technical skills as the key barrier to maintenance highlight the importance of capacity-building alongside infrastructure provision.

5.4 Interpretation of Findings: Psychosocial Well-Being (RQ3)

The findings on psychosocial well-being reveal a paradox. On one hand, children face significant risks: nearly half have experienced flood-related injuries, and over one-third have experienced heat-related injuries. Hazards include sharp objects, sewage contamination, and unsafe climbing structure conditions that threaten not only physical safety but also psychological security. On the other hand, observations reveal strong social bonds among children and a unanimous community consensus on the need for a dedicated play space.

This paradox speaks to children's remarkable resilience and the fundamental human drive to play. As Dberg (1980) argued, play is not a luxury but a developmental necessity; children will create play opportunities even in the most challenging environments. The observation that "there exist good, cordial, friendship relationships between the children" and "strong bonds among children with no definite play space" demonstrates that children's social-emotional capacities can flourish even without formal infrastructure. However, the presence of injuries and hazards also indicates that these capacities are developing under conditions that could and should be improved.

Lundy's (2007) model of participation emphasises that children's voices must not only be heard but also acted upon. In this study, children expressed their preferences through drawings and workshops; caregivers expressed their priorities through surveys. Together, these voices articulate a vision of play spaces that are safe, engaging, climate-resilient, and community-owned. The finding that over three-quarters of caregivers support the dual-use concept of play spaces as

climate shelters suggests that the community sees the potential for these spaces to serve multiple functions, protecting children from climate hazards while supporting their development.

From Bronfenbrenner's Ecological Systems Theory, well-designed play spaces can positively influence multiple levels of children's development. At the microsystem level, they provide safe, stimulating environments for peer interaction and exploration. At the mesosystem level, they create connections between home, community, and school. At the exosystem level, they can serve as models for child-inclusive urban planning. At the macrosystem level, they contribute to cultural shifts toward recognising children's rights to play and participation.

5.5 Recommendations

Based on the findings and their interpretation, the following recommendations are proposed for stakeholders at multiple levels.

5.5.1 Recommendations for Policy

The Lagos State Urban Resilience Strategy should be revised to explicitly integrate child-inclusive climate adaptation, incorporating provisions for safe, climate-resilient play spaces in informal settlements, and the evidence-based model this study provides. Current playground guidelines, which focus on general safety, should be expanded to include specific provisions for flood and heat resilience, adopting nature-based solutions such as permeable surfaces, elevated structures, and strategic shade planting as standard practice. Finally, policy frameworks should enable and resource community-led maintenance models, such as parent committees, building on caregivers' demonstrated willingness to contribute while ensuring technical support is available where needed.

5.5.2 Recommendations for Practice

A pilot play space should be implemented in Erunkan, incorporating children's preferences (slides, swings, trees, covered structures) and caregivers' priorities (flood-resistant structures, shade trees), with multifunctional elements such as elevated platforms that serve as both play structures and flood-safe zones prioritised. Given that technical skills were identified as a key barrier to maintenance, training programmes for community members, particularly parents and local artisans, should accompany infrastructure development to build local capacity. Additionally, practitioners should consider integrating age-appropriate digital tools in future co-design initiatives, as children's preference for the virtual exploration tool suggests digital methods can significantly enhance engagement in child participation processes.

5.5.3 Recommendations for Future Research

Future research should examine how access to dedicated play spaces affects children's psychosocial well-being and social-emotional development over time, using longitudinal studies with both quantitative and qualitative measures. Comparative research across multiple informal

settlements would enhance understanding of context-specific factors that influence design preferences and outcomes. At the same time, evaluation of different maintenance models, parent committees, local government, and NGO partnerships would identify best practices for community-led infrastructure management.

5.6 Contribution to the Field

This study makes several contributions to knowledge and practice. First, it provides empirical evidence on the specific ways climate change disrupts children's play in Nigerian informal settlements, contributing to a literature that has largely overlooked this context. Second, it demonstrates the feasibility and value of participatory methods with young children (aged 3-6), including innovative digital approaches, in co-design processes. Third, it offers an integrated theoretical framework combining Lundy's participation model, constructivist play theories, and Bronfenbrenner's ecological systems that can guide future research and practice at the intersection of climate adaptation and early childhood development. Fourth, it generates actionable design recommendations grounded in community preferences and local knowledge, providing a model that can be adapted to other vulnerable communities.

5.7 Limitations

Several limitations should be acknowledged. First, while community leaders were engaged through questionnaires, the originally planned in-depth interviews were not conducted due to scheduling constraints. The caregiver data, however, captured community-level perspectives, and the two leader responses provide complementary institutional insights. Second, the study is limited to a single community, which may restrict generalisability; however, detailed contextual documentation supports transferability to similar settings. Third, the child workshop data are drawn primarily from drawings, without recorded narratives or quotes from children. Future research should incorporate audio or video documentation to capture children's voices better. Fourth, the 12-month timeframe limited opportunities for iterative design feedback and validation. Finally, the originally planned GIS spatial analysis was not conducted; observational mapping and community-identified flood zones provided sufficient spatial context for design recommendations.

6. Conclusions

This study set out to investigate how participatory co-design can develop climate-resilient play spaces that support early childhood development in Erunkan, Ikorodu. Guided by three research questions concerning climate mitigation, design elements, and psychosocial well-being, the research employed a participatory action research design engaging approximately 50 children aged 3-6 and 94 caregivers, complemented by behavioural observations and community leader perspectives.

The findings reveal that flooding and extreme heat disrupt children's play with alarming frequency, forcing them indoors or into unsafe environments; nearly half of children experience flood-related injuries, and over one-third experience heat-related injuries. Despite these risks, children demonstrate remarkable social-emotional capacities, forming strong peer bonds even without dedicated play spaces. At the same time, caregivers express unanimous support for safe, educational, and climate-resilient play infrastructure. Children's drawings articulate clear design preferences for slides, swings, trees, and covered structures. At the same time, caregivers prioritise flood-resistant structures and shade trees, with over three-quarters willing to contribute labour, materials, or advocacy to maintenance.

The study makes several contributions. Theoretically, it demonstrates the value of integrating Lundy's Model of Participation, constructivist play theories, and Bronfenbrenner's Ecological Systems Theory for understanding child-inclusive climate adaptation. Methodologically, it shows that participatory methods with young children, including digital tools, are not only feasible but essential for generating contextually appropriate solutions. Practically, it provides actionable design recommendations grounded in community preferences and local knowledge, offering a model that can be adapted to other vulnerable communities.

Several directions for future research emerge. Longitudinal studies are needed to examine how access to dedicated play spaces affects children's psychosocial well-being and social-emotional development over time. Comparative research across multiple informal settlements would enhance understanding of context-specific factors influencing design outcomes. An evaluation of different maintenance models, parent committees, local government, and NGO partnerships would identify best practices for community-led infrastructure management. Finally, the methodological insight that children preferred the virtual exploration tool to drawing suggests that future research should examine how digital methods can enhance children's participation in co-design processes.

In conclusion, this study affirms that children in climate-vulnerable communities are not merely passive victims of environmental change but active agents with clear preferences, remarkable resilience, and the right to shape the spaces they inhabit. Co-design offers a pathway to honour that right, producing solutions that are simultaneously safe, engaging, climate-resilient, and community-owned. The children of Erunkan have made their voices heard; the task now is to act.

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List of Appendices

Appendix A: Child-Centred Co-Design Workshop Tools

Tool A.1: Visual Exploration Guide and Storytelling Prompts

Items: A3 Card Boards, Pencils, Crayons, etc

Activities: Draw your favourite current place to play.

Draw where you feel safe when it rains/floods.

Draw your dream play space.

Draw where you do not like to play.

Storytelling Prompts: “One day, it was raining heavily/very hot....”

“Tell me about playing when it's very hot.”

Purpose: To understand the children’s experiences with play and climate impacts.

Tool A.2: Visual Preference Boards

Items: Map of site.

Boards with images of various plays and learning elements (swings, slides, etc)

Boards with images of Climate-resilient features (shades, elevated structures, etc)

Stickers with Happy and Sad faces for children to communicate their preference

Purpose: To help the children express their preferences for play space elements.

Appendix B: Caregiver/Parents Interview Guide

A. Climate Disruptions to Play

1. How often do these climate events prevent outdoor play?
Flooding: ☐ Daily ☐ Weekly ☐ Monthly ☐ Rarely
Extreme heat: ☐ Daily ☐ Weekly ☐ Monthly ☐ Rarely
2. Where does your child play during floods/heat? (Select all)
☐ Indoors ☐ Makeshift shaded areas ☐ Flood-safe elevated spots ☐ Unsafe areas (roads/drains)

B. Play Space Priorities

3. Rank this play space features by importance (1=most important; 5=less important):
☐ Flood-resistant structures ☐ Shade trees/canopies ☐ Safe water play areas ☐ Soft landing surfaces
4. Maximum walking time to a play space you approve:
☐ <5 mins ☐ 5-10 mins ☐ >10 mins

C. Safety & Health

5. Has your child experienced play-related injuries due to:
Floods: ☐ Yes ☐ No
Heat: ☐ Yes ☐ No
6. What injuries occurred? (*Select all*)
☐ Cuts/bruises ☐ Heat exhaustion ☐ Waterborne illness ☐ Other: _____

D. Community Action

7. Would you contribute to maintaining a play space?
☐ Labor ☐ Materials ☐ Advocacy ☐ Unable
8. Preferred maintenance model:
☐ Parent committees ☐ Local government ☐ NGO partnerships

E. Climate Adaptation

9. Which flood-proofing solution is most feasible?
☐ Elevated platforms ☐ Permeable surfaces ☐ Drainage channels
10. Should play spaces double as climate shelters?
☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree

Appendix C: Community Leaders Questionnaires

A. Climate Risks

1. Most critical climate threat to play spaces:
☐ Flooding ☐ Heat islands ☐ Erosion
2. Do we have an existing play space in the area:
☐ Yes ☐ No
3. Rate current play space climate resilience:
☐ Very poor ☐ Poor ☐ Fair ☐ Good ☐ No place space

B. Design Solutions

4. Most feasible local material for flood-resistant play equipment:
☐ Bamboo ☐ Recycled plastics ☐ Laterite clay
5. Should designs reflect any cultural elements?
☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree

C. Implementation

6. Key barrier to maintaining play spaces:
☐ Funding ☐ Technical skills ☐ Community engagement
7. Preferred policy action:
☐ Local ordinances ☐ State partnerships ☐ NGO collaborations

Appendix D: Behavioural Observation Sheets

Tool D.1: Mapping Template

Items: Printed Map of the study area within Erunkan.

Activity: Positioning of markers on the Map based on areas used for play.

Tool D.2: Observation Sheet

Date: _____ Time (Start): _____ Time (End): _____

Observer Name: _____

Section 1: Environmental Conditions & Climate Indicators

1. Weather Conditions:
☐ Sunny ☐ Cloudy ☐ Rainy ☐ Overcast
2. Estimated Temperature (in °C): _____
3. Surface Conditions:
☐ Dry ☐ Damp ☐ Wet (Puddles/Standing water ☐ Muddy ☐ Dusty
4. Shade Availability:
☐ Adequate natural shade ☐ Adequate artificial shade ☐ Partial shade ☐ No significant shade
Notes on shade effectiveness: _____
5. Water Presence (beyond puddles):
☐ Open drains ☐ Stagnant water bodies ☐ Visible sewage/contamination ☐ Others
6. Air Quality (Subjective):
☐ Clear / Fresh air ☐ Visible dust / Haze ☐ Noticeable odours (e.g., smoke, waste)
Notes on air quality issues: _____

Section 2: Child Play Behaviour & Spatial Usage

(Record observations in 5-minute intervals or continuous notes, focusing on children aged 3-6)

Activities: (Running, Climbing, Social Play, Group Games, etc.)

Time Interval							
Number of Children							
Activity							

Section 3: Barriers & Hazards Observed

Physical Hazards: _____

Environmental Hazards: _____

Section 4: Overall Impression & Additional Notes

Appendix E: Informed Consent Form

Study Title: Co-Designing Climate-Resilient Play Spaces for Early Childhood Development in Erunkan, Ikorodu
Researcher: Omobolanle Kayode James
Affiliation: Moving Minds Alliance
Contact: JAMESOMOBOLANLE@OUTLOOK.COM

Dear Participant,

You are invited to participate in a research study to understand how to design safe, climate-resilient play spaces for young children in the Erunkan community. This study involves a short survey and, for some, observation of children's play. Your participation is voluntary, and all information you provide will be kept strictly confidential.

Participation Involves:

- Completing a short questionnaire (approximately 10-15 minutes) about your child's play habits and your views on play spaces.
- For a smaller group, allowing your child (aged 3–6) to participate in drawing, storytelling, or play-based activities supervised by the researcher.

Risks and Benefits:

There are no anticipated risks to participation. The benefit is that your views will directly contribute to the co-design of safer, more inclusive, and climate-resilient play spaces for children in Erunkan.

Confidentiality:

All data collected will be used only for research purposes. Your name and identity will not be shared in any reports. Participation is entirely voluntary, and you may withdraw without penalty.

Consent Declaration:

I have read (or had read to me) the information above. I understand what my participation involves and agree to take part in this study.

Name/Initials of Participant: _____

Signature: _____ Date: _____

Name of Researcher/Investigator: _____

Signature: _____ Date: _____

Appendix F: Screenshots of Data Collection Processes

F.1: Copies of Signed Consent Forms

MOVING MINDS
ALLIANCE

Topic: Co-Designing Climate-Resilient Play Spaces for Early Childhood Development in Erunkan, Ikorodu
Research Plan By: Omobolanle Kayode James

Appendix 4.0: Informed Consent Form

INFORMED CONSENT FORM

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Affiliation: Moving Minds Alliance

Contact: JAMESOMOBOLANLE@OUTLOOK.COM

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Consent Declaration:

I have read (or had read to me) the information above. I understand what my participation involves and agree to take part in this study.

Name/Initials of Participant: Ajasa

Signature: [Signature] Date: 22/08/2025

Name of Researcher/Investigator: KJD

Signature: [Signature] Date: 22/08/2025

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Appendix 4.0: Informed Consent Form

INFORMED CONSENT FORM

Study Title: Co-Designing Climate-Resilient Play Spaces for Early Childhood Development in Erunkan, Ikorodu
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Contact: JAMESOMOBOLANLE@OUTLOOK.COM

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Risks and Benefits:

There are no anticipated risks to participation. The benefit is that your views will directly contribute to the co-design of safer, more inclusive, and climate-resilient play spaces for children in Erunkan.

Confidentiality:

All data collected will be used only for research purposes. Your name and identity will not be shared in any reports. Participation is entirely voluntary, and you may withdraw without penalty.

Consent Declaration:

I have read (or had read to me) the information above. I understand what my participation involves and agree to take part in this study.

Name/Initials of Participant: DReyomi ADEBAYO
Signature: [Signature] Date: 22/08/2025
Name of Researcher/Investigator: [Signature]
Signature: [Signature] Date: 22/08/2025

F.2: Copies of Completed Structured Questionnaire Guides

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MOVING MINDS ALLIANCE  **ed**

Topic: Co-Designing Climate-Resilient Play Spaces for Early Childhood Development in Erukan, Ikoredu
Research Plan By: Omobolanle Kayode James

Appendix 3.0: Structured Questionnaire Guides

Tool 3.1: Caregiver/Parents Interview Guide

A. Climate Disruptions to Play

1. How often do these climate events prevent outdoor play?
Flooding: ☐ Daily ☐ Weekly ☒ Monthly ☐ Rarely
Extreme heat: ☐ Daily ☐ Weekly ☒ Monthly ☐ Rarely

2. Where does your child play during floods/heat? (Select all)
☐ Indoors ☐ Makeshift shaded areas ☒ Flood-safe elevated spots ☐ Unsafe areas (roads/drains)

B. Play Space Priorities

3. Rank these play space features by importance (1=most important; 5=less important):
☒ Flood-resistant structures ☐ Shade trees/canopies ☐ Safe water play areas ☐ Soft landing surfaces

4. Maximum walking time to a play space you approve:
☒ <5 mins ☐ 5-10 mins ☐ >10 mins

C. Safety & Health

5. Has your child experienced play-related injuries due to:
Floods: ☒ Yes ☐ No
Heat: ☒ Yes ☐ No

6. What injuries occurred? (Select all)
☒ Cuts/bruises ☐ Heat exhaustion ☒ Waterborne illness ☐ Other: _____

D. Community Action

7. Would you contribute to maintaining a play space?
☒ Labour ☐ Materials ☐ Advocacy ☐ Unable

8. Preferred maintenance model:
☐ Parent committees ☒ Local government ☐ NGO partnerships

E. Climate Adaptation

9. Which flood-proofing solution is most feasible?
☐ Elevated platforms ☐ Permeable surfaces ☒ Drainage channels

10. Should play spaces double as climate shelters?
☐ Strongly agree ☐ Agree ☒ Neutral ☐ Disagree

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Appendix 3.0: Structured Questionnaire Guides

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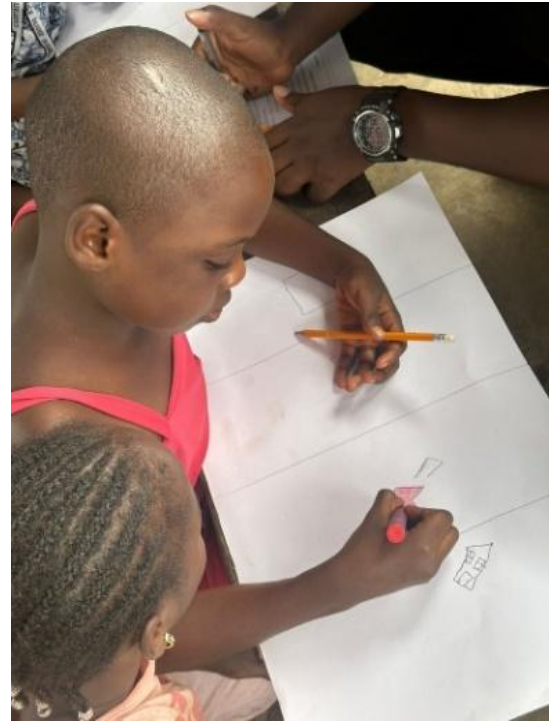
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☒ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree

F.3: Child Co-Design Workshops



Child participating in a visual co-design workshop using drawing materials. Face obscured to protect anonymity. Erunkan, Ikorodu. (Source: Observer, August 2025)



Child's drawing of "dream play space" showing covered structure. The inclusion of a roof indicates intuitive awareness of climate protection needs. Erunkan, Ikorodu. (Source: Observer, August 2025)

F.4: Copies of Behavioural Observations

Appendix 2.0: Behavioural Observation and Mapping

Tool 2.1: Mapping Template

Items: Printed Map of the study area within Erunkan.

Activity: Positioning of markers on the Map based on areas used for play.

Tool 2.2: Observation Sheet

Date: 23/08/25 Time (Start): 05:10pm Time (End): 05:02pm
Observer Name: Seloni Mojed

Section 1: Environmental Conditions & Climate Indicators

1. Weather Conditions:

☐ Sunny ☐ Cloudy ☐ Rainy ☐ Overcast

2. Estimated Temperature (in °C): _____

3. Surface Conditions:

☒ Dry ☐ Damp ☐ Wet (Puddles/Standing water) ☐ Muddy ☐ Dusty

4. Shade Availability:

☐ Adequate natural shade ☐ Adequate artificial shade ☐ Partial shade ☒ No significant shade

Notes on shade effectiveness: Roof eaves are not really effective

5. Water Presence (beyond puddles):

☐ Open drains ☐ Stagnant water bodies ☒ Visible sewage/contamination ☐ Others

6. Air Quality (Subjective):

☐ Clear / Fresh air ☐ Visible dust / Haze ☒ Noticeable odours (e.g., smoke, waste)

Notes on air quality issues: Carbon emissions from mechanic Workshop

Section 2: Child Play Behaviour & Spatial Usage

(Record observations in 5-minute intervals or continuous notes, focusing on children aged 3-6)

Activities: (Running, Climbing, Social Play, Group Games, etc.)

Time Interval	5:20	5:25	5:30	5:40	5:45	5:53	6:02
Number of Children	40	21	38	45	48	48	48
Activity	Running	Climbing	Climbing	Group Games	Climbing	Running	Climbing

Section 3: Barriers & Hazards Observed

Physical Hazards: The children were climbing Bungalows of a closed shop.

Environmental Hazards: _____

Section 4: Overall Impression & Additional Notes

There is a strong bond among the children in the community, however there are no safe defined play spaces for them.

Appendix 2.0: Behavioural Observation and Mapping

Tool 2.1: Mapping Template

Items: Printed Map of the study area within Erunkan.

Activity: Positioning of markers on the Map based on areas used for play.

Tool 2.2: Observation Sheet

Date: 23/8/25 Time (Start): 3:00 Time (End): 4:00

Observer Name: DOLAPO ADEYEM

Section 1: Environmental Conditions & Climate Indicators

1. Weather Conditions:

☐ Sunny ☐ Cloudy ☐ Rainy ☐ Overcast

2. Estimated Temperature (in °C): _____

3. Surface Conditions:

☒ Dry ☐ Damp ☐ Wet (Puddles/Standing water) ☐ Muddy ☐ Dusty

4. Shade Availability:

☐ Adequate natural shade ☐ Adequate artificial shade ☒ Partial shade ☐ No significant shade

Notes on shade effectiveness: very little roof eaves in most buildings.

5. Water Presence (beyond puddles):

☐ Open drains ☐ Stagnant water bodies ☒ Visible sewage/contamination ☐ Others

6. Air Quality (Subjective):

☐ Clear / Fresh air ☐ Visible dust / Haze ☒ Noticeable odours (e.g., smoke, waste)

Notes on air quality issues: Presence of mechanic workshop in the community

Section 2: Child Play Behaviour & Spatial Usage

(Record observations in 5-minute intervals or continuous notes, focusing on children aged 3-6)

Activities: (Running, Climbing, Social Play, Group Games, etc.)

Time Interval	3:15	3:25	3:30	3:40	3:45	3:50	3:58
Number of Children	2	1	2	3	1	4	2
Activity	Running	Running	Climbing	Social Play	running	Group Play	Climbing

Section 3: Barriers & Hazards Observed

Physical Hazards: Space Port from mechanic workshop

Environmental Hazards: Smoke from vehicle

Section 4: Overall Impression & Additional Notes

A community driven environment that has very little government infrastructure.

Appendix G: Children's Drawings

