# Humanitarian Architecture in Service of Children: Designing an Orphanage for Vulnerable Children in Yaoundé

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Abstract:- This research explores the impact of humanitarian architecture in designing an orphanage for vulnerable children in Yaoundé, Cameroon. In a context where millions of children are affected by social, economic, and political crises, particularly in Sub-Saharan Africa, humanitarian architecture emerges as a viable response to ensure their protection and well-being. The literature review highlights the key principles of humanitarian architecture, such as user-centered design, the use of local and sustainable materials, and the creation of resilient spaces in times of crisis. Through case studies, including projects in Burkina Faso and Mali, this research examines how architectural approaches can be integrated into educational and care facilities to improve the living environment of vulnerable children. The work concludes with design proposals for an orphanage in Yaoundé, focusing on adaptation to the local climate, material sustainability, and community participation, aiming to strengthen the resilience and autonomy of children.

*Keywords:- Humanitarian Architecture, Vulnerable Children, Orphanage, Sustainable Design, Resilience.* 

## I. INTRODUCTION

In 2024, it is estimated that there are 153 million orphaned children worldwide, with around 100 million homeless or living in precarious conditions, according to UNICEF. This situation is particularly severe in Sub-Saharan Africa, which is heavily impacted by humanitarian and political crises. In Cameroon, conflicts in the North-West and South-West regions, insecurity due to Boko Haram, pandemics such as HIV/AIDS and Covid-19, extreme poverty have significantly increased the number of vulnerable children. In response to this reality, humanitarian architecture emerges as an essential solution. It not only provides physical shelter but also aims to improve the well-being of children by designing spaces that are adapted, safe, and sustainable. This research examines the challenges of designing an orphanage for vulnerable children in Yaoundé, focusing on their security, protection, and development. Our goal is to propose an architectural model that addresses local needs by integrating the principles of humanitarian architecture.

#### II. HUMANITARIAN ARCHITECTURE: DEFINITION AND PRINCIPLES

Humanitarian architecture focuses on the design and planning of human settlements in vulnerable conditions, ranging from short-term emergency situations to long-term poverty reduction, addressing the primary needs of people in precarious situations, with an emphasis on processes rather than products. (aalto.fi, 2023). It is based on fundamental principles aimed at improving the living conditions of vulnerable populations.

## A. The Principles of Humanitarian Architecture

Humanitarian architecture is based on several key principles designed to meet the needs of vulnerable populations during crises. Here is a summary of the main principles:

#### User-Centered Design:

This principle places beneficiaries at the heart of the design process, actively involving them to ensure that the infrastructure meets their actual needs. This participatory approach helps create spaces that enhance dignity and the quality of life of vulnerable populations while strengthening their autonomy.



Fig 1 Makoko Floating School, Lagos-Nigeria

## ➤ Use of Local and Sustainable Materials :

Priority is given to local resources for construction, reducing costs and supporting the local economy. Local materials also allow for better adaptation to climate conditions and ensure the durability of the buildings.



Fig 2 The Gando Primary School in Burkina Faso

## ➢ Resilience and Durability :

Humanitarian architecture seeks to design infrastructure capable of withstanding natural disasters and prolonged crises while minimizing environmental impact. Resilience is a priority to ensure the longevity of structures in crisis contexts.



Fig 3 La Dignité School, Haiti

## Community Participation :

Integrating local communities into the design and construction of projects is essential for ensuring collective ownership and sustainability of infrastructure. It also helps develop local skills in sustainable construction and infrastructure management.



Fig 4 Use of Laterite for the Construction of the Amadou Hampaté Bâ College

## ➤ Adaptability and Flexibility :

This principle focuses on designing modular and flexible structures that can adapt to changing user needs and environmental conditions. In times of crisis, this flexibility allows buildings to be easily modified or expanded based on evolving needs and available resources.



## Fig 5 Usage of the Kit

## > Accessibility and Inclusion :

Humanitarian architecture aims to design spaces accessible to all, regardless of age, gender, or physical abilities. This principle ensures that essential infrastructure and services are inclusive and accessible, especially for disabled or elderly individuals, who are often neglected during crises.

#### B. Some Humanitarian Architects

Some architects have distinguished themselves through their commitment to humanitarian architecture projects by developing architectural innovations that meet the needs of vulnerable populations, including:

#### > Shigeru Ban

Japanese architect Shigeru Ban, recipient of the Pritzker Prize in 2014, is known for his humanitarian work. He is recognized for his innovative use of unconventional materials such as cardboard tubes and bamboo in the design of temporary shelters for displaced populations. Since the 1990s, he has been involved in humanitarian projects around the world, notably during the Rwanda war in 1994 and after the Kobe earthquake in 1995. His projects combine aesthetics, functionality, and resilience, providing quick and sustainable solutions for vulnerable populations.



Fig 6 Prototype of the Paper Log House by Shigeru Ban

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#### ➢ Rizvi Hassan

Bangladeshi architect Rizvi Hassan specializes in creating structures for marginalized populations, particularly the Rohingya refugees in Bangladesh. He designed community centers for women and children in refugee camps, promoting their well-being and safety. Using local materials such as bamboo, his projects reflect a sustainable approach focused on the specific needs of users, while offering a response adapted to humanitarian emergencies.



Fig 7 Community Center for Rohingya Refugees, Bangladesh by Rizvi Hassan

#### > Anna Heringer

Austrian architect Anna Heringer is a pioneer of humanitarian and sustainable architecture, focused on using local materials and traditional techniques. Her most notable project, the METI Handmade School in Bangladesh, is an example of vernacular architecture, where local materials like earth and bamboo are used to create a sustainable educational environment, involving the community in the construction process. Her work embodies the idea that architecture can empower local communities.



Fig 8 METI Handmade School - Built with the People, by Anna Heringer Bangladesh

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### ➢ Alejandro Aravena

Chilean architect Alejandro Aravena is known for his progressive social housing projects, which allow families to start with basic structures that they can expand according to their needs and resources. His Quinta Monroy Housing Project in Iquique, Chile, exemplifies this approach. Families can progressively enlarge their homes, a solution that adapts to economic conditions while promoting residents' autonomy. Aravena advocates for architecture that helps reduce social inequalities.

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Fig 9 Implementation of the Quinta Monroy Housing Project in Iquique, Chile by Alejandro Aravena



Fig 10 Expansion of the project by the residents, Iquique, Chile

## III. HUMANITARIAN ARCHITECTURE AND VULNERABLE CHILDREN

#### A. Vulnerability: Definition and Framework

According to UNICEF, vulnerability refers to the extent to which certain individuals may be disproportionately affected by disruptions in their physical environment and social support systems due to a disaster or conflict. In Cameroon, conflicts in the North-West and South-West regions, insecurity caused by Boko Haram, the HIV/AIDS and COVID-19 pandemics, as well as extreme poverty, have left thousands of children orphaned or displaced. According to UNICEF and local reports, approximately two million children are vulnerable for multiple reasons, including:

#### > Children abandoned at birth as a result of :

Frequent maternal mortality (780/100,000) (Ministry of Health, 2014). Sexual abuse of girls aged 15 to 19 (22% rapes, 60% sexual violence) (ACESF-CA Report)

## > Physical or Mental Disability.

- Children whose parents were victims of AIDS, estimated at 390,000 in 2020 (ILO Report, Article 7, paragraph 2).
- Children whose parents were victims of Boko Haram's actions : Since 2014, more than 50,000 children have been orphaned due to attacks by this terrorist group, according to estimates from Human Rights Watch and the UN.
- Children orphaned due to the conflicts in the North-West and South-West: The conflict, ongoing since 2017, has caused significant violence, leaving thousands of children without parents. Although exact figures vary, at least 400,000 children are directly affected by these conflicts, with many becoming orphans or displaced.
- Children who are refugees or displaced due to regional and neighboring country instability: Over 1 million displaced children, according to UNHCR reports. This figure includes both internally displaced children and refugees who have fled to neighboring countries.
- Children from poor or extremely poor families who are temporarily abandoned.

Additionally, over one million children have been displaced by regional instability, further exposing them to malnutrition, lack of social protection, and violence.

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## B. The Needs of Vulnerable Children

According to the CRC: "The child, for the full and harmonious development of their personality, should grow up in a family environment, in an atmosphere of happiness, love, and understanding."

According to the Convention on the Rights of the Child (CRC), a child must grow up in a family environment filled with love, happiness, and understanding in order to fully flourish. The CRC defines the fundamental needs of children and serves as a legal framework to ensure their well-being, development, and protection, based on four key principles: non-discrimination, the best interests of the child, the right to life and development, and respect for the child's views. These rights are especially crucial in humanitarian crisis contexts, where children are often the most vulnerable.

> The Fundamental Needs of Children Include:

- **Identity and belonging**: Every child has the right to a name, nationality, and to know their parents (Article 7).
- **Family environment**: Children should live in a loving and secure family environment and maintain regular relationships with their parents, even in cases of separation (Article 9).
- **Protection** : Children must be protected from all forms of violence, abuse, and exploitation (Article19).
- Education : Access to quality, free, and compulsory education at the primary level is essential for their development (Article 28).
- **Healthcare and well-being**: Children have the right to the best possible healthcare, a balanced diet, and decent living conditions (Article 24).

#### C. Architecture as a Solution to Child Vulnerability

Abraham Maslow's hierarchy of needs theory highlights the importance of addressing human needs progressively, from basic physiological needs to self-actualization. For vulnerable children, who often lack family or environmental stability, it is crucial to first meet their physiological needs (shelter, food) and their need for safety.

## SELF-**ACTUALIZA-**TION morality, creativity, spontaneity, acceptance, experience purpose, meaning and inner potential SELF-ESTEEM confidence, achievement, respect of others, the need to be a unique individual LOVE AND BELONGING friendship, family, intimacy, sense of connection SAFETY AND SECURITY health, employment, property, family and social ability PHYSIOLOGICAL NEEDS breathing, food, water, shelter, clothing, sleep

Fig 11 Maslow's Hierarchy of Needs

Humanitarian architecture plays a vital role in this response. It provides immediate emergency solutions, such as temporary shelters, and durable infrastructure for long-term rehabilitation. Shigeru Ban's projects, such as the Paper House, demonstrate how architecture can deliver quick and decent shelters. Projects like Alejandro Aravena's show how architecture can help restore human dignity and reintegrate individuals into society.

In Cameroon, which is affected by internal crises, conflicts, and extreme poverty, humanitarian architecture is a key solution for children. Pandemics (COVID-19, HIV/AIDS) and the conflicts in the North-West and South-West regions have particularly endangered thousands of children. Adapted architectural solutions, such as Rizvi Hassan's Community Center for Refugee Women and Children, not only ensure physical safety but also promote social reintegration and children's autonomy.

Thus, humanitarian architecture is not only a response to immediate crises ; it becomes a tool for strengthening the social fabric by creating infrastructure that meets the fundamental needs of children, restoring their dignity, and transforming them into active participants in community development. D. Orphanages and the Humanitarian Approach in Cameroon

## Definition and Mission of Orphanages

An orphanage is an institution that accommodates orphaned children, those who have lost their parents or whose parents can no longer care for them. Historically, these institutions were mainly managed by religious or charitable organizations. Today, their role has expanded to include the education and well-being of children, focusing on their overall development through a stable environment and psychological support.

#### Operating Principles of Orphanages

Orphanages must provide essential services to protect and develop vulnerable children:

- **Secure shelter**: Provide a safe haven to ensure physical security, especially in crisis contexts.
- Health care and psychological support: Offer basic medical care and psychological support tailored to children who have experienced trauma.
- Access to education: Ensure quality education to foster cognitive and social development.

- **Food and nutrition**: Provide balanced nutrition to support growth and development.
- **Support for family reintegration**: Whenever possible, promote reintegration into foster or biological families to avoid prolonged institutionalization.
- Issues with Orphanages in Cameroon
  Orphanages in Cameroon face numerous challenges :
- **Inadequate infrastructure**: Often poorly built, they do not take the local climate into account, resulting in uncomfortable living conditions.
- Lack of resources: Relying mainly on donations, orphanages regularly face interruptions due to financial constraints and a shortage of qualified staff.
- **Overcrowding**: Orphanages are often overcrowded, with an insufficient ratio between children and staff, affecting the quality of supervision.
- **Poor management of donations**: Misappropriation of funds is sometimes reported, directly impacting the quality of life for children.
- > The Humanitarian Approach to Improving Orphanages

Humanitarian architecture offers sustainable solutions by using local materials adapted to climatic conditions, which helps reduce costs while improving the durability of buildings. The integration of bioclimatic concepts, such as natural ventilation, minimizes energy dependence and improves living conditions. Community involvement in the design and construction fosters project ownership, strengthens local skills, and ensures that children's needs are better addressed. Collaboration with NGOs and donors can also ensure stable funding, while enhancing transparency and resource management. Rigorous management and regular monitoring of services (health, education, nutrition) are essential to optimize resources and improve the overall functioning of orphanages.

#### E. A Mission Aligned with the SDGs

The Sustainable Development Goals (SDGs) aim to eradicate poverty, protect the planet, and ensure prosperity for all by 2030. Several of these 17 goals align directly with UNICEF's mission, which focuses on protecting and improving the living conditions of the most vulnerable children:

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- **SDG 1 : No Poverty** UNICEF ensures that children living in extreme poverty have access to vital resources such as clean water, healthcare, and quality education.
- **SDG 3 : Good Health and Well-being** UNICEF provides healthcare for children, fights malnutrition, and improves access to basic health services, especially in crisis areas.
- **SDG 4 : Quality Education** UNICEF supports access to inclusive and quality education, particularly for children in conflict zones or in extreme poverty.
- **SDG 5 : Gender Equality** The organization is committed to empowering girls and combating inequalities by ensuring their protection in education, health, and against gender-based violence.
- **SDG 6 : Clean Water and Sanitation** UNICEF works to ensure access to clean water and sanitation, particularly in humanitarian crisis contexts.
- **SDG 10 : Reduced Inequalities** Through the creation of inclusive, safe, resilient, and sustainable urban spaces, humanitarian architecture helps design equitable environments.
- **SDG 11 : Sustainable Cities and Communities** aligns with UNICEF's mission and humanitarian architecture by promoting safe, resilient, and sustainable environments for vulnerable children, ensuring access to adequate housing and essential services.

These goals aim to reduce inequalities and ensure that all children, including those in orphanages, have access to quality services that protect them and allow them to fully develop.



Fig 12 The 17 Sustainable Development Goals

#### IV. CASE STUDY: HUMANITARIAN ORPHANAGE PROJECTS

#### A. Noomdo Orphanage in Burkina Faso - Francis Kéré

#### > Project Context

The Noomdo orphanage, located near Koudougou in Burkina Faso, covers an area of 4,000 m<sup>2</sup> and accommodates over fifty vulnerable children aged 6 to 17. Funded by the NGO Le Soleil dans la Main (A.S.D.M.), this project addresses an urgent need to provide a secure environment that fosters the development of these children.

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#### > Project Concept

The architectural concept is inspired by local village configurations, with modular buildings arranged around a central courtyard, creating a community-oriented environment. This layout promotes a balance between privacy and social interaction, while ensuring natural ventilation and thermal comfort suited to the hot climate.



Fig 13 Exploded Axonometry of the Noomdo Orphanage by Francis Kéré

#### > Spatial Organization

The orphanage comprises five modular buildings, including four residential units and an administrative building. The separation of spaces for boys and girls, as well as the organization by age, creates secure areas for each group, while maintaining shared spaces for social activities. This structure ensures a safe, supervised environment that also preserves the privacy of residents.



Fig 14 Spatial Organization of the Noomdo Orphanage Orphanage by Francis Kéré

## Materials and Construction Techniques

The project uses local materials, such as laterite stone for the walls and floors, combined with stabilized clay bricks for vaulted ceilings. A double-layered roofing system protects the buildings from heat and rain while facilitating air circulation. Modular windows and wooden shutters ensure proper ventilation and visual isolation, enhancing the building's thermal comfort and durability.



Fig 15 Wall Materials of the Noomdo Orphanage by Francis Kéré



Fig 16 Structural Sections of the Noomdo Orphanage by Francis Kéré

## Humanitarian Architecture Principles Applied

The Noomdo orphanage embodies several key principles of humanitarian architecture :

- **Local materials** : Using local materials reduces costs, supports the local economy, and ensures the durability of the structures.
- **Climate adaptation** : The bioclimatic design allows for natural ventilation, minimizing the need for air conditioning in a resource-limited region.
- **Resilience and durability** : Buildings are designed to withstand local climatic conditions, ensuring their longevity.
- **Community participation** : Local labor was involved in the construction, fostering community ownership of the project and enhancing their skills.

• **Social value creation**: The project offers educational and training opportunities, promoting the autonomy of the children.

#### Community Activities

The project emphasizes community integration with a central courtyard serving as a gathering space, encouraging social interaction, games, and cultural events. Adjacent spaces host workshops and educational activities, supporting the holistic development of children and local involvement.

#### Limitations and Challenges

While well-suited to rural environments, the project may require adjustments for implementation in denser urban settings.

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#### B. Falatow Jigiyaso Orphanage in Mali by F8 Architecture

#### > Project Context

The Falatow Jigiyaso orphanage, initiated by the namesake association under the direction of Fatoumata Goundourou in collaboration with F8 Architecture, was built in Dialakoroba, 50 km south of Bamako. Completed in 2012, it covers 891 m<sup>2</sup> and accommodates around 50 children with

a staff of 9 adults. The project was funded by the SEMAF Bamako association.

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#### > Project Concept

The architectural concept draws inspiration from traditional Sahelian construction, with buildings organized around a central courtyard to encourage social interaction and ensure optimal thermal comfort through natural airflow.



Fig 17 Master Plan of the Falatow Jigiyaso Orphanage Site by F8 Architecture

## > Spatial Organization

The orphanage includes accommodations for children, sanitary blocks, an infirmary, play areas, two classrooms, a

computer room, and educational activity zones connected by covered terraces.





Fig 18 Spatial Organization of the Falatow Jigiyaso Orphanage by F8 Architecture

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## Construction Materials and Techniques

The walls are built from "H"-shaped concrete blocks filled with Banco (a mixture of earth and cereal husks), providing excellent thermal insulation. Three passive design strategies ensure interior thermal comfort without air conditioning:

- Limiting solar heat absorption: A double roof shields the walls from sunlight and creates balconies for children's activities.
- Enhancing thermal mass: Hollow concrete walls and stone gabions reinforce thermal resistance.
- **Optimizing natural ventilation**: The arrangement around a central courtyard and air vents allow cross-ventilation throughout the building.



Fig 19 Cross-Section of the Falatow Jigiyaso Orphanage by F8 Architecture

Resource Supply and Management : Water and Electricity

The orphanage is self-sufficient thanks to photovoltaic panels that generate electricity and a 70-meter-deep well for

water supply. Wastewater is collected and treated through a digestion and biofiltration system, allowing the water to be reused for aquaculture and agriculture. This system ensures both food security and practical education for the children.



Fig 20 Resource Management Plan of the Falatow Jigiyaso Orphanage

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#### Activities and Community Engagement

The orphanage goes beyond shelter, offering educational and social activities such as agriculture and fish farming, fostering the children's autonomy and social integration.

#### Humanitarian Architecture Principles Applied

The orphanage applies several fundamental principles of humanitarian architecture, which are:

- Use of local materials to reduce costs and support the local economy.
- Climate adaptation through bioclimatic design promoting natural ventilation.
- **Resilience and durability** with structures suited to Sahelian climate conditions.
- **Community participation** by integrating local expertise in construction.
- **Creating social value** by providing children with educational and autonomy-building opportunities.

#### > Limitations and Challenges

The project faces long-term maintenance challenges, particularly for water and electricity systems. The architectural solutions suited to rural areas may need adjustments in an urban context or different climatic environments.

#### V. SUMMARY OF BEST PRACTICES FOR DESIGNING AN ORPHANAGE IN YAOUNDÉ

The design of an orphanage in Yaoundé, based on best practices in humanitarian architecture, is guided by several essential principles:

#### Holistic and Resilient Approach:

The orphanage should go beyond providing shelter by incorporating spaces for education, psychological support, and social interaction. This comprehensive approach addresses the overall needs of the children, fostering their development and ensuring resilience to climatic and functional changes.

#### ➤ Use of local Materials and Sustainability :

Choosing local materials ensures better environmental integration, adequate thermal insulation, and reduced costs. This approach also supports the local economy while ensuring the durability of the infrastructure.

#### > Community Participation :

Involving the community in the design and construction strengthens local ownership and the project's sustainability. It also develops local skills and engages residents in the future management of the orphanage.

#### > Technical and Cultural Adaptability :

The structures should be flexible, adaptable, and multifunctional to meet changing needs. Incorporating local cultural elements in the design enhances the community's acceptance and ownership of the orphanage.

#### Respect for Dignity and Privacy :

It is essential to ensure spaces that respect the children's dignity, including separate dormitories based on age and gender, as well as private spaces for rest.

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#### Sustainable Resource Management :

The orphanage should integrate systems like rainwater collection and solar panels to ensure a regular supply of water and electricity, reducing dependency on local infrastructure.

#### Community Spaces and Social Support :

Dedicated spaces for community, educational, and recreational activities should be included to foster social integration and support the children's development.

#### VI. CONCLUSION

In summary, this literature review explored the key principles of humanitarian architecture applied to the design of an orphanage for vulnerable children in Yaoundé. The central objective is to create a secure space that meets the needs of protection, comfort, education, and psychological well-being of the children. A holistic approach, integrating sustainability, flexibility, and respect for local cultural specificities, is prioritized. The use of local, durable, and economical materials, along with community participation, ensures the project's longevity and ownership. The organization of spaces should promote both privacy and social interactions, while adopting a bioclimatic design to guarantee self-sufficiency and optimal living conditions. Humanitarian architecture thus presents itself as an appropriate response to the challenges of caring for vulnerable children in the context of Yaoundé.

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