Research Article

The Sustainable Architectural Design of The Lusaka District Community Development Center

*[1]Bwalya Henry, [1]Sapato Pethias

About Article

About Author

[1] Department of Architecture, School of Engineering, Information and Communications University (ICU), Lusaka, Zambia

ABSTRACT

The dependence on mining has caused Zambia a lot of problems especially that mining has been faced with a lot of challenges. Even at the pick of mining, especially copper, communities have received very little attention in terms of improvement especially in accessing better facilities. This has caused further problems to communities with less economic survival and over the years has contributed to a large extent in unplanned settlement, lack of income generating activities, lack of access to social services such as, access to clean water, proper access roads, among others due to poor planning. In most cases, schools and hospitals are not built closer to the people for easy access, and force the communities to travel long distances to access the services. This kind of settlements has for a long time faced challenges to attract even donor funds to improve lives as there are no places to build the said facilities and many other empowerment ventures, hence the people continue being exposed waterborne diseases such as cholera. The aim of this project is to bring social changes in the community through architecture. After researching the problems faced by the community, the space and profile of the project is developed. The plan, in particular, defines and explains the concept of community centers, as well as the community development business unit, which is developed through community and other stakeholder consultations' input into decision-making about community development priorities and funding, also to assist with the consolidation of current plans and documents and to create wealth for the commutates and surrounding areas for a better place to live in considering the involvement of the community.

Contact @ Bwalya Henry
henrybwalya1978@gmail.com

1. INTRODUCTION

"*We must work together to ensure the equitable distribution of wealth, opportunity, and power in our society.*" Nelson Mandela

A community is a group of individuals residing in a relatively connected geographic area who share common traits in their way of life, including customs, traditions, and a general mode of communication. Arthur Dunham defined community as "*a group of people who live in a thickly populated area and show their common and share life through/by their customs, traditions, and way of conversation.*" Community development is a process where people come together to take action on what's important to them. At its heart, community development is rooted in the belief that all people should have access to health, wellbeing, wealth, justice and opportunity. It recognizes that some people, some groups and some communities are excluded and oppressed by the way society and structures are organized. Community development seeks to challenge this and ensure fairness for all citizens.

In practice, community development:

• Supports communities, of place and identity, to use their own assets to improve the quality of community life.

• Helps communities and public agencies to work together to improve services and the way in which decisions are made.

Community development embraces sustained resident empowerment and equity: social, economic, racial and environmental. It strives to build social cohesion. It holistically integrates planning, community education, advocacy, resident support and economic development in a defined neighborhood. It also supports residents in their advocacy for their neighborhood: influencing positive change in city government practices, human services, safety, equitable development, environmental equity or school reform; or organizing around other related issues that affect the life of a neighborhood.

A community center, or community hall is a public location where members of a community gather for group activities, social support, public information, and other purposes. They may be open for the whole community or for a specialized subgroup within the greater community. These centers serve as hubs for providing humanitarian aid, offering services such as psychosocial support, socio-economic development programs, social cohesion activities, and protection services for vulnerable populations, including refugees and migrants. These community centers are vital in crisis contexts, facilitating recovery and resilience by addressing the social and emotional needs of affected individuals.

A Community Center is as much a concept and intention as it is a physical building. It is the base of operations for the provision of services to the community at the same time that it is a haven, a refuge and a meeting point for the community.

1.1. Background Information

The history of community development centers usually begins with the efforts of settlement workers and other activists in the inner areas of fast developing cities for the use of school buildings after school hours as neighborhood social centers. School buildings had been used for various community activities for many years. However, as Robert Fisher commented, those arguing for social centers departed from previous attempts to provide free adult education classes and recreational activities (often to speed up the process of 'Americanization').

The new social centers were to be different because they were not limited to recreational activities, and, most important, because 'socialized schools', their organizers argued, could act as magnets attracting citizens whose segregation into class and ethnic groups had obscured their common bonds, loyalties, and responsibilities. Like social settlements before them, social centers would lend harmony and foster cooperation among the working-class and immigrant elements and at the same time ease some of the difficulty of slum life (Fisher, 1994, Neighborhood organizing in America).

In Zambia, specifically in Lusaka, community development centers evolved from initial multi-purpose facilities to more specialized centers which focused on specific community needs, particularly related to water supply projects and community-based activities. They were designed to include water tariff collection, and functions like sub-health centers, reflecting a community driven approach to development. The centers are designed to support the work of community-based organizations, like the Residential Development Committee (RDC), and provide a space for meetings and other activities.

1.2. Project Justifications

Community development centers offer employment opportunities, attracting visitors, and supporting local businesses, community development centers contribute to the economic development of the area.

Additionally, these community development centers play a crucial role in addressing social issues such as poverty, unemployment, and lack of access to resources by providing support services and advocating for change. They also serve as a hub for accessing various services and resources, such as job assistance, childcare, and local information.

Furthermore, community development centers encourage active participation from residents in planning, decision-making, and programming, fostering a sense of ownership and pride.

Having a community development center provides a safe space for people to connect, learn, and participate in activities, ultimately strengthening the fabric of the community.

Figure 1. Brick Laying
(Source: Lusaka Vocational and Technical College Official Website)

1.3. Scope of Research

The scope of this project covers creating spaces and an Environment for the community development center.

(i) Administration block

(ii) Dormitory

(iii) Adult clinic

(iv) Skill building and education

(v) Day clinic

(vi) Child clinic

(vii) Community dining facility

1.4. Objectives

1.4.1. General Objective

(i) To design and develop the community development center in Lusaka.

1.4.2. Specific Objectives

(i) Supporting economic development: may offer job training programs, entrepreneurship support, and resources to help residents access economic opportunities.

(ii) Building capacity and empowerment: community centers empower residents by providing opportunities for leadership development, skill building, and participation in decision-making processes.

(iii) Supporting community development: provide resources, training, and support to help individuals and organizations within the community in order to grow and thrive.

(iv) Supporting education and learning: community centers provide educational opportunities for all ages, including children, youth, adults, fostering lifelong learning.

(v) Promoting health and well-being: Offer health services, promote healthy lifestyles, and provide access to resources that support mental and physical health.

2. LITERATURE REVIEW

2.1. Overview

The community development center will create wealth for the Commutates and surrounding Areas for a better place to leave in with the involvement of the Community. Community development center will also empower community members and creates stronger and more connected communities.

2.2. Related Works

Numerous studies have highlighted the importance of community development centers (CDCs) in promoting community development and social change. Research has shown that CDCs can:

i. Enhance community cohesion and social capital (Putnam, 2000)

ii. Provide essential services, such as education, healthcare, and job training (Kretzmann & McKnight, 1993).

iii. Foster community engagement and participation (Bhattacharyya, 2004).

iv. Support economic development and poverty reduction (Sherraden, 2001).

Community development centers have also been recognized for their role in:

i. Promoting community-led initiatives and grassroots development (Maguire, 2009).

ii. Addressing specific community needs, such as youth development (Lerner, 2005).

iii. Building partnerships with local organizations and stakeholders (Bryson *et al.*, 2006).

2.3. Gaps in literature

Despite the significant contributions of CDCs, there are gaps in literature that need further research:

i. Limited understanding of the long-term impact of community development centers on community outcomes

ii. Insufficient evaluation of the effectiveness of specific CDC program and services

iii. Lack of research on the role of community development centers in addressing emerging community issues, such as climate change and social justice.

iv. Need for more studies on the experiences of community development centers in diverse contexts, including rural and urban areas.

2.4. Bridging the gaps in literature

To address these gaps, the following solutions can be implemented:

i. Engage community members: involve community members in the planning, implementation, and evaluation of community development center programs and services to ensure they meet community needs and priorities.

ii. Provide capacity-building support: offer training, technical assistance, and resources to help community development centers build their capacity and sustainability.

iii. Develop evaluation frameworks: establish standardized evaluation frameworks to assess the effectiveness of community development center programs and services.

iv. Foster collaboration and knowledge sharing: encourage community development centers to share experiences and best practices with one another, and facilitate collaboration between community development centers and other community organizations.

By implementing these solutions, community development centers can become even more effective in promoting community development and social change.

3. METHODOLOGY

The following are the software's can be used to support site analysis, user engagement, and environmental stimulation in architectural design. These software's will facilitate good presentation of the community development center in terms of providing both visual and audio output.

(i) ArchiCAD- creation of detailed 2D and 3D models of the building.

(ii) Microsoft word- for design scheme preparations which includes images of the design.

(iii) Microsoft PowerPoint- presentation which incorporates relevant images and graphics to illustrate the center's activities, facilities and services.

(iv) Adobe Photoshop- refining visuals, enhancing presentations and creating detailed 3D renderings of the building and surrounding areas.

(v) Twin motion- for 3D renders final environmental visualizations.

Site analysis- ArchiCAD and Twin motion are used to analyze site conditions, informing design decisions related to sustainability, energy efficiency and user comfort.

4. RESULTS AND DISCUSSION

4.1. Discussion

4.1.1. Design Requirements

The approach in the design is to create a structure which is sustainable, relaxed, and interactive and has a pleasant working environment.

(i) Architecture

• To design buildings that can facilitate, Administration Block, Dormitory, Adult Clinic, Skills Building and Education, Day Clinic, Child Clinic and Community Dinning Facility
  • Efficient use of space.
  • Green roof.
  • Use of curtain walls on the facade face

(ii) Energy efficiency
  • Landscapes planned to maximize passive solar energy.
  • Natural Ventilation system.
  • Use of natural lightning in daylight

(iii) Waste and water management
  • Water-saving plumbing fixtures.
  • Rain water harvesting.
  • Less use of water during landscape maintenance.
  • Harvesting water from the Septic tank for other use such as irrigation and other uses.

(iv) Landscape
  • Minimal harm to the natural habitat.
  • Building a green environment around the community development center.

4.1.2. Design Approach

4.1.2.1. Holistic architecture

The current COVID-19 pandemic has shown us yet again how architects and designers need to constantly reinvent the wheel and bring changes in construction practices with time and circumstances. Where they are working on 'emergency architecture' re-imagining spaces and temporary structures to be turned into corona isolation camps in a time of crisis, lockdown has given us time to reflect, form, and present our ideas and solutions to combat the era of self-isolation.

Holistic architecture is an approach that considers the whole system of a building or structure, including its physical, social, and environmental aspects.

Holistic architecture takes into account the whole systems in which buildings exist and function. It considers the impact of buildings on their surroundings, the environment, people who use them, and wider society and also promotes health and well-being of occupants and works in harmony with the natural environment.

4.1.3. Design Concept (Reconnecting Man's Environment to Nature)

Reconnecting humanity with nature involves fostering a

Figure 2. Architectural render of the agora tower.
Source: archdaily

deeper appreciation and understanding of the natural world, encouraging sustainable practices, and promoting a sense of belonging within the ecosystem. This can be achieved through experiential activities like visiting the packs or engaging with nature through art. It also requires a shift in mindset, moving away from viewing nature as a resource to be exploited and instead as a living, interconnected system.
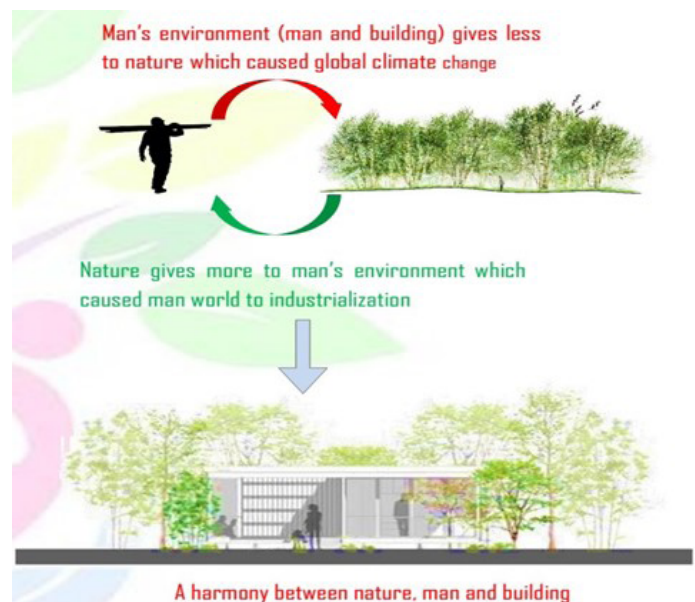

Figure 3. Design Concept.
Source: Author

4.1.4. Concept Influence

"Reconnecting man's environment to nature" concept was influenced Due to the sustainable, innovative nature of the project and the site being privileged with a natural green landscape.

The architecture of this project shouldn't be imposed but rather becomes part of the of the natural environment man needs nature more than nature needs him. Nature can exist without man, but humans can't exist without nature.
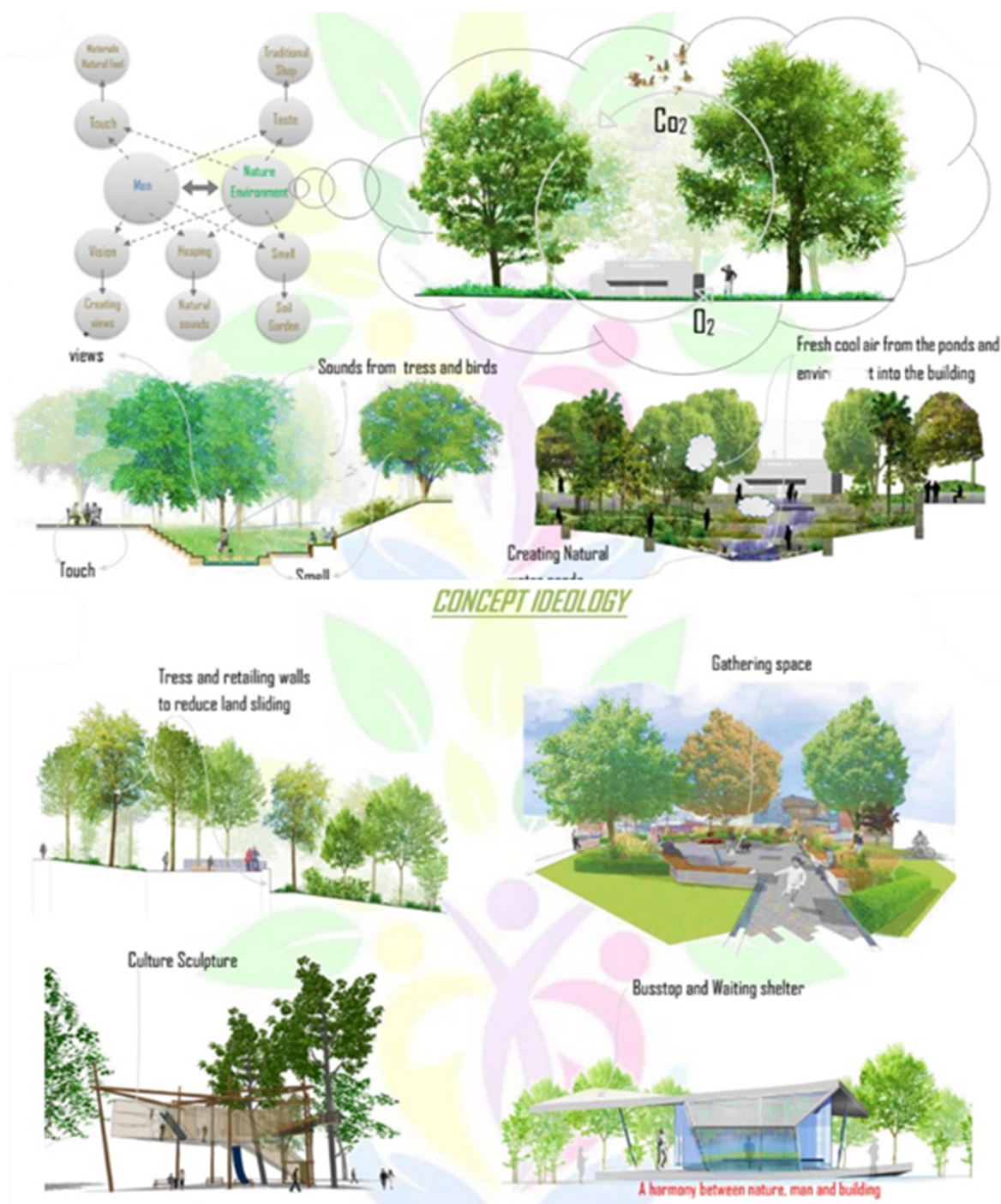
4.1.5 Concept Ideology

Figure 4. Concept Ideology.
Source: Author

4.1.6 Concept Interpretation

Nature never wastes anything; it uses its waste as a resource for another Process Thereby completing the Cycle with no residual waste cycle like, Plant Cycle, Air Cycle etc., for the Benefit of Everybody. It uses minimum of Energy in all these processes. In the Project, all the Services have been designed so as to use all the wastes a Resource to Cycle the Loop.
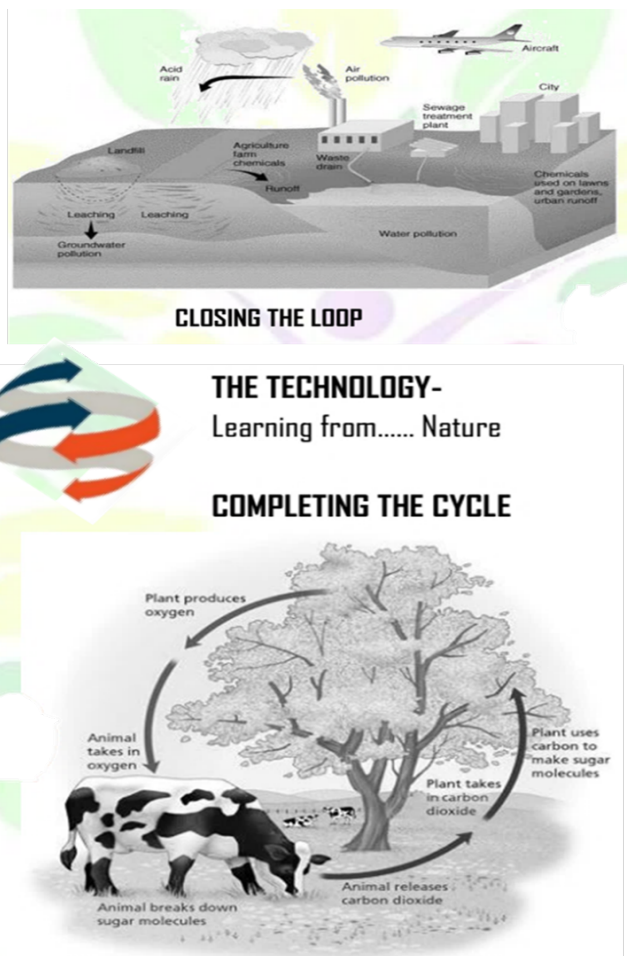
Figure 5. Photosynthesis Cycle
Source: Numerade

In order to reconnect man's environment to nature, holistic approach design is used.

The use of the following will be the base;

(i) Use of local materials -be selective of materials and technologies in order to reduce consumption and green house emission.

(ii) Cost effective- focuses on achieving the desired functionality and aesthetics of a building while minimizing overall costs, considering initial construction and long-term operational expenses.

(iii) Labor intensive-the design encourages the use of skilled and unskilled labor for tasks like bricklaying, carpentry, plastering, and other construction processes. This approach contrasts with designs that heavily rely on machinery and off-site fabrication.

(iv) Energy effective- focuses on reducing a building's overall energy consumption through a combination of design strategies, construction techniques, and materials. This approach aims to minimize energy use for heating, cooling, lighting, and other building operations, resulting in lower energy costs.

4.2 RESULTS
4.2.1 The Building Appraisal

Structural Analysis: The building to be supported by beams, slabs and structural reinforced concrete walls to be in external walls and other partition areas.

(i) Masonry walls: All masonry walls are constructed of 200mm or 300mm ferroconcrete as they form.

(ii) Non-Structural walls: Non-structural walls consist of steel or wood frames which are fixed to floor with beam studs' glass and wood panel inserts.

(iii) Exterior cladding walls: Exterior cladding walls are applied on the buildings and constitute of gypsum boards and low UV glass panels and solar control toughened glass curtain walling for the building.

(iv) roof: The building has gable roofs. It is covered by a white roof coating.

Figure 6. Roof.
Source: Author

4.2.1.2 Design Sensitivity

(i) Accessibility: Access into the building has two main entrances. One is on the southern side along Elm Road which leads to the car park next to the Administration block and the other entrance is on the western side along Chitukuko road which leads to the parking area for deliveries near the dormitories and sports building. Every building will have provisions for the differently able by the use of ramps, or special access doors and handles.

Figure 7. Accessibility.
Source: Author

(ii) Environmental impact: This architectural design is part of the environment. The building has different shapes which

emerges from the landscape distancing itself from a housing environment without a clear order and architecture.

Figure 8. Environment impact.
Source: Author

(iii) Circulation: The architectural design has clear and accessible entry and exit points, ensuring that circulation is accessible to people of all abilities.

(iv) Flexibility: The building has spaces that can accommodate a wide range of users and activities ensuring there is an ability to convert spaces entirely into different types of spaces.

(v) Comfort: The building has visual comfort which allows the user to feel the integration between the surrounding environment and the building, also providing sufficient ventilation and air filtration to remove pollutants and ensure occupants breathe clean, fresh air.

Figure 9. Comfort.
Source: Author

(vi) Safety: Every building will have provisions for the differently-able by the use of ramps, or special access doors and handles. It will also have automatic fire suppression system which is incorporated to instantly extinguish fire, near the emergency fire exit area and near the doors of each floor to quickly evacuate any person from the building for easy fresh air.

Figure 10. Safety.
Source: Author

4.2.1.3. Services

(i) Water: The building will utilize water from the Lusaka Water and Sanitation Company (LWASCO).

(ii) Electricity: Electrical supply is tapped from the ZESCO power line on the site and supplied from the main power lines and augmented with that which is generated on site using the solar panels.

(iii) Waste Disposal and Control: Automated Refuse collection system has been installed at the entry level for usual refuse and recyclable material disposal at the social heart and administrative blocks. For recyclable waste, a chute system is used in the laboratory area which is then collected in the basement through containers that sort the material in accordance to size, and type. In addition, a separate lift for solid waste disposal is provided to prevent ignition leading to fire if a chute system I used for such waste. It is then collected and disposed of in the basement and then channeled to a central waste processing plant located on the southern end of the site to be sited in phase two of the facility's development.

(iv) Decentralized wastewater system (DEWATS): The Decentralized Wastewater System has been proposed for this project which is a sustainable approach to wastewater management. Since various toxic chemical fluids can come from labs, it is very important to dispose them off by treating them properly. DEWATS takes up all the fluid wastes from toilets, kitchen areas, labs and after being sent to septic tank, it goes to another chamber where it treated before discharge.

(v) Runoff Drainage: Runoff is collected from the roof gutters and channeled to storm water drains through hollow steel sections in the columns at the perimeter of each building section. The water is then collected into large water reservoir tanks through PVC pipes encased in concrete laid to 1: 12 falls running at a velocity of 1.5m/s (safe flow speed). Water is collected from the concourse through collector pipes installed within the slab and channeled to the reservoir tanks for landscape irrigation.

4.3. Special Study
4.3.1. Greywater Management System

Grey water management System has been proposed for

this project which is a sustainable approach to wastewater management.

4.3.2. What is Greywater?

Greywater is the name given to water that's already been used for washing purposes, like laundry, handwashing, showering, and bathing (NOT water that's been in contact with feces, like from the toilet or washing diapers). Greywater systems, then, are used to redirect and recycle this "once-used" water for other purposes. In ecological sanitation, greywater is source separated from toilet systems, allowing for simpler treatment systems than conventional sewage treatment plants. Successful management of greywater includes both technical methods and user participation in running and maintaining the system. All parts of the system, from the point of origin to the final discharge, should be considered when planning.

Figure 11. Greywater Management System.
Source: Author

4.3.3. Objectives of Greywater Management

• Ensuring the safety of reused greywater to prevent health risks associated with contaminated water.

• Promotes resource efficiency and contributing to a more sustainable water cycle.

• Minimizing energy use associated with water treatment and transportation by reusing greywater on-site.

• Utilizing the nutrients in greywater for plant growth and improving soil health

• Reducing water bills and potential cost savings associated with reusing greywater.

4.3.4. Greywater management system functionality

A greywater system is designed to collect, filter, and distribute gently used water from household sources such as sinks, showers, bathtubs, and washing machines. Unlike blackwater, which comes from toilets and contains sewage, greywater is relatively clean and can be repurposed for irrigation, toilet flushing, and other non-potable applications. A greywater tank is used to collect and store greywater before it is reused or

dispersed. These tanks can be part of a filtration system that removes debris and contaminants, ensuring the water is safe for irrigation or other permitted uses. Some greywater tanks come equipped with pumps to facilitate distribution to gardens or toilet systems. Drain pipes from bathrooms and kitchen are extended to an underground collection tank via a strainer. The strainer traps particulate matter, hair and other contaminants lager than 0.3 mm. The tank is sized as per water required per day (excess water if collected is drained). The collected water is passed through fine sand filter to remove dust, sand, dirt and other solid particulate matter up to 50-micron size. Then water is ozonized to destroy organic matter, oils, soaps, color, odor and bacteria using a process known as advanced oxidation. Finally, the water is filtered using a 10micron bag filter. The ozone system (heart of equipment) is selected on quantity of water treated per hour and level of oxidation required (COD). Generally, for domestic graywater a level of 50 grams of ozone for 1000 liters of water (50 ppm) is considered sufficient.
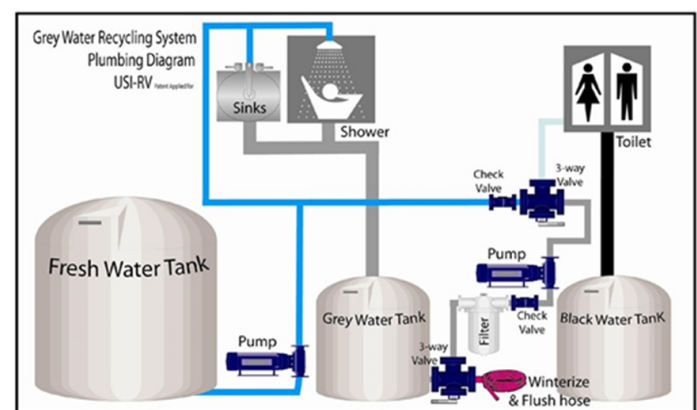

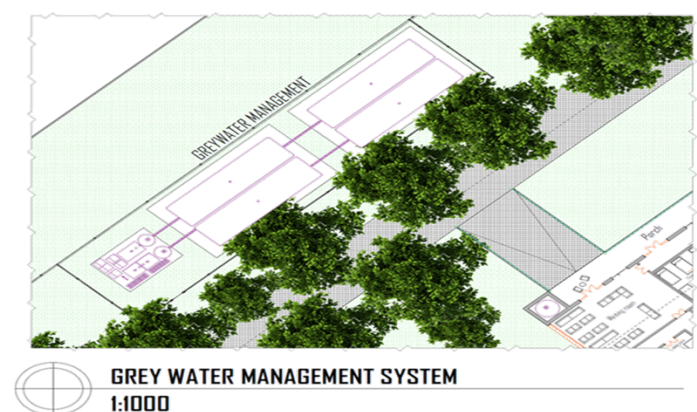**Figure 12.** Greywater System Plumbing diagram.
Source: Author

Figure 13. Greywater Management System.
Source: Author

4.3.5. Final Scheme
4.3.5.1. Site Plan and Floor Plans

Figure 14. Site Plan and Floor Plans.
Source: Author

Figure 15. Floor Plans.
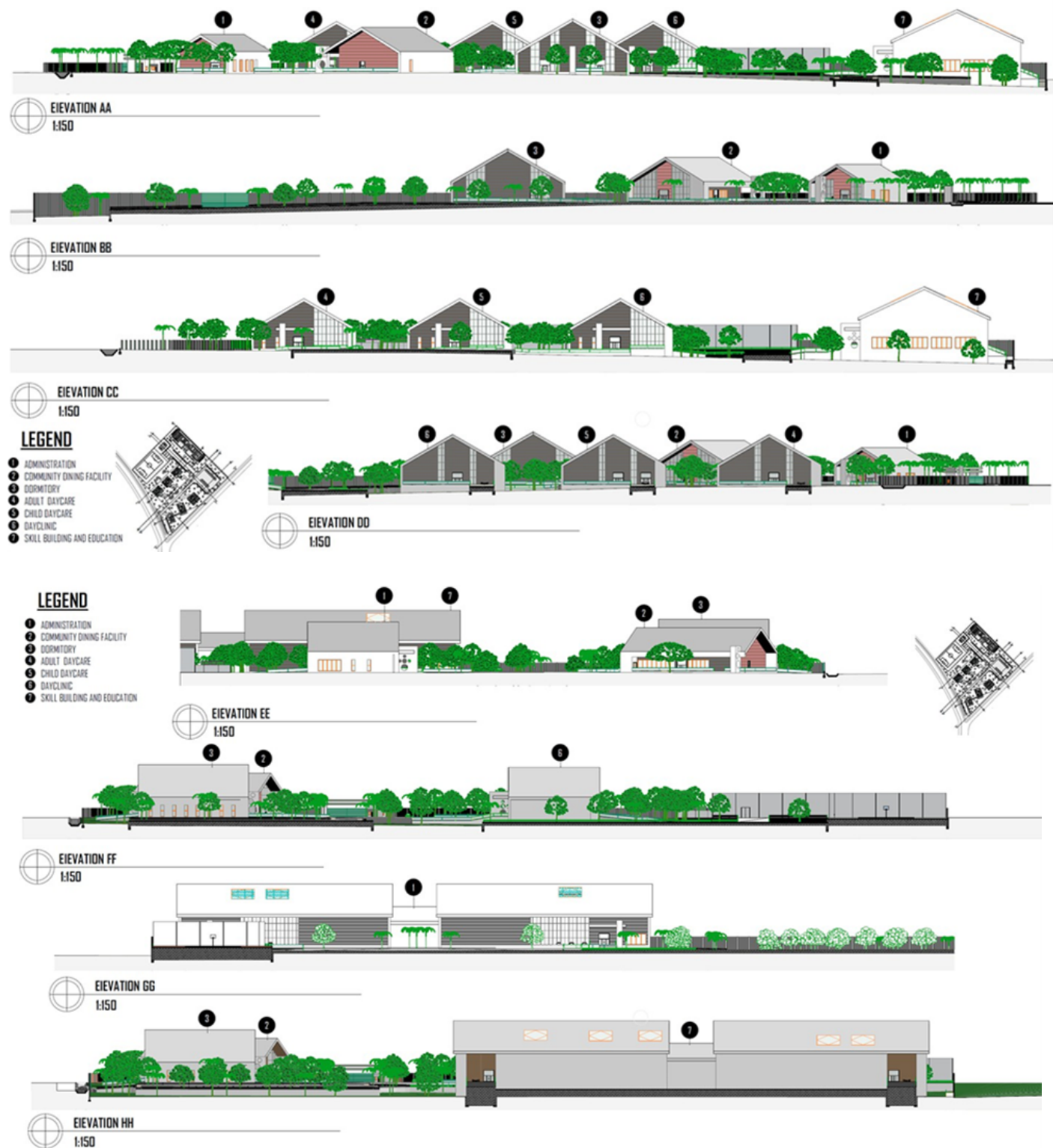*Source: Author*

3.5.3.2. Elevations

Figure 16. Elevations.
Source: Author

4.3.5.3. Building Sections

Figure 17. Building sections.
Source: Author

4.3.5.4. D Perspectives

Figure 18. 3D perspectives.
Source: Author

Figure 19. 3D perspectives.
Source: Author

4.4. Research Findings
This study has revealed the following;
The Community development Centre will;
- Provide Capacity Builders for the Community.
- Provide Universal Services.
- Provide a sense of comfort/safety to the Users.
- Encourage social interaction among a diverse public cross section.

5. CONCLUSION
Community development centers are essential for local development and the well-being of the local people. They serve as a hub for education, recreation, and support services, fostering personal growth and community cohesion. Moreover, community centers play a vital role in promoting local entrepreneurship and economic development. It is crucial for communities and local governments to invest in the establishment and maintenance of community centers to ensure the continued growth and prosperity of their neighborhoods. Therefore, designing a community development center brings positive change in the people's socio-economic, environmental, cultural, religious, and political lives. This also enables community members to be trained in different skills that will help them find employment to eradicate poverty in their communities or rather their homes.

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