

Urban Renovation from Precarious to Sustainable Districts: Study Case of Mvog-Ada in Yaounde

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Abstract:- This article explores the possibility of transforming precarious neighbourhoods, commonly known as slums, into good-living and environmentally-friendly places by rethinking their layout. It examines the state of the study case and highlights the relationships between the road system, parcels of land and other components of the urban fabric, with the aim of resolving the problems caused by the poor occupation of urban space and the lack of architectural knowledges and basic infrastructure necessary for people's lives in Cameroon. This research addresses the problems of anarchic urbanisation, urban densification and unhealthy living conditions, it proposes concrete solutions for decongesting the area, strategically redeveloping the space and ensuring the sustainable development of the site, while incorporating a biomimetic and circular approach. To achieve this goal, it was important to put in place a renovation strategy that is both up-to-date and adapted to the local context. With this in mind, this work presents a comprehensive and innovative master plan designed to solve the problems of development, bad urban traffic and degradation of the area through the use of an appropriate methodology of sustainable urban planning. Finally, the concept of sustainable district is presented as a pillar of the development of precarious districts and as an opportunity of growth for the development of their country.

Keywords:- Urban Renovation, Precarious Neighborhood, Sustainable District, Master Plan, Sustainable Urban Planning.

I. INTRODUCTION

Rapid urbanisation in the cities of developing countries, particularly in sub-Saharan Africa, is often marked by the growth of informal settlements, commonly known as shanty towns. Although these areas are spontaneous responses to pressing needs for housing and urban integration, they are often synonymous with poverty, social marginalization and environmental precariousness [1]. The city of Yaoundé, the capital of Cameroon, is no exception to this dynamic, and the Mvog-Ada neighbourhood is a striking illustration. The aim of this dissertation is to address the problem of regenerating this type of neighbourhood, taking into account the social, economic and environmental issues involved, in order to propose a sustainable urban development model that is adapted to the needs of the inhabitants. The redevelopment project is part of a global vision of the sustainable city, in which land zoning is no longer a simple functional division, but a tool that can be used to improve the quality of life of the inhabitants. harmonious organisation of urban space, in dialogue with the needs of local residents. The idea is to create a neighbourhood capable of self-regulation. Thus, this article shows how slums area should be seen not as spaces to be eradicated, but as laboratories for urban innovation and an opportunity to creation sustainable districts in the long run [2].

II. PRESENTATION OF THE SITE

A. Site Location

Mvog-Ada is a district of the city of Yaoundé, the capital of Cameroon. It is located in the Yaoundé V district, a subdivision of the Yaoundé Urban Community. Mvog-Ada is bordered to the north by the Elig Essono district, to the south by the Administrative Centre and Nkolndongo, and to the east by Essos. Our study in Mvog-Ada covers the areas commonly known as Fanta Citron, Pakita Mvog-Ada and Cornier, between rue Martin tabi Essomba and rue Ze Mendouga.

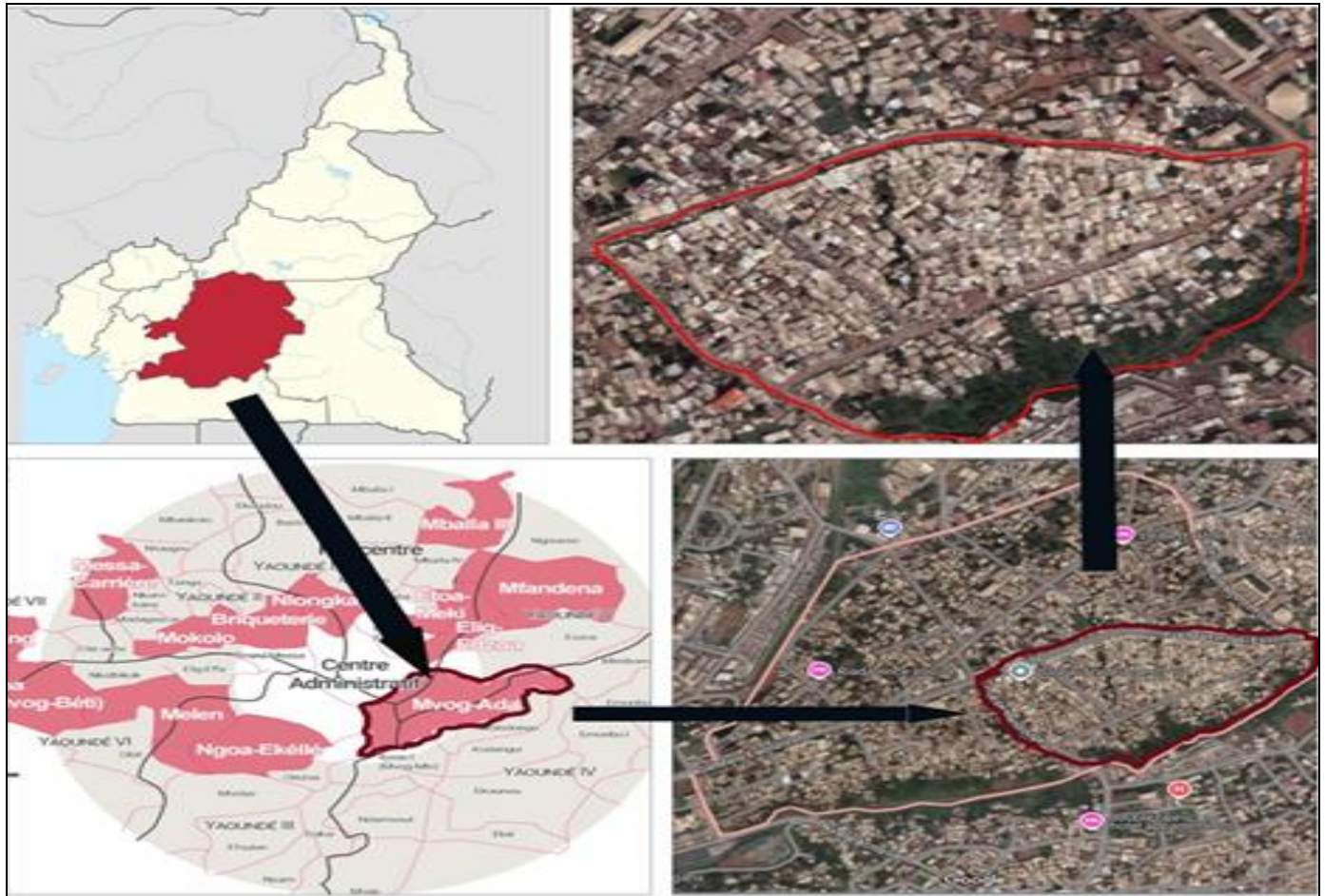


Fig 1: Location of the Study Site

B. History

Mvog-Ada means descendants of Ada. It is the name of the indigenous lineage of the place named. Ada, one of the wives of Otu Tamba, son of the ancestor Tsungui Mballa, gave birth to the Mvog Ada clan. Today, Mvog-Ada has become a popular district of Yaoundé, famous for its liveliness, its bars and its high level of promiscuity.

C. Climate

As our site is located in the centre of the city of Yaoundé, its climatic data are under the city of Yaoundé, where the average annual temperature is 26 degrees, and marked by two seasons [3].:

- A cool, humid season (April-November): with an average air temperature of around 19oc 24oc and relative humidity of 65% - 75%.
- A dry season (December-March): a hot, humid season with an average air temperature of around 23oc - 27o and relative humidity of 55%-70%.

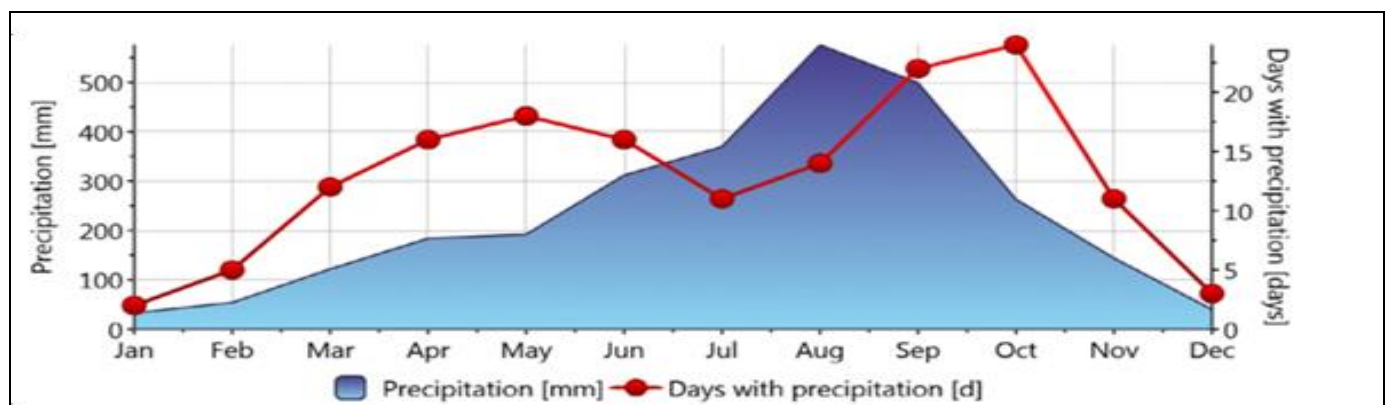


Fig 2: Annual Rainfall Rate

The prevailing wind speed in the area is between 0.3-2.2 m/s from the south-west, as shown in Figure 3.

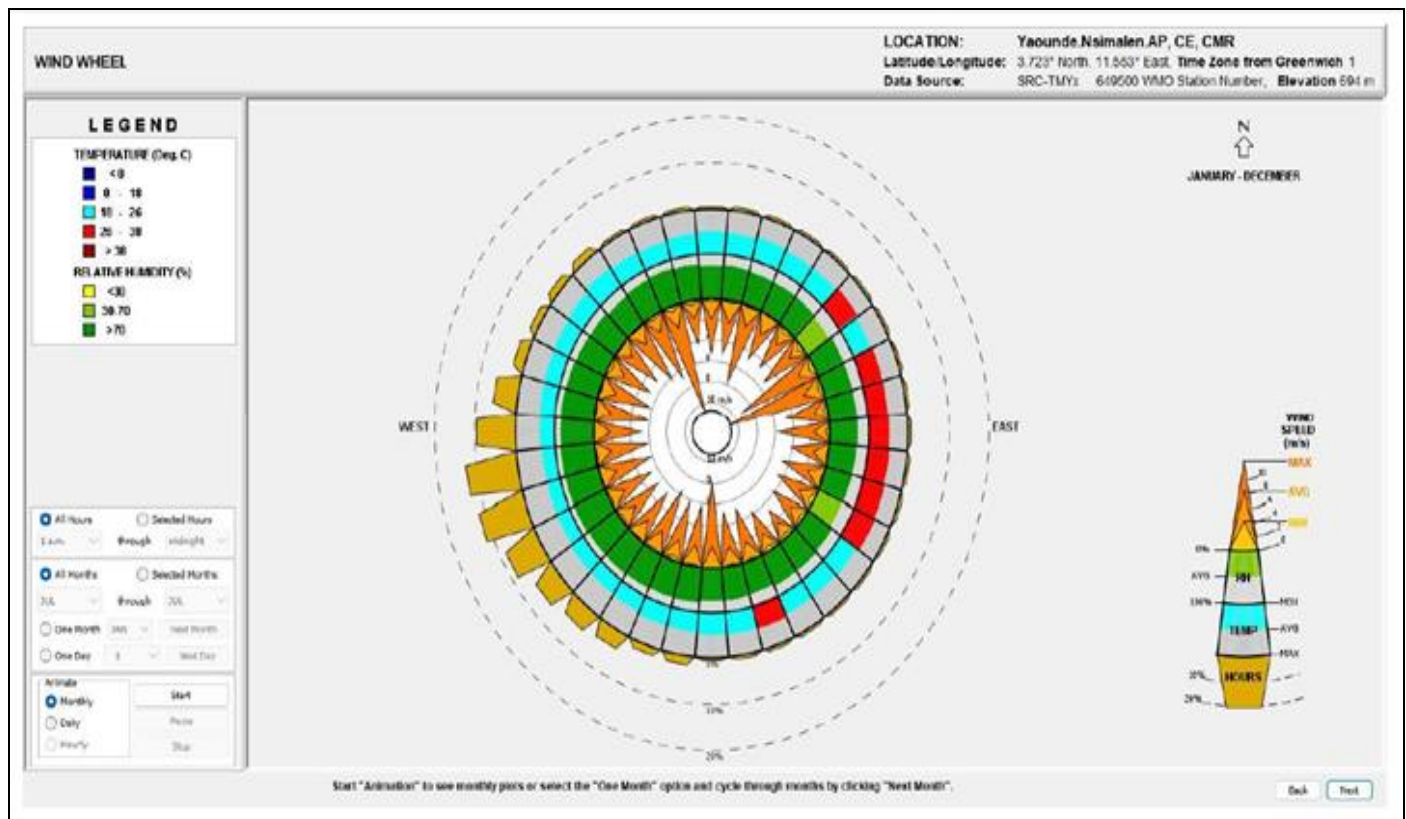


Fig 3: Wind Rose (climate Consultant Capture)

In the area, overall solar radiation on a surface is between 5 and 6.4 KWh/m²/day except on cloudy days, as shown in Figure 4.

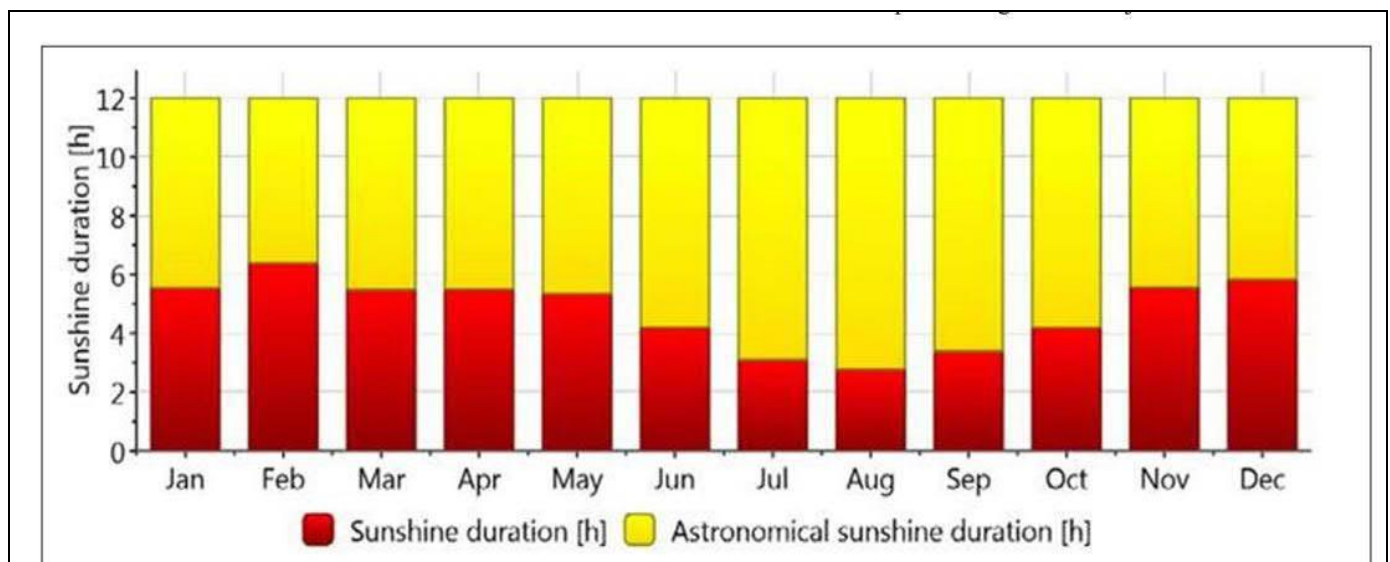


Fig 4: Average Monthly Sunshine Duration in Yaounde

D. Topography

The Mvog-Ada district is located on a hill, so most of the buildings are on sloping land. The slope is between 3% and 10%. Due to its proximity to the Mfoundi canal and its particular topography, part of the area is marshy.

E. Description of Existing Equipment

The selected study area covers a total surface area of 17.2 hectares, including more than 500 homes, the Mont-Calvaire Catholic health centre, the private secular college Les Pharaons, 3 mortician's companies, and nearly 100 commercial establishments in the food, automotive, IT, hotel, entertainment and other sectors.

III. RESULTS OF THE ANALYSIS OF THE URBAN DEVELOPMENT OF THE SITE

A. Evaluation of the existing urban planning

According to Alain Borie and François Denieul (1984), in their book *Méthode d'analyse morphologique des tissus urbains traditionnels*, "To analyse a given urban fabric, we can therefore situate the specific characteristics of its components, its systems and its relationships between components and between systems in relation to the types defined throughout the analysis"[4]. The urban fabric is subdivided into four systems: the road system, the parcel system, the built system and the open space system.

➤ The Parcellar System

The study site consists of 03 plots. The directions of the plots are perpendicular to the contour lines, which makes it easier for rainwater to run off and then collect in

the Mfoundi canal. The current urban configuration is unsuitable for occupation, as all the shops and high-rise infrastructures are placed around the roads, compacting the dwellings within the plots, which further prevents any form of internal circulation and blocks access to light and natural ventilation in the houses.

➤ The Road System

The road system is made up of all the routes and movements in a given region. The roads are linear, non-hierarchical and the only tracks are those of the road. Access to residences is very poor, with no marked streets delimiting the homes within the plots. What's more, the alleyways between the houses were designed from scratch by the occupants and are far too narrow, even for pedestrians. The pavements have been monopolized by small street traders, kiosks, street vendors and cars looking for parking spaces.



Fig 5: Images of Alleys Between Houses

➤ The Built System

• Housing

Most of the houses in the Mvog-Ada district are in a very poor state of repair: water leaks from the roofs, the houses are increasingly sagging due to poorly laid foundations on marshy plots, and the plank walls have been

completely destroyed by termites and damp. The materials used are of poor quality, not very durable, not maintained and weakened by the wear and tear of time. Also, most of the houses are over-occupied, since a house originally built to accommodate a specific number of people ends up accommodating more, or even twice as many.



Fig 6: Views on Housing Conditions

- *Public Buildings and Infrastructures*

In addition to the fact that the current infrastructure is old and damaged by the many bad weather conditions, there is still a multitude of missing facilities to improve the living conditions of the population, such as public toilets, boreholes and water points, car parks, play areas and street lamps to light up the streets and paths at night. With the number of assaults increasing all the time, residents expressed the urgent need for a police station in the district to reduce the level of public misconduct. There are no parking areas for vehicles, forcing them to park at the side of the road or on the verandas of buildings.

- *The Open Spaces System*

The open space system refers to the organization, planning and management of undeveloped spaces in an urban environment. Given that open spaces are divided into public, semi-private and private spaces, they are actually non-existent on the site, resulting in a lack of urban connectivity, coupled with poor accessibility within the plots.

- *The Environment*

- *Waste Management*

There is massive pollution in the quarter due to the lack of an effective waste management system. Household rubbish is piled up either in the corners of the alleyways, or on the banks of the water canal, causing huge problems of pollution, bad smells and spoiling the aesthetics of the district, which reinforces the image of precariousness and during the rainy seasons, there are frequent floods.



Fig 7: Piles of Rubbish Around a Drainage Canal and in Front of an Abandoned House

- *Wastewater Management*

The absence of gutters and the current gutters at the edges do not allow rainwater to be collected or channelled, which increases the frequency of flooding and the deterioration of buildings in the district. Due to the absence of a drainage and sewerage system in the district, residents are obliged to create their own, which causes more damage.

B. Morphological Analysis of the Urban Fabric

By studying the relationship between these different systems, we can determine how space should be managed and how best to combine them to create a fluid, coherent system that is adapted to the topography of the study site.

- *Relationship between the Built and Open Space Systems*

We examined the size of the built-up areas in relation to the gaps between them, i.e. land use. Over 75% of urban space is occupied by buildings, which is not in line with recommended land-use standards. These two systems do not coexist, but rather conflict, with one overpowering the other, since the entire land-use process on the study site currently consists of building as many dwellings as possible on an improvised basis. The only areas that are not built on are those at risk of flooding. Given that the built elements are continuous, the open space on the site is fragmented into a larger number of smaller areas.



Fig 8: Improvised Gutters Around Houses



Fig 9: Relationship between the Built and Open Space Systems



Fig 10: Relationship between the Road System and the Parcel System

- *Relationship between the Road System and the Parcel System*

The distribution of the land on the study site is non-hierarchical. There is no directional obedience in the traffic relationships, either in relation to the topography of the site or the distribution of the plots. The first parcel runs perpendicular to the main road, while the other two run in the same direction. There is one main road and one secondary road providing access to the entire site, and there are no marked wheels between the plots. The number of roads is insufficient to provide access to the buildings, which can only be accessed via the main road. All the dimensions of the plots are adjacent to the streets.

The analysis carried out during the methodological process provided an understanding of the urban fabric that makes up the site in terms of a set of systems divided as follows:

C. Results of the SWOT Analysis

SWOT is the strategic analysis tool we used to identify the strengths, weaknesses, opportunities and threats of our site. Thanks to the information gathered in the table, we will be able to target the points of intervention for the renovation of this district:

Table 1: SWOT Analysis Data

STRENGTHS	WEAKNESSES	OPPORTUNITIES	THREATS
The district is located in the centre of Yaoundé.	90% of the houses built are very old and date from the end of the 19th century	The growing real estate market	The unpredictability of the duration of the structures, as they could collapse at any time
The population living in this district is predominantly young.	Construction using poor quality and unsuitable materials	Using derelict houses to create new spaces	The lack of a waste management system in place for the area, as hygiene conditions are conducive to health problems and epidemics
This area has many commercial activities that also serve other districts of the town.	Lack of space	Possibility of receiving financial aid to set up businesses or renovate homes	Insecurity and criminal activity due to idleness and lack of control by the authorities demographic growth
	Lack of access to basic infrastructure such as drinking water and sanitation		
	Lack of architectural and technical know-how in current planning and construction		
	A low construction budget		

In view of all the elements arising from the urban analysis of the area under study, it was found that it has all the characteristics of a precarious neighbourhood. As a result, it is essential to establish urban operations adapted to resolving the various problems identified, while integrating environmental parameters. With this in mind, we are proposing an urban development plan for this area, to turn it into a sustainable neighbourhood.

IV. SITE RENOVATION PROPOSAL

A. Renovation goals

With the aim of responding to the various development problems and needs of the people living on our site, the urban renewal project will include 03 of the following objectives [5]:

- *Decongesting the Area*

This will be achieved by eliminating all the architectural and urban obstacles on the site, which are responsible for spatial anarchy. New roads will also be created to improve traffic flow within the plots.

- *Strategic Redevelopment of Urban Space*

The strategic redevelopment of urban space will enable better use to be made of the urban fabric and the elements that make it up to be enhanced, whether they be residential, commercial, educational or mixed-use areas. Integration of infrastructure identified as lacking and necessary to improve living conditions for residents (water, electricity, sanitation).

- *Sustainable Development of the Site*

If we are to succeed in transforming this precarious area into an eco-neighbourhood, we need to move towards sustainable urban planning by integrating ecological and energy solutions that are adapted to local realities and that prioritise the environment. It will also be necessary to create inclusive public spaces, encourage urban mixing and soft mobility, which will improve safety, strengthen social cohesion, contribute to the enhancement of the area and the development of its occupants. These operations will be implemented through a methodical architectural process throughout the design of the project.

B. Project Design

- *Conceptual Approach*

Throughout the ages, architects have drawn inspiration from their environment and what constitutes it in order to create and innovate. It was in this vein that Michael Pawlyn, an architect specialising in biomimicry, said that rather than imposing our will on nature, we should understand how it works and work in harmony with it. This line of thinking has guided the design of our leaf-shaped layout. This idea expresses our desire to turn the page on the painful cycle of precariousness and poverty rooted in the existence of shantytowns, and to start a virtuous cycle of prosperity, growth and sustainability. The green leaf symbolises growth and renewal. And just as a leaf dies and is replaced by our own in order for the cycle of life to prosper, it is necessary to go through destruction to enable the district to be reborn: this is the Renaissance of Ada's descendants. We drew inspiration from the tree structure of the leaf veins for the flow of sap to create the circulation routes within the plots and to include mixed mobility. The aim was to relieve congestion on the site, balance the distribution of spaces and make it easier for residents to get around.

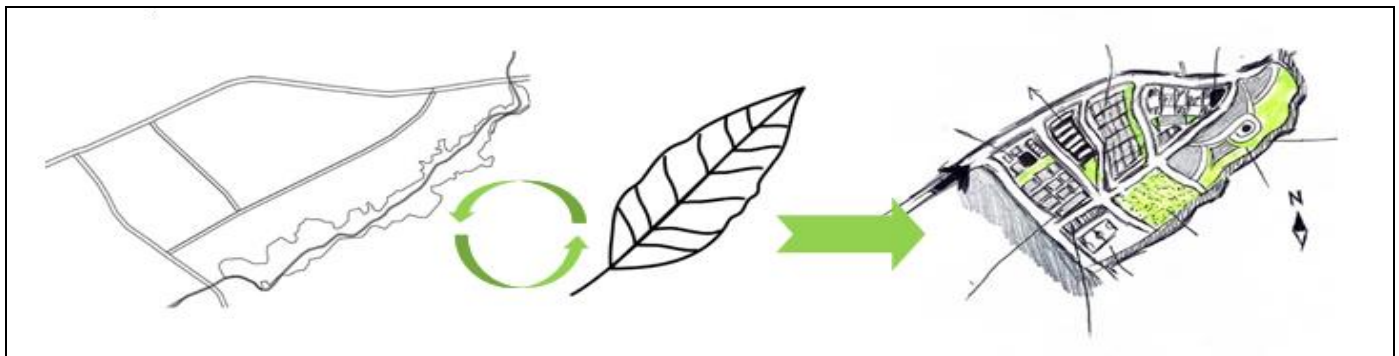


Fig 11: Conceptual Approach

- *Urban Layout Program*

The survey carried out as part of our methodological approach, combined with our research, has enabled us to identify the needs of local residents, the basic facilities and infrastructure that are lacking and those that need to be integrated with a view to sustainable design. The proposal is designed for having.

- ✓ Social housing to accommodate more than 70 households
- ✓ Residential units
- ✓ Administrative buildings
- ✓ A football stadium
- ✓ A playground for leisure activities such as urban dance, murals, hopscotch and many others.
- ✓ Landscaped gardens - A police station

- ✓ A park - A religious space
- ✓ A public car park
- ✓ Bicycle stands
- ✓ Mixed zone
- ✓ Street furniture: including public benches and solar-powered street lamps
- ✓ A commercial space with shops available to residents.

- *Conceptual Site Plan*

The integration of the development programme into the new spatial configuration of the study site, taking into account the cohesion of the functional layout of the relationships between them, leads us to the proposal presented in the figure below.



Fig 12: Conceptual Site Plan

C. Urban Planning Tools

• Zoning Plan

The zoning plan is a regulatory urban planning tool that delimits an area into different zones according to their use. These uses may be residential, commercial, industrial, educational or mixed. Each zone has specific rules on building height, density, types of activity permitted, etc. This plan will enable us to better organise the space to meet the needs of residents, as shown in the figure below.

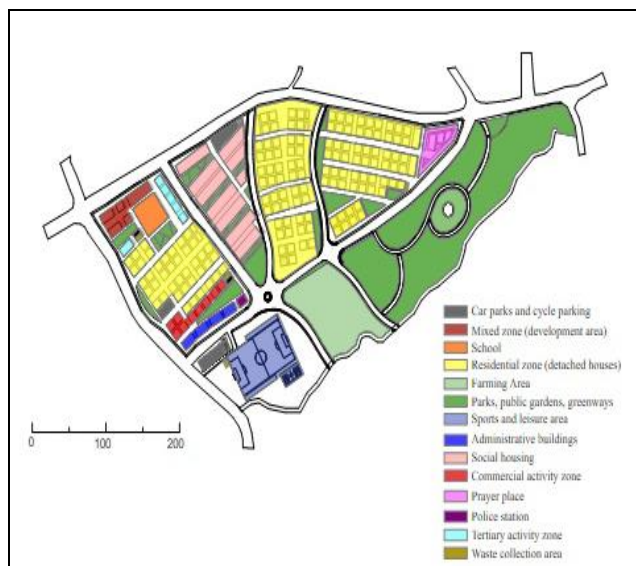


Fig 13: Zoning Plan

• Traffic Plan

The traffic plan focuses more specifically on managing the flow of vehicles in a town or district, taking into account the need for fluidity, safety and the reduction of traffic jams.



Fig 14: Traffic Plan

• The Master Plan

It covers the spatial and functional organisation of the neighbourhood, including elements such as road networks, technical infrastructure, and the layout of buildings and public spaces.



Fig 15: Master Plan

D. Comparative Analysis Between the Traditional Existing and the Renovated Urban Fabric

During our approach, we progressively recomposed the urban fabric starting with the range of plots and roads. Before the renovation, the frame was saturated, dense and the systems smothered each other, with the predominant building dominating over the others and it was difficult to read the site, which is often a sign of poor planning. Now, not only is the grid hierarchical, but the land is better distributed, the area is less dense and traffic flows more smoothly, as can be seen in the following figures.

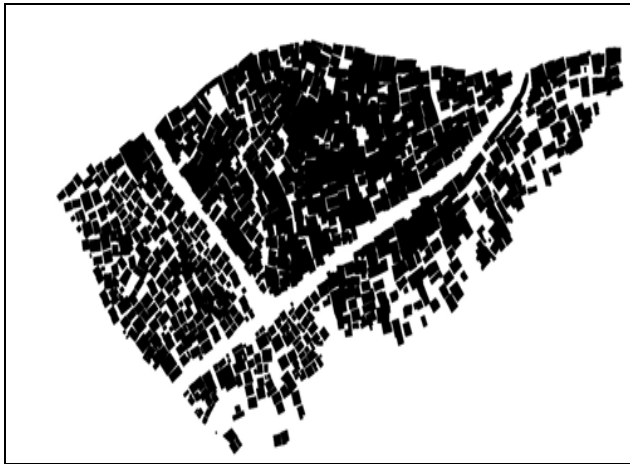


Fig 16: Traditional Frame

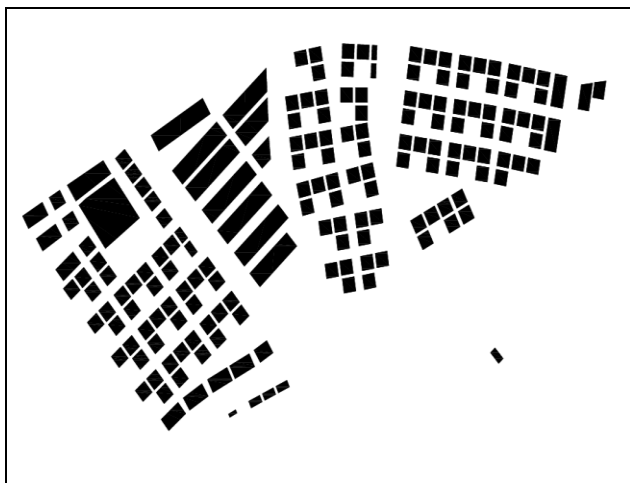


Fig 17: Renewed Frame

V. SUSTAINABLE DESIGN STRATEGIES

A. Eco-Design of Buildings

Thanks to the strategic reorientation of the locations of the housing areas, taking into account the sun's course and the wind's direction, the houses built will be able to benefit from passive ventilation methods and have access to greater thermal comfort inside the buildings [6]. In addition to this, the use of local sustainable building materials such as stone and wood or mud bricks will minimise the environmental impact of the renovation and become beneficial in the long term. These construction principles are inspired by the La Duchère renovation project, where the emphasis is on renovating buildings while taking energy efficiency into account.

B. Functional and Social Diversity:

The new development integrates residential, commercial, educational and cultural functions in close proximity to limit travel and encourage neighbourhood life. The creation of an area of alternative social housing will serve to accommodate low-income populations, guarantee social inclusion and prevent gentrification.

C. Sustainable Mobility:

Sustainable mobility covers the design and implementation of safe, low-impact modes of transport that produce the lowest possible greenhouse gas emissions. Our development encourages soft mobility by creating cycle paths and safe, pleasant footpaths to encourage walking and cycling. We have also created a public car park to avoid alternative parking for cars at the roadside. Walking by building cycle paths and safe pavements, as has been done in Jnane Aztout to improve local mobility.

D. Energy Optimisation:

Improving the current electricity network and pooling energy resources, through the use of renewable energy from solar panels installed to reduce household consumption over the long term.

E. Creation of Green Spaces

The creation of green spaces, shared gardens and natural areas will improve the quality of life and contribute to biodiversity. Green spaces also play a role in regulating the district's temperature and providing natural shade for the houses. They also improve air quality and create places for residents to relax.

F. Tactical Urbanism:

Tactical urban planning is an approach to urban development that consists of carrying out temporary, inexpensive and small-scale interventions to improve public space. It was applied in the project with the installation of transportable public benches in the landscaped areas, barriers, posts on the pavements and planters. They are made from recycled plastics and metals. They will be used to demarcate spaces and moderate car traffic in the alleyways between homes.

G. Resource and Waste Management

The creation of a sustainable rainwater management system using retention basins and cisterns will help to reduce the risk of flooding and improve water quality. Rehabilitation of the drinking water network, installation of effective drainage systems to prevent flooding, paving of roads, Waste management: Introduction of a waste collection and selective sorting system, inspired by the ecological programme set up in Jnane Aztout, which encourages the reduction and recycling of waste.

➤ Implementation Plan

With regard to the various means of implementation for this urban renewal [7], we have:

- **Progressive Renovation:**

The project will take place in several phases, and throughout the renovation of a plot the social housing built will be used to house residents whose houses are being renovated or restructured.

- *Citizen Participation:*

Involving residents in every stage of the project to ensure that their needs and concerns are taken into account, because what is done with us is done for us, whereas what is done without us is done against us.

- *The Creation of a Temporary Social Housing Zone,*

It will be used to accommodate low-income populations on a rotating basis during periods of renovation and even afterwards to ensure social inclusion and avoid gentrification.

- *Funding:*

Funds for the project will be raised through public-private partnerships, government funds and aid from non-governmental organisations such as. Drawing on the participatory funding mechanisms to involve the local community and external stakeholders [8].

- *Micro-Credit and Training:*

Set up training programmes and offer micro-credit to help local people start up small businesses, such as crafts or commerce.

VI. PROJECT IMPACT ASSESSMENT

A. Social Impact

➤ Positive Impacts

- Transport: improving road access and links with other neighbourhoods thanks to well-designed streets and multiple modes of transport.
- Citizen participation: by involving residents in the neighbourhood design process to meet the real and specific needs of the community, while encouraging their long-term commitment.
- Reduced unemployment: because the renovation work, infrastructure maintenance and new commercial establishments will create a large number of jobs.
- Safety: Installing solar street lighting and reinforcing safety measures, creating well-designed public spaces, based on the models studied.

➤ Negative Impact

- Moving residents: The displacement of residents during renovation work is likely to create discontent and disrupt their daily routine.

B. Economic impact

Urban regeneration is a process that has a major impact on the economy, both positive and negative.

➤ Positive Impacts

- Growth of the local market: because the urban innovation and the spaces created will attract visitors who will become customers for the shops in the area, as well as potential investors and property developers.

- Job creation: Supporting the local economy by creating small spaces for local businesses that are lacking, such as a bakery, kiosks, a cybercafé, shops, short food circuits and local craftsmen, so that young unemployed people can benefit. Urban agriculture will be encouraged with the creation of community vegetable gardens, to help ease the financial burden on households and strengthen social ties.

➤ Negative Impacts

- Cost of the project: Urban regeneration is a very costly operation, particularly because of the demolition work and the construction of new infrastructure, as well as the surface area involved.
- Loss of jobs: The demolition phase will lead to the closure of small illegal kiosks and roadside food stalls - Social discrimination: The high costs associated with the new infrastructure may limit access to certain services for the local community, particularly the poorest.

C. Environmental Impact

➤ Positive Impacts

The developments created for our study site offer a number of environmental benefits, which are:

- Improved infrastructure resilience: The buildings constructed will now be adapted to the topography and climate of the site, which will reduce the risk of flooding and the early deterioration of buildings.
- Reduced pollution: by using local resources to create street furniture from sustainable and recycled materials. Noise pollution will be reduced thanks to the reduction in road traffic, the promotion of soft mobility and the reorientation of leisure activities in the new urban development.

➤ Negative Impact

- The demolition and reconstruction of the infrastructure will affect the area and its surroundings, particularly through the creation of waste and noise pollution.

VII. CONCLUSION

Finally, this work has enabled us to use an analysis of the urban fabric to identify and resolve the major development problems in the following areas slums, especially in Cameroon [9] taking a degraded sector as a case study and then producing a global proposal of a comprehensive master plan with an innovative urban design process. The essential elements on which the renovation project has focused are the appropriate use of space, improved circulation between plots, accessibility to the site, comfort for residents and protection of the environment [10].

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