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Article

Endogenous and exogenous factors influencing urban planning and the sustainability of secondary towns in Chad: The case of the town of Pala

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Abstract: Over the past 50 years, urban planning documents have been drawn up in sub-Saharan African cities without any convincing results. The study of secondary towns in Chad shows that these planning documents have been hampered by natural and man-made factors. The aim of this study is to determine the factors hindering the implementation of planning documents in the town of Pala in Chad. To carry out the study, a methodological approach (using quantitative and qualitative data) based on a questionnaire and interview survey was deployed for data collection. With a sample of 300 households surveyed, the main conclusions of the study show that all the factors identified, such as water erosion with a rate of 17.7 T/Ha/year, expose the town to various risks. Demographics, on the other hand, represent a lesser and therefore acceptable challenge. As far as exogenous factors are concerned, the level of education of the head of household is a determining factor in the implementation and acceptance of urban planning documents in Pala. Confirmatory factor analysis and the Chi^2 test revealed that consideration of stakeholders' needs and their inclusion in the process of drawing up these documents are factors that significantly influence their implementation. In contrast, age, gender and other variables did not reveal any significant anomalies in our analyses. Consequently, future efforts to implement Pala's planning documents must be based on community participation and awareness of the acceptance of these documents, which are necessary in a process of decentralization and urban planning.

Keywords: endogenous factors; exogenous factors; urban planning; sustainability; secondary city

1. Introduction

Urbanization is a key feature of the 21st century: the proportion of the world's population living in cities is expected to reach 60% by 2030, an increase of 72% in 30 years (Yvonne et al., 2012). According to UN-Habitat, approximately 68% of the world's population live in urban agglomerations (Profilo, 2024). Over the past few decades, urban planning issues in developing countries have been constantly evolving; due to rapid urbanization and complex challenges, urban planning has increased (Teadoum et al., 2024). Urban planning must consider cities as complex systems with synchronized interurban and intraurban processes, enabling new tools for sustainability and resilience (Leonardo and Angéla, 2020). One of the great challenges of the 21st century is finding an opportunity for intelligent urban planning, understanding the complexity it can represent and approaching it from four angles—urban planning, sustainability, resilience and smart cities—to overcome the challenges

associated with increasing urban densification and the deficit in the supply of basic elements (Leonardo and Angéla, 2020). Urban planning must consider cities as complex systems with synchronized interurban and interurban processes, enabling new tools for sustainability and resilience. In sub-Saharan Africa, the demographic and spatial explosion of cities is taking place against the backdrop of poverty, which compromises waste management, inadequate facilities and green spaces (Iléri and Follygan, 2016). In Colombia, development plans and territorial planning programs (TPP) are examples of traditional urban planning instruments (Leonardo and Angéla, 2020). Because they are deficient and managed according to a totalitarian approach, these plans encourage the destruction of precious natural resources at peripheries, as well as urban expansion (Mejia and Camacho, 2020). In Chad, urban issues in general, and planning in particular, have received very little attention in the priority projects of public authorities (Teadoum et al., 2024). Most of Chad's cities have long developed without a strategic planning document (Allarané and Mahamat, 2024). In Pala in southwestern Chad, urban issues are often relegated to second place, giving way to the birth of urban disorder (Nguémadjita, 2024). On the regulatory front, it was not until 2010 that the Chadian government established the fundamental principles applicable to urban planning in Chad through law N°006/PR/2010 (Teadoum et al., 2024). This law stipulates that urban planning in Chad consists of various tools, including the SDAU, the urban development plan, the urban reference plan and the detailed urban plan (Teadoum et al., 2024). To date, 17/95 urban centers in Chad have at least one planning document to guide their urban development (Allarané and Mahamat, 2024). Urban planning in Chad's secondary towns, such as Pala, is crucial for sustainable and inclusive development. As the country faces rapid urbanization, it is essential to analyze the endogenous and exogenous factors influencing this dynamic. Endogenous factors, such as local governance, citizen participation and financial resources, play decisive roles in the implementation of urban planning policies (Teadoum et al., 2024). Moreover, exogenous factors, including national policies, economic influences and climate change, can also significantly impact the sustainability of secondary cities (UN-Habitat, 2022). It is therefore fundamental to contribute through this research to the various studies that exist in the field of urban planning in Chad and to make our own contributions to the implementation of various planning and urban governance documents. The aim of this research is therefore to identify the natural and anthropogenic factors hindering the implementation of planning and urban governance documents in the town of Pala. More specifically, it will examine the development process, acceptability and, finally, the main factors hindering the implementation of these various urban projects and programs.

2. Literature review

2.1. Planning and urban sustainability

The term planning refers to a formalized activity that enables a society to promote, regulate or manage economic, urban or social change (Actors, 2022). It is usually defined as "a set of studies, approaches or legal procedures that enable public players to understand the evolution of urban environments, then to define development hypotheses, and finally to intervene in the implementation of the chosen options"

(Evans et al., 2016). The plurality of scales (from a large territory to a specific project), of the institutional perimeters concerned and of the tools mobilized accompanies a diversity of project owners and players involved. Researchers define planning as the establishment of an ordered sequence of actions leading to the achievement of specified or declared objectives (Cirolia and Berrisford, 2017). A study by Faludi (2004) stated that planning is essential for guiding activities in the midst of uncertainty and providing the basis for future decision-making (Negeri et al., 2023). According to Pickcance (1982), urban physical planning is essential for showing land uses in the city's administrative zones and issuing planning permission for the development of these lands. As indicated in the references (C et al., 2007; Nallathiga, 2015), the preparation of planning documents involves estimating the future population, socioeconomic conditions and infrastructure requirements, as well as preparing land for future development to ensure that the necessary facilities are in place when development takes place. Urban planning is an exercise in resource planning, generation and management and is seen as a process rather than a final statement. A number of studies have highlighted the poor ability of regulatory and strategic tools to regulate and guide urban development: the predominance of projects over plans, vague standards opening up numerous margins for interpretation, poor articulation with operational tools, and poor articulation of strategies between interdependent territories (Maulat, 2020). There is also a significant gap between, on the one hand, the hierarchy of standards projected by the regulatory framework or major laws (the plan and then the project) and, on the other hand, the reality of spatial production practices, according to nonlinear logics and inverted hierarchies (regulatory standards and plan content adjusted according to the project and not vice versa). These empirical analyses shed light on the real role of planning tools. In view of the limitations of planning to bring about the territorial transformations envisaged, certain works call for us to go beyond the dominant categories to analyze urban planning beyond the plan and the project. While this question is at the heart of many studies of major cities, the analysis of "unplanned" or "spontaneous" urbanism is less well addressed in secondary cities, even though urban development is taking place in a diffuse way, in a game with planning standards. J. Idt and al. Studied the "spontaneous densification" processes observed in the Rome and Paris regions. They show that these processes, which are sometimes illegal, are driven by a variety of players and are often based on playing with standards, taking advantage of areas of uncertainty in regulatory plans. They often lead public players to regulate and manage the effects of these operations a posteriori. While all territories today face challenges such as adapting to climate change, cities focus on many issues and must consider long-term development, hence the notion of a sustainable city (Colombert, 2012). Paradoxically, however, the sustainable city is difficult to define, as it is more a project than a theory. However, the three principles highlighted by Emelianoff (2005) attempt to clarify a few principles:

- A sustainable city is "a city capable of sustaining itself over time" owing to its critical distance from the present. Emelianoff underlines the city's ability to redefine itself.

- A sustainable city is one that offers quality of life in all places, with less differentiation between living environments. One of the principles on which this city is built is functional proximity (as opposed to the separation of functions advocated by urban planning in the 1960s), the emergence of new proximities and the reduction of constrained mobility.
- A sustainable city is a city that has reclaimed a collective political project (Climatize, 2022).

A sustainable city is thus a city that has an environmental, economic and social impact (Saint Lucia Fisher Folk Cooperative Society Ltd, 2024). These are the three pillars of sustainable development (Purvis et al., 2019). However, the organization of urban life also introduces a not inconsiderable political dimension, since local governance is also one of the challenges of a sustainable city.

2.2. Urban planning and community participation in the development process

Urban planning in Africa is an evolving field, facing unique challenges such as rapid urbanization, poverty, and social inequalities. Community participation is increasingly recognized as an essential element in ensuring that planning processes meet the needs of local populations. Community participation refers to the active involvement of citizens in the decision-making process concerning their urban environment. This participation can take many forms, from consultation to direct involvement in project implementation (Swapan, 2016). Involving local communities in urban planning strengthens the legitimacy of projects, as it ensures that the needs and priorities of local residents are taken into account. Projects that incorporate community participation are often more sustainable, as they enjoy local support and greater ownership by beneficiaries (Cobbinah et al., 2020). Community participants also contributes to local capacity building, enabling citizens to acquire skills in urban planning and management (Aldegheishem, 2023).

Governance structures in Africa can sometimes be rigid and unreceptive to citizen input. Political and technical actors, limiting effective community participation (Ahmad and Anjum, 2020), often dominate planning processes. The lack of financial and human resources to support community participation initiatives is a major obstacle. Local governments often lack the means to organize consultations and workshops (N'djilbé, 2015). Social and economic inequalities can also hinder participation, with some voices being heard more than others are. Marginalized groups, such as women and young people, are often underrepresented in planning processes (UN-Habitat, 2018). Several case studies in Africa show that innovative participatory approaches can improve urban planning. Urban planning in Africa requires an integrated approach that values community participation. Although challenges remain, best practices and case studies demonstrate that citizen engagement can lead to more sustainable outcomes tailored to local needs. To strengthen this participation, it is essential to overcome institutional barriers, mobilize adequate resources and promote social inclusion. Future research should focus on assessing the impact of participatory initiatives and developing models adapted to African contexts.

2.3. Urban development and growth

Urban planning is understood as a process of interaction between the government and society: this relationship aims to articulate public policies and their implementation in territories with local, regional and national priorities in general, facilitating administration in favor of greater development and the well-being of society (Leonardo and Angéla, 2020). The world is becoming increasingly urbanized. Since 2007, more than half the world's population has lived in cities, and this proportion is set to increase to 60% by 2030 (Baker, 2018; Véron, 2020). Urbanization of the African continent is largely unplanned and informal (Veolia, 2021). Urbanization is a megatrend that most sub-Saharan countries have experienced this century. Urban planning is a framework that helps urban leaders and administrators turn their declared vision into reality and improves quality of life, prosperity and equity (ONU, 2014) in the use of resources (Harris, 2008). People to promote the well-being of current and future urban residents by creating a healthy, attractive, efficient and practical urban environment use urban planning. It is therefore the most transformative process of the 21st century (Zheng, 2020) and has led urban areas to become centers of environmental, social and cultural interaction. Over the past 50 years, sub-Saharan African cities have developed urban development plans with no convincing results (Veolia, 2021). The demographic definition of urbanization is the growing proportion of a country's population living in urban areas (Ibrahim and Elhadi, 2024; Satterthwaite et al., 2010). This translates into a physical expansion of the built environment to accommodate the urban population and its activities (Christophe et al., 2017). Today, urbanization in Africa is neither controlled nor supported by African city councils. We are witnessing an ever-increasing concentration of urban dwellers, with no development of urban functions to serve the inhabitants and territories. In a way, we have the city without urbanity. This rapid urbanization has resulted in a growing number of people living in slums, as well as inadequate and overloaded infrastructures and services (such as waste collection and water supply and sanitation systems, roads and transport), aggravating air pollution and unplanned urban sprawl. However, studies have shown that in most countries worldwide, the built environment in urban areas is growing faster than that in urban populations (Karen et al., 2010). While the urban population is expected to almost double from 2.6 billion in 2000 to 5 billion in 2030, urban areas are expected to triple in size between 2000 and 2030 (Ibrahim and Elhadi, 2024). Urbanization in developing countries poses numerous challenges, such as degradation of the urban environment, destruction of housing, social instability and substantial reduction in arable land, in short, the operationalization of urban programs supported by planning documents (Raphaël et al., 2019). Rapid urban population growth outstrips the capacity of most cities and increases the demand for urban land, resulting in higher land values, the uncontrolled occupation of land or even the occupation of non-Aedificand zones (Pribadi and Pauleit, 2015; Raphaël et al., 2019) The city of Pala is experiencing difficulties in keeping up with the urbanization of its territory. The no application of a city's urbanization plan poses a problem, with the emergence of unequipped outlying working-class neighborhoods (Nguémadjita, 2024).

2.4. Urban practices in African cities

African cities have often been built haphazardly without adequate planning, leading to problems such as congestion, insalubrity and vulnerability to flooding and landslides (Ndouba, 2023). As developed in reference (Chénal, 2014), the urban reality of the African continent is less about accommodating population growth and territorial expansion, poverty, environmental degradation and the informality of a significant proportion of urban activities. The urban population of African cities is growing considerably, reaching 400 million, or 40% of the continent's total population (ONU, 2014). This figure is expected to rise to 58% by 2050. This demographic growth and spatial expansion of African cities and their effects in terms of poverty, urban inequality, environmental degradation and urban insecurity should form the basis of urban planning (Jean Claude and Abigael, 2011). Urban planning is a tool used by people to promote the well-being of current and future urban residents by creating a healthy urban environment. In Africa, the practice of urban planning is still at the stage of urban sustainability and is based on an approach focused on the management of urban natural resources (Okeke, 2015). Many African cities are experiencing discontinuous, dispersed territorial development on their outskirts, influencing the continued expansion of the urban area toward the suburbs and raising questions about coherent, integrated regional development between cities and the countryside (Silva, 2015). As indicated by reference (Hameed and Nadeem , 2008), the challenges of poor urban implementation lead to problems such as wasted money, time and human resources, which are important in the plan-making process. Without proper implementation of the plan, plan preparation achieves nothing in terms of development.

2.5. Overview of secondary cities in Chad

Although there is no universal definition of a city, demographic, cultural and economic criteria do allow us to define it in several ways. A city can be defined as the concentration of population, activities, buildings and infrastructure in a small area (Humain-Lamoure and Laporte, 2017). The world's cities, including those in Africa, are getting bigger and bigger, so big that we no longer know what to call them metropolises, megacities, global cities, etc. In any case, we have clearly outgrown the original framework of the city, and we're living in a new urban area that no specialist could have foreseen. Whatever the case, we have clearly outgrown the initial framework of the city, and we're living in a new urban area that no specialist could have foreseen (Yemmafouo, 2013). Africa's urban growth has been accompanied by a shift from compact cities to sprawling cities. Peri-urban areas are created on the bangs of towns and cities. These little-studied areas are the sites of new social and cultural dynamics (Yemmafouo, 2013). The official definition of towns in Chad recognizes administrative status as the only criterion for urbanization (Ministère de l'Aménagement du Territoire, 2011). The chief towns of prefectures, sub prefectures and administrative posts have the status of towns, whereas other agglomerations (cantoning chief towns and other villages) are rural (Ministère de l'Aménagement du Territoire, 2011). This definition does not consider the size of agglomerations, their economic activities or their social infrastructure (Sambo, 2012). New agglomerations have been granted the status of cities by governmental decisions on the occasion of

administrative promotions (new divisions). On the other hand, towns with fewer than 2000 inhabitants and no special facilities or economic activities may be promoted to the status of a city simply because the state wishes (cities created on the basis of political promises made after elections).

Table 1. Urban classification of cities according to demographic weight and population size.

City Category	Number	Population 2025	Demographic Weight
Over 3 million	1	3,191,001	40%
300,000–500,000	3	1,114,986	14%
100,000–200,000	12	1,695,549	21%
50,000–100,000	18	1,321,651	16%
20,000–50,000	20	627,959	8%
< 20,000	8	109,463	1%
Total Urban	62	8,060,609	100%

Beyond this classification, it must be said that in Chad, capital cities (N'Djaména and Moundou) and secondary cities exist. However, there is no national standard or regulation for classifying cities in Chad. In addition to demographic criteria, there are towns that have this status simply in terms of political will.

2.6. Justification for the study

Far from stifling other related research, this study is justified by the fact that little research has been done on secondary cities in sub-Saharan Africa in general and in Chad in particular. Secondary towns have undergone a major demographic boom, and problems related to development, planning, the environment and its corollaries are becoming increasingly acute. The town of Pala, which is located in the southwest of the country, has not been the subject of much literature. Research has focused more on large cities, yet secondary towns sometimes have more problems than large cities do. Importantly, through this study, we want to confront both the natural and human factors that hold back the sustainable urban development of the aforementioned city, despite the existence of framework documents.

3. Materials and methods

3.1. Study area

The town of Pala is located in the southwest of the country in the Mayo Kébbi-Ouest Region at 9°21′36″ N; 14°52′20″ E. The hub of the region, the town of Pala, is approximately 360 km from the capital N'Djamena and 140 km from the Cameroon border toward Figuil. It is crossed by the Figuil–Léré–Kélo–Moundou national road. Pala is the capital of the Mayo Kébbi Ouest region, the Mayo Dallah department and the commune of the same name. Established as a medium-sized commune on 21 June 1961, under the name Pala, the town has evolved to include 24 districts, which are structured into 117 squares. According to this delimitation, the municipal territory of Pala covers an area of 192.7 km^2 or 19,270 ha. It is bounded to the north by the Gouin

and Gouey-Goudoum cantons, to the east by the Tagal and Gagal cantons, to the south by the Goumadji canton and to the west by the Doué canton. The 24 districts of the commune of Pala are divided into four (4) arrondissements.

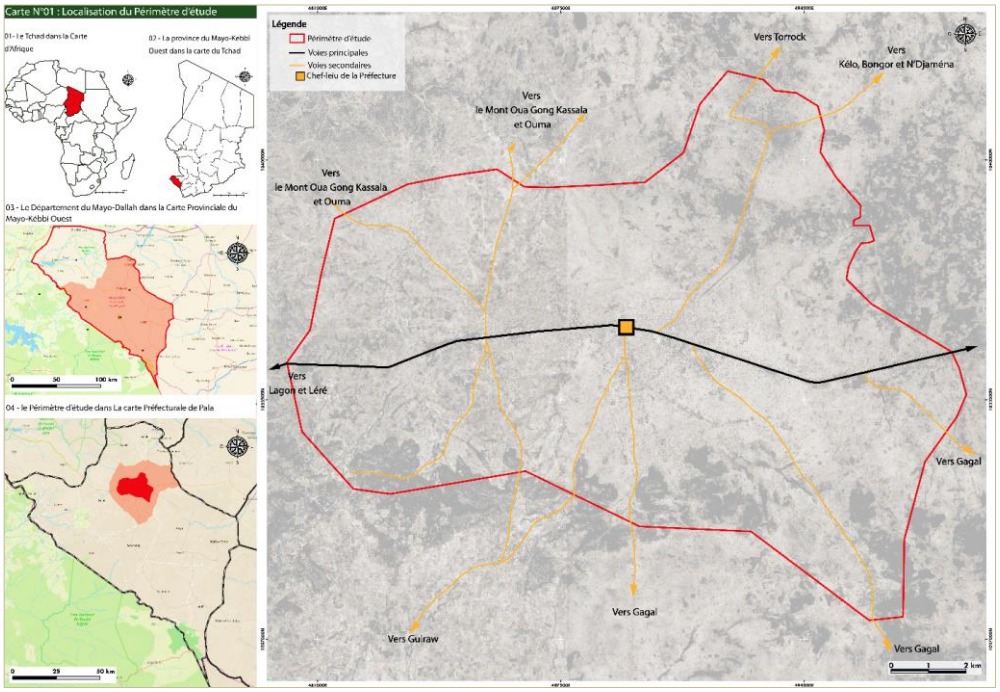

Figure 1. Location of the study area.

3.2. Sampling and data used

This study was carried out via a methodological approach based on documentary research, meteorological data collection, group interviews with officials in charge of public urban planning structures and individual interviews with the populations of the city's four (4) districts (Allarané et al., 2023). The documentary research enabled us to review similar studies carried out in other geographical areas and address the same issue (Allarané et al., 2023). The interviews with the heads of decentralized government departments took place in the four districts, and all the departments concerned responded. The profile of those in charge of the structures included technicians from the land registry, the urban planning delegation and many other municipal profiles. Individual surveys were also carried out among the sampled households in the town of Pala. For the household interviews, we interviewed several households in each arrondissement whose size was proportional to the total number of households. A simple random sampling method was used to select the households to be interviewed. To calculate the sample size, we applied the inverse of the margin of error formula suggested by Daniel Schwartz. Let *n* represent the sample size for a rounding *q*, and we have the following:

$$Nq = \frac{[(Za)^2 x\ P\ (1-P)]}{d^2}$$

With *Z* being the fixed or reduced deviation at the 5% risk (1.96), corresponding to a 95% confidence interval, *d* being the margin of error set at 5%, and *P* being the proportion of households per neighborhood (Allarané et al., 2023). Unable to survey

all households in the city, a survey of 300 households in the city of Pala was carried out to gather socio-demographic data on the population. All heads of households in the districts of the city of Pala were considered as samples. This approach was also used in a recent study conducted in Central Africa by Vanel and Coffi (2024). To obtain more detailed information on the approach to developing planning tools, the following specific criteria were defined for the population to be studied.

- At least 18 years of age.
- Have lived in the city for more than 10 years (this residency criterion was used to emphasize mastery of the city and the various existing planning tools).
- The level of education is not emphasized here, as the questionnaires are translated into local languages, so all respondents can answer them.

The survey was based on a questionnaire with closed and open-ended questions. This method has been used in studies carried out in East Africa (Admasu and Jenberu, 2020; Maru et al., 2021). The information collected from households is based on variables such as:

- Stakeholders' views on communication around the document;
- Factors they consider to have hindered the implementation of planning documents in the city of Pala;
- The direct impact of the planning documents on improving their living conditions.
- Socio-demographic characteristics of respondents (age, gender, occupation, education and residence status);
- Respondents' knowledge of planning and urban governance tools;
- Respondent's involvement in the development of urban planning tools;
- Consideration of the needs expressed by local populations prior to the implementation of these reference documents.

Households were divided according to population density in the 24 districts of the city of Pala. For example, densely populated districts, comprising mainly residential areas and old urban cores, were given a larger sample than less popular districts, comprising mainly administrative and service areas. To establish this distribution, the quota method based on population density was used to ensure a spatial distribution of households proportional to the population density of four districts. This technique was used by Admasu and Jenberu (2020) in a study of the town of Arba Minch (Ethiopia). It guarantees valid and representative results for assessing the level of population participation in the process of drawing up the reference urban plan for the city of Pala. **Table 2** shows the number of respondents per district.

Table 2. Distribution of respondents by city district in Pala.

Pala	Number of respondents	Percentage (%)
1st district	100	33.33
2nd district	100	33.33
3rd district	70	23.33
4th district	30	10.01
Total	300	100%

The first and second arrondissements have a significant demographic weight in the town, as they are the former village cores on which the town of Pala was built. The 3rd arrondissement follows, and the newly-created 4th arrondissement does not have a high population density. The distribution is designed to ensure that each arrondissement is representative.

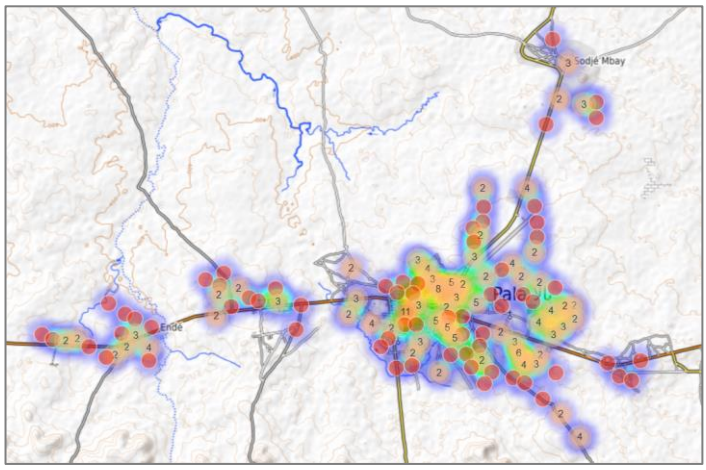

Figure 2. Heat map by survey area density.

In addition, individual interview questionnaires were designed to gather experts' knowledge and opinions on both natural and anthropogenic factors hindering the implementation of urban planning and governance documents (Sunkavilli Ravi et al., 2023). This methodology has already been used by Negeri et al. (2023) to identify the factors affecting the implementation of the structure plan for the city of Nekemte (Ethiopia). Accordingly, individual interview questionnaires were administered to thirty-four (34) executives of the deconcentrated state services and the and technical services of the municipality of Pala as well as representatives of civil society. The interviews provided an opportunity to gather useful information and gain a better understanding of urban planning practices in Chad and the challenges facing the country, particularly in terms of the implementation of urban planning tools. **Table 3** shows the distribution of respondents by district. **Table 3** shows the distribution of respondents by arrondissement.

Table 3. Distribution of respondents to interviews and focus groups.

City of Pala	Number of participants	Typology of participants
1st district	10	4 district chiefs, 2 representatives of civil society associations, 1 youth representative, and 2 heads of government departments.
2nd distric	10	4 district chiefs, 2 traditional chiefs, 2 youth representatives, 1 district women's representative, 1 government department head.
3rd district	8	3 district chiefs, 1 traditional chief, 2 representatives of civil society associations, 2 government department heads.
4th district	6	2 district chiefs, 1 district delegate, 1 youth representative, 1 women's representative, 1 government department head
Total	34	

Interviews and focus groups are organized according to respondents' availability. Unable to listen to everyone, these interviews and focus groups are conducted in such a way as to include the various stakeholders. Hence the presence of youth and civil society representatives in some places. As for the heads of deconcentrated government departments, they came from the fields of urban planning, municipal affairs, urban management or environmental services, with a variety of profiles.

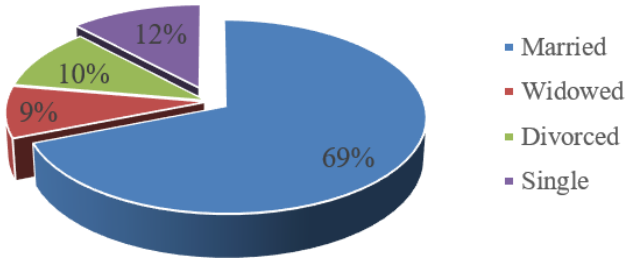

Figure 3. Marital status of the respondents.

Figure 3 gives an overview of the respondents' marital status. In fact, around 69% of our respondents are married and therefore all of legal age.

3.2.1. General research methodology

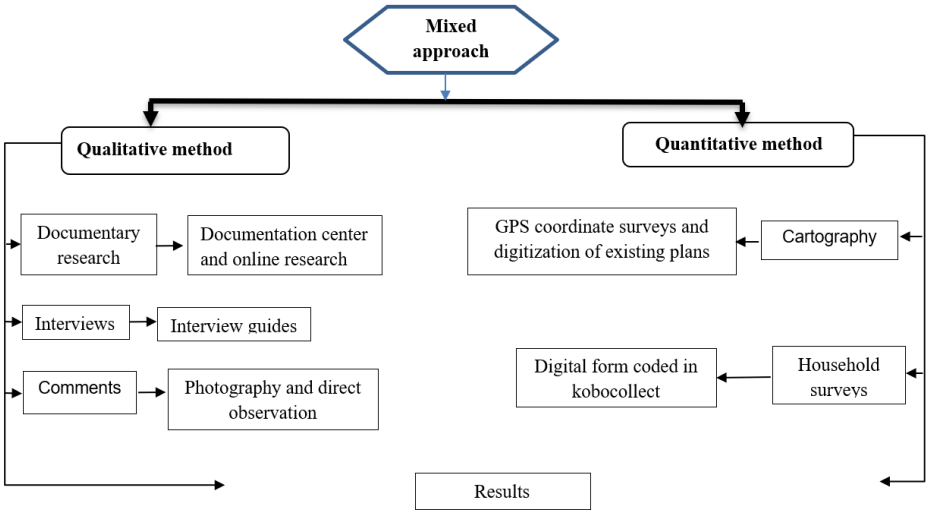

Figure 4. Diagram of the methodology adopted.

3.2.2. Data collection and processing tools

For data processing and analysis, Microsoft Excel 2019 was utilized to organize and format the data gathered from the KoboToolbox platform. Subsequently, Jamovi software, along with specialized packages, was employed to analyze the data in line with specific objectives. Statistical tests were conducted to examine correlations between factors, aiming to achieve certain precision and decision-making goals. The presentation and illustrative map of the study area were created using QGIS software, which integrated geographic data (in shapefile format) with cadastral data in DWG format. To model the readability rate, the RUSLE calculator was used, taking into account rainfall, soil, porosity, conservation and cultivation methods. GPS points were placed in specific corners or areas at risk of erosion in order to measure the depth and amplitude after each rainy season and conclude the erosion damage through a follow-

up sheet. These tools were chosen for their flexibility of handling and the quality of the expected results.

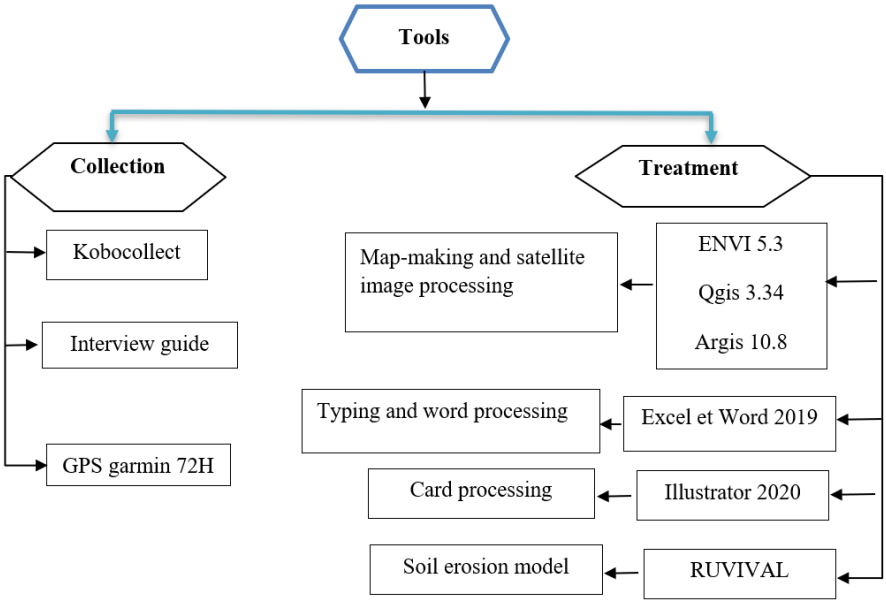

Figure 5. Catalog of tools used.

All these tools and non-exhaustive methodological approaches have enabled us to obtain results which we present here as those which, for us, seem significant.

4. Results

4.1. Natural factors

4.1.1. Abnormal demographics

With a natural growth rate of $\alpha > 4\%$ of the area, compared with the national average of 3%, the population of the town of Pala has doubled in less than 15 years. With the opening of universities and other private training facilities, an additional population of approximately 3000 is being added to the existing urban population every year. **Table 4** below shows RGPH 2 data from 2009, PDC data from 2017 and the population projection made in 2023.

Table 4. Demographic distribution of the town of Pala.

City of Pala	Population per inhabitant	Additional population	Total population
Population RGPH2 2009	47,982	00	47,982
Population 2021 PDC	83,089	5000	88,089
Population 2024	86,413	5000	91,089
Population 2030	109,339	7000	116,339

- RGPH2: Second general population and housing census
- PDC: Municipal development plan

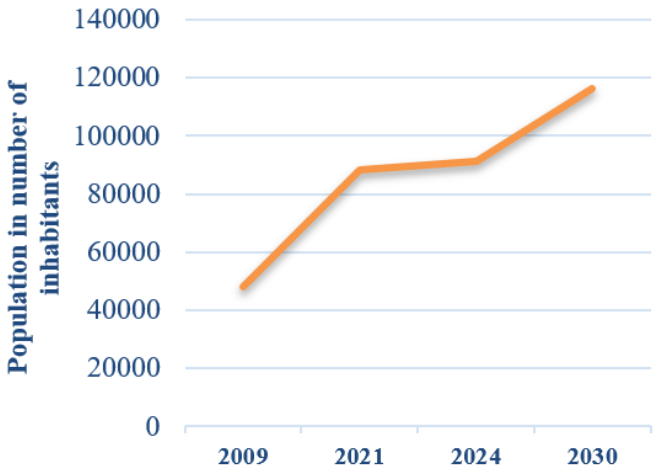

Figure 6. Population curve for the town of Pala.

For the purposes of this study, the sample variables are shown in the following figures:

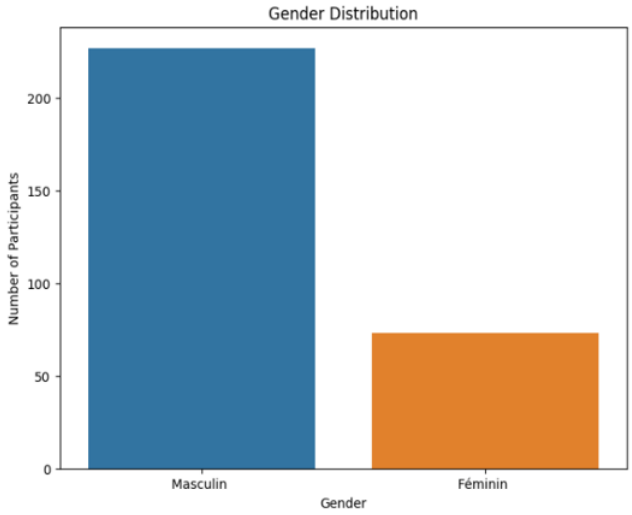

Figure 7. Gender breakdown of the respondents.

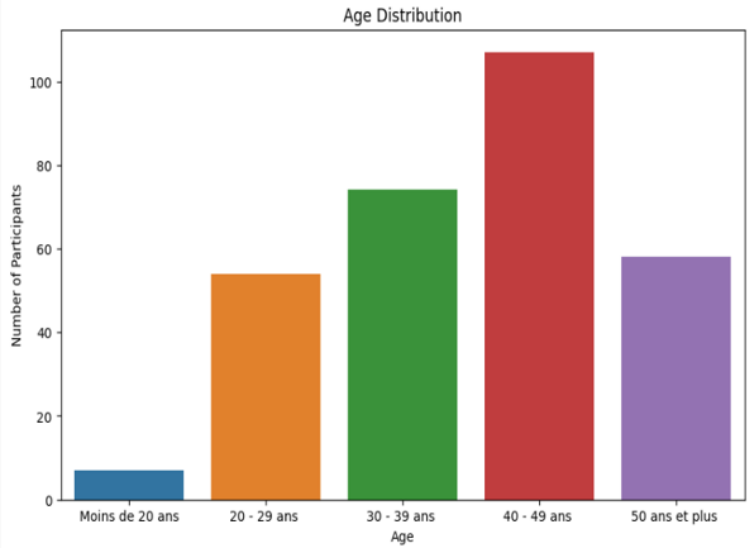

Figure 8. Distribution of respondents by age.

The two figures above show the interest of the gender and age breakdown. For reasons of culture and availability, men were surveyed more than women, and the age range between 40 and 49 is more significant. The frequency distribution **Table 5** shows that 75% of our respondents were men, which explains the culture in the study area, where the man is the head of the family and therefore entitled to answer questions, and therefore an authority within the household.

Table 5. Frequencie gender distribution.

Frequencies of Gender			
Gender	Counts	% of Total	Cumulative %
Female	73	24.333 %	24.333 %
Male	227	75.667 %	100.000 %

4.1.2. Water erosion, a factor in urban land use

Erosion is caused by water when part of the rainfall runs off and carries with it soil or rock particles. In Pala, the average annual rainfall fluctuates between 600 and 900 mm. However, for the past decade, regular anomalies have been observed here and there, challenging any projects with a year-long timeframe. Typically, a year in an area comprises 6 months of rainy seasons and 6 months of dry seasons. However, with increasing temperature in recent years and the effects of climate change, the seasonal calendar has been completely disrupted, and water erosion has become a factor in urban settlement. The table below shows the data sheet used to monitor a number of erosion points in the town of Pala. The average annual erosion rate of an area can be predicted via the Universal Soil Loss Equation (USLE), $A = R \times K \times LS \times C \times P$ (WH and DD, 1960). With A being the estimated soil loss (tons per hectare per year), R being the precipitation and runoff factor, K being the soil sensitivity to erosion factor, LS is the slope and slope length factor, C being the vegetation cover and management factor and P being the conservation practices factor.

The result A = 17.7 shows that the soil in urban areas is exposed to moderate erosion, according to the RUSLE model. This exposure puts both the infrastructure and the built environment in the city of Pala at risk. Approximately 50% of the buildings constructed within 10 years are exposed to the risk of collapse, as the city lacks a sewerage system to evacuate rainwater and household wastewater.

Table 6. Urban soil erodibility factors considered.

N°	**Parameter**	**Quantity considered**	**Results obtained**
1	Erosivity factor R or rainfall factor	1100 mm, max	
2	Soil erodibility	0.58 (t/ha)	
3	Slope factor	4%	
4	Slope length	25 m	A = 17.7 (t/h/yr)
5	Crop type factor	0.40	
6	Working method factor	0.25	
7	Practice and conservation factor	0.75	

Source: Weather data, terrain and RUVIVA calculator, 2024.

Table 7. RUSLE comparison or reference grid.

Soil erosion class	Potential soil loss (T/ha/an)
Very low (Tolerable)	< 6.7
Low	6.7–11.2
Moderate	11.2–22.4
High	22.4–33.6
Severe	> 33.6

Source: RUSLE model.

Table 5 shows that, on average, 17.7 tons of soil in urban areas are exposed to water erosion if all exposure factors are considered. This class in **Table 6** indicates moderate erosion, with soil losses between 11.2 and 22.4 T/ha/year. At this level, erosion can begin to significantly affect the soil and its production capacity. Therefore, adapting soil conservation measures in urban areas is crucial. The nature of the soil, soil porosity, lack of drainage in the city and heavy rainfall and climatic anomalies are often the factors that orchestrate erosion in urban areas, marking a strong and growing vulnerability. The diagram below shows the impact of water erosion on the environment (**Figure 9a)** and on human settlements (**Figure 9b**). **Figure 9c** shows how, in the space of 10 years, water erosion has caused damage, endangering drinking water drainage facilities between two of the city's districts.

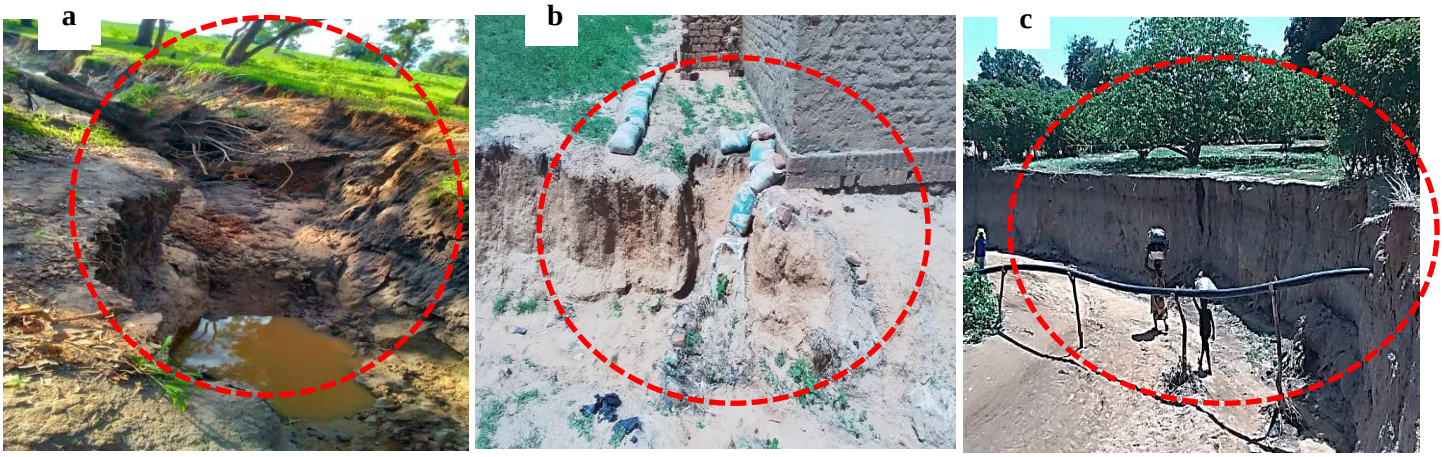

Figure 9. Erosion damage overview.

4.2. Anthropogenic factors hindering the implementation of planning documents in Pala

To measure the exogenous or anthropic factors that have contributed to hindering the implementation of planning documents in the city of Pala, we cross-tabulated those that have significant added value.

Table 8. Cross-tabulation results.

Variables considered	*P*_value
Document knowledge level	Gender = 0.2226 Age = 0.2074 Education level of head of household= 8.783×10^{-5}
Acceptance of document	Age = 0.2074

	Consideration of needs= 2.2×10^{-16} Inclusion in development process 0.007499
Willingness to participate in future planning documents	Gender = 0.8994 Socioprofessional category = 0.5511 Marital status = 0.6743
Financial limitations	Political instability = 0.3434 Inclusion in planning process = 0.6868

Source: Author (2024).

To interpret the results in the **Table 8** above, we start from the basis of the variable groupings. We examine the different variables and their associated *P* values, highlighting their significance and potential impact on document knowledge and acceptance.

4.2.1. Document knowledge level

The *P* value indicates that there is no significant relationship between respondents' gender and their level of knowledge of the document. This suggests that gender is not a determining factor in understanding the document. Similarly, age does not seem to have a significant effect on the level of knowledge of the document (Frederick, 2013). This could indicate that knowledge of the document is relatively uniform across the different age groups. On the other hand, the level of education (Manizhe et al., 2024) of the head of household has a highly significant relationship with the level of knowledge of the document. This suggests that the level of education of the head of household is a key factor influencing the understanding of the document. Higher education (Kathryn and Amy, 2007) could be associated with a better ability to understand and assimilate the information presented.

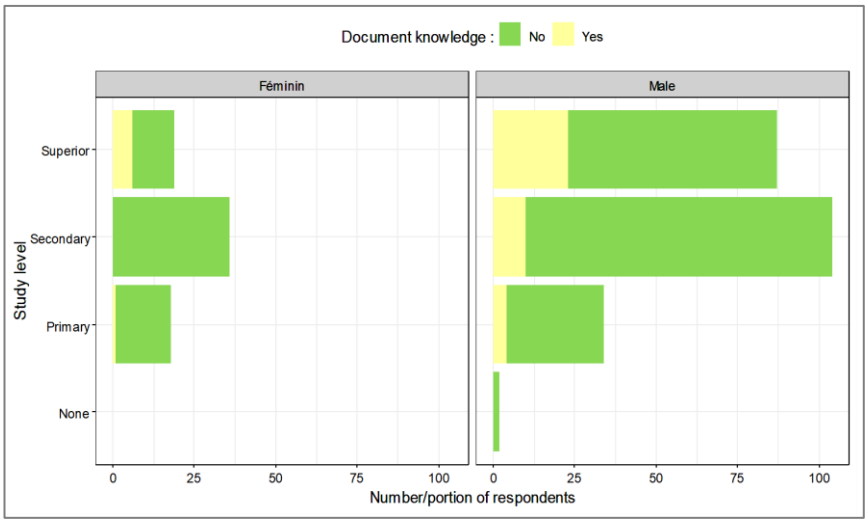

Figure 10. Correlation between level of education and document knowledge.

4.2.2. Document acceptance

As mentioned above, age has no significant impact on document acceptance, reinforcing the idea that opinions on the document do not vary much with age. With an extremely low *P* value, this means that taking respondents' needs into account is crucial to document acceptance. Documents that meet users' needs are more likely to be accepted. Stakeholder inclusion and participation in the planning document

development process also show a significant relationship. This suggests that when respondents feel included in the document development process, their acceptance of the document increases. This underlines the importance of community participation in planning and document development.

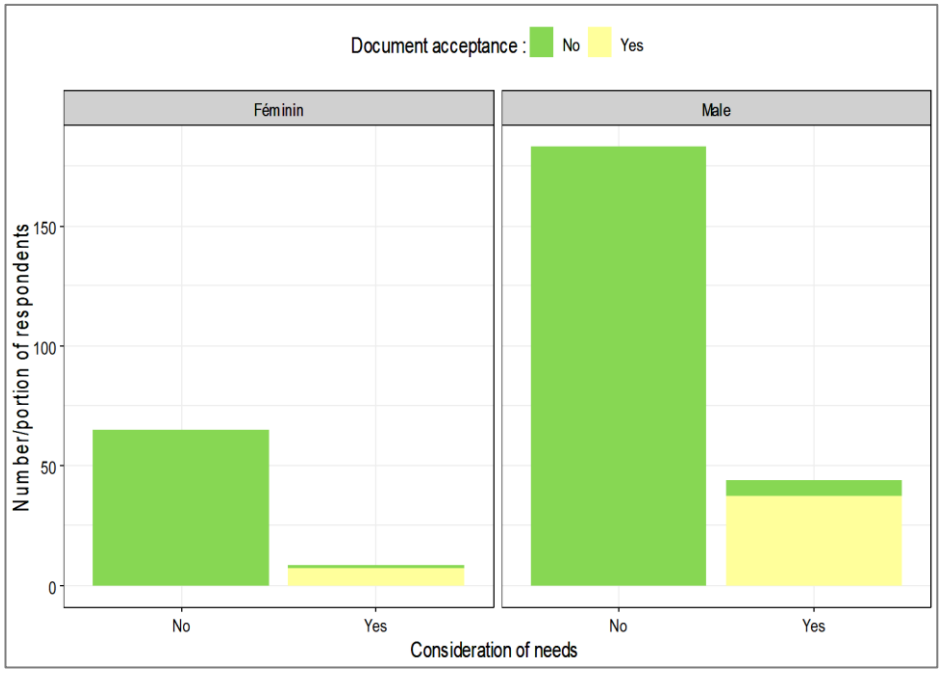

Figure 11. Correlation between level of education and document acceptance.

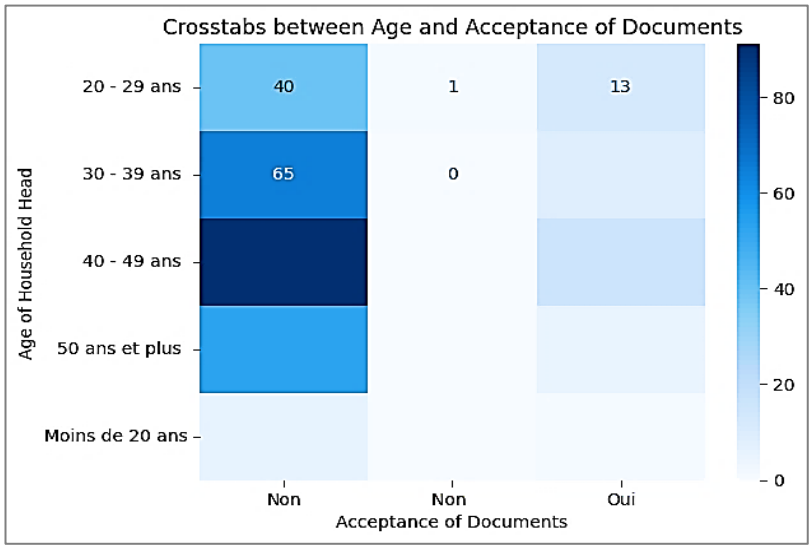

Figure 12. Correlation between age and document acceptance.

Figure 12 shows that there is no significant correlation between age and document acceptance. Age therefore has no influence in this respect.

4.2.3. Willingness to participate in future planning documents

The *P* value indicates that there is no significant gender difference in the willingness (Jiho and Seungkwon, 2004) to participate. This suggests that men and women are equally willing to participate in future planning. The socioprofessional

category also indicates that there is no significant relationship between the socioprofessional category and willingness to participate. This could mean that willingness to participate is relatively homogeneous across different socioprofessional categories. Similarly, marital status has no significant effect on willingness to participate, suggesting that individuals, irrespective of marital status, are equally inclined to participate.

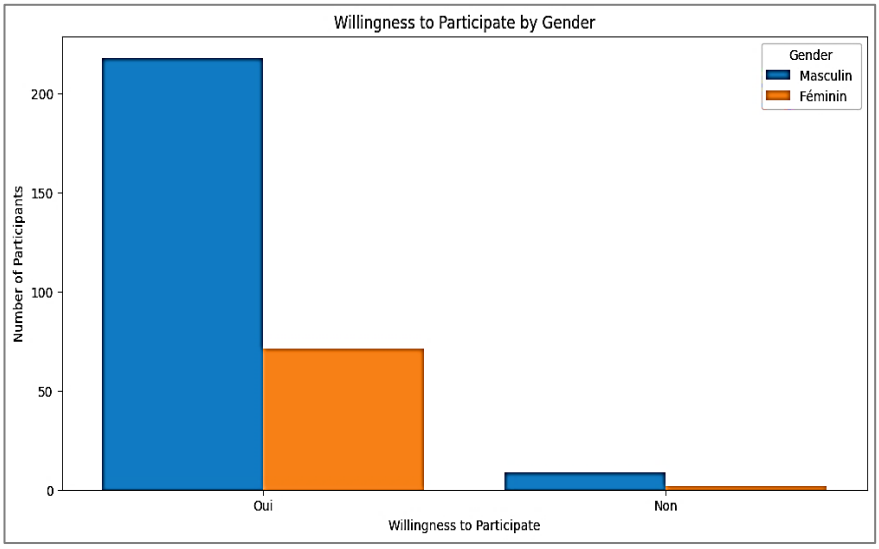

Figure 13. View of willingness to participate according to gender modality.

4.2.4. Financial limits and Impact of political instability

This variable indicates that there is no significant relationship between political instability and financial limits. This might suggest that other factors (Abdoulaye, 2016), such as economic conditions or local policies, could have a more direct impact on financial limits.

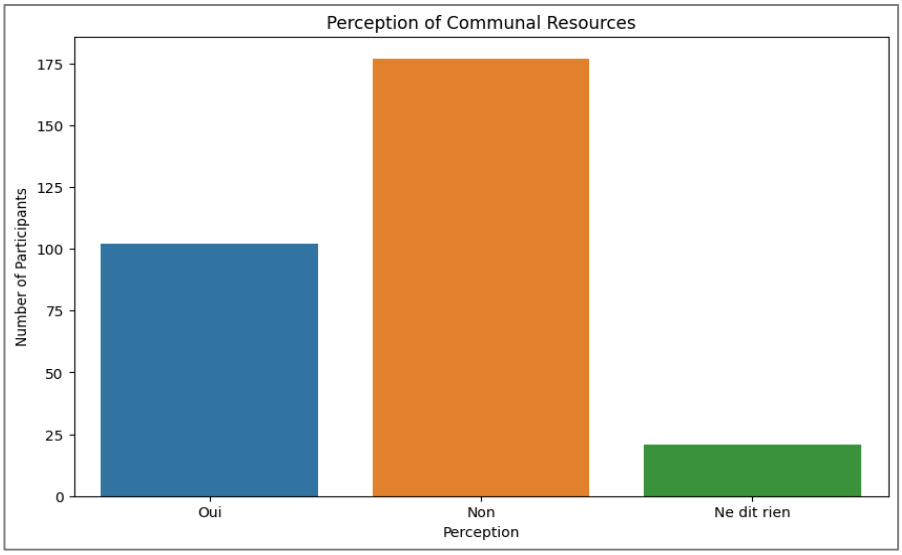

Figure 14. View of willingness to participate according to gender modality.

Despite community and political crises, it must be stressed that these crises have no immediate effect on the implementation of urban planning and governance

documents. At the same time, which questions the wills of the leaders and the crisis situations, which are transitory and passing, is a challenge.

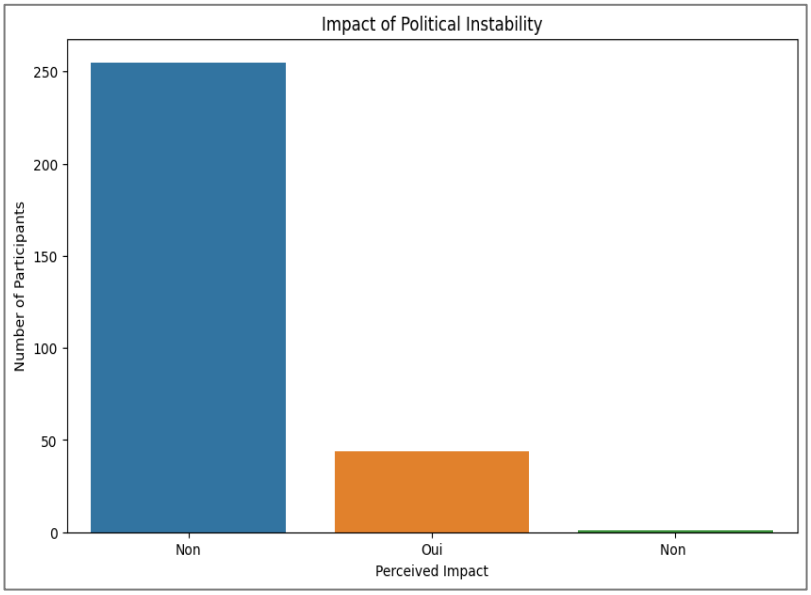

Figure 15. Impact of political instability.

5. Discussion

5.1. Natural factors hindering the implementation of planning documents

In its report, UNDESA (World Urbanisation, 2018) highlights the demographic challenges that need to be taken into account to avoid significant planning anomalies. Our results indeed show that abnormal demography is a factor influencing the implementation of planning documents. This limits access to certain basic urban services. On the other hand, Duranton (2015) believes that demographics, however abnormal, can make a significant contribution to economic development. He concludes that to maximize the benefits of urbanization, developing countries must invest in urban infrastructure, public services and policies that foster an environment conducive to economic growth. He argues for an integrated approach that recognizes the central role of cities in economic and social development. Analysis of the results obtained from the Revised Universal Soil Loss Equation (RUSLE) model enables us to assess potential soil erosion in a given context. The erosivity factor (*R*) is crucial in assessing the impact of precipitation on erosion. The *R* value of 1100 mm is relatively high, indicating significant erosive potential. According to Renard et al. (1997), *R* values greater than 1000 mm are often associated with high erosion rates, especially in tropical and subtropical regions. In their study, they noted that intense rainfall can lead to increased erosion. A soil erodibility (*K*) of 0.58 t/ha is indicative of moderately erodible soil. Wischmeier and Smith (1978) established that *K* values above 0.5 t/ha are cause for concern, especially in combination with high erosivity factors. Lal (2001) reported that readability is influenced by soil texture, structure and organic matter content, which may explain the variations observed in different regions. A crop type factor of 0.40 indicates moderate vegetation cover, which can reduce erosion. Pimentel et al. (1995) reported that well-established crops can reduce erosion by increasing soil

cover and improving soil structure (Santoso, 2021). However, a factor of 0.40 suggests that there is still a risk of erosion, especially if the cover is insufficient. The results obtained from the application of the RUSLE model reveal that erosion potential can be influenced by various factors, including rainfall erosivity, soil erodibility, slope, slope length, crop type, tillage method and conservation practices. Compared with other studies, these results underscore the importance of adopting sustainable management practices to minimize soil erosion. The work of Renard et al. (1997), Wischmeier and Smith (1978), and Lal (2001) provides a sound theoretical framework for understanding these dynamics and guiding the necessary interventions. From these discussions, our results are concordant in that a moderate erodibility factor of 17.7T/Ha/a is observed. This explains why Pala's urban soils are exposed to the risk of erosion.

5.2. Exogenous factors hindering the implementation of planning documents

Our research results suggest that the level of education of the male head of household in question is statistically significant in determining the level of comprehension of the document in question. This observation is consistent with the work of Schultz (1961), who argued for the role of education in improving people's knowledge and abilities. Schultz argued that education is an important resource that improves people's productivity and, consequently, their ability to interpret complicated documents. For example, Sakketa (2023) observes that education is a powerful strategy for empowering people, so that they have an increased ability to understand and relate to complex documents, so that they can better communicate actively and in an informed way in decision-making processes. The level of education and the inclusion of stakeholders in the document drafting process emerged as key factors affecting the implementation of planning documents in Pala. These findings highlight the energy that citizens need to bring to urban planning projects, while ensuring that the right education and awareness-raising is done to help citizens become essential to the smooth running of the decision-making process. Workineh's (2021) study also manages to make transparent findings such as the fact that the sobriety plan reworked by the town of Injibara in the Amhara region was not well taken on board by the latter due to their lack of understanding of the whole process. Citizen interaction in planning is crucial to the successful economic development of a commune (Kleemann et al., 2017; Negeri et al., 2023; Wilson et al., 2019). Aldegheishem (2023) has also confirmed that urban development in Saudi Arabia is without a long-term vision in return for real ones, as this prevents the right level of participation in the planning tools that could have induced this sustainability. Swapan (2016) further concluded that the idea of the current project spectrum of decentralization through development exercise not to be achieved is that the vast majority of a developing country's population goes through passivity during plan and program projections. Beyond this, taking the needs of respondents into account was an important factor in the document's acceptability. This assessment is validated by Arnstein (1969) where she gives the example of the need for citizens to be involved in the decision-making process so that policies and documents are adapted to the needs of society. Arnstein

points out that when citizens' needs are believed in and taken into account, they are more receptive to whatever has been decided and documented. Considering respondents' needs is of considerable importance to the acceptability of documents. This thesis is in turn confirmed by the recent work of Kuddus et al. (2020), according to whom the inclusion of citizens in decision-making is of great need if policies are to be consistent with society's needs. When, instead of policy on community projects, community needs are used to guide planning, this greatly improves their mood and decisions. The low level of activation of socio-community infrastructure and facilities envisaged in the Master Plan confirms the hypothesis supported by Chirisa (2014) that a low level of activation of plans in developing countries engenders a development of the physical framework below requirements and thus producing perverse effects. Dube (2013) has shown that the master plans drawn up for the town of Arba Minch in Ethiopia were implemented, but did not fully achieve their stated aims. The lack of good governance and the absence of policy corroborate the claims of Nuhu (2019) and Cobbinah et al. (2023), who showed that the ministry's reluctance to delegate powers to local authorities coupled with contradictory laws and normal rules played a part in the implementation of urban plans in Tanzania and Ghana. Similarly, Admasu and Jenberu (2020) ranked the lack of involvement of the general population as one of the main problems in the implementation of urban planning programs in the town of Arba Minch in Ethiopia.

Included in the development process also showed a significant relationship with document acceptance. This ties in with Fischer's ideas (Frank, 2000), where he states that including citizens in the decision-making process strengthens the legitimacy of policies and documents, as citizens feel more invested in the results. With respect to the willingness to participate in future planning documents, the results show that gender, socioprofessional category and marital status have no significant impact. This could be interpreted in light of the work of Putnam (2000), who discussed the decline in civic engagement and participation in modern communities, suggesting that structural factors, rather than individual characteristics, may influence participation. This observation is in line with Putnam's (2000) findings and is corroborated by recent research, which emphasizes that structural factors, such as the quality of institutions and civic culture, have a more decisive impact than individual characteristics do on civic participation (Weiss, 2022). Finally, financial limitations and political instability did not have significant relationships. This may be in line with research by Mansuri and Rao (2013), who conclude that although participation is often advocated as a means of improving development outcomes, economic and political constraints can often hinder such participation, making inclusion efforts less effective. A recent study by Frick and Rodríguez-Pose (2018) reinforced this idea, showing that weak governance contexts can limit the effectiveness of participatory initiatives.

In view of these findings, our study highlights the importance of education and consideration of the needs in document acceptance. However, factors such as gender, socioprofessional category and marital status appear to have a limited impact on willingness to participate, which may indicate that more systemic approaches are needed to encourage community participation. These findings are part of a broader theoretical framework that emphasizes the importance of education, inclusiveness and socioeconomic contexts in development and planning processes.

6. Conclusion

The study of endogenous and exogenous factors influencing urban planning and the sustainability of secondary cities in Chad, particularly in the case of the city of Pala, highlights complex dynamics shaping urban development in a rapidly changing context. The results reveal that elements such as the quality of institutions, local governance and civic engagement play a crucial role in the success of urban planning initiatives. Indeed, effective and inclusive governance fosters greater consideration of citizens' needs, which is essential for ensuring the acceptance and sustainability of urban projects. At the same time, exogenous factors such as economic constraints, rapid urbanization and environmental impacts pose significant challenges to the sustainability of the city of Pala. Urbanization, while a driver of development, also leads to increased pressure on urban infrastructure and services, exacerbating inequalities and environmental problems.This study is far from being a barrier to previous research, but rather a contribution to existing literature in the field of urban planning. It is done exclusively within the framework of this unique doctoral thesis in urban planning. In perspective, it is therefore imperative that decision-makers adopt a holistic approach that integrates both endogenous and exogenous dimensions in urban planning. This means not only improving the quality of institutions and strengthening citizen participation, but also developing strategies tailored to local realities and global challenges.

The results obtained could serve as a benchmark for other cities in Chad and sub-Saharan Africa facing similar challenges, helping to improve good urban planning practice in the sub-region. Furthermore, time and resources are limited for a detailed analysis of the various factors hindering the implementation of the reference urban plan and urban governance documents. An exploration of citizen participation mechanisms in other urban contexts in Chad and sub-Saharan Africa, in order to identify models of best practice adapted to each city, would be relevant. A more in-depth analysis of the interactions between planning actors could shed light on urban governance. Ultimately, research into the impact of public policies and international funding for the implementation of urban plans would be useful in ensuring the sustainability of secondary cities like Pala. It is therefore essential to promote urban planning policies that are both inclusive and resilient, capable of meeting current needs while anticipating future challenges. Such an approach will not only help to improve the quality of life of inhabitants, but also to ensure sustainable and equitable urban development in the Chadian context.

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References

Abdoulaye, M. (2016). Investment in Africa: Some positive effects on growth and obstacles facing investment. International Journal of Social Science and Humanities Research.

Actors, N. P. D. (2022). Benin/Communal Development Plan 4th generation: Winning the battle of local planning by aiming far. Availbale online: https://jumelages-partenariats.com/en/actualites.php?n=17523 (accessed on 11 November 2024).

Allarané, N., & Mahamat, H. H. (2024). Outils d'urbanisme comme instruments de fabrication de la ville de N'Djaména (1990 à 2023). Available online: https://revues.imist.ma/index.php/AMJAU/article/download/48673/26222/140033 (accessed on 11 November 2024).

Allarané, N., Atchadé, A. J., Azagoun, V. V. A., et al. (2023). Assessment of Climate Risks, Vulnerability of Urban Health Systems, and Individual Adaptation Strategies in the City of N'Djaména (Chad). Climate, 12(1), 5. https://doi.org/10.3390/cli12010005

Allarané, N., Vidjinnagni Vinasse, A. A., Assouhan, J. A., et al. (2023). Urban vulnerability and adaptation strategies to recurrent climate risks in Central Africa: evidence from the city of N'Djaména (Chad). Urban sciences.

Arnstein, S. R. (1969). A Ladder Of Citizen Participation. Journal of the American Institute of Planners, 35(4), 216–224. https://doi.org/10.1080/01944366908977225

Baker, J. (2018). Introduction to the Sustainable Development Goals (SDGs). Pressbooks.

C, A., J, M., & E, C. (2007). Evaluation de l'impact du programme de rénovation urbaine: étude de la région métropolitaine de santiago 1991-2006. Ministère du Logement et de l'urbanismede santiago. Santiago.

Chénal, J. (2014). The West African city: urban space and urban planning models (French). EPFL presse.

Christophe, B. D., Femke, R., Giovanni, B., et al. (2017). Expansion future des terres urbaines et implications pour les terres cultivées mondiales. National Library of medicine.

Cirolia, L. R., & Berrisford, S. (2017). 'Negotiated planning': Diverse trajectories of implementation in Nairobi, Addis Ababa, and Harare. Habitat International, 59, 71–79. https://doi.org/10.1016/j.habitatint.2016.11.005

Climatize. (2022). Development of Smart Cities—A Sustainability Objective. Available online: https://www.climatize.ae/development-of-smart-cities-a-sustainability-objective/ (accessed on 11 November 2024).

Cohen, B. (2005). Urbanization in developing countries: Current trends, future projections, and key challenges for sustainability. Technology in Society.

Duranton, G. (2015). Growing through Cities in Developing Countries. The World Bank Research Observer, 30(1), 39–73. https://doi.org/10.1093/wbro/lku006

Evans, B., Elisei, P., Rosenfeld, O., et al. (2016). HABITAT III—Toward a New Urban Agenda. DisP—The Planning Review, 52(1), 86–91. https://doi.org/10.1080/02513625.2016.1171053

Faludi, A. (2004). The Impact of a Planning Philosophy. Sage Journals.

Frank, F. (2000). Citizens, Experts, and the Environment: The Politics of Local Knowledge. Duke University Press.

Frederick, C. C. (2013). The keep, the institutional repository of Eastern Illinois University. Available online: https://thekeep.eiu.edu/theses/1174/ (accessed on 11 November 2024).

Frick, S. A., & Rodríguez-Pose, A. (2018). Change in urban concentration and economic growth. World Development, 105, 156–170. https://doi.org/10.1016/j.worlddev.2017.12.034

Hameed R., Nadeem O. (2008). Challenges of Implementing Urban Master Plans: The Lahore Experience. World Academy of Science, Engineering and Technology.

Humain-Lamoure, A. L., & Laporte, A. (2017). Chapter 1. The city: a complex object to understand (French). Dans Introduction à la géographie urbaine.

Ibrahim, A. N., & Elhadi, A. (2024). Urbanisation in Sub-Saharan Cities and the Implications for Urban Agriculture: Evidence-Based Remote Sensing from Niamey, Niger. Urban Science, 8(1), 5. https://doi.org/10.3390/urbansci8010005

Iléri, D., & Follygan, H. (2016). Problèmes de sous-équipement et stratégies d'assainissement à Notsé (Togo): Acteurs et enjeux de la gestion des services urbains. Cahiers du Centre Béninois de la recherche scientifique et Technique (CBRST).

Jean Claude, B., & Abigael, K. (2011). Technologie et villes: Quel type de développement pour les villes du Sud?. Journal de technologie urbaine.

Jiho, J., & Seungkwon, Y. (2004). Does Political Instability Matter? U.S. Foreign Direct Investment (FDI) Policy and Political Instability in Korea. Korean Social Science Journal.

Karen, C., Burak, G., & Lucy, R. (2012). Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon reservoirs. NEXUS PNAS.

Karen, C., Roberto, S. R., & Michail, F. (2010). The New Geography of Contemporary Urbanization and the Environment. Annual Review of Environment and Resources, 35(1), 167–194. https://doi.org/10.1146/annurev-environ-100809-125336

Kathryn, M., & Amy, E. (2007). Effects of Social Desirability on Students' Self-Reporting of Partner Abuse Perpetration and Victimization. Violence and Victims, 22(2), 243–256. https://doi.org/10.1891/088667007780477348

Kuddus, M. A., Tynan, E., & McBryde, E. (2020). Urbanization: a problem for the rich and the poor?. Public Health Reviews, 41(1). https://doi.org/10.1186/s40985-019-0116-0

Lal, R. (2001). Soil degradation by erosion. Land Degradation & Development, 12(6), 519–539. Portico. https://doi.org/10.1002/ldr.472

Leonardo, J. R., & Angéla, I. G. (2020). Sustainability and Resilience in Smart City Planning: A Review. Sustainability.

Manizhe, J., Fatemeh, V., Hamidreza, A., & Noshin, J. (2024). The level of awareness and attitude of residents over 18 years of age in the villages covered by the health and treatment center in two rural areas in Zanjan province regarding the ways of brucellosis transmission. Oncologie et radiothérapie.

Mansuri, G., & Rao, V. (2013). Localizing Development. The World Bank. https://doi.org/10.1596/978-0-8213-8256-1

Maulat, J. (2020). Urbanisme et aménagement. Armand colin, 213–232. https://doi.org/10.3917/arco.bogno.2020.01.0213

Mejia, R., & Camacho, C. L. (2020). Lineamientos para la inserción de restricciones ambientales en el ordenamiento territorial de la periferia de Maracaibo. Available online: https://www.academia.edu/12678148/Lineamientos_para_la_inserci%C3%B3n_de_restricciones_ambientales_en_el_ordenamiento_territorial_de_la_periferia_de_Maracaibo (accessed on 10 November 2024).

Ministère de l'Aménagement du Territoire, D. D. (2011). Rapport définitif des Plans urbains de référence des villes du Tchad. N'Djaména: STUDI International.

Nallathiga, R. (2015). Assessing the Role of Master Plans in City Development: Reform Measures and Approaches. Political Science.

Ndouba, M. H. (2023). Urbanisation au Tchad: une croissance anarchique malgré des ressources pétrolières. Available online: https://www.alwihdainfo.com/Urbanisation-au-Tchad-une-croissance-anarchique-malgre-des-ressources-petrolieres_a120726.html (accessed on 10 November 2024).

Negeri, M. D., Guta, M. S., & Erena, S. H. (2023). Determinant factors hinder urban structure plan implementation: The case of Nekemte Town, Ethiopia. Heliyon, 9(3), e13448. https://doi.org/10.1016/j.heliyon.2023.e13448

Nguémadjita, R. (2024). Occupation Des Espaces Non Planifiés Et Mutations Territoriales Dans La Ville De Pala. Dans Thèse de doctorat en géographie. Cameroun: Université de Maroua.

Okeked, C. (2015). African Approaches to Spatial and Green Planning. Environmental Science, Geography, Sociology.

Pickcance, C. (1982). Physical Planning and Market Forces in Urban Development. Geography, Economics, Sociology.

Pimentel, D., Harvey, C., Resosudarmo, P., et al. (1995). Environmental and Economic Costs of Soil Erosion and Conservation Benefits. Science, 267(5201), 1117–1123. https://doi.org/10.1126/science.267.5201.1117

Pribadi, D. O., & Pauleit, S. (2015). The dynamics of peri-urban agriculture during rapid urbanization of Jabodetabek Metropolitan Area. Politique d'aménagement du territoire.

Profilo, V. (2024). Biophilic cities. Available online: https://verdeprofilo.com/en/biophilic-cities/ (accessed on 11 December 2024).

Purvis, B., Mao, Y., & Robinson, D. (2018). Three pillars of sustainability: in search of conceptual origins. Sustainability Science, 14(3), 681–695. https://doi.org/10.1007/s11625-018-0627-5

Putman, R. D. (2000). Bowling Alone: The Collapse and Revival of American Community. APA PsycInfo.

Raphaël, A. A., Owusu, A., Charles, P., & Stephen, A. T. (2019). A review of practices for sustaining urban and peri-urban agriculture: Implications for land use planning in rapidly urbanising Ghanaian cities. Land Use Policy.

Renard, K. G. (1997). Predicting soil erosion by water: A guide to conservation planning with the Revised Universal Soil Loss Equation (RUSLE). USDA Agricultural Research Service, Agriculture Handbook.

Ruiz, P. A., & Josep, L. T. (2015). Rethinking the city: strategies for sustainable urban development in Latin America's medium-sized cities (Spanish). Revista Nodo.

Saint Lucia Fisher Folk Cooperative Society Ltd. (2024). Value addition/Creation of organic bio-stimulants for the agriculture industry using Sargassum seaweed which has an environmental, economic and social impact in a poor region of Saint Lucia. Available online: https://www.equatorinitiative.org/2017/06/21/value-addition-creation-of-organic-bio-stimulants-for-the-agriculture-industry-using-sargassum-seaweed-which-has-an-environmental-economic-and-social-impact-in-a-poor-region-of-saint-lucia/ (accessed on 2 November 2024).

Sakketa, T. G. (2023). Urbanization and rural development in sub-Saharan Africa: a review of pathways and impacts. Research in Globalization.

Sambo, DC. (2012). Assessment of the performance of small-scale water infrastructure (SWI) for multiple uses in nebo plateau, Sekhukhune District, South Africa. University of KwaZulu-Natal. Available online: https://efwe.ukzn.ac.za/wp-content/uploads/2021/11/Sambo_C.pdf (accessed on 11 November 2024).

Santoso, S. (2021). Relationship between Social Media, Organizational Support, Subjective Norms and Perceived Behavioral Control to Form Entrepreneurial Intention. Expert Journal of Business and Management.

Satterthwaite, D., McGranahan G., Tacoli, C. (2010). Urbanization and its implications for food and farming. Société royale.

Schultz, T. W. (1961). Investment in Human Capital. The Free Press. London: Collier-Macmillan.

Silva, C. N. (2015). Urban Planning in Sub-Saharan Africa. Routledge.

Sunkavilli Ravi, K., Yudheera, K., Yella, R., et al. (2023). Association between periodontitis and preterm low birth weight in human immunodeficiency virus seropositive pregnant women in India: A cohort study. Journal of Family Medicine and Primary Care, 7830-7835. https://doi.org/10.4103/jfmpc.jfmpc_1203_22

Teadoum, N. F., Tob-Ro, N., Allarané, N., et al. (2024). Factors hindering the implementation of urban planning tools in Central Africa: Case study of reference urban plan for Sarh Town (Chad). Journal of Infrastructure, Policy and Development, 8(13), 8409. https://doi.org/10.24294/jipd8409

UN. Population Division. (2014). World Urbanization Prospects: The 2005 Revision. Etats Unis: Google scholar.

UN-Habitat. (2014). A New Strategy of Sustainable Neighbourhood Planning: Five principles - Urban Planning. Nairobi.

Veolia, I. (2021). Water, waste, energy: what future for essential services in Africa? (French). FACTS Reports.

Véron, J. (2020). Should we be afraid of the world's population? (French). Points Essais.

W, H. (2008). How Urban Planning Works?. howstuffworks.

Wei, Y. D., & Ewing, R. (2018). Urban expansion, sprawl and inequality. Landscape and Urban Planning.

Weiss, R. D. (2022). Civic Engagement and Participation in the 21st Century. Journal of Community Development.

WH, W., & DD, S. (1960). Équation universelle de perte de sol. Amérique: ministère américain de l'Agriculture .

Wischmeier, W., & Smith, D. (1978). Predicting Rainfall Erosion Losses: A Guide to Conservation Planning. Environmental Science.

World Urbanisation. (2018). Revision of World Urbanization Prospects. Available online: https://www.un.org/en/desa/2018-revision-world-urbanization-prospects (accessed on 11 November 2024).

Yemmafouo, A. (2013). Urbanization and peri-urban spaces in sub-Saharan Africa (French). Cameroun.

Yvonne, R., Ana, B., Michael, D., et al. (2012). Shaping cities for health: complexity and the planning of urban environments in the 21st century. Elsevier.

Zheng J. J., Kamal A. M., & Ullah, A. (2020). The direct and indirect effects of China's wastewater treatment service on urban household wastewater discharge. Groth and changes.