



Topographic Variation and Suburbanization Currents: A Comparative Analysis of the South Western and the North Eastern Fringes of Dschang, Cameroon

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Suburbanization is a facet of the development and extension of cities characterized by growth poles and suburban zones at the detriment of the Central Business District which gradually becomes depopulated. While significant evidence on the human triggers of this process exists, the role

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played by physical factors has seemingly received less attention in the literature. To close the research gap, this paper uses the case of Dschang to analyse the patterns of topographic differences as a precursor of variations in suburbanization. Using the northern and southern borders of the city, relief data was collected through a combination of satellite imagery and field georeferencing. For georeferencing, GPS (Garmin 65) was used to generate topographic data while landsat imagery 2022 was used to generate data on land use/land cover. In addition, data on the differential trends of suburbanisation in the northern and southern borders were gathered through field observations. Altitude, slope gradient and land uses were among the quantitative data collected while the perception that influence the growth of suburbia represented qualitative data. The results of the qualitative and quantitative data analyses showed that the truncated relief in the south western part characterized by the escarpment is a strong impediment to suburbanization due to limited technology. This has contributed to a truncated suburbanization and a high risk of environmental hazards as some urban dwellers continue to settle in rugged and non-constructible zones toward the south western part of Dschang. In addition, the relatively gentle relief to the north-east has favoured suburbanization leading to the multiplication of suburban zones characterized by the leap-frog of urban activities. It was also established that the southern western part is characterized by sparse settlements and rangelands while the north-eastern fringe is dominated by growth poles which continue to leap-frog north-eastward. The study recommends the provision of utilities, a stringent planning and control of land use in the suburban to avoid future anarchy.

Keywords: Suburbanization currents; comparative study; borders; western highlands and dschang.

1. INTRODUCTION

The Western Highlands is a rapidly urbanizing area with eight Divisions and forty Sub Divisions. The rapid urbanization in Dschang in particular and the Bamelike Plateau in general is accentuated by the population explosion which contributes to the emergence of suburbs and urban sprawl. According to Fogwe and Njong (2018), the Western High Lava Plateau is a high population cluster and one of the highest population density areas in Cameroon. The population of Dschang is 112405 inhabitants characterized by an average density of 429 pers/km² built on a surface of 262km². This paper uses the case of Dschang to analyse the pattern of topographic differences as a precursor of variation in suburbanization. Suburbanization is a function of the physical environment, decentralized planning and urban sprawl. The growth of suburbs in Dschang is inextricably linked to topographic variation and urban sprawl. There is a significant difference between the relief in the south western part and that of the north eastern section of the town which has impacted the urbanization of the town. The south western part of the Dschang overlooking the escarpment is rugged and characterized by incised valleys and steep slopes whereas the north eastern fringe is dominated by broad-based valleys and relatively gentle slopes. Jauthiainen (2013) and Hegedus *et al.*, (2023) reported that suburbanization has different tendencies wherein some areas proved to be continuously dynamic

in the urban fringes. Some urban fringes are characterized by agricultural territories while others are dominated by rapid densification and the extension of the built-up areas. On the basis of typology, Jauthiainen (2013) identified modern suburbs which include terrace suburbs, villa suburb, industrial and working-class suburbs, garden suburbs, extended suburbs, suburban sprawl and shanty town suburban areas. The centrifugal nature of urban processes is related to urban growth and population growth with patterns determined by several factors including topography. Petrov and Petar (2020) and Terbeck (2020) have established that in Europe, the definition of suburbanization processes differ from one country to the other.

Suburbs draw the attention of urban geographers because they are arenas for contemporary social, economic, administrative and political issues. Suburbanised areas are settlements located adjacent to major cities as a result of leap frogging. Suburbanisation is a determining element in spatial development in several countries of the world. In Germany, suburban spaces are treated as components of metropolitan regions (Markus, 2018). In most developed countries, suburbanization emanates from urban or regional planning policies but in developing countries, suburbanisation is the brainchild of planning mistake or other physical factors. According to the OECD/UNECA/AfDB (2022), urbanization and suburbanization are among the most profound transformations that

was analysed using quantitative and qualitative approaches. Qualitative data analysis included the description and interpretation of field observations of land use pattern, urban sprawl and the truncated growth of suburbs. Quantitative analysis was used to analyse topographic and land cover data while the qualitative approach was used to analyse the trends and perception of suburbanization. Dschang extends from latitude 5°25'0"N to 5°27'30"N and lies between longitude 10°2'30"E and 10°5'0"E. Dschang is bounded to the south by Santchou, to the north by Bafou, to the east by Nkongni and to the west by Fotetsa. The population of Dschang is 445792 inhabitants (Ngwaimbi, 2023). Dschang is sited on a rugged landscape overlooking the escarpment while trade and education are the major functions of the town. Fig. 1 shows the study area.

The south western and the north eastern sections of the town of Dschang were considered for the study due to their variations in topography and the growth of suburbia. The analysis showed the influence of topography on suburbanization. The rapid urbanization of Dschang is bringing pressure to bear on land and other resources thus causing activities to leap-frog to the peripheries.

3.RESULTS

Topographic variation has played a significant role in the development of suburbs in Dschang. The development of transport network, the social and economic conditions of the town have led not only to suburbanisation but also to urban sprawl.

3.1 Processes of Suburbanisation in the South West and North East of Dschang

Dschang was founded in 1903 by the Germans (Tsafack, 1986) and by 1920; it became the capital of the Bamelike Region. In 1960, the capital of the Bamelike Region was transferred from Dschang to Bafoussam. Dschang town started from two historic core areas or growth poles namely; Foreke and Foto. Suburbanization in the south-western and north-eastern fringes of Dschang is largely dominated by the processes urban sprawl and decentralization. The processes of suburbanization are limited to the south west by rugged topography and the escarpment. The north eastern section of the

town is characterized by urban sprawl and the emergence of suburbs as a result of accessibility and not too rugged relief. Some activities and services have been decentralized and such have created growth poles amidst the rapidly growing population. The creation of the Food Market, the police post, Diamond Travel Agency and a myriad of shops in Ntsingveum south of Dschang has contributed to the growth of the suburb in the area. The growth of Minka, Mindong and Tsingsop to the south west of Dschang is the result of urban sprawl.

Urban sprawl and decentralized administrative services are major processes which underpin the growth of suburbs in the north eastern border of Dschang. The creation of Foto Market, GHS Touladjong, Travel agencies, the new park, shops and residential areas has contributed to the growth suburbs such as Foto, Baleng, Baleving, Carrefour Mbouh and Keleng located to the north east of Dschang. Suburbs are accompanied by private and public services, residential facilities and commercial activities. The changing land values in city centre are responsible for the rapid growth of suburbs in the periphery of Dschang especially toward the north east of the town. Table 1 shows the public and private drivers of suburbanization in Dschang.

The drivers are the nucleus of the suburbs and the pioneer land uses of suburbanization in Dschang. In the process of suburbanization there is decentralization of people, services, employment and varying land uses amidst urban sprawl. In addition, urban sprawl and suburbanization are also driven by in-migration from the country side to the city.

3.2 Influence of Topographic Variations on Suburbanization in Dschang

Comparatively, it was established that the town of Dschang has been witnessing suburbanization currents in recent years but which has been impacted by topography variations in its southern and northern fringes. The suburbanization currents in Dschang town have been completely short-circuited to the south by the presence of a massive escarpment with steepness of about 10°. The study revealed that, it was only after the construction of Dschang-Mélong road that a few growth poles and settlements propped up in the southern part of Dschang. The zone of the escarpment was found to be characterized by incised valleys and steep slopes which render construction of dwellings not only impracticable

Table 1. Drivers of suburbanization

Suburbs	Public services	Private activities
Tsingfveum	Food Market, police post, Car park	Hotels, shops, Bus stop, eatries, Residents, health
Foto	Market, Police post,	Hostels, hotels, shops, reidents, brewery depots, micro finance
Baleng	Schools	Bus Stops, beer palours, shops,
Keleng	Schools,	Hostels, Hotels, residents, stores
Baleving	Schools, hospitals, gendarme post, police post, council, toll gate, market	Snacks, shops, residents, health centres, welding shops, garages
Douzem	Market, Buchery	Motels, welding shops, garages
Ndzingsop		Welding shops, micro finance
Letieu	Police post, schools, micro finance	Residents, stores, sand depots

Source: Field investigation (2024)

but risky and hazardous. Dschang town which is the Headquarters of the Menoua Division is completely severed from Santchou which is the nearest Sub Division to the capital by the Foreke escarpment. The spatial pattern of suburbanization in the southern limit of Dschang has been hall-marked by topographic variations. It revealed that the ridge-like feature that stretches from Dschang to Litieu on which the Dschang-Mélong road was constructed is characterized by steep-sided cliffs unfavourable for settlement. The rugged nature of topography in this part of the town sets a limit to suburbanism in the southern borders of Dschang. This zone is characterized by deeply

incised valleys, some of which are dry, rounded convex slopping hills and rocky outcrops.

It was established that Fossong-Wentcheng, Fotetsa and Fonakeukeu which are localities under Dschang Central Sub Division are completely severed from the town by rugged relief. The escarpment which extends from the South-east to the north-west of the town has separated these localities from the administrative unit (Dschang Central Sub Division). The mountainous topography to the south of Dschang makes the construction of houses a daunting task. The small locality of Litieu overlooking the

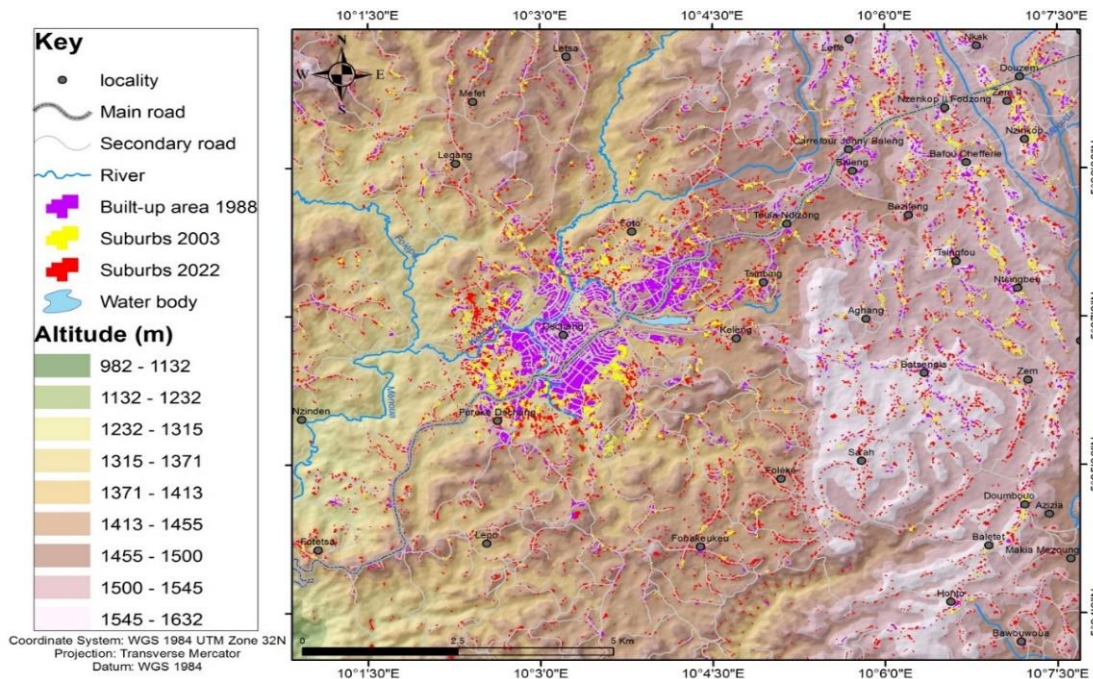


Fig. 2. Topographic variation and suburbanization in Dschang

Source: Field investigation (2024)

Table 2. Variation in the bid rents and price of land with distance from the city

Locality	Average Distance from the CBD (km)	Average Rents (fcfa)	Average price of land (fcfa/m ²)
CBD	0-1	50000	25000
Ndzingsop	3	17000	10000
Minka	2	25000	15000
Baleng	4	20000	8000
Ndouzem	6	15000	5000
Ntsingfveum	2	30000	15000
Baleving	3	20000	4000
Keleng	2	25000	12000
Fotetsa	5	10000	3500
Entre Cheferie	4	15000	7000
Bafou			

Source: Field investigation (2024)

escarpment was found to be a suburban spot with a bleak future since chances of growth and expansion are slim due to the rugged nature of relief which is not favourable for construction. Fig. 2 shows topographic variation and suburbanization in Dschang.

The rugged and mountainous terrain to the south-eastern borders of Dschang with average altitude of 1500m has put a limit to activities leap-frogging from the center of the town as shown on Fig. 2. The north eastern portion of Dschang has a higher altitude (1300m-1500m) on average but characterized by a relatively uniform topography. On the contrary, the south western section has a lower altitude (900m-1300m) but characterized by steep slopes, incised valleys and rugged relief. The rough terrain to the south west inhibits the sprawling and the growth of suburbs whereas the town extends north eastward characterized by the growth of suburbs.

It was observed that the north-western axis of Dschang is characterized by a myriad of suburban centers. This was explained by the relatively uniform relief and accessibility. The average altitude in the north-western frontier of Dschang ranged from 900m to 1300m. It was found that this part of the town is not as dissected by streams as the south-eastern portion. This makes the zone favourable for settlement. Over 90% of the suburban centers are located in the north-eastern section of Dschang within a perimeter of 5km to 10 km at the periphery of Dschang. For example, pronounced suburban centers to the north-western border of Dschang include, Ndouzem, Baleng, Keleng, Batchinglah and Foto. It was realized that the process of suburbanization is accompanied by social and economic activities

which are flourishing in the suburbia. It was established that the churches, schools, bars, eateries, building material shops and petty trading are battling for space in the area.

3.3 Variations in Bid Rents

It was revealed that bid are high in the Central Business District (CBD) with the exception of zones within the city which have suffered from inner city decay like part of the town in the vicinity of Marche B and the Haousa Quarters. The rents on real estate property fall with increasing distance from the city centre. This implies that only businesses and land use activities with the ability to afford for the high land rents are allowed to locate in the CBD. Real estate on the high streets of Dschang are expensive and only businesses with a high turnover such banking services, bakeries, large shopping centres,, building material stores wine shops, pharmacies, fast food restaurant and electronic shops. These land uses compete with the limited space available and are willing to pay high bid rents to stay in the CBD where they have high accessibility. It was established that businesses which do not have the requisite financial power naturally relocate to the periphery hence contributing to the growth of suburbs. Table 2 shows the decline of bid rents with increasing distance away from the city centre.

Findings revealed that the suburbs under the sphere of influence of Dschang are characterized by small-scale commercial activities which do not have the financial power to sustain rents in the Central Business District (CBD). These activities include; small provision stores butcheries, light-weighted garages, building materials, food stuff, gardening and residential areas. Findings

indicated that the spatial configuration of bid rent was not uniform due variation in topography even within the urban area. The poor urban dwellers occupied the inaccessible risk zones within the town because that is the best they can afford for in order to carry out life-sustaining activities.

It was revealed that land values and bid rents have risen in recent years in the Central Business District of Dschang thus making less viable activities to the suburbs. Baleng and Ndouzem are rapidly growing suburbs characterized by several urban activities. Foto and Foreke were once suburbs of Dschang but Urbanisation and urban sprawl have led to their coalescence thereby forming integral neighbourhoods of Dschang. Meanwhile Keleng remains severed from Dschang not because of topography variation but due to presence of the Airstrip and the Municipal Lake. Keleng and Badzinglyah are two very buoyant suburbs with functional role being dominantly residential. It was found that Baleng is linked to Dschang by relatively gentle topography but has remained a suburb today due to the hoarding of land by the people of that locality. The Baleng people have a long standing tradition of not selling land to strangers. At worst, they sell land among themselves.

It was established that bid rents and land values decrease with increasing distance from the center of Dschang town and therefore petty businesses are leap-frogging to take advantage of the affordable land values and favourable bid rents in the outskirts of the town, Nkumbesone, (2019 and 2002). As bid rents and land values fall from the city centre to the peripheries, suburbs become attractive to many retail activities. Several traders and residents move to the suburbs where land is affordable and rents are significantly low. It was observed that some suburbs which are nearest to the city centre have had spillover effects of increasing land values. This is the case of Ndzingmfvem, Keleng and Minka-Foreke which enjoy a high degree of accessibility. Distant suburbs such as Baleving located to the north-east of Dschang and Fotetsa are relatively accessible but do not fetch high land values because they are considered to be located typically in rural areas.

3.4 High Accessibility in the North East of Dschang

It was revealed that the north-eastern part of Dschang harbours 70% of the suburbs due to

accessibility. The Bafoussam-Dschang highway has increased accessibility and encouraged the growth of suburbia. Businesses located along this axis are easily supplied with goods and services since they are along a busy highway. Cement, iron rods and corrugated iron sheets which are heavy items are delivered to the shop keepers with ease. Fig. 2 shows a north-east orientation of suburbs from Dschang town along the Bafoussam-Dschang road. The major suburbs along this road are Baleng, Ndouzem and Baleving. The study revealed that new suburbs are being established, especially the one at Carrefour Mbouh due to the Dschang-Mbouda Highway via Batcham whose construction was completed in 2023. As traffic gets busy on that road, several suburbs characterized by petty businesses are cropping up and enriching Dschang suburbia. It was realized that the south-western part of Dschang has few suburbs due to the rugged nature of the area characterized by the escarpment, incised valleys and steep slopes while the north-eastern section is dominated by suburbs favoured by the relative level terrain and the road network. The more accessible areas to the north east of Dschang are witnessing increasing growth of suburbs. Most suburbs are unplanned characterized by the occupation of marginal lands by different land uses such as cliffs, marshes and steep slopes.

4. DISCUSSION

The objective of this study was to demonstrate that topographic variations have influenced suburbanization currents in the south western and north eastern fringes of Dschang. It was realized that the rugged relief and the presence of the massive escarpment to the south west of Dschang have led to truncated urban sprawl and limited the extension of decentralized services toward this direction. The few suburbs located to the south west of the city find it difficult to develop or grow in a truncated manner due to poor topography which has rendered the construction of infrastructure costly. On the other hand, the north eastern section of Dschang is characterized by relatively flat relief which enables the town to grow and extend this direction. In addition, the Bafoussam-Dschang High Way has also given north east of Dschang good accessibility which allows the growth of suburbs. What is more, high land values and rising bid rents have contributed to the centrifugal movement of people, employments and services to occupy lands relatively affordable in the

peripheries. The south western fringes of Dschang requires a more adapted technology of terracing, building of embankments and retaining walls to make the area habitable. Fombe and Acha (2020) and Mbanga *et al.*, (2021) reported that land use dynamics and variations are the products of urban sprawl and suburbanization. Mullard and Salles (2021) posited that topographic variations is a strong deterrent to urban development while Jauthiainen (2013) and, Petrov and Petar (2020) pointed out that explosive growth of world urban population is inextricably linked to suburbanization. In developing countries, environmental determinism is still a major factor in defining settlement locations due to low technology. This explains why the rugged topography in the south western border of Dschang is a limiting factor to the growth of suburbs. Hegedus *et al.*, (2023) Nzoffou *et al.* (2020) drew attention to the different tendencies of intra-urban suburbanization in which some areas are continuously dynamic with densification and extension of built-up areas at the fringes. Terbeck (2020) argued that political boundaries of inner-city and regional variation in metropolitan structure are important characteristics that need to be considered when selecting suburb definition. Aggergaard *et al.*, (2021) concluded that between villages and towns are suburbs characterized by small-scale business activities.

5. CONCLUSION

Suburbanisation currents in the south western and north eastern sections of Dschang bear significant differences due to topography variations. The south western corridor dominated by rugged terrain and the steep-faced escarpment has limited the growth of suburbs toward this area. The only prominent suburbs toward this direction are Minka-foreke and Ndzinsop as well as the last at the check point overlooking the escarpment. Though Dschang-Melong Highway is a favourable factor for the growth of suburbs in the south western section of the town, the roughness of the landscape is a limiting factor. Conversely, the north eastern part of the town has a relative flat landscape which is favourable for settlement and consequently, the growth of suburbs. Suburbanisation currents toward the north east of Dschang are highly remarkable and characterized by 80% of suburbs. In addition to the favourable landscape, Dschang-Bafoussam road has made the area quite accessible. Major suburbs found toward the north east of Dschang include; Baleng, Baleving,

Entrée Cheferie Bafou, Carrefour St Laurent and Ndouzem. These suburban centres are dominated by urban and semi-urban activities. Suburbanisation currents in Dschang are accentuated by rising land values in the city, the need for space and affordable land in the periphery. As the suburbs grow and coalesce with the city, urban disorder set in due to poor planning. The study therefore recommends that municipal authorities and stakeholders embark on stringent urban planning measures, the provision of utilities and the control of land use including the suburbs in order to avoid future chaos. The non-constructible and rugged zones in the South Western fringe of Dschang should be identified and urban dwellers prohibited from settling on them while environmental friendly trees are planted therein.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Authors hereby declare that NO generative AI technologies such as large language Models (ChatGPT, COPILOT etc and text-to-image generators have been used during the writing or editing of this manuscript

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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