



Anarchical Periurbanisation and Environmental Management in Nkoabang (Center Region-Cameroon)

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ABSTRACT

Urban sprawl and anarchical periurbanisation in Nkoabang have posed problems of environmental management. This is linked to poor urban planning policies, with the occupation of risk zones, inadequate dumps sites, pollution, absence of drains, difficult access to potable water resources and extinction of biodiversity. This has necessitated the collection of secondary and primary data via documentary research, observation, surveys and interviews. Manual and computerized processing of collected data as well as their analysis helped to obtain results for the production of maps and tables via software's like ARCGIS, Word, Excel and SPSS (Statistical Package for the Social Sciences). Findings revealed that, environmental management problems in Nkoabang of which occupation of ecological fragile zones with risks of flooding, difficult access to potable water, poor wastes disposal, poor drainage and extinction of biodiversity is as a result of its anarchical periurbanisation process. Wherein the need for a sustain town and environment that will pass through state and individual policies, of which rules and regulations in favour of environmental protection, the consumption of more renewable resources and wastes recycling amongst others.

Key words: Anarchical periurbanisation, Environmental Management, Urban Planning, Sustain town

1. INTRODUCTION

The 21st century is marked with more than half of world's population living in urban centers (Dauvergne, 2011). According to the United Nations Population Fund (UNFPA, 2007); a majority of the world's population, about 3,3 billion peoples nowadays live in cities. In a United Nations report of 1953, 30% of the global population lived in urban centers, in 2008 it reached 50% and an estimated 70% is projected to live in cities by 2050 (UN, 2007a; Amao, 2012). Publications like the UNFPA (United Nations Population Fund) report 2007 emphasize on opportunities of urban growth (UNFPA, 2007) and people's right to live in the city. Urban growth is faster in less developed countries where economic and institutional limitations restrict local governments to manage it (Philippe, 2005) and urbanization creates a tremendous spatial phenomenon since the last century especially for countries of the south (Rahayu and Mardiansjan, 2018). It is one of the most powerful and visible anthropogenic forces (United Nations Human Settlements Programme-UN-Habitat (2016), often termed in less developed countries as "over-urbanization", meaning population growth in urban areas is much greater in speed and scale than anything experienced by industrialization. Bahr defines urbanization as the increase, expansion or enlargement of cities according to their number, area or inhabitants in absolute terms as well as in relation to the rural population and non-urban settlements (Bahr 2004). It involves the development of peri-

urban areas which could be defined as transitional zones between cities and rural areas (Rahayu and Mardiansjan 2018). This kind of uncontrolled urban growth is related to several environmental problems in developing countries like Cameroon and the increase in demands of urban land can produce disordered and unsafe urban settlements and urban encroachments in non-developable areas like farmland or fragile ecosystems, a challenge for sustainable development objectives.

Urban sprawl is the result of the expansion of urban buildings above their boundaries or over their periphery. Nowadays, urban sprawl is probably one of the most remarkable phenomena of urban dynamics in sub-Saharan African countries wherein, most big African towns are subjected to a remarkable spatial mutation (Redman and al., 2004). These towns expand towards their peripheries (Dauvergne, 2011), leading to uncontrolled urban growth rates and anarchical periurbanisation. If the periurban land is considered as land tenure reserves for town's expansion and its valorization deriving from plan regional projects in most developing countries, its dynamics and management raises a lot of concerns (Tchékoté and Ngouanet, 2015). Nkoabang is a periurban at the eastern periphery of Yaounde where anarchical periurbanisation is at its peak. Its proximity to Yaounde, its geographic and economic situation favour massive population movements on its grounds, leading to uncontrolled periurbanisation with significant environmental management problems (occupation of risk zones, illegal dumps, poor canalization of used waters and extinction of biodiversity).

2. Research methodology

2.1. Choice of study area and sample

Our study focuses on Nkoabang which is found in the eastern periphery of Yaounde (Fig 1), located between two planned urban zones MAETUR (Mission d'Aménagement ET Equipement de terrains Urbain ET Ruraux) Nkomo and MAETUR Mimboman. Geographically, Nkoabang is situated between latitude $4^{\circ} 38' 00''$ N and longitude $12^{\circ} 31' 00''$ E and covers an assembly of quarters of the subdivision, including Nkolo1, Nkolo2, Nkolo3, Biteng, Bitotol, Lada1, Lada2 in Nkolafamba subdivision and Mefou-and-Afamba division of the center region of Cameroon. It is characterized by a plain surface, some hilly areas and few valleys (Tchékoté and Ngouanet, 2015). The choice of Nkoabang as observation unit is due to its proximity and reliance on the city Yaounde on one hand and due to the city's great influence on its environment (Tchékoté and SA'A, 2019).

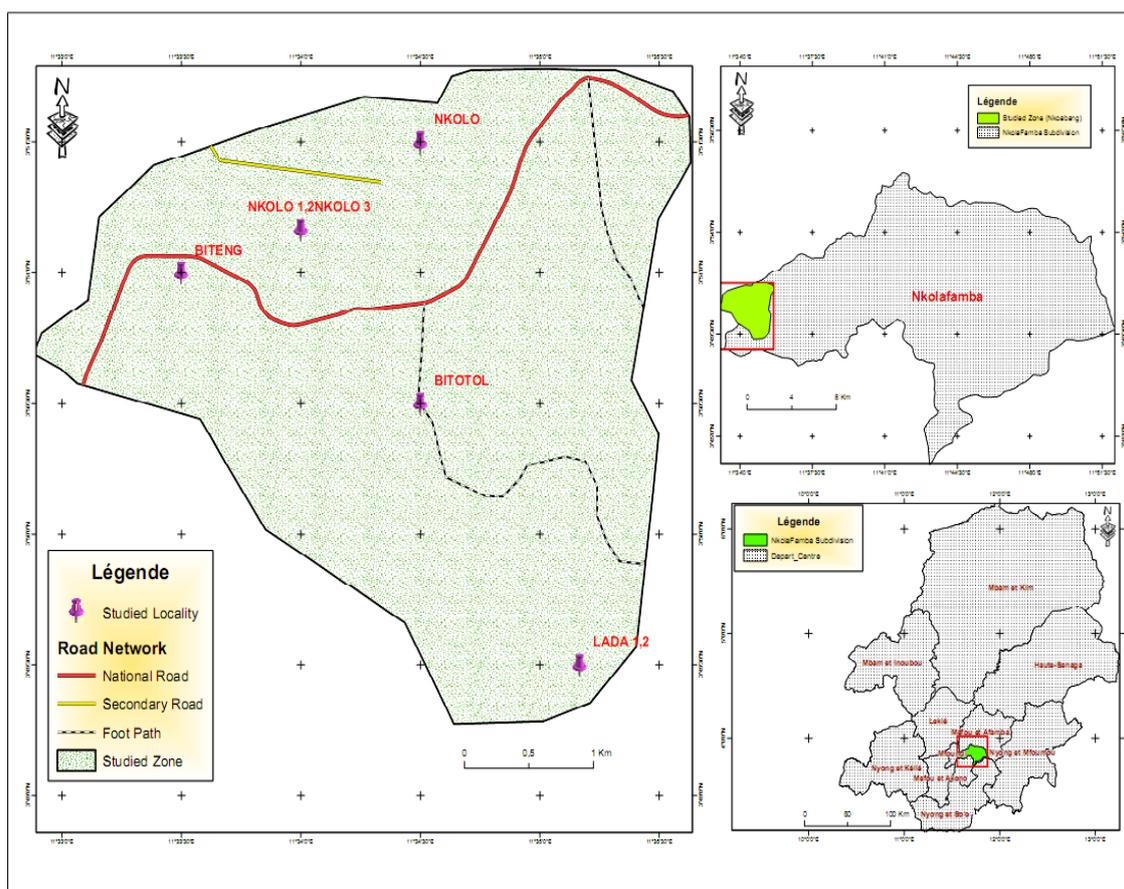


Figure 1: Location map of the study area

This study covers the time range 2004-2018. In 2004, Nkoabang's natural environment was subjected to little or negligible threats while in 2018 this natural environment has been subject to significant effects mainly from urban spatial expansion of Yaounde on its eastern periphery.

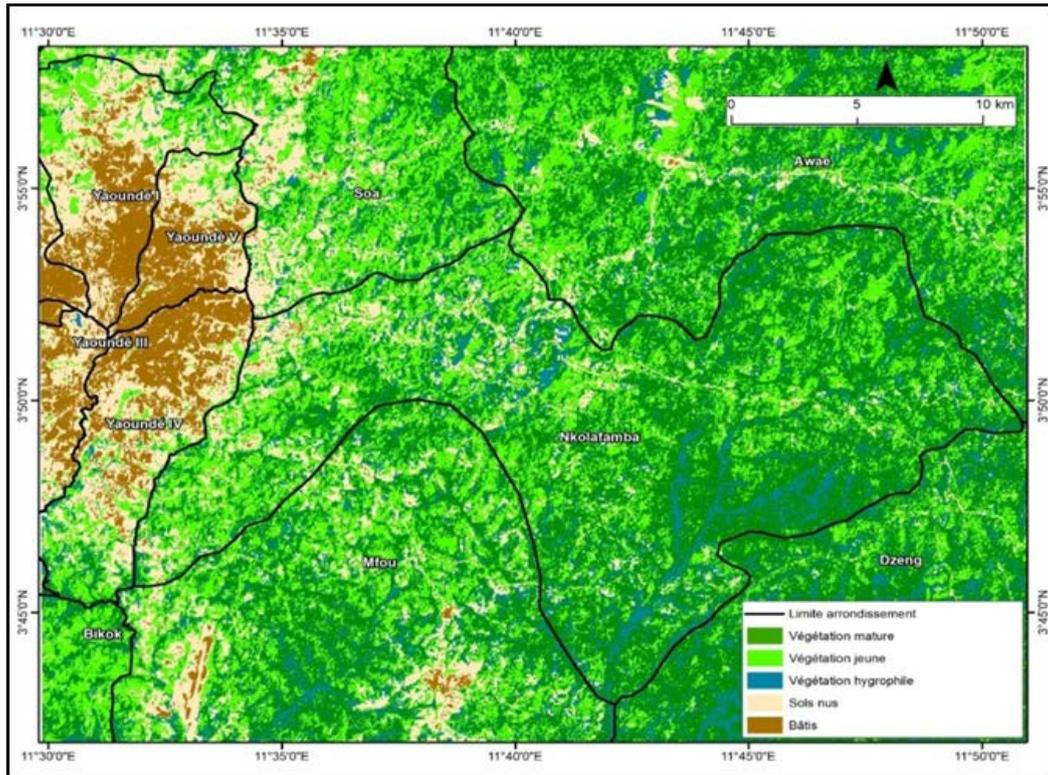
2.2. Methods and Tools

Both qualitative and quantitative research methods were used. This was through documentary and computerized research, through observations and inquiries via interviews and questionnaires administered to resource persons. 25 households have been surveyed in each of these localities Nkolo I, II, III, Biteng, Bitotol and Lada I, II where the spreading speed is more accentuated, including resource persons amongst which the administrative and municipal authorities of Nkolafamba council. The GPS device was used to map and collect geographic data (waypoints). Landsat data were used to assess the evolution of buildings and biodiversity with particular reference to vegetation in assessing the negative effects of anarchical periurbanisation on flora. Moreover, the processing of information collected (via software's like ArcGIS and SPSS) has eased the production of maps and tables used in this paper.

3. Presentation and Discussion of results

3.1. Urban sprawl and anarchical periurbanisation in Nkoabang

The trends of urban expansion on the eastern part of the peri-urban area of Yaounde 16 years ago was insignificant with negligible effects on the natural environment. (Figure 2)

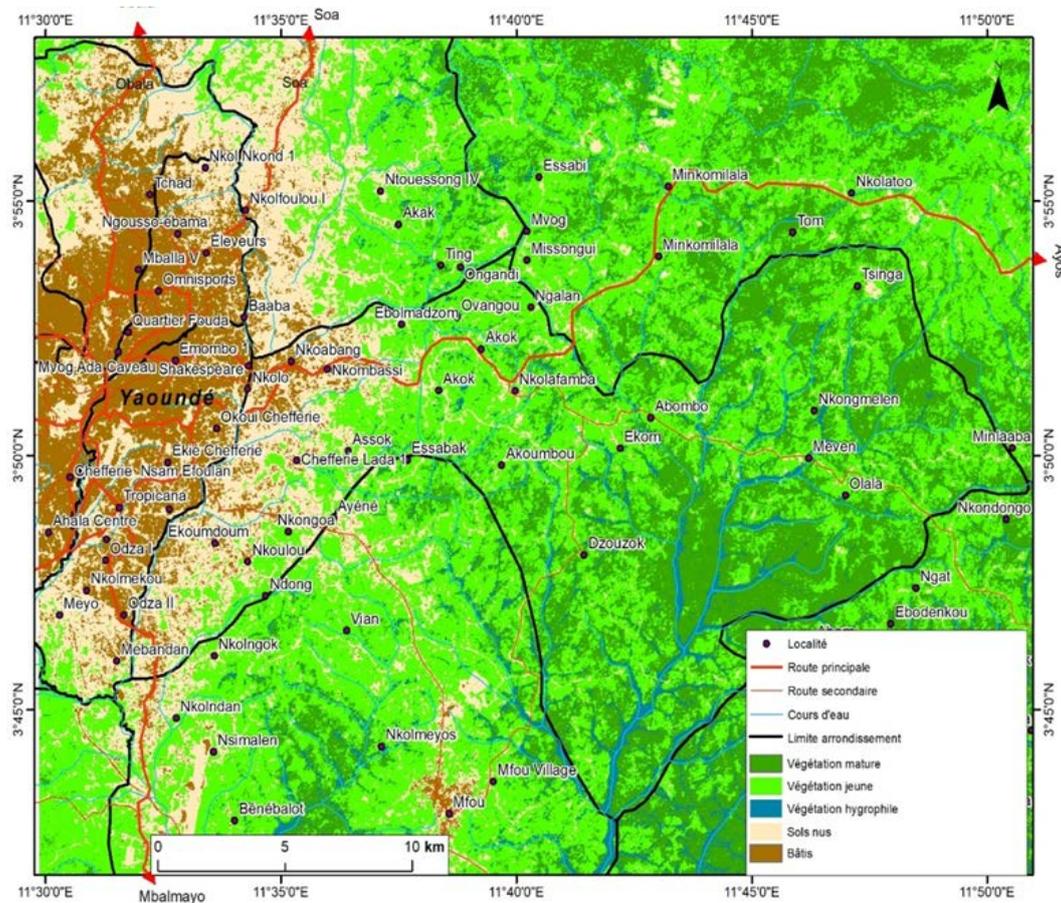


Source : *Satellite image (Landsat image 07 feb 2004)*

Figure 2: Spatial occupation of Yaounde eastern periphery in 2004

As shown on figure 2, in 2004 Yaoundé's spatial expansion to its eastern periphery was not significant and with negligible impact on Nkoabang's natural environment. Land cover in terms of flora was significant in contrast to human occupations and the natural environment less subjected to environmental degradation.

With time, Yaounde spatial expansion has seriously affected its Eastern periphery and nowadays, an artificialized landscape took over the pre-existing natural landscape with modern architectures that have replaced existing natural land cover (figure 3).



Source : Satellite image (Landsat image 04 jan 2018)

Figure 3: Yaounde urban expansion over it eastern periphery of Nkoabang in 2018

As shown on figure 3 above, there have been significant urban spatial expansion of Yaounde on its eastern periphery by 2018 in contrast to 2004(fig 2).By 2004, Nkoabang witnessed a significant increase in the number of buildings from 14% of its surface area in 2008 to 19% in 2018(Tchékoté and Ngouanet, 2015), a result of persistent expansion of urban blocks across urban boundaries (Tchékoté & Sa'a, 2019) at the detriment of the traditional locality/natural environment replaced by artificial landscapes.

3.2.Periurbanisation and anarchical constructions in Nkoabang

In the 1980s, Yaounde formed a single urban center of almost 38 km². At first a small town and today a billionaire city, Yaounde owes this change to it expansion over it eastern spere as well as the extensive growth of the town across it boundaries (Tchékoté and Ngouanet, 2015). Urban sprawl adds to illegal sales and purchase of land in-between the autochthones and halogens in the peri-urban of Nkoabang and goes a long way to promote illegal and irregular constructions(Anastasia, 2007), guided in most cases by ignorance of existing tools of urban planning and occupation (Tchékoté & Ngouanet, 2015). As revealed by the target population, persistent anarchical constructions in Nkoabang is a result of households and investors choices to construct buildings in line with modern standards but in non-respect of existing urban planning norms. Photo 1 above shows anarchical construction in Nkoabang. Such an uncontrolled spatial distribution makes difficult the visibility of existing roads as well as to distinguish one building from the other.



Source: Snap shot, Maffo K.G.A.,2019.

Photo 1: Anarchical constructions in Nkoabang.

Anarchical periurbanisation and access to potable water

Anarchical periurbanisation in Nkoabang has led to deforestation, exposing the earth surface to direct incoming solar radiation and other environmental management problems (water tables exposed to evaporation and subsequent reduction). This, couples with the withdrawal of the state from its functions of supplying its population with potable water (Tchékoté,Ngouanet,2015). Access to water is today a real luxury for Nkoabang's population. Even though households turn to provide themselves with individual bore holds and locally dogged wells, inhabitants are still in constant search for potable water as some depend on rains water.



Source: Snap shot, Maffo K.G.A.,2019.

A: Buckets placed outside to collect rain water

B : Boreholds per household

C : Search for potable water

Plate 1: Water problems in Nkoabang.

On plate 1 above,picture a shows buckets placed to the roof to collect rain water. Picture B presents individually constructed boreholds by househlods.Picture C shows a child

with a truck full of buckets in search of potable water as a result of anarchical constructions, exposing populations to water borne diseases.

3.3. Anarchical periurbanisation and occupation of ecological fragile zones / Risks of flooding

Anarchical constructions in Nkoabang has induced great environmental management problems, through the occupation of high risk zones/zones forbidden for constructions or classified *non aedificandi* like swamps. Toilets are haphazardly constructed on steep slopes, closer to rivers and locally dugged wells, exposing populations to various linked diseases and to risks of flooding and innondation.



Source: Snap shot, Maffo K.G.A., 2019.

Photo 2: Occupation of Ecological fragile zone (non aedificandi zone)

Photo 2 illustrates anarchical constructions on ecological fragile zones (swampy areas). Latrines constructed without adequate canalisation in which liquid wastes are emptied in water courses on which populations depend, a real threat for human health and the immediate natural environment.

3.4. Anarchical periurbanisation and inadequate waste disposal in Nkoabang

Spontaneous or uncontrolled spatial occupation of space in Nkoabang has led to uncontrolled waste disposal on unauthorized sites (Plate 2). Anarchical constructions is responsible for access difficulties face by hygiene bodies and stakeholders for the clean and collection of solid wastes dumped on households verandas today main targets for wastes disposal.



Source: Snap shot, Maffo K.G.A.,2019.

Plate 2: Poor solid waste disposal in Nkoabang

The plate above illustrate the manner in which anarchical constructions in Nkoabang has led to uncontrolled solid wastes disposal from households along road sides and veranders. Wastes juxtaposes with houses and fights over space with the forest which retreats. Agricultural surfaces are replaced by dumps and the immediate natural environment and populations are exposed to degradation and induced diseases.

3.5. Anarchical periurbanisation and Poor drainage

Haphazard construction in Nkoabang has led to accessibility problems. Roads are predominantly secondary roads and footpaths, constructed in non-respect of urban and environmental norms (no drains). This has favoured poor drainage and stagnant waters from rains and domestic liquid wastes everywhere, especially during the raining seasons (reducing infiltration rates, favoring pollution and soil degradation. Moreover, available canalization channels are filled with solid wastes, awaiting for upcoming rains to be washed away.



Source: Snap shot, Maffo K.G.A.,2019.

A: Flooded road

B : Absence of drains for household wastes

Plate 3: Inaccessible roads and Poor drainage in Nkoabang

On plate 3 above, picture A illustrates a flooded road and stagnant water due to absence of drains. This saturates the soils and consequent floods, as infiltration rates are reduced. Picture B shows stagnant decayed liquid wastes from households along road sides still due to absence of drains. Such stagnant decayed water on grounds acts as agent for soil degradation cycle and breeding grounds for mosquitoes harmful to populations and the immediate natural environment.

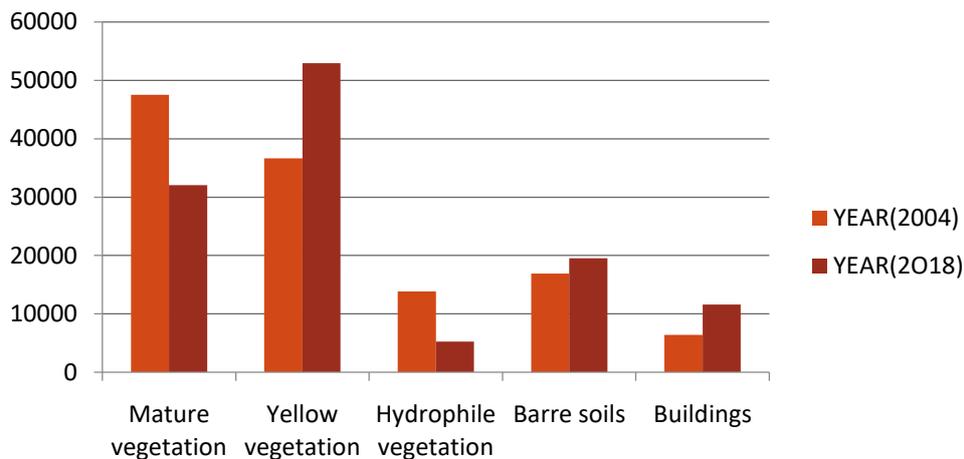
3.6. Anarchical periurbanisation and extinction of biodiversity

Nkoabang was an important forest basin at the gate way of Yaounde (Tchékoté, Ngouanet, 2015). Nowadays due to pressure from anarchical periurbanisation, it has witnessed an aggressive disappearance of peri-urban agriculture and reduction of its natural forest resources to the benefit of populations through a predation relation, wherein, populations behave more as exploiters than managers of natural resources at their disposal without consideration for the regeneration of neither these resources nor their conservation.

Table 1: Land cover/Land use in the eastern periphery of Yaounde

| Element | YEAR | |
|-----------------------|-------------------|--------|
| | 2004 | 2018 |
| | Surface area (ha) | |
| Mature vegetation | 47522 | 32033 |
| Yellow vegetation | 36671 | 52966 |
| Hydrophile vegetation | 13843 | 5234 |
| Barre soils | 16913 | 19508 |
| Buildings | 6401 | 11609 |
| Total (ha) | 114949 | 121350 |

Source: Spatial data (Landsat 2004 and 2018)



Graph 1: Land cover/Land use evolution in the eastern periphery of Yaounde

From table 1 and graph 1, it realized a great contrast in the surface area covered by flora and human occupation. In 2004 for example, matured vegetation, yellow vegetation, hydrophile vegetation, and bare soils covered 47522ha, 36671ha, 13843ha, 16913ha of the surface area respectively. In 2018, these figures were 32033ha, 52966ha, 5234ha, 19508ha respectively. A drastic reduction in vegetal cover to the advantage of human occupations is witnessed with an exponential increase in surface area of buildings from 6401ha in 2004(graph 1) to 11609ha in 2018 (table 1). This shows rapid urban growth and massive extinction of biodiversity in Nkoabang.

4. DISCUSSION

Urban sprawl is a major characteristic of African metropolises that naturally occurs on city's peripheral belt (Réné and Harold, 2016). Nkoabang is thus that eastern periphery of Yaounde, that part of Nkolafamba sub-division closest to Yaounde town, over which Yaounde exercises her expansionist policy.

The result of our analysis shows that, Yaounde's expansion over Nkoabang is responsible for demographic boom, saturation, rapid and uncontrolled proliferation of urban constructions. If Nkoabang has become so attractive nowadays, it mainly because of its proximity to Yaounde town. This concurs with Tchékoté and Sa'a (2019) non-urbanized territory contiguous to the city is subject to potential annexation by the city.

Moreover, anarchical periurbanisation in Nkoabang is animated by a game of actors via illegal and uncontrolled land sales and purchase of lands, justifying what Anastasia (2007) equally pointed out that, the illegal sales and purchase of land between autochthones and halogen populations goes a long way to promote illegal and irregular constructions or settlements.

In addition, anarchical periurbanisation in Nkoabang has resulted in great environmental management problems, for instance, the absence of trash cans and wastes disposal points has given rise to wild dumps that goes a long way to monopolize grounds or surfaces, coupled with deforestation, they promote the retreat of the forest and drastic reduction of agricultural surfaces with the extinction of biodiversity which is amongst others, a source of food and protection, thus, with diverse negative environmental implications in Nkoabang.

Furthermore, it results from our analysis that anarchical periurbanisation in Nkoabang has gone a long way to reduce infiltration rates through artificialisation of surfaces and stagnant waters on grounds, similar to what Sebastian and Marek (2013) pointed out that, the lowering of water tables is also result of decreased natural infiltration. This anarchical periurbanisation is thus, further responsible for difficult access to potable water resources, as well as poor canalization of used waters and the massive occupation of non aedificandi zones by populations who are thus dangerously exposed to various ills just like their surrounding environment subject to a subsequent degradation.

Urban sprawl and induced environmental management problems sparked the need for a sustained town and environment, this would best pass through adequate and efficient implementation of sustainable urban and environmental management strategies, justifying what Tchékoté and Sa'a (2019) pointed out that, environmental problems, result of anarchical periurbanisation, and should be handle from the perspective of their sustainable management.

5. CONCLUSION

Urban expansion is a real threat for peri-urban natural environment. This work has as objective to contribute knowledge for a mastery of mechanisms that guides anarchical periurbanisation and induced environmental management problems, as well as contribute in decision making for a sustained town and environment. To this effect, a profound study guided our analysis and it results that, great environmental management problems in Nkoabang is directly linked to it anarchical periurbanisation (occupation of risk zones, poor wastes disposal and poorly drained used waters). An effective sustain town and environment in Nkoabang, can only best be insured via varied strategies of which multiplication of protected zones/Creation of parks and reserves, the reinforcement of re-afforestation, the promotion of eco-habitats, the effective respect and application of hygiene days in Nkoabang, the elaboration/revision and effective implementation of laws and norms in favor of environmental protection, the elaboration and effective implementation of urban and soil occupation plans and effective reinforcement of environmental valorization in Nkoabang. For,

environmental protection can only be best ensured through efficient urban and environmental management plans and norms in Nkoabang.

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