REPUBLIQUE DU CAMEROUN
Paix- Travail- Patrie
****
UNIVERSITE DE YAOUNDE I
****
CENTRE DE RECHERCHE ET DE FORMATION DOCTORALE EN SCIENCES HUMAINES, SOCIALES ET EDUCATIVES
****
UNITE DE RECHERCHE ET DE FORMATION DOCTORALE EN SCIENCES HUMAINES ET SOCIALES
****
DEPARTEMENT DE GEOGRAPHIE
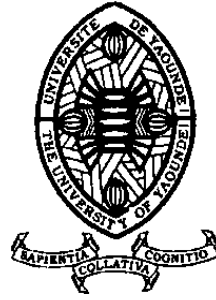
REPUBLIC OF CAMEROON
Peace- Work- Fatherland
****
THE UNIVERSITY OF YAOUDE I
****

POST GRADUATE SCHOOL FOR SOCIAL AND EDUCATIONAL SCIENCES
****
DOCTORAL RESEARCH UNIT FOR SOCIAL SCIENCES
****
DEPARTMENT OF GEOGRAPHY

THE NEGATIVE IMPACTS OF SOCIOECONOMIC DEVELOPMENT ON THE ENVIRONMENT OF SANGMELIMA TOWN-SOUTH CAMEROON

A research thesis presented and defended on the 27th of May 2022, in partial fulfillment for the award of a Master's Degree in Geography

Specialty: Urban and Rural Dynamics

Presented by

July Jordana Fernanda ASSEA

Matricule: 16W854

Bachelor of Science in Geography

JURY

QUALITY	NAME	UNIVERSITY
PRESIDENT	*MOUPOU MOISE*	YAOUNDE 1
RAPPORTEUR	*MOUGOUE BENOIT*	YAOUNDE 1
EXAMINER	*DEFO LOUIS*	YAOUNDE 1

SUMMARY

DEDICATION

This work is dedicated to my parents, **Mr. TALATALA Blondeau** and **Mme NTYAM Helene Ginette Sylvie,** and to my uncle **Mr. OBAM Charles Jackson**, most near, most dear and most far.

ACKNOWLEDGEMENTS

ABSTRACT

Debates on the implications of socio-economic development on the environment constitutes one of the major challenges facing many societies. This study seeks to analyze the negative impacts of socioeconomic development (SED) on the physical environment of Sangmelima town. The hypothetico deductive method was applied in the study where a review of primary and secondary sources of data were done through field works. The fieldwork facilitated the collection of information through direct observation, collection of GPS points, interviews and questionnaires administration. A time series analyses using Landsat images of Sangmelima town for the year 2001, 2011 and 2019 was equally done. Results of this study show that, socioeconomic development impacts on the environment are glaring and constantly growing. Socio economic development has several negative impacts on the environment of Sangmelima, they include: waste production and poor waste management practices, air pollution, soil pollution, water pollution, loss of biodiversity and erosion. Forest cover has been affected in quality and quantity as a result of urban infrastructural development and increase in fuel wood demand for consumption, experiencing a reduction of 12.67%, leading to forest fragmentation, and biodiversity loss. Poor waste management practices in the town has also polluted and degraded the soil, air and water. Water pollution by floating waste has influenced eutrophication in certain parts of River lobo. Air pollution has been observed through the uncontrolled burning of waste by several households. Open dumping of waste was equally observed, which constitutes the cause of soil pollution. The inaccessibility of some neighborhoods like "Afambasi" and some blocks of "Sangmelima village", limited human and technical capital, the reluctance and incivility of the population and societal apathy have been identified as factors that limit the performance of local actors in environmental management. This is aggravated with the fact that the budget allocated for waste recycling and treatment is very limited, 90% of budget dedicated to waste management is allocated to waste collection and transportation and the rest, 10% for treatment and recycling. Technical capacity constitutes one of the major tools in addressing environmental issues, in Sangmelima, local actors are limited in this. As a result, addressing environmental problems becomes difficult. The study suggests strategies to curb the growing impacts of SED on the environment of Sangmelima and for a better environmental management.

Key words: Socio-economic development, impact, Sangmelima and environment

RESUME

Les débats sur les impacts du développement socio-économique sur l'environnement constituent l'un des problèmes majeurs auxquels sont confrontés de nombreux pays étant donné que, le développement socio-économique a un impact significatif sur l'environnement. Cette étude a pour objectif principal d'analyser les impacts du développement socio-économique sur l'environnement physique de la ville de Sangmelima. La méthode hypothético déductive a été appliquée dans l'étude. Une analyse des données de sources secondaires et primaires a été faite doublée des travaux sur le terrain. Le travail de terrain a permis la collecte des données par observation directe, collecte de points GPS, entretiens et administration de questionnaires. Une analyse diachronique des images Landsat de la ville de Sangmelima pour les années 2001, 2011 et 2019 a également été faite.

Les résultats de cette étude montrent que les impacts du développement socio-économique sur l'environnement sont importants et en constante augmentation. Le développement socioéconomique affecte négativement l'environnement de la ville de Sangmelima. Ces effets pervers comprennent : augmentation de la production de déchets et mauvaise pratique de gestion, pollution de l'air, pollution du sol, pollution des cours d'eau, perte de la biodiversité et érosion des sols. Le couvert forestier a été affecté en qualité et en quantité en raison du développement des infrastructures urbaines et de l'augmentation de la demande en bois de chauffe par les ménages, avec une réduction de 12,67%, entraînant une fragmentation des forêts, la dégradation des écosystèmes et la perte de biodiversité. Les mauvaises pratiques de gestion des déchets dans la ville de Sangmelima ont également pollué et dégradé le sol, l'air et l'eau. La pollution de l'eau par les déchets a générer l'eutrophisation dans certaines parties de la Rivière lobo. La pollution de l'air est induite par l'incinération incontrôlée des déchets par plusieurs ménages.

Des décharges à ciel ouvert ont également été observées, elles polluent le sol. L'inaccessibilité de certains quartiers tels que le quartier Afambasi et certains blocs du quartier Sangmelima village, un capital humain et technique limité, la réticence et l'incivisme des population et l'apathie ont été identifiés comme des facteurs limitant la performance des acteurs locaux en matière de gestion environnementale. L'étude suggère des moyens d'améliorer la performance de la gestion environnementale des acteurs locaux en fonction des défis auxquels ils sont confrontés.

Mots-clés : Développement socioéconomique, impactes, Sangmelima et environnement

LIST OF ABBREVIATIONS

ATLEG: African Forest LAW Enforcement and Governance

BUCREP: Bureau Central de Recensement et d'Etude de la Population au Cameroun

CITES: Convention on International Trade in Endangered Species of Wild fauna and flora

CBD: Convention on Biological Diversity

CDP: Council Development Plan

CHM: Clearing-House Mechanism

CPT: Central Place Theory

DSDSR: Document de Stratégie de Développement du Secteur Rural

EMS: Environmental Management System

Franc CFA: Franc de la Communauté Financière d'Afrique

GEF: Global Environment Facility

HYSACAM: Hygiène et Salubrité du Cameroun

NIS: National Institute of Statistics

IWM: Integrated Waste Management

MINEPDED: Ministry of Environment Protection of Nature and Sustainable Development

MINDUH: Ministry of Housing and Urban Development

MINFOF: Ministry of Forestry and Wildlife

MINPMESA: Ministry of Small and Medium Enterprises, Social Economy and Handicraft

MINSANTE: Ministry of Public Health

MINEDUB: Ministry of Basic Education

MSWM: Municipal Solid Waste Management

NEMP: National Environmental Management Plan

PANGIRE: National Action Plan for Integrated Water Resource Management

PNACC: Plan National d'Adaptation aux Changements Climatiques

PPP: Public Participation Program

PSFE: Programme Sectoriel Forets et Environnement

SED: Socio-Economic Development

SMIG: Inter-Professional Guaranteed Salary

SNGDES: National Strategy on Sustainable Management of Soils

SPANB: National Biodiversity Strategy and Action Plan

ST-EP: Sustainable Tourism – Eliminating Poverty initiative

SWM: Solid Waste Management

UNDP: United Nations Development Program

UNEP: United Nations Emvironmental Program

UNIDO: United Nations Industrial Development Organisation

UNWTO: United Nations World Tourism Organisation

WTC: Waste Treatment Center

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOS

APPENDICES

GENERAL INTRODUCTION

Introduction

Increasing human populations and the quest for better life through socio-economic activities have led to negative implications for environmental management especially in the developing world. The impacts of socio-economic development on the environment have been widely discussed in environmental studies, emphasising on the impacts of population growth on environmental conditions. The level of concern and state of urgency has reached new levels both at the local, national and international strand. The extent of environmental degradation varies across countries and regions of the world (Holtz-Eakin and Seldon, 1995). Poverty has been the major cause of the depletion of natural resources and environmental degradation in Africa (Kalipeni, 1992). In the Asia Pacific region, both rapid population growth and continous economic development are major causes of environmental pollution (Dewaram 2007). In the United States, where population density is much lower than in India, the main cause of environmental degradation is the extremely high per capita consumption of resources and the consequent high carbon emissions (United Nations 1997). Smyth (2008) conducted a study on the relationship between growth and environmental issues in China, and concluded that high rate of economic growth leads to high rates of pollution. This is because population growth and the resulting economic activities generate pressure on the natural environment. This is visible through the rapid decline in tropical forests, global warming and environmental pollution (United Nations, 1992).

In a bid to ensure environmental sustainability, the Cameroon government has instituted a battery of legal/regulatory instruments (Ndi et al, 2017). *Law no. 94/01 of 20 January 1994* to lay down forestry, wildlife, and fisheries regulations and the *Law no 96/12 of 5th August 1996* relating to Environmental management were adopted in Cameroon. This law outlines the general legal framework for environmental management in Cameroon. It is grounded on the principles of precaution, prevention and corrective action, pollute and pays responsibility, participation and subsidiarity. Population size and growth, related consumption patterns and environmental policies are critical socioeconomic factors of environmental degradation in Sangmelima. Curbing these impacts is a great challenge as it is important and constitutes the bases of sustainable development.

I-   Context (Scope) of the study

Despite the benefits derived from the environment (raw materials, food, shelter, and pharmaceutics) and the efforts to establish a sustainable management of the environment, the environment continues to degrade. Debates on the implications of socio-economic development on environmental management has gained grounds with the aim of raising awareness on the increasing threats. According to Klarin (2018), aspirations of developed countries to improve the socio-economic and ecological situation of developing and undeveloped countries gathered scientists, economists and humanists from ten countries in Rome in 1968 to discuss the current problems and future challenges (limited natural resources, population growth, economic development, ecological problems, etc.) of humankind. The world environmental conference that took place in Stockholm in 1972 drew world attention to the inextricable links between development and the environment (Okonkwo, 2013). Since 1972, the twin issues of economic development and environmental protection have engaged the attention of scientists and nonscientists alike all over the world (Okonkwo, 2000).

In 1983, the United Nations World Commission on Environment and Development (WCED) was established to develop a global change program aimed at raising awareness and concern about the negative impact of socio-economic development on the environment (Drexhage and Murphy, 2010). In 1987 a Commission of 19 delegates from 18 countries published a report *Our Common Future*, better known as the *Brundtland Report*. Where the concept of sustainable development was introduced (Drexhage and Murphy, 2010). This report analyzed and provided a clear overview of the conditions in the world (socio-economic development, environmental degradation and population growth) and elaborated the concept of sustainable development. As a new approach, it aimed to respond to future challenges, such as achieving balance between socio-economic development and the environment, reducing environmental degradation and the exploitation of natural resources, (WCED, 1987 in Klarin, 2018). The terms such as "development and environment", "development without destruction" and "development in accordance with the environment" were increasingly used in publications (Klarin, 2018).

II-   Justification of the study

Debates on socioeconomic development and the environmental management have gained grounds. The Brundtland Report in 1987 and the promotion of sustainable development aiming to consolidate in the long run the social, economic and environmental dimensions of growth have encouraged the development of indices (Environmental Impact Assessment and Social Impact Assessment) that will help measure human activity impact on the ecosystem. The Rio

conference on development and the environment in 1992, the world summit on sustainable development in 2002, the UN conference on sustainable development in 2012 and the UN sustainable development summit in 2015 are based on the progress of Sustainable development and the relationship between man and the environment. With time the notion of Sustainable development has been adopted by stakeholders, putting effective environmental management as a top priority.

Cities are constantly changing and the impacts are not only felt at the national level but also at the local level. In Sangmelima, the impacts are important and constantly growing. This has made local authorities to put environmental management at the top list. Environmental, social, cultural and economic challenges are the results of demographic growth. Deforestation, pollution and poor resource management have drastic impacts on human development and society. Diagnosing the causes and measures to curb these impacts on the environment is of paramount concern. Although the impact of socio-economic development on environmental management has gained ground, many cities and governments still omit to address the question of environmental management in their objectives of development.

III-   Delimitation of the study

III.1- Thematic delimitation

This study examines the implications of socio-economic development on environmental management in Sangmelima, as the environment gradually degrades due to increasing population. The study analyses the socio-economic situation of the town of Sangmelima in a bid to diagnose the causes and impacts on the environment. It analyses how socioeconomic development has negatively affected the physical environment in Sangmelima town. It further examines the effectiveness of local actors in the environmental management of the town, the strategies employed by the town authorities to curb the growing negative effects of such activities on the environment and the factors influencing the performance of local actors in environmental management in Sangmelima.

III.2- Spatial delimitation

Sangmelima is found some 200 km South-East of Yaounde and 105 km from Ebolowa. It is the head quarter of the Dja and Lobo division. It is located between longitude 11°55' and 12°15' E and latitude 2° 45' and 3°02' N and covers a surface area of 2931 km².
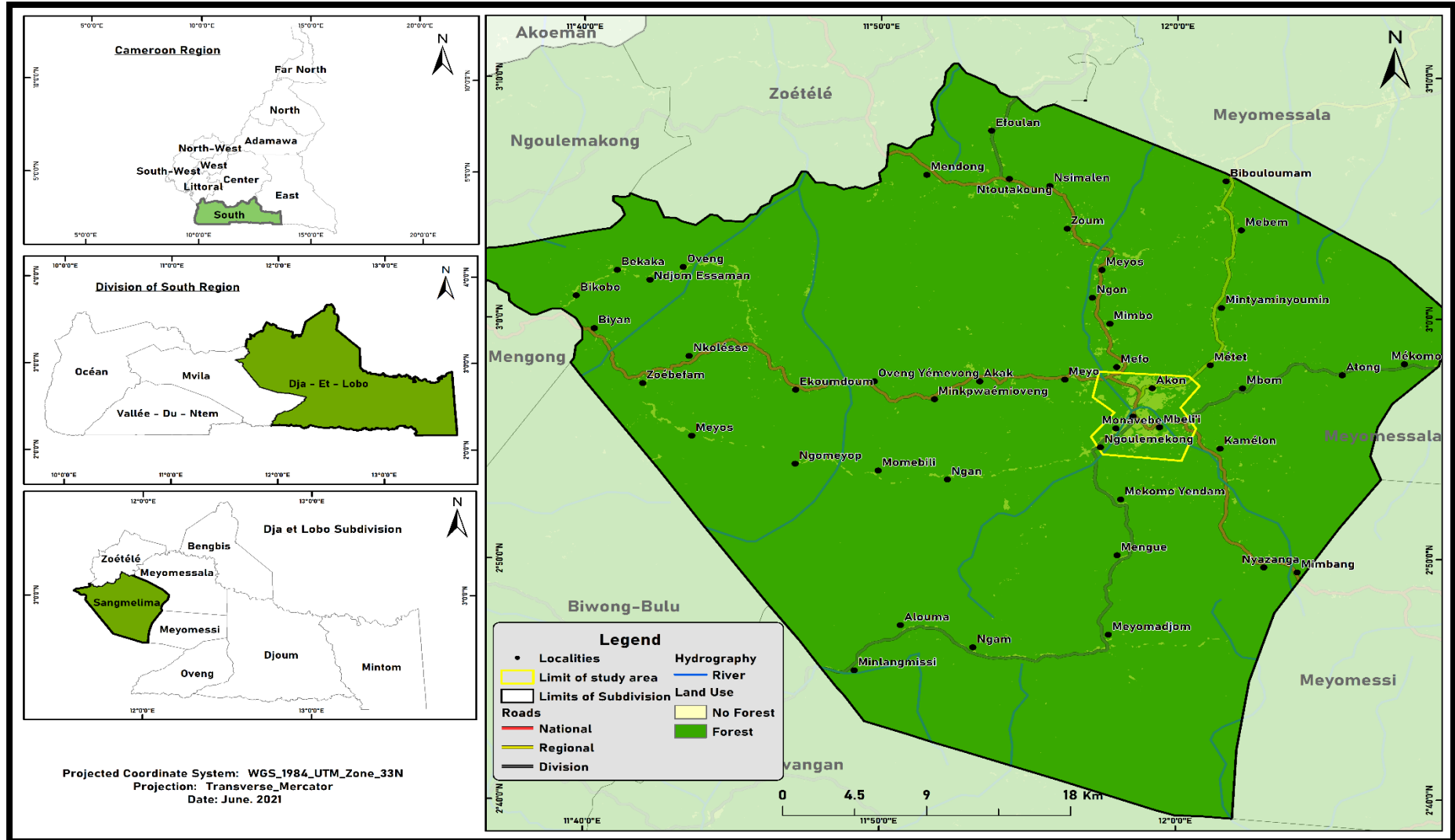
Source: INC, Google Earth Pro, June 2021

Figure 1: location map of Sangmelima

The subdivision of Sangmelima is bounded:

- to the North by Ngoulemakong and Zoétéle subdivisions,
- to the South-East by Meyomessi, to the South-West by Mvangan subdivisions,
- to the East by Meyomessala subdivisioon and
- to the West by Mengong and Biwong Bulu subdivisions.

The urban space of Sangmelima is made up of 17 neiborhoods (BUCREP, 2005) that constitute our study**.**

III.3- Temporal delimitation

This study begins from 1960 and ends in 2020 (60 years). After independence in 1960, the town experienced a remarkable growth in the socio-economic domain and thus became the head quarter of the Dja and Lobo division in the South region. Various factors account for this growth. First, its social (recreational centres, educational centres, health centres and hospitals), economic (banking and finance services, market places and employment opportunities) and political (divisional and sub divisional offices, delegations) characteristics, makes it a pull factor. This is statistically confirmed as the town alone shelters 52.57% of the total population of the Dja and Lobo division (CDP, 2015). Secondly, the lunch of important building sites and construction projects (roads, the Sangmelima referral hospital created in 2014, the Inter-state University created in 2012 and the Sangmelima Municipal market inaugurated in 2019) has attracted a lot of civil servants, scholars, business men and people in search of job opportunities.

IV-   Statement of the Research Problem

The debate on the implications of socio-economic development on the environment is one of the major challenges facing mankind today. The environment is continuously degrading due to increase in population. The government of Cameroon through its environmental policies has been seeking ways to ensure the sustainable utilization of land so as to preserve and protect the environment, so as to respond to the sustainable development goals.

The town of Sangmelima has undergone a remarkable growth in its population over the past years. Results from the 2005 National Population and Housing census show that its population has doubled between 1976 and 2005. As population size increases, so too does consumption; the greater the population size, the greater the consumption pattern thus an increase in the impacts of socio-economic development on the environment.

Socio-economic development through the construction of social and economic infrastructures, like the Sangmelima referral hospital, the Sangmelima Municipal market, the interstate

university and road infrastructures, constitutes a factor of environmental degradation. The demand for food, energy and housing considerably alters land use practices and degrades the environment. As socio-economic activities increase, there is the need for more space and land. Consequently, large pieces of forested land are cleared up.

Poor waste management has for long been considered as a factor of environmental degradation. The growth of the town in terms of production and consumption requires larger inputs of energy and material that obviously generate a large quantity of waste. Uncontrolled waste disposal like municipal solid waste has huge impacts on the environment. Some of the waste is buried, burnt, and deposited. Some will rot but not all and in the process, smell and generate methane which is explosive and contributes to the depletion of the Ozone layer. Litter and leachate equally produce as waste decomposes causing soil, surface water and underground water pollution.

Low public participation constitutes one of the problems of environmental management in the town of Sangmelima. There is little or no participation of the local population in the environmental management practices and policies, from the elaboration to the implementation. This in addition to limited investment in capacity building indispensable to facilitate equitable and inclusive participation has seriously affected environmental management in the town. It is widely accepted that sensitization and mobilization increase awareness and improve attitudes and behaviors. Knowledge dissemination is a critical component in environmental management, as people need to understand environmental problems and some of the priority issues. Such an idea is more of a theory than practice in Sangmelima. Limited environmental awareness is the role rather than the exception. The rules and laws that govern environmental management in Cameroon apply to the entire territory and every citizen must have a good knowledge of these laws. In Sangmelima, People have a poor knowledge on environmental rules and regulations, which greatly hinders effective environmental management in the town. It is based on the above issues that some controversies come in to mind; rapid population growth, increase in socioeconomic activities and impacts on the environment.

V- Research Questions

V.1- Main question

How does socio-economic development impacts on the physical environment of Sangmelima town?

V.2 - Secondary questions

- What is the physical, political and socio-economic situation of the town of Sangmelima?

- Who are the actors of the environmental management and socioeconomic development in Sangmelima?

- What are the impacts of socio-economic development on the environment of Sangmelima?

- What strategies can be applied to curb the growing impacts of socioeconomic development in the town of Sangmelima?

VI- Objectives of the study

VI.1- Main Objective

The principal goal of this study is to examine the impacts of socio-economic development on the physical environment in Sangmelima town.

VI.2- Secondary objectives

- To analyze the physical, political and socio-economic situation of the town of Sangmelima

- To examine the actors of the environmental management and socio economic development in Sangmelima

- To analyze the impacts of socio-economic development on the environment of Sangmelima

- To suggest strategies to master the impacts of socioeconomic development on the environment in the town of Sangmelima

VII- Hypothesis

VII.1- Main hypothesis

Socio-economic development has a negative impact on the physical environment of the town of Sangmelima.

VII.2- Secondary hypotheses

- The physical, political, social and economic diversity of Sangmelima has contributed to its socio-economic development

- Local actors play an important role in the environmental management and socioeconomic development of Sangmelima

- A direct relationship exist between socioeconomic development and environmental degradation in Sangmelima

- The impacts of SED on the environment of Sangmelima can be mastered if all actors work hand in gloves

VIII- Literature Review

The literature review is organized in to three parts. The first part reviews literature on socio-economic development, the second, the impacts of socioeconomic development on the environment and the third part reviews literature on environmental management.

VIII.1- Socioeconomic development

Socioeconomic development may refer to the transformation of a society with regard to social and economic dimensions. It incorporates public concerns in developing social policy and economic initiatives. To better understand the process of socio-economic development, it is necessary to define its basic terms:

- development,

- social development, and

- economic development

The definition of development varies from one writer or researcher to another. According to Arthur G. and Judith G. (2007), development is the process of growth/expansion or realization of potentials, bringing regional reserves in to full productive use. Dudley (1969) defines development as a decline in poverty, unemployment and inequality from high levels. In a similar dimension, Goulet (1971) defined development as a multidimensional process involving changes in structures, attitudes and institutions as well as the acceleration of economic growth, the reduction of inequality and the eradication of poverty.

According to Todaro (2003), the concept of development focuses on three main objectives;

- raise people's standards of living; this implies an increase in income and consumption, levels of food, medical services and education through relevant processes.

- create conditions to the growth of people's self-esteem through the establishment of social, political and economic systems and institutions which promote human dignity and respect.

- increase people's freedom to choose by enlarging the range of their choice variables.

Social development on the other hand is the process of social transformations of institutions in a society in a manner which improves the capacity of the society to fulfill its aspirations. It implies a qualitative change in the way the society shapes itself and carries out its activities such as through more progressive attitude and behavior by the population, the adoption of more effective processes or more advanced technology (Fellmann and Getis, 2007). Social development encompasses a set of elements which include; security, community life, participation, equity or non-discrimination, long and healthy life, empowerment, education and skills.

Economic development has always been seen as the first form of development until the mid-1960s. Associated to economic growth in the past, the term was defined as an increase in the per capita income of the economic system. Economic development thus refers to the development of economic wealth (goods and services) of countries or regions for the wellbeing of their inhabitants. This is often reflected in the country's purchasing power, level of technology and communication networks. Economic development implies a reduction in poverty levels, and increases in the provision of goods services and in the provision of basic needs. The principal goal of economic development is to improve the economic wellbeing of a community through; job creation, job retention, tax base enhancements and quality of life.

Socio-economic development varies from one country to the other and in the long run can have significant impact on the environment.

VII. 2- The impacts of socio-economic development on the environment

There exists a wide variety of documents on socioeconomic development and environmental management. Between the 1960s and 1990s, earth's population doubled from 3 billion to 6 billion which obviously reflected good news for humanity. On the other side, population increase had an adverse effect on the environmental pattern. This issue gave rise to a series of questions that triggered the minds of stakeholders and policy makers.

Human activities are altering the global environment on an unprecedented level. The concentration of green house and ozone depleting gases in the atmosphere, the accelerated extinction of species, the breakdown of biogeochemical cycles, deforestation, and natural resource depletion are undeniably related to the human activity (Asici, 2011). The World Commission on Environment and Development held in 1987, in the essay entitled "*Our Common Future*", argues against the 1972 Stockholm conference on the Human Environment providing an alternative perspective on sustainable development. Brundtland argues "the "environment" is where we live. "Development" is that we all do in attempting to improve our

lot within that abode, the two are inseparable". The commission characterizes the environment as an entity above physicality including social, economic, cultural and political behaviors and dynamics. It is in this same light that Vintar (2006, 2007) articulates that socio-economic and environmental aspects of development are closely interrelated and interdependent.

This is further articulated during the United Nations Conference on Environment and Development held in June 1992 in Rio de Janeiro. The conference addresses the issues of food insecurity, rising fossil fuels consumption, transportation polices, agricultural practices and water scarcity. It argues that climatic variability and climate change are the results of the increasing utilization of fossil fuels. It proposes alternative sources of energy to replace the use of fossil fuels. It pushes by proposing a reliance on public transport in order to reduce the vehicle emissions, congestion in cities and health problems caused by polluted air and smoke. It states that "we must conserve our natural resources in a world that is growing in population with ever increasing demands for food, water, shelter, sanitation, energy, health services and economic security".

The question of how human activity interacts with environment can be traced back to the *times of* Malthus. In his famous 1798 book, titled, *"An Essay on the Principle of Population" Malthus* proved that the growth of population will eventually reach the limit of resource base in the absence of technological progress. While socio-economic development produces many benefits, raising standards of living, and improving people's quality of life, it also results in the depletion of the environment. Through their action, humans have negatively impacted on the environment, endangering the survival of the Earth and the future generations (Klarin, 2018).

However, there is another channel which, given the state of technology and population, negatively contributes to environment; economic growth and resulting prosperity. In early 1970s, a debate between Commoner, Ehrlich and Holdren (1971) gave rise to the development of a formula, called as IPAT (Commoner et al. 1971), which summarizes the impact of human activity on the environment. This formula states that total impact (I) on environment is a function of population (P), affluence (A) and technology (T). Paul Erlich's 1968 formulation is expressed with extreme concision and clarity in terms that have been rightly defined as "*a classic statement*":

"The causal chain of deterioration (of the environment) is easily followed to its source. Too many cars, too many factories, too much detergent, too many pesticides, multiplying contrails, inadequate sewage treatment plants, too little water, too much carbon dioxide, all can be traced to "too many people"

Even if this may seem a simple explanation, it is a formulation that clearly indicates the predominance of demographic growth as a prevailing cause of environmental decay.

Another strand in the literature consider environmental degradation by focusing on particular environmental indicators such as carbon dioxide, sulfur dioxide emissions (Boulatoff and Jenkins 2010; Grossman and Krueger 1991; Roberts and Grimes 1997); urban air quality (Esty and Porter 2005); deforestation (Ehrhardt-Martinez, Crenshaw, and Jenkins 2002) and heavy metal contamination (Grossman and Krueger1995). Initiated by Grossman and Krueger (1991) study, the Environmental Kuznets Curve (EKC) literature hypothesizes that environmental degradation first improves then declines with income growth.

Grossman and Krueger (1991) indicates three different channels through which economic growth affects the environmental outcomes: the scale effect, the composition (or structural) effect and the technique effect. Scale effect asserts that growing economic activity leads to increased environmental damage because a greater amount of resources, including natural, is required for the production activities and increasing production would lead to more polluting emissions. Secondly, structural changes in the development trajectory of countries (from agriculture to manufacture and from manufacture to service industry for example) have different environmental effects.

Population growth negatively contributes to environment through increased land and resource uses, and pollution. The 2012 United Nations Economic Development report entitled; *Structural transformations and Sustainable Development in Africa* noted that land use efficiency is very low in sub Saharan Africa. It argues that the phenomenon is primary due to the large-scale land cover changes (deforestation) and land degradation. In several African countries, the productivity losses associated with human land use are much higher than the harvested biomass. The report concludes that many African countries have not been able to improve land use efficiency over time unlike many European and Asian countries. Examples like Senegal, Uganda and the Democratic Republic of Congo are states, where land use efficiency has declined over the past decades.

The natural environment is central to economic activity and growth, it provides the necessary resources needed for the production of goods and services. It also absorbs and process unwanted by-products in the form of pollution and waste. Waste generation is increasing at an alarming rate. Countries are rapidly developing without adequate systems in place to manage the changing waste composition of citizens. According to the World Bank's *What a Waste 2.0 report 2018* projection, rapid urbanization, population growth, and economic development will push global waste to increase by 70% over the next 30 years, to a staggering 3.40 billion tons

of waste generated annually. Increasing population levels, booming economy, rapid urbanization and the rise in community living standards have greatly accelerated the municipal solid waste generation rate in developing countries (Minghua et al., 2009). Population growth and economic development lead to enormous amounts of solid waste generation by the dwellers of the urban areas (Karishnamurti & Naidu, 2003). Urban MSW is usually generated from human settlements, small industries and commercial activities (Singh et al., 2011). Waste management is a universal issue that matters to every single person in the world. And with over 90% of waste openly dumped or burned in low-income countries, it is the poor and most vulnerable who are disproportionately affected (World Bank, 2018). Poorly managed waste is contaminating the world's oceans, clogging drains and causing folding, transmitting diseases, increasing respiratory problems from burning, harming animals that consume waste unknowingly, and affecting the environment.

As the economy grows and income rises, the increased demand for natural resources and manufactured consumer goods has put strains on the environment (Swanson, 2008). Subsequently, the amount of solid waste generated increases in parallel to economic development (Liu et al, 2015). According to the United States Environmental Protection Agency (USEPA), solid waste that is not properly managed poses risk to human health and the environment by contaminating water, attracting insects and rodents, increasing flood due to blocked drainage of canals or gullies, among others (USEPA, 2002). Nearly all human activities generate waste, and the way in which this is handled, stored, collected and disposed of, can pose risks to the environment and to public health (Zhu et al., 2008). Several fluxes of waste and cover materials from different sources end up at these dumpsites and due to the heterogeneity and complexity of wastes, these dumpsites contain a variety of contaminants which can pollute the soil of the area (Sukop et al., 1979). Environmental impact of land filling of MSW can usually result from the run-off of the toxic compounds into surface water and groundwater (Belevi and Baccini, 1989) which eventually lead to water pollution as a result of percolation of leachate (Rajkumar et al., 2010). Ali et all (2014) argued that, in developing countries open dumpsites are common, due to the low budget for waste disposal and non-availability of trained manpower. In this regard, developing countries are even deeper into the chaos as having poor financial resources to upgrade their disposal facilities and turned out to be more vulnerable to the hazards of dumping for their environment (Hazra and Goel, 2009).

The contamination of soil by heavy metal can cause adverse effects on human health, animals and soil productivity (Smith et al., 1996). Over the last many years, heavy metals have

considerably damaged the soil quality and fertility in consequence of increased environmental pollution from industrial, agricultural and municipal sources (Adriano, 1986). Waste carries different metals which are then transferred to plants by different ways (Voutsa et al., 1996). Depending on the tendency of the contaminants they end up either in water held in the soil or leached to the underground water (Ali et al, 2014). Contaminants like Cd, Cu, Ni, Pb and Zn can alter the soil chemistry and have an impact on the organisms and plants depending on the soil for nutrition (Shaylor et al, 2009). Greenhouse gasses from waste are also a key contributor to climate change. In 2016, 5% of global emissions were generated from solid waste management, excluding transportation. Solid waste management is everyone's business (World Bank, 2018). Left unmanaged, dumped or burned, waste harms human health, hurts the environmental and climate, and hinders economic growth in poor and rich countries alike. Thus, Ensuring effective and proper solid waste management is critical to the achievement of the sustainable development Goals.

Environmental issues are so intertwined with socio-economic issues that it has to be sensitive to them especially in poor developing countries, Athanasiou (1997) and Lakshamana (2013), studying population, development and environment in India, identified some factors that negatively affect the environment and grouped them in two: proximate causes and ultimate factors. The proximate causes consisting; population growth, poverty, and population density, while the ultimate causes correspond to; developmental imperatives like urbanization, industrialization, and economic development. All of which often result in unsustainable use of natural resources and eventual degradation of the environment Lakshamana (2013). She did not considered the possible negative impacts of socio-economic status on the environment.

For Zaccai (2009), the important aspects to consider when studying human activities impacts on the environment both at the local and national level is the type of consumed resources, their nature (renewable or nonrenewable), the Nature in itself and the consequences endangered by these activities. In his study, the author ignored the possible solutions that could be applied to curb these impacts. Grossman and Krueger (1995) argued that economic development can affect environmental quality through the scale of economic activities, its composition and structure. Economic activities are bound to operate where ever humans gather for the purpose of increasing standards of living and wellbeing in the society. Economic activities according to frank Bernanke (2001) are the organizations of activities on the earth's surface so as to cope with scarcity. The larger the scale of economic activities, other things being equal, the higher the level of environmental degradation (pollution, resource depletion) is likely to be, since increased economic activities results in increased levels of resource use and waste generation

(Somlanaré 2013). Environmental problems and the accelerating changes in living conditions have become a fundamental part of the world in general and metropolises in particular. Earlier, environmental problems have been considered as technical and economic problems; while in the recent decades the social dimensions of environmental problems such as 4 public attention and people's attitudes towards environment have become one of the areas of environmental Concern (Kalantari et al, 2007)

Conservative estimates indicate that within the next two decades, 87% of the population growth will take place in urban areas (Adedeji and Ibem, 2010). Urban areas are centers of arts, culture, technological innovations, providers of specialized services and "economic engines" (Kjellstrom and Mercado, 2008) and are products of urbanization which come with far reaching environmental consequences. Generally, environmental problems are mostly due to developmental processes and are of local, regional and global effects, this effects are viewed as consequences of human activities and are most often harmful on human beings, livelihoods, animals and plant lives, presently or transferred to posterity (Addedeji and Ibem, 2010). In Nigeria for instance, several studies have identified many of the environmental problems as having serious adverse ecological implications (Adedeji and Ibem, 2010). Mba et al (2004) identified several types of environmental problems classified as ecological poaching and habitat loss, increasing desertification and soil erosion. They identified deforestation resulting from road projects, subsistence activities, logging, mining and dam construction as constituting the greatest threat to environmental sustainability in Nigeria (Adedeji and Ibem, 2010). It is in this same light that, Turner et al, (1990) in Sherbinin et al (2007) argue that the conversion of natural land to croplands, pastures, urban areas, reservoirs and other anthropogenic landscapes represent the most visible and pervasive form of human impact on the environment.

VII.3- Management of the environment

Stufflebeam and Shinkfield (2007) stated that evaluation helps improve all aspects of society, they considered evaluation as the process of giving assertions on reliability, effectiveness, and efficiency among other things (Panya et al, 2017). One model that has been applied is based on the evaluation of the entity's context, input, process, and product (the CIPP model) and consists of: (1) context evaluations, which assess needs, problems, assets, and opportunities to help decision makers, and outcomes; (2) input evaluations, which assess alternative approaches, staffing plans, and budgets for their feasibility and potential cost-effectiveness to meet targeted needs and to achieve goals; (3) process evaluations, which assess the implementation of plans to help staff carry out activities and to help the administration make

decisions regarding program implementation; and (4) product evaluations, which identify and assess the outcomes intended and unintended in the short term and long term, to help the staff keep focused on achieving important outcomes and to help the administrative board gauge the success of goals (Stufflebeam & Shinkfield, 2007 in Panya et al, 2017).

The environmental management system (EMS) is the international standard specifying the requirements for an environmental management system to enable an organization to develop and implement policy and objectives, which take into account legal requirements and information about significant environmental aspects (International Organization for Standardization, 2004). It is intended to be applied to all types and sizes of organizations and to accommodate diverse geographical, cultural, and social conditions (International Organization for Standardization, 2004). These operating principles of an EMS follow a Plan Do-Check-Act cycle (PDCA cycle). Environmental management following the PDCA cycle would be beneficial to local governments by creating better opportunities to work more efficiently regarding environmental issues, decreasing negative environmental impact, and saving natural resources (Panya et al, 2017).

It is difficult to trace back the origin of human concern for environmental factors, but there was a general, well-established belief that the modern concept of environmental concern grew its roots in the 20th century, with the first efforts to conserve natural resources, the beginning protests against air pollution, and the campaigns against fossil fuel combustion

Environmental activism has surfaced at various times, for various reasons and in various forms, but the scale of activism shown by the environmental organization Greenpeace has been unprecedented (Mahamat, 2018). As a movement, Greenpeace has hundreds of millions of adherents around the world, the organization is expanding and spreading into other forms of environmental protection. The rise of environmental movement and social movements has ignited the debate around what motivates individuals to engage in environmental protection groups.

Some scholars have identified factors influencing the elements of environmental degradation such as waste management. According to Sujauddin et al. (2008) the generation of waste is influenced by family size, their education level and the monthly income. Households attitudes related to separation of waste are affected by the active support and investment of a real estate company, community residential committees' involvement for public participation (Zhuang et al., 2008) and fee for collection service based on the waste volume or weight (Scheinberg, 2011). Gender, peer influence, land size, location of household and membership of environmental organization explain, household waste utilization and separation behavior

(Ekere et al., 2009). It has been reported that collection, transfer and transport practices are affected by improper bin collection systems, poor route planning, lack of information about collection schedule (Hazra and Goel, 2009), insufficient infrastructure (Moghadam et al.,2009), poor roads and number of vehicles for waste collection (Henry et al., 2006). Organizing the informal sector and promoting micro-enterprises were mentioned by Sharholy et al. (2008) as effective ways of extending affordable waste collection services. Lack of knowledge of treatment systems by authorities is reported as one factor affecting the treatment of waste (Chung & Lo, 2008).

Tadesse et al. (2008) analyzed the factors that influence household waste disposal decision making. Results showed that the supply of waste facilities significantly affects waste disposal choice. Inadequate supply of waste containers and longer distance to these containers increase the probability of waste dumping in open areas and roadsides relative to the use of communal containers. Insufficient financial resources limiting the safe disposal of waste in well-equipped and engineered landfills and absence of legislation are mentioned by Pokhrel and Viraraghavan (2005). In relation to the pricing for disposal Scheinberg (2011), analyzing the data from ''Solid Waste Management in the World's Cities'' (Scheinberg et al., 2010), notes that there are indications that high rates of recovery are associated with tipping fees at the disposal site. High disposal pricing has the effect of more recovery of waste generated, that goes to the value chains or beneficial reuse of waste. In relation to recycling Gonzalez-Torre and Adenso-Diaz (2005) reported that social influences, altruistic and regulatory factors are some of the reasons why certain communities develop strong recycling habits.

The authors also showed that people who frequently go to the bins to dispose of general refuse are more likely to recycle some product at home, and in most cases, as the distance to the recycling bins decreases, the number of fractions that citizens separate and collect at home increases. Minghua et al. (2009) stated that in order to increase recycling rates, the government should encourage markets for recycled materials and increasing professionalism in recycling companies. Other factors mentioned by other scholars are financial support for recycling projects and infrastructures (Nissim et al., 2005), recycling companies in the country (Henry et al., 2006), drop-off and buy back centers (Matete and Trois, 2008) and organization of the informal sector (Sharholy et al., 2008). Waste management is also affected by the aspects or enabling factors that facilitate the performance of the system. They are: technical, environmental, financial, socio-cultural, institutional and legal.

Literature suggests that technical factors influencing the system are related to lack of technical skills among personnel within municipalities and government authorities (Hazra and Goel,

2009), deficient infrastructure (Moghadam et al., 2009), poor roads and vehicles (Henry et al., 2006), insufficient technologies and reliable data (Mrayyan and Hamdi, 2006). Matete and Trois (2008) and Asase et al. (2009) respectively suggested that the factors affecting the environmental aspect of solid waste management in developing countries are the lack of environmental control systems and evaluation of the real impacts. Ekere et al. (2009) proposed that the involvement of the population in active environmental organizations is necessary to have better systems. Municipalities have failed to manage solid waste due to financial factors. The huge expenditure needed to provide the service (Sharholy et al., 2007), the absence of financial support, limited resources, the unwillingness of the users to pay for the service (Sujauddin et al., 2008) and lack of proper use of economic instruments have hampered the delivery of proper waste management services. Sharholy et al. (2008) indicated that the involvement of the private sector is a factor that could improve the efficiency of the system. It is generally regarded that waste management is the sole duty and responsibility of local authorities, and that the public is not expected to contribute (Vidanaarachchi et al., 2006). The operational efficiency of solid waste management depends upon the active participation of both the municipal agency and the citizens, therefore, socio cultural aspects mentioned by some scholars include people participating in decision making (Sharholy et al., 2008), community awareness and societal apathy for contributing in solutions (Moghadam et al., 2009).

Management deficiencies are often observed in the municipalities. Some researchers that have investigated the institutional factors that affect the system have come to the conclusion that local waste management authorities have a lack of organizational capacities (leadership) and professional knowledge. Besides they concluded that the information available is very scanty from the public domain (Chung and Lo, 2008). The extremely limited information is not complete or is scattered around various agencies concerned, therefore, it is extremely difficult to gain an insight into the complex problem of municipal solid waste management (Seng et al., 2010).

Waste workers are associated to low social status (Vidanaarachchi et al., 2006) situation that gives as a result low motivation among the solid waste employees. Politicians give low priority to solid waste compared to other municipal activities (Moghadam et al., 2009) with the end result of limited trained and skilled personnel in the municipalities (Sharholy et al., 2008). Positive factors mentioned that improve the system are support from municipal authorities (Zurbrügg et al., 2005) and strategic plans for waste management that allows monitoring and evaluating annually the system (Asase et al., 2009). Researchers have documented how an adequate legal framework contributes positively to the development of the integrated waste

management system (Asase et al., 2009) while the absence of satisfactory policies (Mrayyan and Hamdi, 2006) and weak regulations (Seng et al., 2010) are detrimental to it.

The existing literature posits that socioeconomic and demographic characteristics of individuals might explain their involvement in environmental concerns. Some authors went as far as claiming that in general women show more care for the environment than men (Bord and O'Connor, 1997; Franzen and Meyer, 2010; McCright, 2010). It is in this light that Rowe and Levine (2005) argue that female education should be at the center of analyses.

Environmental management is thought to be more effective when local communities are given responsibility. Oosterveer and Vleit (2010) argued that, local communities are better placed to manage their neighboring environment and natural resources but omitted the fact that, this might lead to conflict of interest and thus a supervision from the central government is needed. Stern (1997) argued for an environmentally significant behavior proposing the Value Belief-Norm theory offering one of the best supports of account for the environmental movement. For Romerio and Nejandan (2012), a positive synergy between economic growth and the environment can be possible following two main conditions;

- the existence of a set of measures ranging from legal, technical and economic making it possible to limit the impact of economic growth on the environment all this guaranteeing the respect of different limits.
- the utilization of part of the resources generated by economic growth to finance policies of environmental protection.

Obviously, these conditions could be effective but to an extent. Romerio and Nejandan (2012) ignored the capital role of environmental education in consolidating economic growth and the environment According to Sterling (1995), education is essentially a process driven, participative and empowering, liberatory and continuous. For Somlanaré (2013) Education attainment is generally considered a determinant of environmental preferences as well as an essential tool for environmental protection. Education is a vehicle for effective environmental management, and matters greatly in behavioral changes. It enhances one's ability to receive, to decode and to understand information. Information processing and interpretation has an impact on learning and change behaviors (Nelson and Phelps, 1966).

Farzin and Bond (2006) consider that educated people are more likely to generate an environmentally progressive civil service, and therefore have democratically minded public policymakers and organizations that are more receptive to public demands for environmental protection. Mukudi (2003) claims education has a key role in accessing public information.

He articulates that only people with a minimum level of education can properly capture and elaborate information. There is strong believe that educated individuals are more likely to be concerned about environmental issues than non-educated, because they have better understanding about the consequences environmental problems may bring (Olli et al., 2001). This is true to an extent, all these scholarly writings focused on education attainment as a factor of affective environmental management but people don't need necessarily to go to school or for a class in order to be educated, to have a pro-environmental attitude, yes we can learn be educated, but from the mass too.

Lars Rydén (2006) brings the notion of education and participation as indispensable tools for sustainable development. He points that, the present and future generation need to be considered as part of the process equally bringing in the concept of globalization which he argues can be made possible via education. Environmental management demands awareness which are multidimensional often affected by politics, perception and ethics. With increased protection of environment, States have assumed the responsibility to meet dangers and risks, which may threaten a great number of citizens and even the general public (Madhuri Parikh, 2017). To achieve maximum impact in environmental protection, community participation is essential. People should be included in decision making system. They should have a say in decisions that will affect their lives, this increases awareness and pro-environmental attitudes. For this reason, education on the conservation of the environment and environmental management should be expanded.

As pressure on the environment continues to mount, it is important that policy makers and stake holders have a clear understanding of community beliefs and attitudes towards, the environment (Hornback & Eagles, 1999). This is particularly important in order to engender and maintain support for conservation and protection (Iglis, 2008). Research has shown that "environmental attitudes and knowledge of one's own negative impact is also a critical factor in mitigating backlash" to policies concerning the environment (Hornback & Eagles 1999). From an historic perspective, Mebratu (1998) explains that humans have always affected the environment as they rely on the earth's resources to sustain life. Likewise, humans are skilled at adapting to the depletion of resources and are innovative in developing new ways of surviving such crises. At the close of the 20th Century, evidence emerged that the earth was showing vital signs of disintegration (Brown, Lenssen & Kane, 1995). Experts believed that if this situation, driven by accelerated population growth, outdated technologies and social power, was not halted, the earth would be pushed towards destruction (Gottlieb, 1996). In 1987, a report by the World Commission on Environment and Development titled, 'Our

Common Future', defined a global view of environmental sustainability and prompted environmental initiatives across the globe. In the 1980s, the seed of contemporary environmentalism emerged to examine the Human Natural World Relationship and its role in conservation management (Mebratu, 1998).

In 1978, Dunlap and Van Liere in the New Environmental Paradigm Scale (NEP scale) to measure the belief that humans are part of nature that they should preserve it and avoid exploitation of natural resources (Berchel & Churchman, 2003). NEP scale is a belief system embedded and difficult to change on an individual regarding his perspective on the environment. NEP scale measure the ecological core beliefs as their ecological limits and the importance of maintaining the balance of nature (Berchel & Churchman, 2003). In its development, the NEP scale was found significantly associated with pro-environmental behavior (Berchel & Churchman, 2003). Therefore, we can approach the NEP scale as a form of human values guide to describe their behavioral tendencies pro-environment. Previous research has identified several demographic variables that influence individual attitudes toward the attitude towards the environment (Clayton & Myers, 2015). These variables are generally weak and sometimes inconsistent between populations. Among them, the respondents were young and highly educated tend to be more positive about environmental issues (Bodur & Sarrigolu, 2005). Women tend to be more pro-environment than men (Floyd, 1999). Certain ethnic groups in care more about the environment than other ethnic groups (Clayton & Myers, 2015). High socioeconomic status and ethnic origin majority (elitism) tend to have a positive attitude towards the environment (Clayton & Myers, 2015). Meanwhile, other studies have shown that social context influence the behavioral expression of an attitude, such as between ethnic groups with environmentally friendly behavior (Milfont & Duckitt, 2004). The social institution itself is a means of transmitting norms, values, beliefs, habits, and so on between generations. That is, social institutions is an effective tool to raise a certain world view, including new ecological paradigm. Social institutions themselves structure the availability of social and economic incentives in the community for a certain behavior or attitude. Changes in society created mainly through the support of social institutions that contain systems of values stored in social institutions. Social institutions increasingly important role in modern society is a society of risk. Risk society characterized by a fragmented view and there is competition between institutions and values. It can be said, containing risk society institutions that pro-environment, are vying for dominance. Such a society is going to be tough when pro-environmental institutions able to control the entire system in a holistic and integrated (Godfrey

& Risky, 2008). This is because social institutions, especially if tied to a spatial context, will be a significant impact on the lives of community members (Pelling, 2012).

Past research has identified the stakeholders or people or organizations that may have an interest in adequate environmental management. They include: national and local government (Shekdar, 2009) municipal authorities, city corporations, non-governmental organizations (NGO's), households (Sujauddin et al., 2008), private contractors, Ministries of Health, Environment, Economy and Finance (Geng et al., 2009) and recycling companies (Tai et al., 2011). Management of the environment areas in the 21st Century is likely to involve a diverse range of participants (Figgis, 1999). The choice of participants would however have significant consequences for environmental management. Natural resource management agencies, environmental groups, local communities, businesses and households are all essential players in the environmental protection and conservation challenge.

Present environmental governance depends on easily accessible information about environmental quality and environmental policies (Hoas and Peter M, 1990). Rapid economic development causes environmental degradation, pollution, and also global warming, and therefore, the environmental management of local government is of high value to improve the quality of life of people through good environmental quality (Panya et al, 2017).

Since the 1990s, many countries have promoted decentralized environmental governance as part of a broader trend towards the decentralization of governmental responsibilities. This decentralization is designed to improve effectiveness, efficiency, transparency and democracy. Many environmentalist consider the local community to be the most appropriate custodian of environmental management since they are better able to understand and intervene in environmental problems because they are "closer" to both the problem and the solution (Lane and Mc Donald, 2005). It is in this light that, Agrawal and Gibson (1999) argue that decentralized environmental and natural resource management would allow local communities to be actively involved and address their main environmental problems in ways that suit their local needs. Some observers regard the decentralization of environmental policy as even an "institutionalized" form of participation (Ribot, 2002). The decentralization of environmental and natural resource management is therefore not only an administrative act but also a political process involving a redistribution of power and resources (Larson and Soto, 2008).

Studies such as, Franzen and Meyer (2010), Kemmelmeier et al. (2002) and Franzen and Vogl (2013) found that wealthier individuals are more likely to be greener than poorer ones. Additionally, Inglehart (1990) argued that individuals' values and personal beliefs may explain to certain extend their involvement in environmental protection.

A number of studies reveal that citizens in both developed and developing countries unveil high degree of concern for the environment (Brechin and Kempton, (1994); Dunlap, Gallup, and Gallup, (1993); Dunlap and Mertig, (1995)). In response, Inglehart revises his original thought by distinguishing among concern for the environment due to subjective environmental values and objective environmental problems. He adds that environmental concerns in developing countries can be explained mainly by the need to overcome severe local environmental conditions, such as air pollution and lack of clean drinking water prevailing generally in developing countries. A second line of studies related to environmental concern emerges and advocates that environmental quality rises with the level of affluence (Diekmann & Franzen, (1999); Franzen, (2003); Kemmelmeier et al. (2002)).

Though, public support for the environment should be seen as a global phenomenon, emerging from multiple sources, such as direct exposure to environmental degradation resulting from industrialization, trade liberalization, quality of institutions, rather than being determined solely by a particular result of post-materialism values or of a country's wealth. With the recent increase in environmental degradation, the world has seen environmental groups multiplied and environmental protests intensified.

The world Summit on Sustainable development (2002) addresses a comprehensive range of environmental and development issues, calling for a substantial increase in used of energy with a sense of urgency, declaring that the fault line between the rich and the poor threatens prosperity, thus the necessity to adopt broad methods to alleviate poverty and protect the environment. Economic and environmental performance must go hand in hand. Environmental assets contribute to managing risks to economic and social activities, regulating the local climate and maintaining the supply of clean water and other resources (Richard Price, 2010).

Following all these authors our study shall analyze the impacts of urban expansion and population growth as variables of socio-economic development. Nonetheless a land cover time series (2001, 2010, and 2018) analyses of Sangmelima town shall be done in order to have a broad view of the situation.

Unlike these studies, our study analyses the implication of socioeconomic development on the environment in a town where the process of economic development is still embryonic. Going from the theses that "where there is economic activity, there is impact on the environment", our study aims to build concern on environmental issues such as poor waste management and their various impacts, air pollution through waste incineration and water pollution through floating waste, which accentuate at an exponential rate.

IX-   Conceptual and theoretical framework

A variety of concepts and theories in the social and management sciences have been used to explain the causes, impacts, solutions and interrelations of social, economic and environmental management. The concepts here include; Socio economic development, environment and impact respectively. On the other hand, the theoretical framework includes the central place theory and evolving sustainability theories such as the theory of environmentally responsible behavior, the theory of citizen participation, and the theory of innovation diffusion.

IX.I- Conceptual Framework

IX.I.1- Socio-economic development

Till the 1960s development was identified with economic growth. Physical capital accumulation was believed to be the core of development (Litwinski, 2017). At the beginning of the 1960s, Singer (1961) underlined the importance of human capital indicating that wealth creation is significant but capability of doing it an essential issue. The idea of identification of development with economic growth was also challenged because of concentration of the situation of poor people (Litwinski, 2017). It was then realized that unequal distribution of economic growth effects leads to increase of the level of poverty (Sach, 2000). Therefore the concept of social development was taken in to consideration and the importance of the social dimension of economic development increased (Litwinski, 2017).

Socio-economic development can be defined as the process of social and economic development in a society. The concept is thus a combination of both social and economic dimensions of development. It refers to the improvements of people's lifestyle through improved education, income, skills, development and employment. It is the process of economic and social transformations based on cultural, political and environmental factors. It is measured with indicators such as literacy and levels of employment. The concept of socio-economic development in our work thus covers two dimensions; a social and an economic dimension, (**cf. Figure 2**).

The social dimension is subdivided in to two variables; population and its characteristics and urban spread. Population and its characteristics highlights population change, population growth, and participation. Urbanization on the other hand focuses on the development of social and economic infrastructures such as roads, markets, infrastructures, habitat and schools.

The economic dimension is also subdivided in to two variables; economic activity and income levels. Economic activity investigates the nature, state, and the types of occupation of the respondents. Social class on the other hand focuses on income levels; low, middle and upper.

CONCEPT	DIMENTIONS	VARIABLES	INDICATORS

SOCIO ECONOMIC DEVELOPMENT

Social

Population and its characteristics
- Population change in Sangmelima town
- Growth rate in Sangmelima town
- Participation in the political process
- Population Literacy level

Urbanization or urban spread
- Lunch of important building sites
  - ✓ Hospitals and schools
  - ✓ Roads and Habitat
  - ✓ Markets and social grounds

Economic

Economic activities
- Banking and finance
- Commerce, retail and arts and crafts

Source: Field work, 2020

Figure 2: Conceptualization of the concept "socio-economic development

IX.I.2- Environment

The word environment is derived from the French word "environ", meaning "surrounding". Bain (1973) defined the environment as all the external and non-personal conditions and influences that affect the welfare of people in a given area. *Article 4 of law no 96/12 of 5 august 1996 relating to environmental management in Cameroon* defines the environment as, *"all the natural or artificial elements and bio geochemical balances that participate in, as well as the economic, social and cultural factors which are conducive to the existence, transformation and development of the environment, living organisms and human activities"*. From these definitions, the environment can be viewed as a system that provides a natural surrounding for the existence of organisms and humans, which is a prerequisite for their evolution. The environment constitutes abiotic (nonliving things such as water, minerals and energy) and biotic (living things from the simplest to the most complex) components. To summarize, the environment is all which surrounds us. It can equally be defined from a biological and an ecological approach.

Ecologically, the environment is a set of all factors with which a living organism interacts, and of all surroundings which encompass it. Thus, it is everything that a subject influences directly or indirectly. A subject may be an organism, a population, a human or whole human society. Usually the notion of living environment is conceived in the sense of human development. Since this is the meeting point between the study of living organisms and their environment, an ecological behavior must be adopted in the protection of the environment and its resources while guaranteeing the future livelihood of living things. This is recommended in the town of Sangmelima to guarantee the protection of the environment of this town and the wellbeing of the local population.

Biologically, the environment denotes the surroundings of an organism or a species, the ecosystem in which it lives. At the same time, it is the physical environment within which an organism interacts with other organisms.

The urban environment that is our point of interest covers areas such as air, water, climate, vegetation and habitat. It refers not only to the urban environment but also to all that surrounds a well-defined living space specific to the town, opposed to the rural and under the influence of man. It includes physical elements such as the quality of water and air, the elimination of waste, collective and green spaces. The environmental issue in the urban area is usually expressed in terms of problems (pollution and degradation) or risk. It is well known that urban growth is perceived as an environmental problem when it takes shape on sites that are not

conducive to construction and generates risks. The concept is divided in to five dimensions in this work, vegetation, soil, air, fauna, and water. (**cf. Figure 3)**.

IX.I.3- Impact

The word impact can be defined from two perspectives. It is a noun and a verb. As a noun, the word impact refers to the effect of one person, thing or action on another. As a verb it is the action of having or causing a strong effect on someone or something. In our context, we define an impact as the effect of socioeconomic development on the environment.
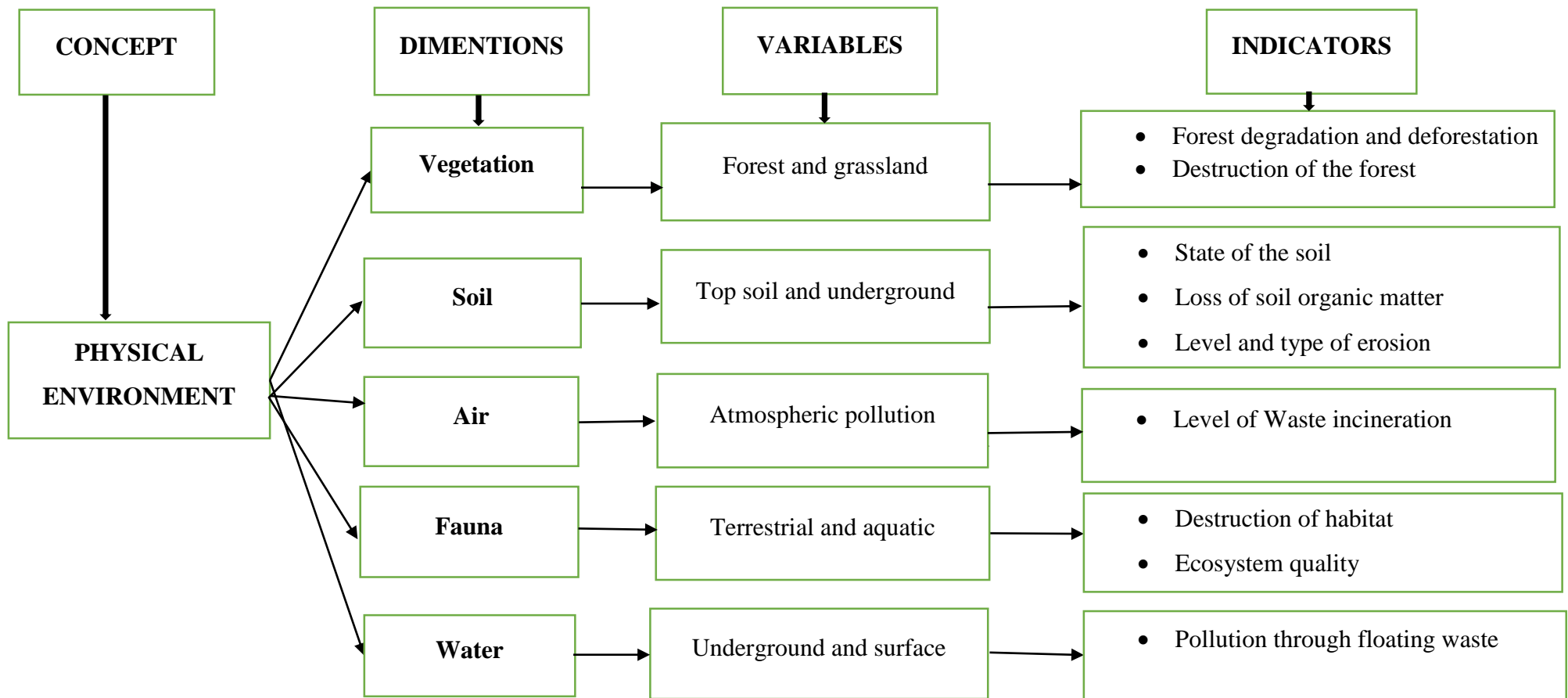
Source: Field work, 2019

Figure 3: Conceptualization of "physical environment"

IX.2- Theoretical framework

X.2.1- The central Place theory (CPT) by Walter Christaller 1933

The theory was developed in 1933 by the German geographer Walter Christaller based on his study of settlement pattern in Southern Germany. The CPT tries to explain the spatial arrangements and distribution of human settlements and their number based on population and distance from another human settlement. Walter Christaller explained why highest order settlements have very peculiar activities which can only be supported by them and the reason behind those activities taking place only in those particular highest order settlements. The CPT is of great importance and forms the basis of various present-day theories used in urban geography.

By examining and defining the functions of the settlement, structure and size of the hinterland he found it possible to model the pattern of settlement locations using geometric shapes. Christaller defined a central place as a settlement which provides one or more services for the population living around it. A central place has the main function to supply goods and services to the surrounding population. It is specialized in the provision of various goods and services and the market area is the summation of consumers traveling to the central place, which is a part of hierarchy with other central places. Its influence is a function of its market area and the size of its market area will determine the nature of spatial order.

The CPT, as a model of regional spatial structure has been the subject of numerous criticisms. The basic hierarchical rules can be questioned, partly because the theory relates only to the service sector. Settlements may develop only due to other factors such as the availability of natural resources or as a gateway in the transport system. The CPT holds such factors constant assuming a uniform distribution of natural resources. The theory also assumes a uniform distribution of population, which rarely occurs in practice since factors such as the landscape, soil, fertility and climate vary and distort the spatial structure. Again, the dominance of a large metropolitan center may create a "shadow effect", inhibiting the growth of smaller centers nearby.

Being the head quarter of the Dja and Lobo division and constituting a highest order settlement as compared to other surrounding settlements, the town of Sangmelima acts as a pull factor by attracting the surrounding population. It is the central place and provides a bulk of services (educational, health, leisure, employment banking and finance…) to the surrounding population. Coupled with rural exodus, the town is subjected to a demographic growth with consequences on the environment.

IX.2.2- Theory of Environmentally Responsible Behavior (ERB)

This theory was proposed by **Hines, Hugerford and Tomera in 1987**. This model argues that, having an intention to act is a major factor influencing ERB. It points out that an individual with the intention to act is more likely to act than an individual with no such intention. The model argues that, before an individual can intentionally act on a particular environmental problem, he must be aware of the existence of the problem. The theory goes forward by pointing that, a person's desire to act is influenced by a host of personality factors such as his or her

- locus of control (Internal Control Centre),
- attitudes towards the environment and towards taking action, and
- social factors such as level of education, age, gender and economic activity.

Published in the work entitled "*Analysis and Synthesis of research on Responsible Environmental Behavior: A Meta-Analysis*" in 1987, the researchers analyzed 128 studies which assessed variables in association with responsible environmental behavior and which reported empirical data on this relationship.

The theory of ERB is of great importance and will be applied in this study as a measure to serve as a base for initiating environmental responsibility in the town. The theory will help us to establish a base to understand the relationships that exist between man and the environment. It will help in the analyses of various human and environmental parameters and to solve environmental issues that trigger, (**cf. Figure 4**).
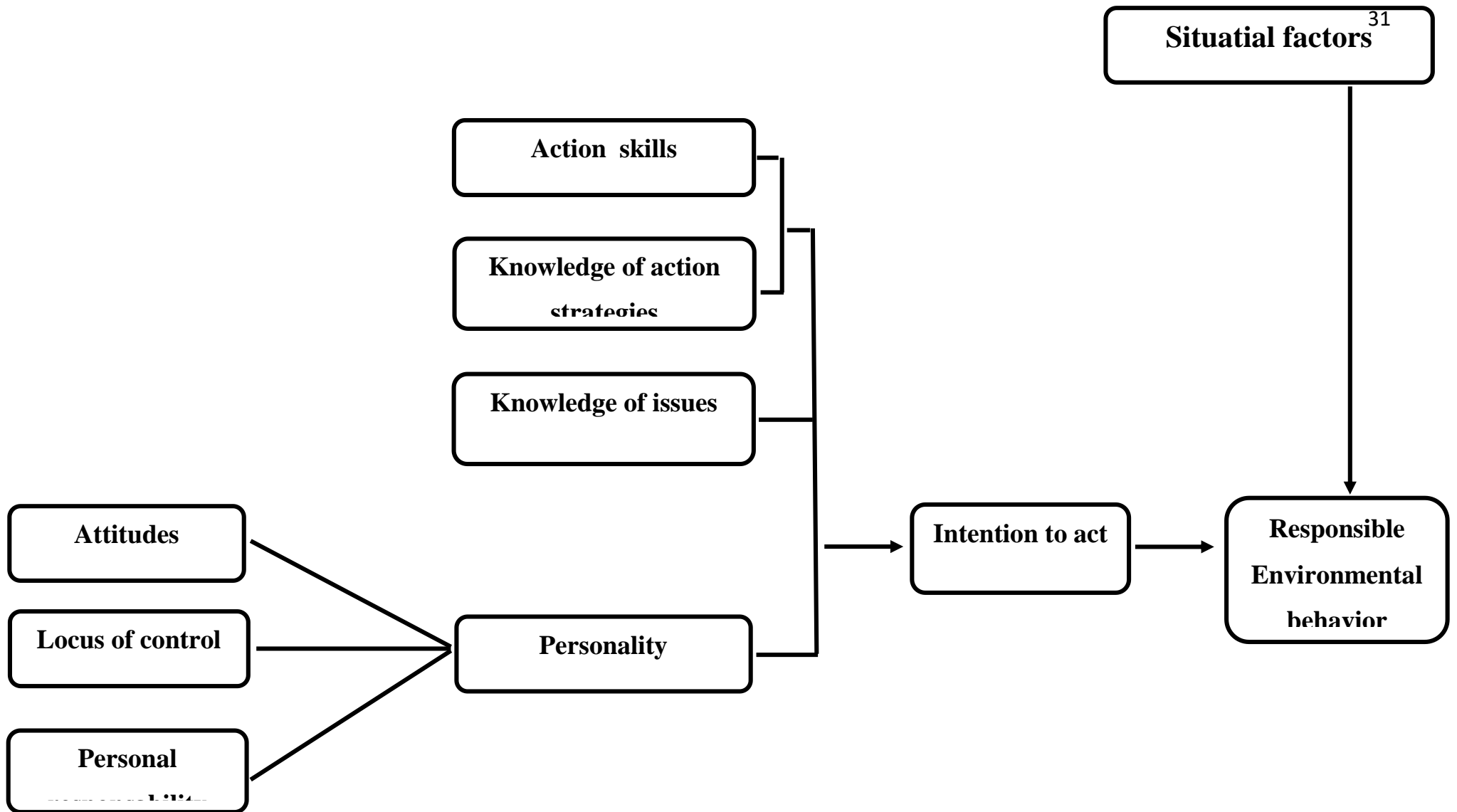
Source: Hines, Hugerford and Tomera 1987

Figure 4: Theory of Responsible behavior

IX.2.3- Theory of citizen participation by Cogan and Sharpe (1986)

Citizen participation is a process which provides private individuals an opportunity to influence public decisions. Its roots can be traced back to ancient Greece and colonial New England. Before the 1960s, governmental processes and procedures were designed to facilitate "external" participation. In the 1960s, citizen participation was institutionalized with President Lyndon Johnson's Great society programs (Cogan and Sharpe 1986). Public participation can be seen as a means to ensure that citizens have a direct voice in public decisions. Many governments and societies choose to minimize and in some cases exclude public participation in their policies claiming it is too expensive and time consuming. **Cogan and Sharpe (1986)** identified five benefits to citizen participation:

- information and ideas on public issues,
- public support for planning decisions,
- avoidance of protracted conflicts and costly delays,
- a reservoir of Goodwill and a pathway for future decisions and,
- spirit of cooperation and trust between the agency and the public.

Participation is thus associated with greater social, more effective public services and a society of self-confident citizens (Beetham et al 2008). Taking in to considerations the voices and ideas of people affected and interested by the initiatives make us assure that the decisions are taken with equity and justice.

The inclusion of participation is very important in environmental management. It is necessary for us to include the notion of "participation" rather than "representation" which is common and not reflecting the actual needs of the population. Generally, the population is represented by elites that are usually guided by political, tribal and even gender interest and priorities usually living aside the real issues to be defended. We will thus call Public institutions to formalize, institutionalize and promote a real participative platform for the population of the town of Sangmelima. By including the population in its decision process our main objective should be; to inform the different parties on the implications and possible consequences that the projected activities can have on their environment. Taking in consideration the ideas and information of various parties, bring together the local and traditional knowledge that could be used during the decision making process. Including the public in decision making processes will make sure that the important aspects have not been neglected. The most important points in participation not to be neglected in the environmental management of Sangmelima include the proper diffusion of information and the existence of trust between the various parties.

Nevertheless, we may have some features that will have a negative impact on the participation process. They include the local culture and traditions, the confidential character of certain data and information, and the financial and time cost. We should note that strategies for implicating the local population in the decision making process aiming at sustaining their environment should be conceived with respect to cultural and traditional norms.

X- Interests of the study

X.1- Academic interest

The study combines urban development with environment in the context of sustainable development within the town of Sangmelima with an equatorial forest registered as world heritage. It emphasizes the role of the government and education as key factors of environmental responsibility and suggests measures for better environmental management in the town. It therefore completes the literature not only on the town but also on the debate of human-environment integration. It equally contributes to bridge the gap between the social and environmental science, as it brings to light various linkages that exist between the human and environmental processes through the elaboration of the socio-economic and environmental profile of the town.

X.2- Technical interest

The study contributes to environmental management through the elaboration of a framework that includes human and cultural dimensions as part of the environment. The framework provides a mechanism to understand socio-economic-environment interactions which will help to establish management priorities and strategies. A greater understanding of urban-environment processes and interactions will surely help to develop effective management tools and techniques. The result of this study will inform the town managers and stakeholders about the community views and values of the environment in the town.

X.3- Socio-Economic interest

The study will help to provide green measures to boost community standards of living and productivity through the elaboration and identification of potential growth points and mechanisms. Knowledge on environmental issues resulting from socio-economic activities in the town will help the population to have a clear view and develop an environmentally responsible behavior. This may equally create a spirit of initiative and innovation within the population. It will help the society in having a different (positive) apprehension of the

environment which may be seen as a fundamental factor of growth and wellbeing rather than just an instrument.

X.4- Personal interest

The study will help to acquire more knowledge on the environment, environmental challenges and on human-environment interactions. It will help set the bases for future research and enlarge the authors research ground.

XI- Methodology

The success of a research lies on the viability of the collected data. Contributing to world knowledge necessitates the collection of adequate and relevant information and data about the study, as well as the phenomenon of matrix. According to Bowling (2002), methodology is the complete structure of the research study; the size and sample methods, the practices and techniques utilized to collect data and the process to analyze data. Creswell (2003) portrays methodology as a coherent group of methods that harmonize one another and that have the capability to fit to deliver data and findings that will reflect the research questions and suit the researcher's purpose. In general, the method applied to our study is the Hypothetico Deductive Method.

To accomplish the study, various methods were used and have been classified under the data collection and data analyses.

XI.1- Data Collection

Data was collected from two sources; secondary and primary sources of data.

XI.1.1- Data of Secondary sources

Data of secondary sources were collected from several services which include;

- Sangmelima Municipal Council, where data on physical and the socioeconomic situation of the town was collected;
- Divisional Delegation of Small and Medium Enterprises, where data on the economic situation of the town and on the adoption of pro environmental attitudes by local enterprises was collected;
- Divisional Delegation of Nature and Sustainable Development, to collect data on the state of the environment and environmental management in the town;
- Divisional Delegation of Forestry and Wildlife, to inquire data on forest management in the town;

- Divisional Delegation of Secondary and Basic Education, where data on the number of schools and data environmental education was collected;

- Hysacam Sangmelima, to collect data on waste production and waste management in the town;

- JEURAC (Jeunesse Rurale Active), to collect data on socioeconomic development;

- Cameroon National Institute of Statistics, to collect data on the evolution of the town in terms of social and economic infrastructures;

- BUCREP, to collect data on population growth in the town of Sangmelima;

- Centre for Data collection on the Environment; to collect data on environmental management in Cameroon and the rest of the world and

- the Library of the Faculty Arts, Letters and human Sciences of the university of Yaoundé 1, where past thesis were consulted

To complement the above, information was also gotten from publications, journals, books, past projects, lecture notes, reports, modules, articles, and the internet.

XI.1.2- Primary data sources

Primary data sources constituted information and data gotten directly from the source, phenomenon or matrix studied in the cause of field surveys. Data was gotten through interviews observation of the terrain and questionnaires administration.

XI.1.3- Observation of the terrain

The observatory phase was done on two fronts: general observation of the terrain and observation in situ. General observation consisted of examining the terrain, natural environment and the evolution of urban activities via the use of remote sensing and cartographic techniques (maps analyses). This was to better apprehend the study area and the features (economic, social and physical) that constitute it.

Observation in situ consisted of direct observation of the natural environment and population behavior vis à vis the environment. This stage was vital in the study taking in account that it gave us a clear view of the real situation of socioeconomic development-environment relationship and helped us to properly analyze our variables and establish conclusions.

XI.1.4- Interviews

The number of interviews were limited to 7 involving;

- the council (head of hygiene and sanitation department), to have knowledge of environmental practices and management of the environment by local actors;

- the Divisional Delegations of Primary and Basic Education (inspecteur pedagogique) and Divisional delegation of secondary Education (inspecteur pedagogique), to have information on environmental education in schools in Sangmelima;

- Hysacam Sangmelima, to have information on waste production and waste management in the town;

- JEURAC (Jeunesse Rurale Active), to have information on socioeconomic development and environmental management;

- the divisional delegation of the Ministry of Nature protection and Sustainable Development in Sangmelima, to have information on environmental practices and environmental management in the town;

- the divisional delegation of Small and Medium Enterprises, to have information on the economic situation of the town and on the inclusion of environment in the local industry and

- the divisional delegation of Forestry and Wildlife (the divisional delegate), to get information on forest practices and forest management in the town

The objective was to have information on environmental management, environmental projects and administrative policies.

Informal interview were also conducted with workers in these sectors during participatory field trips. Information obtained from these interview was important because such cannot be sourced through questionnaires. It was also an opportunity to cross check information not yet documented. Policy issues were better explained at interviews.

XI.1.5- Survey

Surveys were done by administering questionnaires to households in order to acquire clear information.

XI.1.5.1- Sampling technique

The sampling technique used was simple random sampling. It consist of choosing an individual from the sample population in such a way that every set of individual has an equal chance to be selected. This technique was applied to households because it guarantees that the sample chosen is representative of the entire population and that the sample is selected in an unbiased

way. Thus, to have a practical situation, a sample of the population was selected for study and analyses.

XI.1.5.2- Sample Unit

The sample unit also known as sample site was the household. A household is the final sample site or unit within which one person, an adult, was chosen for the survey. Two types of households are identified: private households and collective households. A collective household consists of a group of people living in camps, institutions or boarding schools. On the other hand, a private household comprises either one person who provides his own essential needs or group of related or unrelated persons who join together to provide their essential needs. Such a group therefore recognizes the authority of one person: the head of the household. Households are the main source of waste generation in most of the non-industrialized countries accounting for more than 70% of their city solid waste (Tanawa et al, 2002). If household waste is accurately assessed, the town's waste situation can be fairly understood and the remaining waste can even be estimated with reasonable accuracy.

XI.1.5.3- Sample size

The sample size constitutes the number of households to which questionnaires were administered. Due to financial and material challenges, simple random sampling was used. To calculate the sample size, some rules must be followed: firstly we should note that the greater the number of households the smaller the calculated percentage and the smaller the number of households the bigger the calculated percentage.

Given the formula N x n/100, Where **N** is the total number of households per neighborhood and **n**, 3% of the total number of households per neighborhoods.

We extracted 406 households from a total of 13629 in Sangmelima

A sample size of 406 was used for the study. This was because according to Nwana (1995), *"if the population is in few hundreds, 40% sample size will do, and if several hundred, a 20% sample size will do, if a few thousands, 5% or less of the sample will do"*. Therefore, a sample size of 406 representing 3% of the total population of 13629 households (BUCREP 2005) was used for the study, (**cf. table 1**)

Table 1: Distribution of households sample per neighborhood

Neighborhoods	Number of households (3% sample)	Number of Questionnaires
Akon 1	1117	33
Aon 2	1448	43
Akon 3	1086	32
Akon x	311	9
Base	378	11
Bissono	743	22
Centre Administratif	140	4
Ebolengbwang	532	16
Lobosi	3114	93
Mbeli'i	227	7
Monavebe	310	9
Nkolnguet	201	6
Nylon	755	23
Quartier Chic	168	5
Sangmelima village	2593	78
Sources	134	4
Otoakam	370	11
Total	**13629**	**406**

Source: BUCREP, 3rd RGPH (2005) and field work, 2020

XI.1.5.4- Questionnaire administration

The number of questionnaires administered were limited to 406 with 26 questions. The aim of the questionnaire was to have information on; literacy level, total revenue per habitant infrastructures and equipment, economic, waste disposal and population environmental perception and awareness and generalities in socio-economic development and environmental management of Sangmelima town. Each questionnaire was thus divided in to 5 sections;

- Section **A** which investigated on the socio-demographic status of the respondent
- Section **B** which investigated on the economic status of the respondent
- Section **C** which investigated on the waste generation and disposal
- Section **D** which investigated on environmental perception and awareness

- Section **E** which investigated on generalities on socioeconomic development and the environment

The questionnaires was self-administered. This was to guarantee the return rate. However, some respondents insisted on filling out the questionnaires, but not all of them were returned.

XI.2- Data treatment and analyses

The analysis of data involved the use of descriptive and inferential statistical techniques. Descriptive analyses included the spatial analyses of land cover and land use on the bases of satellite images. The aim was to establish the linkages between the socio-economic processes and the physical environment. This was done by examining the spatial evolution of the urban space development linkage through time in relation to the environment.

Out of 406 households surveyed, 306 households responded to the questionnaires while 100 did not, giving a return rate of 75.36%. Given the formula, Rr = Tnaq/Tnqa x 100

Where **Rr** is the return rate, **Tnaq** is the total numbered of answered questionnaires and **Tnqa** the total number of questionnaires administered, (cf. Table 2).

Table 2: Return rate in each of the neighborhoods

Neighborhoods	Number of Households	Number of Questionnaires(3% sample)	Answered questionnaires	Unanswered questionnaires	Return rate(%)
Akon 1	1117	33	27	6	82
Akon 2	1448	43	29	14	67
Akon 3	1086	32	24	8	75
Akon x	313	9	9	0	100
Basse	378	11	9	2	82
Bissono	743	22	22	0	100
Centre Administratif	140	4	3	1	75
Ebolengbwang	532	16	14	2	87.5
Lobossi	3114	93	77	16	83
Mbeli'i	227	7	7	0	100
Monavebe	310	9	9	0	100
Nkolguet	201	6	3	3	50
Nylon	755	23	20	3	87
Camp Chic	168	5	3	2	60
Sangmelima Village	2593	78	41	37	53
Sources	134	4	2	2	50
Otoakam	370	11	7	4	64
Total	**13629**	**406**	**306**	**100**	**75.36%**

Source: BUCREP, 3rd RGPH (2005) and field work, 2020

The treatment and analyses of questionnaires was done with the aid of soft wares such as Microsoft Excel and KoBoCollect. For the treatment of pictures and photos, we used soft wares

such as Adobe photoshop, Adobe flash player and Picasa to increase the luminosity of our images and fixe the contrast, (**cf.Table 3**).

A variety of tools were used during the field work, table 3 illustrates these tools, their functions and the results obtained.

Table 3: Tools used during the study

Tools	Functions	Results obtained
Books, projects, theses, reports, articles and internet	Literature review	Secondary sources of data
Questionnaires, interview guides and investigation files	survey	Primary sources of data
Arc Gis	Geo referencing	Maps
Excel	Data treatment	Tables and graphs
KoBoCollect	Administration, Treatment and analyses of data	Tables and graphs
Camera	Picture taking	Pictures and images
Tape recorder	Recording sound data	Interviews
Adobe photoshop and picasa	Photographic treatment	Pictures
Mobile Topographer	Data collection	GPS points

Source: Field work, 2020

XI.2.1 - Map analyses and treatment

For the analyses and treatment of our maps we used Landsat7 and 8 images with 30m resolution respectively. For the land series analyses, we used 3 images; 2001, 2011 and 2019. The 2001 and 2011 images are Landsat7 images and the 2019 image is a Landsat8 image. The treatment of these images were done using remote sensing and GIS softwares (ENVI and ARCmap).

For the location and distribution maps, we proceeded in two phases. The first phase consisted of collecting data in the field with a GPS; Mobile Topographer. After the collection phase, we imported our data from the GPS to our GIS software (ARCmap 10.5) from which we treated our images and brought out the various Maps presented.

XI.2.2- Method of identification of impacts

The identification of impacts was done through determining the correlation that exists between the different sources of impacts and the various elements of the physical environment in Sangmelima that are susceptible to be affected. The matrix of Leopold (1971) was thus applied in the study. This method consists of a grid of rows (horizontal axis), representing the possible project activities or sources of impacts and columns (vertical axis) representing elements of the environment. Where an impact is expected, the appropriate cell of the matrix is marked

.XII- Difficulties faced during the study

The **Covid 19** has created a challenging, environment for us to conduct the study. It was very difficult to freely move and administer the questionnaires given that almost everybody was confined and the respect of the rules of hygiene were essential. On this bases, some households refused to participate. Added to this harassment (verbal and physical) was on "rendez-vous" and although we prepared for such situations, we were still affected. During the survey, some households could not give the questionnaires back, they were either lost or destroyed. Others asked for compensation which we did not give. We explained our aims and allowed them to decide
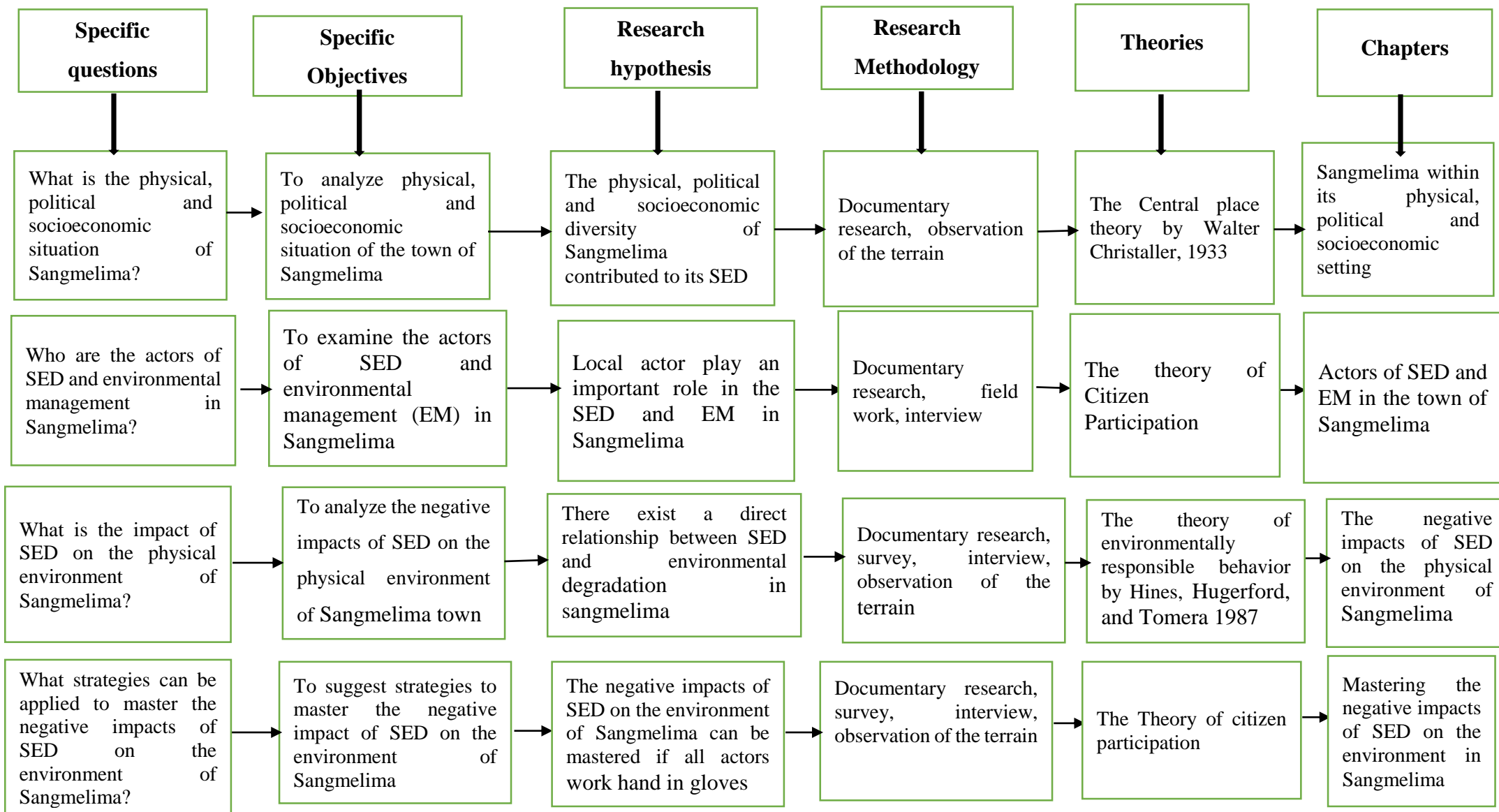
Specific questions	Specific Objectives	Research hypothesis	Research Methodology	Theories	Chapters
What is the physical, political and socioeconomic situation of Sangmelima?	To analyze physical, political and socioeconomic situation of the town of Sangmelima	The physical, political and socioeconomic diversity of Sangmelima contributed to its SED	Documentary research, observation of the terrain	The Central place theory by Walter Christaller, 1933	Sangmelima within its physical, political and socioeconomic setting
Who are the actors of SED and environmental management in Sangmelima?	To examine the actors of SED and environmental management (EM) in Sangmelima	Local actor play an important role in the SED and EM in Sangmelima	Documentary research, field work, interview	The theory of Citizen Participation	Actors of SED and EM in the town of Sangmelima
What is the impact of SED on the physical environment of Sangmelima?	To analyze the negative impacts of SED on the physical environment of Sangmelima town	There exist a direct relationship between SED and environmental degradation in sangmelima	Documentary research, survey, interview, observation of the terrain	The theory of environmentally responsible behavior by Hines, Hugerford, and Tomera 1987	The negative impacts of SED on the physical environment of Sangmelima
What strategies can be applied to master the negative impacts of SED on the environment of Sangmelima?	To suggest strategies to master the negative impact of SED on the environment of Sangmelima	The negative impacts of SED on the environment of Sangmelima can be mastered if all actors work hand in gloves	Documentary research, survey, interview, observation of the terrain	The Theory of citizen participation	Mastering the negative impacts of SED on the environment in Sangmelima

Figure 5: Synthetic matrix of the Study

CHAPTER 1

SANGMELIMA WITHIN ITS PHYSICAL, POLITICAL AND SOCIOECONOMIC SETTING

Introduction

The town of Sangmelima suddenly emerged as the largest urban area in the Dja and Lobo division of Cameroon in the 1950s. It is a typical service center with a relatively high position in the regional urban structure in terms of its areal extent, population, economic activities and environmental characteristics. This chapter therefore in a first place analyze the physical characteristics of Sangmelima and in the second place its socioeconomic situation of Sangmelima, that is, the economic activities (agriculture, commerce, industry and services) and social activities (its location and site, history and political influences, the changing administrative, Health and educational services) that led to its development.

1.1: Sangmelima within its physical setting

Physical and environmental characteristics include everything that is part of the so-called natural. These are the geographic elements proper, that is, what man finds on the spot and which he tries to fashion.

1.1.1: Location

The town of Sangmelima is located 175Km South-east of Yaoundé on the NR9 and 105Km from Ebolowa, between longitude 11°55' and 12°15' E and latitude 2° 45' and 3°02' N. The town is bounded to the North by the subdivision of Ngoulemakong and Zoétéle, to the South-East by Meyomessi, to the South-West by Mvangan, to the East by Meyomessala, and to the West by Mengong and Biwong Bulu, (**cf. figure 1**).

1.1.2: Climate

The climate of Sangmelima is a Guinea type climate with alternating dry and wet periods. The year begins with a long dry season that lasts from around mid-November to mid-March. This is followed by a light wet season from mid-March to mid-June and a short dry season from mid-June to mid-August. A heavy wet season begins around mid-August and lasts through mid-November. Table 4 shows average temperatures, precipitation and humidity in Sangmelima for the year 2020.

Table 4: Average temperatures, precipitation and humidity in Sangmelima for the year 2020

Month	Temperature range(^{0}C)	Precipitation (mm)	Humidity(%)
January	11	95	79
February	11	181	81
March	11	334	85
April	10	343	87
May	10	413	89
June	10	321	90
July	8	222	88
August	8	218	88
September	8	356	90
October	8	495	91
November	10	336	88
December	11	102	82

Source: Sangmelima Council développent plan and fieldwork 2020

Average annual precipitation stands at 1,679mm per year while temperatures are relatively high averaging 32°C. Due to abundant rains humidity is also high (CDP, 2015).
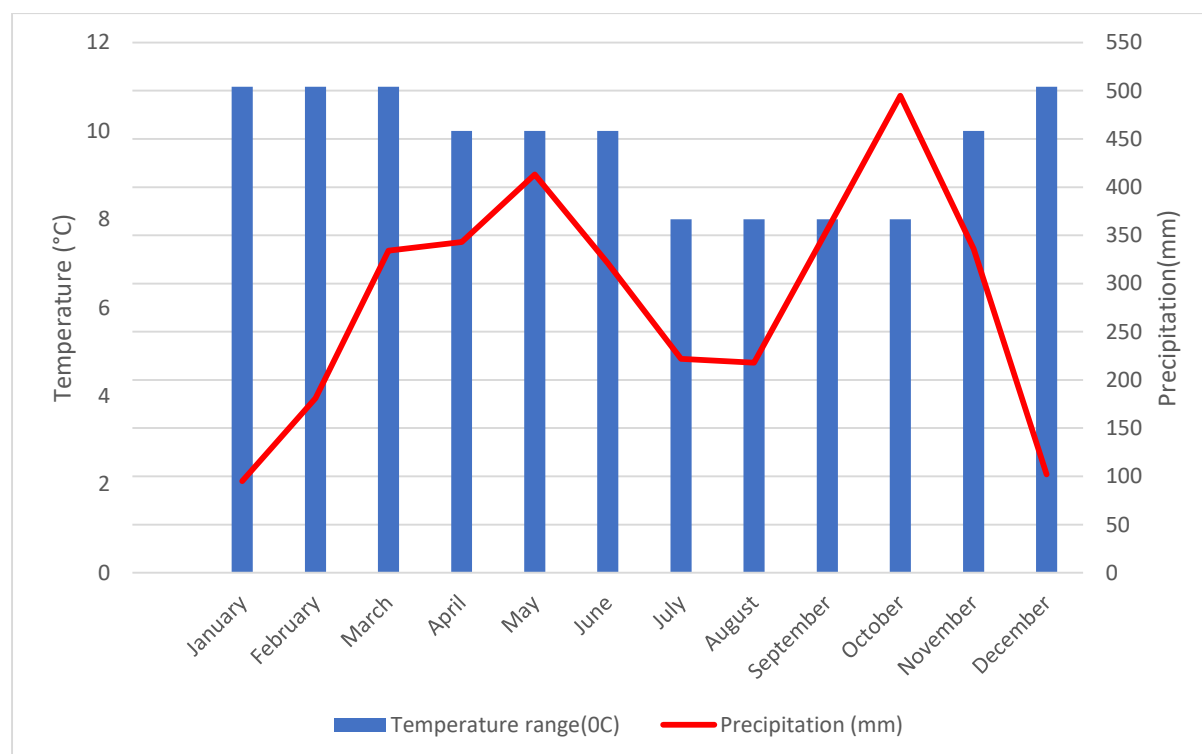
Source: Sangmelima Council development Plan 2015 and field work, 2020

Figure 6: Ombrothermic diagram for the town of Sangmelima

The lowest average precipitation is recorded in January with only 94.52mm. An average of 494.97mm makes October the month with the highest rainfall (CDP, 2015). The variation in the precipitation between the driest and the wettest months is 400.45mm, and the average temperature throughout the year varies by 2.0°C (CDP2015).

1.1.3: Relief, Soil and drainage

The town of Sangmelima is situated in the vast south Cameroun plateau with an altitude varying between 600-700 metres above sea level (CDP, 2015). It presents on a whole a relatively accidental relief likely to sheets, and greatly undulating, it consists of peneplains and valleys which intermingle with hills. In some areas convex hills with narrow valleys are common (CDP, 2015).

According to the USDA "SoilTaxonomy", the soil is classified following four orders: oxisols, ultisols, inceptisols and entisols (CDP, 2015). This low pedological diversity is due to the quasi homogeneity of the parent material. The soil has a medium surface texture with an appreciable sand content (CDP, 2015). The pH is very acidic ranging about 3.5 with a CEC (Catonic Exchange Capacity) averaging 2.25. Nitrogen is the best indicator of fertility and forests soils contain 0.2% (CDP, 2015).

The soils are well provided with organic matter averaging 4% (CDP, 2015). Despite the important reserve of phosphorus (10mcg/L of soil solution), it constitutes a limiting factor. On the other hand potassium averages 1.05Cmol/Kg (CDP, 2015) and aluminium 0.60meq/100g (CDP, 2015). Nonetheless, we equally observe some swampy soils, clayey soils and rock quarries. Soils on swampy grounds are of black colour characterised with high humus content but marginally utilised (CDP, 2015).

The principal water courses that drain Sangmelima are river Afamba and river Lobo. Hydrologically, most of the rivers form part of the Congo river basin. All the rivers and streams flow in to the Dja the principal tributary of the Congo river. We equally have other secondary streams and rivers that flow in to the Lobo river: Mfoumou, Toto'o, Messozili, Missolo, Ndunglu amongst many others (CDP, 2015).
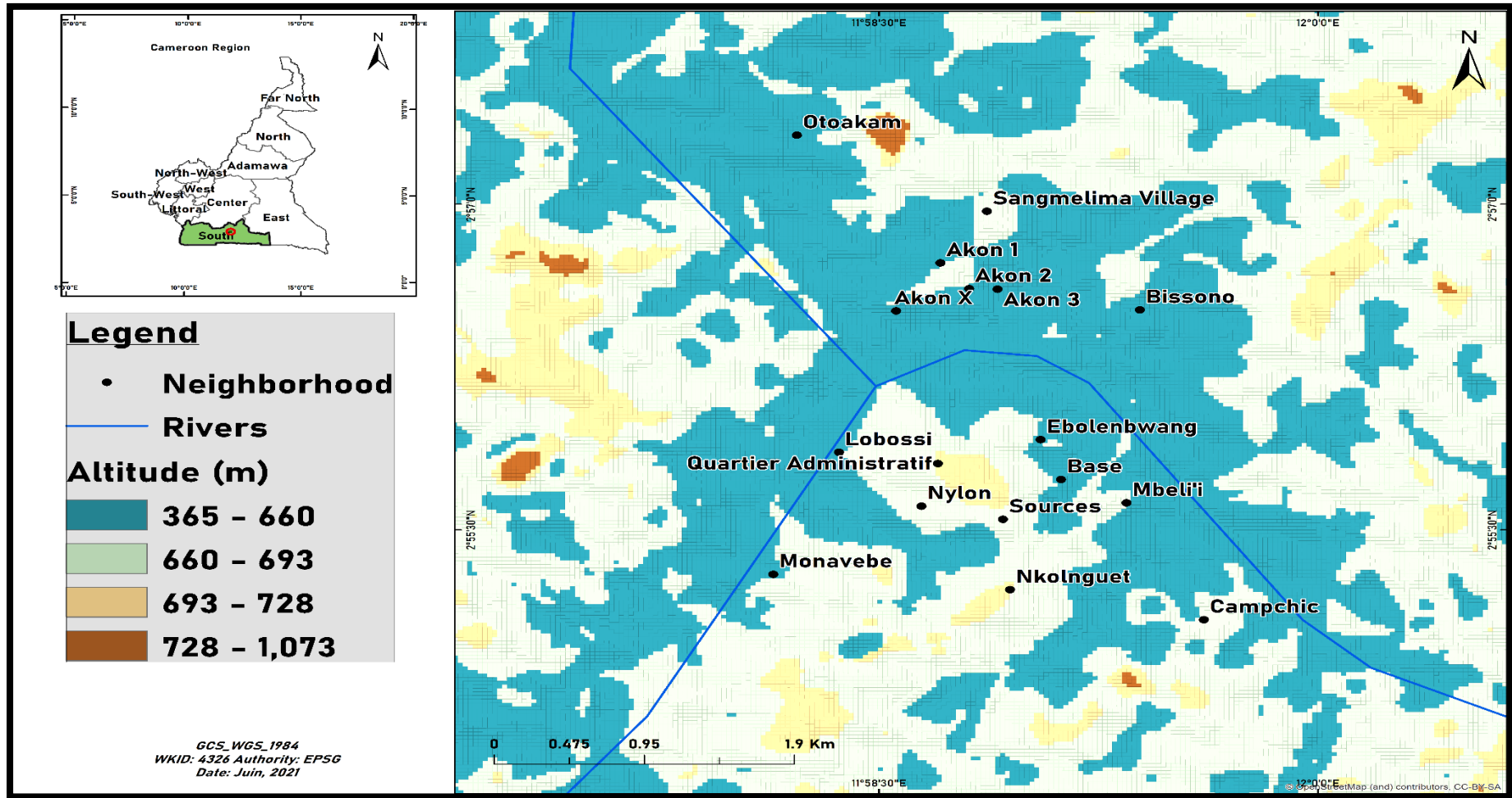
Source: INC, *Openstreetamap*, June 2021 and Fieldwork, 2020

Figure 7: Relief and drainage in Sangmelima

1.1.4: Land scape analyses

The town is built on a relief composed of several hills of almost 700 meters above sea level. The altimetry varies from 650 to 800 meters. Giving it a succession of valleys and plateaus scattered here and there (CDP, 2015). The valleys which link for these hills have within them rivers which can be developed and drained, in order to offer the town not only magnificent banks, but also bodies of water intended for nautical activities (CDP, 2015).

The town of Sangmelima is marked by landscape units strongly determined by the relief. These includes;

- o the secondary forest type which circles the urban center on either side of the town with its palm groves
- o the administrative plateau south of the central area slightly higher (700 m), compared to the surrounding neighborhoods;
- o the commercial sector located north of the central area, it is below the area sheltering the administrative plateau and located at an altitude of 650 m;
- o the entrance to the town in the North zone the town, with its diversity of urban fabrics;
- o the Camp-chic area which is the new urbanization sphere of the city and

In Sangmelima just like in any other part of the world, landscape and humans are the constituents of the environment in which change occur. Socioeconomic development can only occur through human modification leading to landscape change. Today, landscape changes are accelerated due to population growth, economic and social activities and political forces). The neighborhoods that cut Sangmelima's urban space today attest to a first measure that this town has grown in size at least in terms of space. This is certainly due to the availability of land and, secondly, to its administrative functions as the divisional headquarters.

1.1.5: Vegetation and Fauna

The vegetation is part of the Congo Guinea region, green and characterised by several rare species. The vegetation supports abundant wild life and several plant species. Apart from the Major forest, there exist secondary forests, fallowed land and degraded ones along road sides due to agricultural activities and human occupation respectively (CDP, 2015). Swampy forests, raffias, marshy and bushy also exist behind houses. In some forests parts there is the predominance of subsistence agriculture. The Dja reserve that extends to the eastern part of the town and covers 5,260 Km² was designated a World Heritage site in 1984. According to

UNESCO calls it is one of the largest and best protected rain forest in Africa with 90% of its area left undisturbed (CDP, 2015). The forest holds an important place in the social and economic life of Sangmelima. The use of firewood and the artisanal exploitation of non-wood forest products (NWFP) constitute a form of local exploitation for domestic or medicinal purposes (CDP, 2015).

The faunal density in degraded and secondary forests are low due to human activities. Part of the forest supports population of, pangolins, porcupines, bats and birds species and other rodents and genets.

1.2: Sangmelima within its political and socio-economic setting

1.2.1: Human milieu

It is often said, the town is a village that has grown up. Indeed, the urban areas of today were villages of yesterday in which the phenomenon of urbanization is pushed. In its structuring, the city forges its spatial forms and texture, which are determined by its history and its economic resources.

Before the year 2000, the town of Sangmelima counted only 7 primary schools, by 2010, the town counted 12 primary schools and in 2019, there were 26 primary schools in Sangmelima. As concern health centers, the town counted only 5 before the year 2000 (Divisional delegation of basic education). By 2010 the town counted 7 health centers and by 2019 there were 9 health centers in Sangmelima and 2 dispensary pharmacies (Sangmelima District Hospital). Concerning the level of economic activities, the town of Sangmelima haw experience an arithmetic growth since the year 2000. Prior to 2019 only two market centers existed in Sangmelima. Today, there exist three market centers coupled with the emergence of financial institutions. The town of Sangmelima has both an urban center and a rural periphery that shelters economic activities within the town. Sangmelima also shelters, because of its geographical and economic position, some processing facilities for wood extracted from neighboring forests.

The urban landscape has no formal limits, as it rises up in the countryside. The villages closest to the urban center are experiencing progressive urbanization, especially those that have been the subject of development by the installation of a structuring project; such is the case in Camp-chic neighborhood. These limits are observed from the change along the P7 and N9 roads. The town of Sangmelima is organized into 17 neighborhoods including central (9) and peripheral (8) neighborhoods.

Table 5: The neighborhoods in Sangmelima

Central neighborhoods	Peripheral neighborhoods
Akon 1	Nkolnguet
Akon 2	Campchic
Akon 3	Nylon
Base	Monavebe
Bissono	Otoakam
Centre Administratif	Source
Ebolengbwang	Mbeli'i
Lobosi	Sangmelima village
Akon X	

Source: BUCREP 2015 and Survey 2019

The town shelters a cosmopolitan population coming from all over the country and abroad. The population is composed mainly of the Bulu ethnic clan of which the principal tribes include: the Yembong, Yendjock, Yemdam, Yekombo, Esse, Yemfek, Yemveng, Yemvack, Mbidabane, Yemenvong and the Essaman. Nonetheless, the town counts an important population of the Bamileke, Bamoun, Ewondo, Eton, Haussa, Maka, Bassa and Baffia. The town of Sangmelima portrays a mosaic of economic activities which has over the past years contributed to its development

1.2.1: Agriculture

Sangmelima's economic vocation was consolidated in 1953 with the construction of the country's first cocoa road (Sangmelima-Ebolowa road). The Dja and Lobo Division was then the largest cocoa producer in the country and the effects of cocoa farming were then felt in Sangmelima in particular through the existence of stores for storing and selling cocoa and the presence in the city of expatriates involved in the cocoa trade. Then suddenly Sangmelima began to slow down, due to the poor sales of cocoa. Many storage stores had to close due to economic difficulties. It was now for the town of Sangmelima, which believed a lot in the sale of cocoa, to explore new horizons.

The main crops presently cultivated are perennial crops, in particular oil palm. Food crops such as cassava, plantains, corn and fruit crops, in particular pineapple, sugar cane, watermelon, lemon, orange and grapefruit are also cultivated.

Three broad agricultural land use systems exist in Sangmelima; crop based farming, mixed crop-livestock and poultry farming are practiced in the town. In these systems, traditional farming practices are a combination of crop and small livestock husbandry (pigs, goats, sheep)

for the native crop farmers, pure crop and/or livestock farms for commercial urban dwellers. Farmers grow oil palms and a wide variety of fruit trees for household family income, while other crops such as maize, cocoyams, plantains, potatoes, yams, cassava and groundnuts are grown mainly for family consumption.

1.2.2: Commerce and industry

The trade sector in Sangmelima is comparable to other towns of comparable size in Cameroon. The business activities here are represented by a wide variety of trades. Generally, trade is marked by very small and medium establishments, trade in sanitary and alcoholic beverages represented by sales to take out, snacks and wholesale depots. Mechanical trade (motorcycles and spare parts) as well as those of the hardware articles are also present. Again, Sangmelima is also characterized by a myriad of small informal street trades like small restaurateurs, fish sellers, wine sellers palm, fuel, various foods, call boxes, and office secretariats. Sangmelima also shelters due to its geographical and ecological position some processing facilities for extracted wood surrounding forests.

The industry, for its part, is embryonic. It consists of about four sawmills and a cassava processing plant. However, this cassava processing plant is not operational. The hotel industry is represented by a few classified establishments, but also by a multitude of unclassified hotels and inns, operating more or less informal.

1.2.3: Services

Sangmelima is provided with many services which contribute to the diversification of its economic fabric. The many activities such as transport by motorcycle (mototaxi), the small distribution of communication services (call-box), and many others, could have been classified in the service sector if they were better structured (they are classified in the informal sector). The formal service sector is however represented in the town Sangmelima, by banking establishments such as CCA, SCB and BICEC. In addition, there are two dispensary pharmacies, 3 transport agencies (intercity) and an abundance of individual public carriers by coach or passenger cars converted to public transport serving the hinterland

The town of Sangmelima is socioeconomically highly diversified. The secondary sector of economic activity concerns processing activities of agricultural raw materials and arts and crafts. Here we find drinking water and energy production units, artisanal or semi-artisanal transformation of food and wood as well as metallic objects. Crafts are also represented by workshops for making clothes, concrete block factories, factories for various art objects,

painting, screen printing, making banners and drawings. Generally, the town of Sangmelima does not yet have an industrial zone and therefore cannot be thought of an industrial town. Here the administrative, educational and perhaps commercial function would suit it to a certain extent.

This socioeconomic diversity can greatly be attributed to its population growth, its urban expansion, its educational, administrative and health care services. Migrants from all over the country and abroad are attracted in search for business and job opportunities as Sangmelima presented itself as the "new Eldorado"

1.3: Factors influencing Socioeconomic Development in Sangmelima

1.3.1: Administrative and political function

Due to its geographical location (equatorial forest), it is inevitably the center of political power in the Dja and Lobo Division. It is a medium-sized city developed on an administrative unit whose primary function is to bring together the essential services of the administration to the citizens. It is as a result of this that a number of administrative services have been created in Sangmelima. These services are deconcentrated territorial entities that all concur to facilitate the administration procedure by bringing power closer to the people. In villages and nearby towns of the division, these services are not well developed contrary to Sangmelima which harbors law courts, police stations, and a panoply of ministerial delegations. The availability of these services has encouraged the movement of people from different parts of the council and outside eighter permanently or temporally. Majority of this people are individuals in search of markets and business opportunities and public servants who have been transferred and earn between 36,270 frs CFA (Minimum Inter-Professional Guaranteed Salary) and 400,000 frs CFA.

Occupational distribution of Sangmelima shows that of the overwhelming majority of the respondents, 139 constituting 46% were independent workers, 74 of the respondents representing 24% were public workers, while 31 of the respondents, that is 10% were private workers. However, only 62 of the respondents representing 20% were unemployed, (**Figure 8**).
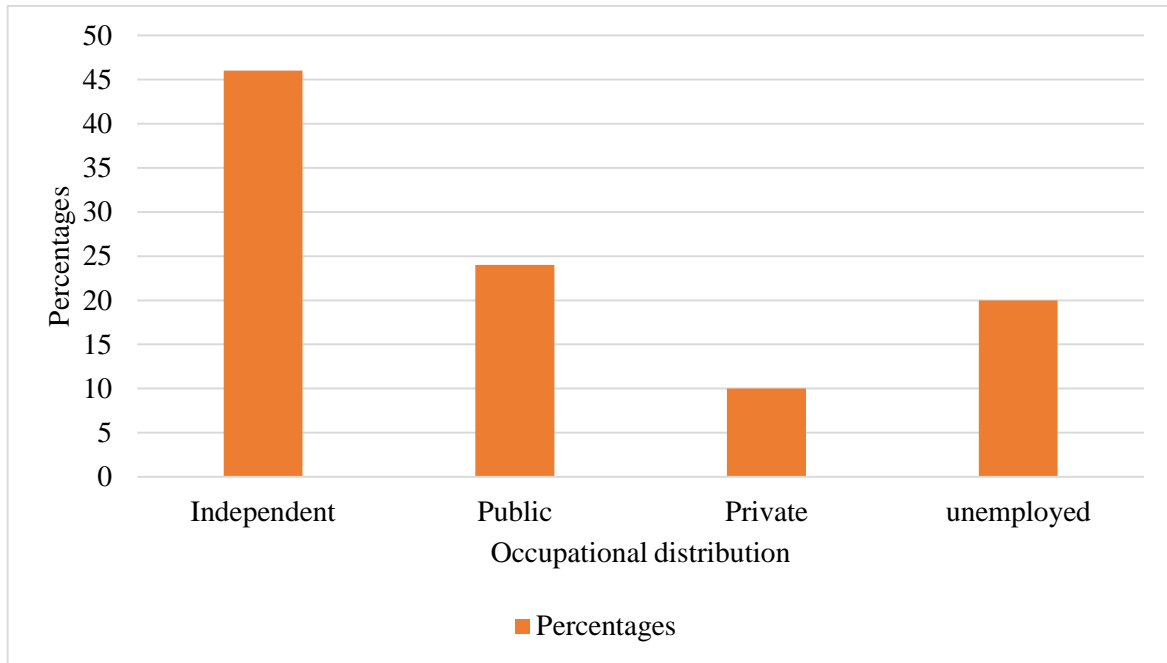
Source: Fieldwork, 2020

Figure 8: Occupational status of respondents

91 of the respondents representing 30% earn less than the SMIG monthly, 92 representing 30% felt between the SMIG to 50000. 90 of the respondents earned between 100000 to 200000, 24 respondents representing 8% earned between 200000 to 300000, 9 respondents corresponding 2% earned between 300000 to 400000 per month. Figure 7 illustrates the estimated monthly income range of respondents.
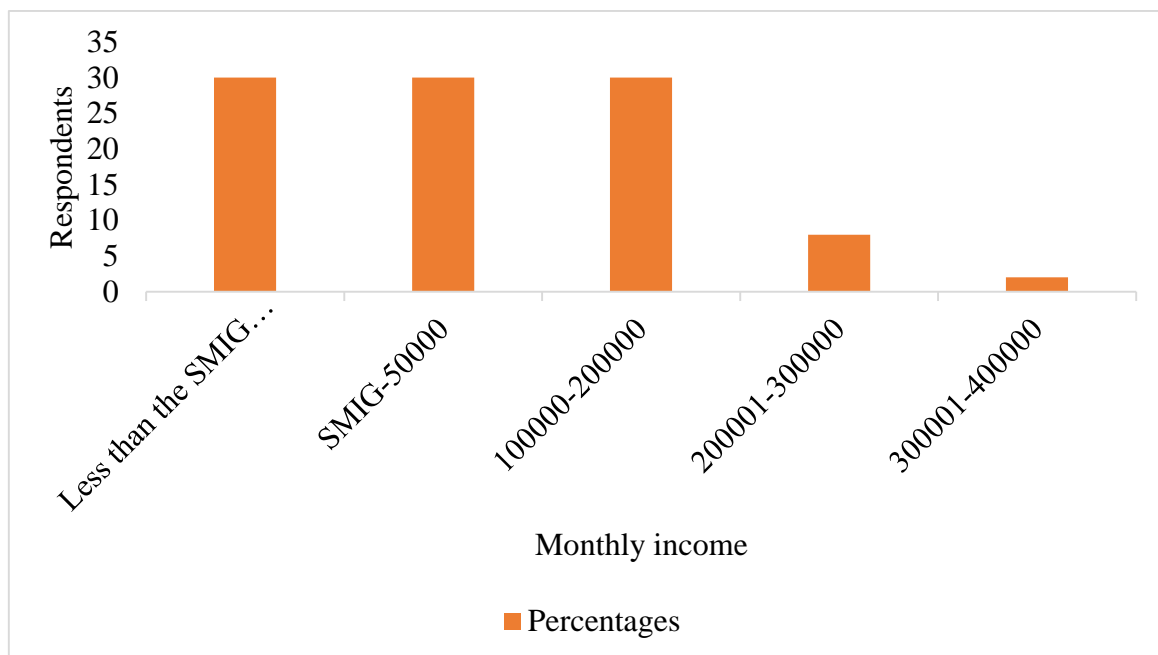
Source: Field work, 2020

Figure 9: Estimated monthly income range of respondents

The transfer of civil servants to state deconcentrated ministerial departments and local services, who in some cases move with their family, the movement of people in search of employment opportunities, to carry on their activities and in search of a market to sell their products has a multiplier effect on Sangmelima. New services develop, new economic activities take root, new exchanges happen and with the increasing population new infrastructures are created to respond to the demand. The town of Sangmelima is however distinguished in the south region by the recreational function (play grounds, night clubs…) it has developed over the course of history, reason why she is nicknamed "*La Belle*".

1.3.2: Population Growth

Sangmelima constitutes a cultural area with not only similar economic, social and political organizations but also similar social characters with similar patterns and forms. For this reason, many people move to Sangmelima. The population of Sangmelima has undergone a remarkable growth over the past years. Results from the National Population and Housing census show that its population has doubled between 1976 and 2005. In 1976, Sangmelima had a population of 13781 inhabitants. In 1987, the population grew to 23,261 inhabitants and in 2005 the population increased more than two folds to 51,308 inhabitants, a triple of that of 1976, and close to a double of that of 1987 with a growth rate of 4.3%. In 2020, projected population stands at 85033 inhabitants almost a double of that of 2005. The table below shows the population growth in the town of Sangmelima.
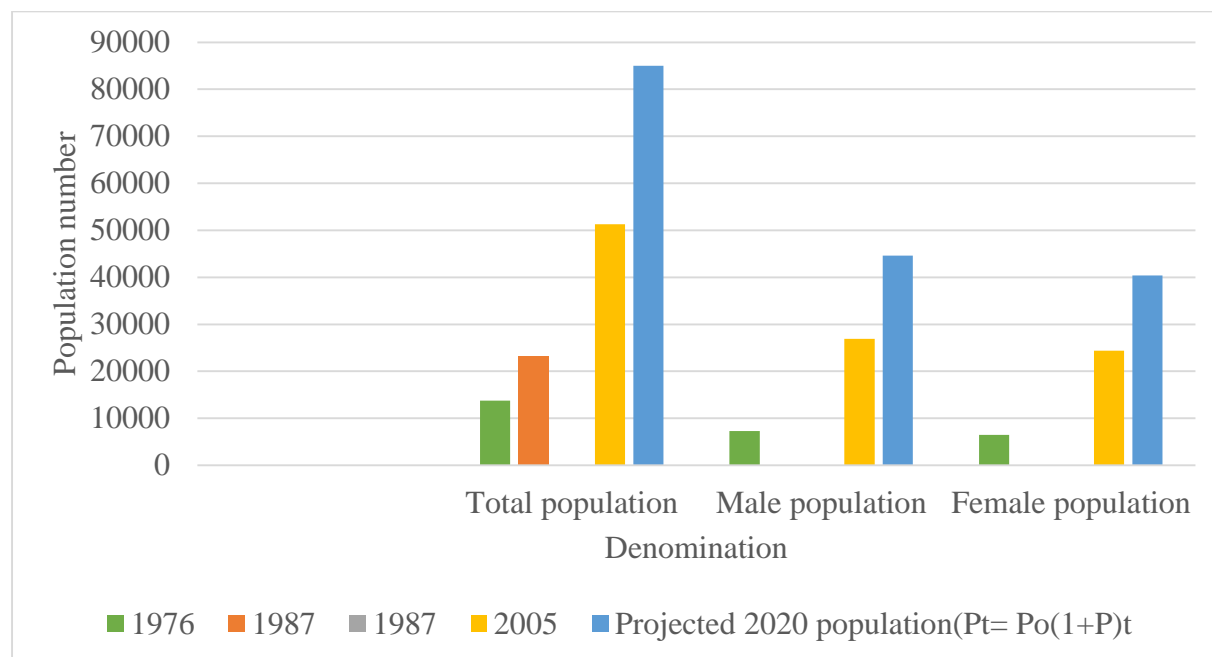
Table 6: Population growth in Sangmelima

Year	1976	1987	2005	Projected 2020 population(Pt= Po(1+P)t
Male population	7305	-	26930	44631
Female population	6476	-	24378	40402
Total population	13781	23261	51308	85033
Growth rate	4.2		4.3	

Source: Bucrep 2005 and field work, 2020

In 1976, male population was 7,305 while female population was 6,476 and in 2005 female population grew to 24,378 and 26,930 for the male population. In 2020, projected male population stands at 44631 while female population is 40402. The dominance of male

population over female population is explained by the migration of most male in to the town than females.

Source: Bucrep 2005 and field work 2020

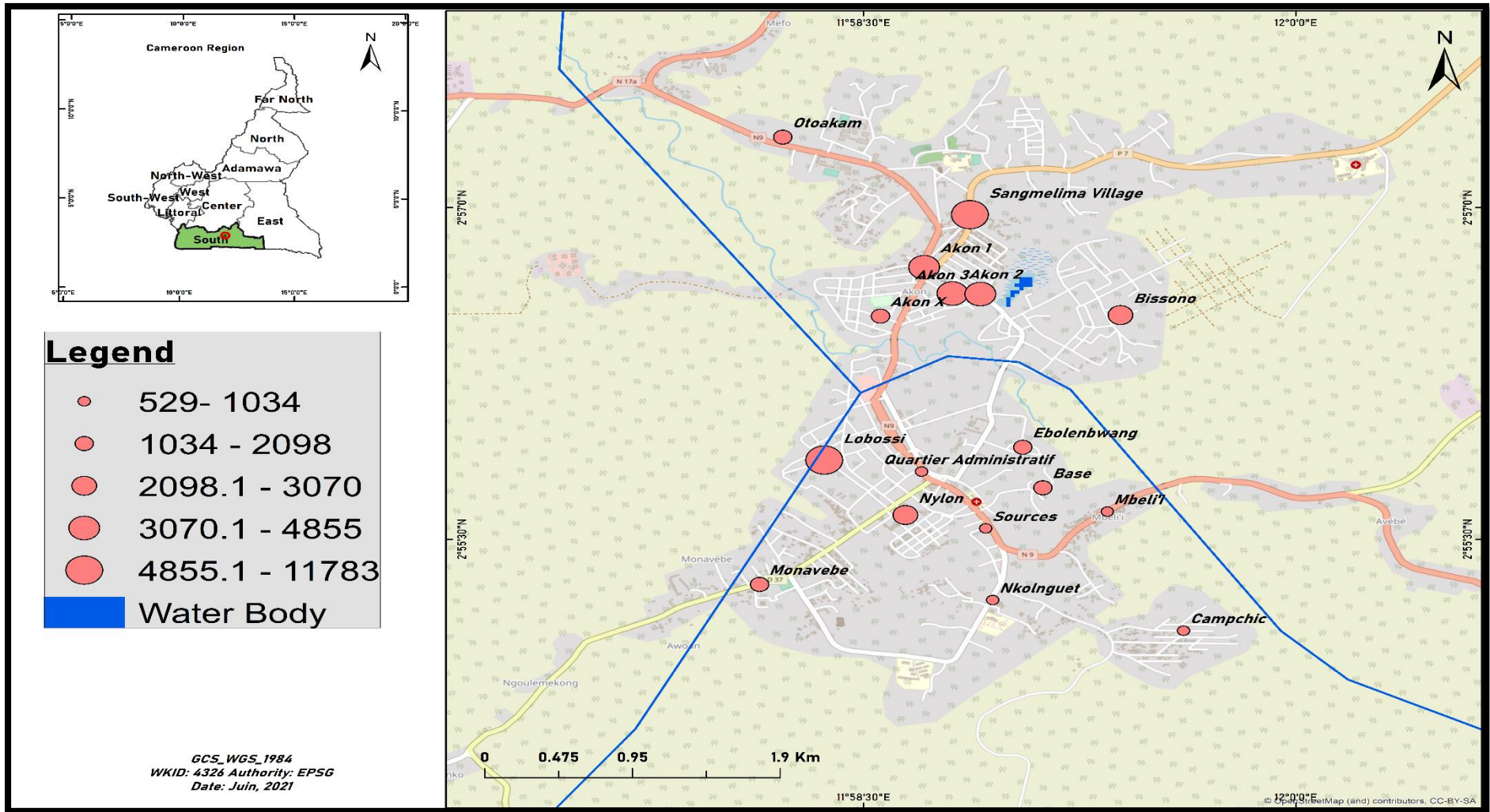**Figure 10: Population growth in Sangmelima**

Sangmelima's population is growing rapidly because of a growing and changing demand for labour, resulting to economic development and the changing composition of a growing output of services. All of these result in both temporary and permanent migration, consequently leading to a diversification of its socioeconomic fabric making it a turning point in the Dja and Lobo Division. The population is however not homogenously distributed, some neighbourhoods are a far more populated than others. Below is a table that shows population distribution in the town of Sangmelima per neighbourhood.

Table 7: Population distribution in Sangmelima town

| Neighborhoods	Total	Male	Female
Sangmelima town	51333	26940	24393
Akon 1	4066	2231	1835
Akon 2	4855	2714	2141
Akon 3	3810	2040	1770
Akon X	1172	601	571
Base	1855	998	857
Bissono	2900	1547	1353
C. Administratif	529	261	268
Ebolenbwang	2098	1079	1019
Lobossi	11783	6054	5729
Mbeli'i	1034	493	541
Monavebe	1348	707	641
Nkolnguet	772	416	356
Nylon	3070	1576	1494
Campchic	800	395	405
Sgma Village	9276	4819	4457
Source	666	332	334
Otoakam	1299	677	622

Source: BUCREP 2005 and Fieldwork, 2019

The most populated neighbourhood in Sangmelima is "Lobossi" (11783), followed by "Sangmelima Village" (9276) and "Akon 2" (4855). This is because of the proximity of social services (schools, hospitals and churches), economic (market and financial institutions such as micro finance, and commercial banks) and infrastructural facilities to these neighbourhoods and the availability of cheap land. Population distribution in Sangmelima is illustrated by the figure below.

Source: INC; *Openstreetmap*, **June 2021**

Figure 11: Population distribution in Sangmelima

Sangmelima is dominated by a youthful male population. 132 of the respondents which represent 43% fell between the age of 20 to 30, of which 89 were female and 43 males. 88 of respondents which represent 29% felt between the age of 31 to 40 with 50 females and 38 males. 43 respondents which represent 14% felt between the age of 41 to 50 comprising 9 females and 34 males. 29 respondents corresponding to 9% were between the age of 51 to 60 of which 12 were females and 17 were males. While 14 respondents which represent 5% fell between the age of 61 and above, where we had 6 females and 8 males.
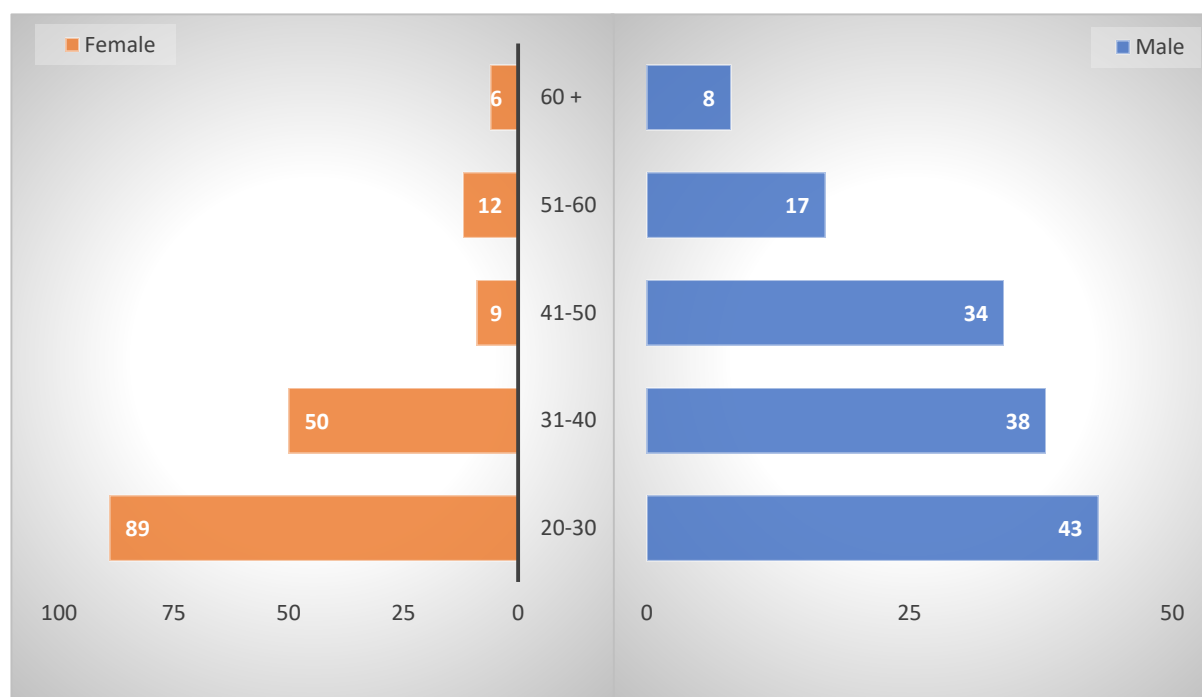
Source: Fieldwork, 2020

 Figure 12: Age pyramid of respondents

The figure shows that majority of the respondents fell between the age of 20 to 30 and 31 to 40. These were able bodied men and women mostly independent workers and public servant workers who engaged in administrative, commercial and trading activities.

1.3.3: Educational Facilities

Many educational institutions are located in Sangmelima and offer opportunities for quality education, providing courses and training for a wide range of subjects and skills. The town counts, 22 primary schools, 10 secondary schools, 5 higher vocational institutions. Table 8 shows the distribution of higher vocational institutions in Sangmelima.

Table 8: Distribution of higher vocational institutions in Sangmelima

Name	Neighbourhood	Status (private/ Public)	Enrolment
Sangmelima Vocational Training Center	Nkolguet	Public	-
Ecole des Technicien d'Agriculture	Nkolguet	Public	-
Ecole des Infirmiers Diplômés d'Etat	Nkolguet	public	152
Université Inter Etat Cameroun-Congo	Nkolguet	public	-
ENIEG de Sangmelima	Mbeli'i	public	-

Source : Field work, 2020

All higher vocational institutions to date are public entities which train many citizens each year after graduating from secondary school.

Table 9: Distribution of Secondary school in Sangmelima

Name	Neighbourhood	Status (public/private)	Enrolment
Lycée Bilingue de sang.	Sangmelima village	Public	1343
Lycée Classique et Modern de Sangmelima	Ebolenbwang	Public	3153
Lycée Technique de Sang.	Otoakam	Public	1381
Lycée de Monavebe	Monavebe	Public	1119
Collège Immaculée Conception	Nkolnguet	Private	575
Alfred & Sarah Bilingual college	Sangmelima village	Private	313
Collège Notre Dame du Sacré Cœur	Sangmelima village	Private	447
CETIC de Sangmelima	Otoakam	Public	1113
CETIF de Sangmelima	Ebolengbwang	Public	518
CODJAL Sangmelima	Lobossi	Private	227

Source: Divisional Delegation of Secondary Education 2020 and Field work, 2020

Secondary educational facilities in Sangmelima include both general and professional schools.

This mixed system offers diverse fields of study for students who want to continue their studies.

Table 10: Distribution of Primary Schools in Sangmelima

Name	Neighbourhood	Status (public/private)	Enrolment (2019/2020)
Government Bilingual Primary School Sangmelima (4)	Centre Adm, camp chic, monavebe & Otoakam	Public	1224
Ecole Privée la Rosée du Sud	Akon 1	Private	273
Ecole Privée Tante Bella	Bissono	Private	274
Ecole publique d'application (5)	Campchic, Bissono, & Lobossi	Public	1865
Alfred and Sarah Bilingual academy	Sang village	private	170
Ecole Privéé Franco-Arabe	Akon 1	Private	109
Ecole Privée Paul Biya et Mohamed 6	Centre Administratif	Private	238
Ecole Catholique Saint Joseph	Lobossi	Private	370
Ecole Catholique Bilingue Saint Rossaire	Sang village	Private	646
Ecole Catholique Notre Dame de la Sainte croix	Akon x	Private	190
Ecole Privée les Juniors	Bissono	Private	75
Royal English school	Akon 3	Private	162
Ecole Catholique Sacré Cœur	Nylon	Pivate	260
Ecole Inclusive de Sangmelima	Monavebe	Public	438
Grace Bilingual School	Bissono	Private	28

Source: Divisional delegation for Basic education 2020 and field work 2020

Primary schools in Sangmelima are mostly bilingual offering opportunities to all social classes. There exist only one official inclusive school but all other schools are also opened to the vulnerable.

Sangmelima is dominated by Secondary education. The educational qualification of the population of Sangmelima indicated that 17 respondents represent 6% attended primary school, 192 respondents represent 63% attended secondary school, 93 respondents represent 30% attended university while 4 respondents represent 1% could not read nor write. The graph below illustrates the educational qualification of respondents**.**
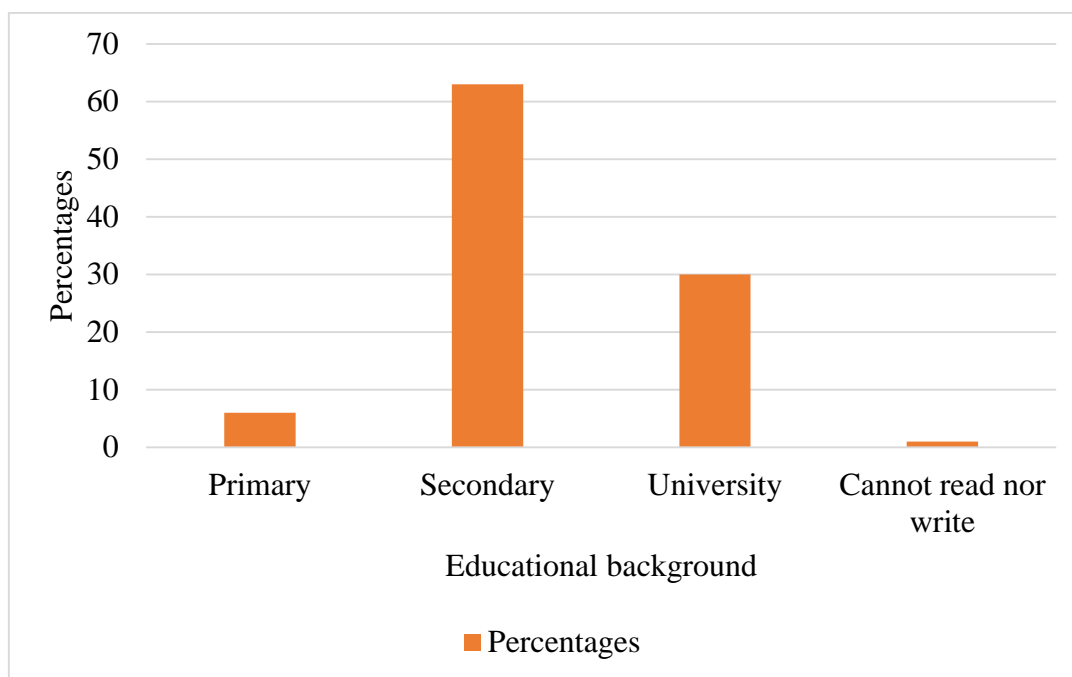
Source: Field work, 2020

Figure 13: Educational qualification of respondents

Neighbouring villages and towns are limited in educational facilities including the structures and teachers. Where these facilities are limited, people especially the youths migrate to Sangmelima to complete their studies, either primary, secondary or higher. The result is felt through an increasing population leading to an increase in the demand for housing and to the development of a panoply of economic and social activities.

1.3.4: Healthcare services

Health care services have also been the factor behind socioeconomic development in Sangmelima. In Sangmelima, we found 8 health centers, 1 referral hospital and 2 dispensary pharmacies. This permits the population of the town and surrounding localities to have access to health services and medication. Table 11 shows the distribution of healthcare services in Sangmelima.

Table 11: Distribution of Healthcare services in Sangmelima

Name	Neighbourhood	Year of creation	Status
Sangmelima Referral hospital	Sangmelima village	2014	Public
Hopital de district de Sangmelima	Base	1925	Public
Centre de sante intégré de Sangmelima	Nkolnguet	1995	Public
Centre de sante de Monavebe	Monavebe	1979	Private
Centre de sante intégré de monazang	Akon 3	2008	Public
Centre de Sante Militaire de Sangmelima	Bissono	2014	Public
Dispensaire Mission Catholique d'Akon	Akon 3	1962	Private
Centre de Sante Léproserie de sang.	Nkolnguet	1975	Public
Centre de sante Prive	Akon 2	2004	Private
Pharmacie Rosa Park	Lobossi	2012	Private
Pharmacie du Centre	Centre Administratif	2003	Private

Source: Hopital de District de Sangmelima and Field work, 2020

Of the 8 health centers, 2 are private. The referral hospital which is the best equipped in the whole country offers a panoply of health care services such as, which play an important role in the development of Sangmelima since its opening in 2015

1.3.5: Urban expansion

As a result of socioeconomic activities, the areal spatial extent of the town has increased significantly. Table 12 shows land cover/ land use in the town of Sangmelima for the year 2001, 2011 and 2019.

Table 12: Land Cover/ Landuse dynamics in Sangmelima

Year	2001		2011		2019	
Surface area	ha	%	ha	%	ha	%
Forest	139465.646	94.17	127663.173	86.2	120686.88	81.5
Habitat	465.41534	0.13	1035.40607	0.7	1707.25767	1.2
Land	8168.25331	5.52	19392.9787	13.7	25705.1837	17.4
Total	148099.314	100	148091.558	100	148099.321	100

Source: Field work, 2021

In 2001, habitat covered only 465,415,34 hectares corresponding to 0.31% of the surface area and in 2011, the surface area covered by habitat increased to 103,540,607 hectares corresponding to 0.7% of the surface area, a double of 2001 with a percentage increase of 0.57% (**table 13**). In 2019, it covered 170,725,767 hectares corresponding to 1.2% of the surface area, a triple of that of 2001.

Table 13: Evolution rate of Land Cover/ land use dynamics in Sangmelima

2001-2011		2001-2019		2011-2019	
Surface Area	Percentage (%) increase	Surface Area	Percentage (%) increase	Surface Area	Percentage (%) increase
11802.473	7.97	-18778.766	-12.67	-6976.293	-4.7
569.99073	0.57	1241.84233	0.89	671.8516	0.5
11224.72539	8.17	17536.9304	11.88	6312.205	3.7

Source: Field work, 2021

Between 2001 and 2011, spatial increase is 569,990,73 hectares in 10 years that is 569,990,73 hectares each year. Between 2011 and 2019, spatial increase is 671,851,6 hectares in 7 years that is 671,851,6 hectares each year. One can thus conclude that, in Sangmelima, spatial increase can exponentially be analyzed.

The desire of the town authorities to turn their backs on the past and restore the image of the town and related requirements of urban life (the construction of habitats, commercial grounds, hotels, football stadium, playgrounds, hospitals and schools), are the prime factors of increasing spatial dimension in Sangmelima.

Conclusion

The objective of the chapter was to analyze Sangmelima within its physical and human setting. In a first place, we presented the physical and human characteristics of the town of Sangmelima. In the second place, the administrative function, population growth, urban expansion, educational facilities and health care services of Sangmelima town were examined as factors of its socioeconomic development. Following the above analyses, it is clear that the physical, political, social, economic and urban characteristics have greatly contributed to socio-economic development in the town of Sangmelima.

CHAPTER 2

ACTORS OF ENVIRONMENTAL MANAGEMENT AND SOCIOECONOMIC DEVELOPMENT IN SANGMELIMA

Introduction

After presenting the town of Sangmelima within its physical, political and socioeconomic setting, it is necessary to present the different actors of environmental management and socioeconomic development in Sangmelima. The present chapter, thus identifies the actors of environmental management in Sangmelima, and analyses the actors of SED in the town of Sangmelima.

2.1: Actors and their role

The actors of environmental management in Sangmelima meet those of other towns in Cameroon. They range from the local government, ministerial bodies, households and economic agents and private actors.

2.1.1: Sangmelima Council

Councils are not only the smallest unit of administration but also the most basic and most important. Everyone in the country lives either in a city or local council area. The local council is the main delivery of services to the population. The economic, social and cultural development of each council area and its people logically means the overall development of the country. This important role of councils is well understood by the government and is demonstrated in the various comprehensive texts in place that define the mission, organisation and functional mechanisms of these councils.

In line with the decentralization process, environmental management has become a main function of local authorities in Cameroon in general and Sangmelima in particular. According to section 157 of law no 2019/024 of 24 December 2019 Law to institute the general code of regional and local authorities, the council is devolved with the following powers, as far as environmental management is concerned:

- drinking water supply;
- cleaning of streets, roads and council public areas;
- industrial waste management, monitoring and control;
- reforestation and creation of council wood lands;

- the fight against squalor, pollution and nuisances;

- protection of groundwater and surface water resources;

- preparation of council environmental action plans;

- preparation and implementation of specific council plans for risks prevention and emergency response in the event of disasters;

- creation, maintenance and management of council green spaces, parks and gardens

- local pre-collection and management of household waste.

Sangmelima council therefore, ensures pro-environmental attitudes and secures the environment from harm of any nature.

2.1.2: Ministry of territorial Administration

Councils are one of the functional units in the national administrative hierarchy and as such are placed directly under the supervision of this ministry, represented by the Senior Divisional Officer (SDO).

Since decree no 98/147 of 17 July 1998, the Ministry is very involved with decentralization and ensuring good sanitation with efficient environmental management are one of its duties.

2.1.3: Ministry of Housing and Urban Development

Decree no. 98/153 of 24 July 1998 creating the ministry charged it with other duties. In article 22-25, with the general cleanliness and drainage, solid waste management, hygiene and salubrity of the cities. Article 24, specifically assigned the ministry with the responsibilities for elaborating plans for evacuation and treatment of solid waste, carrying out research on improving collection and transportation, supervision and coordination of collection and sensitizing the public on the practice of pre-collection of MSW.

In Sangmelima, the ministry carry out its duties in collaboration with the other actors and the population. Coordinating the collection of MSW and sensitizing the population on environmental protection is one of its main concern, its ambition is to make Sangmelima a green city.

2.1.4: Ministry of Environment and Nature protection and the Ministry of Forest and Wild life

These ministries collaborate with other ministries as to define measures for rational management of natural resources, effective control of investigation and pollution in the field, specify the criteria (project specific) and supervise environmental impact assessment.

In Sangmelima, the ministry is responsible for planning, promoting, coordinating and overseeing the implementation of environmental programs in the town. The main activities undertaken include: conservation and survey of the flora and fauna, and forest and other wilderness areas, prevention and control of pollution, afforestation and land degradation mitigation. They provide information to the public to encourage public participation in the management, protection and restoration of the environment and nature. They are responsible for the administration of the Dja reserve.

2.1.5: Ministry of Public Health

Environmental management is a public health issue. Promoting good public health, sanitation and hygiene have long been the responsibility of the Ministry of Public Health. The council hygiene and sanitation department is under the technical supervision of the ministry's preventative medicines services.

The role of the ministry of public health in Sangmelima as far as environment is concerned is to promote a healthier environment, intensify primary prevention and influence public policies in all sectors so as to address the root causes of environmental threats to health. The ministry, assesses and manages risk such as from outdoor and indoor air pollution, chemicals, unsafe water and lack of sanitation.

2.1.6: Ministry of Small and Medium Sized Enterprises, Social Economy and Handicrafts

The ministry promotes the development of industrial, commercial and artisan activities in the town. These areas generate large quantities and varieties of waste. The policy on industrial and commercial waste management is indispensable, needing collaboration with other concerned actors.

2.1.7: Households and Economic Agents

Household and economic agents are the major actors in environmental management in Sangmelima. They constitute the major generators when it comes to waste and their ability to manage the environment greatly determines and shapes the environmental management profile of the town.

2.1.8: Hysacam

Hysacam, partner of Sangmelima council as concerns environmental management, is a private agency that has been exercising in the town for over 10 years. Urban cleanliness is its core business. It is in charge of waste collection, transportation and treatment, cleaning and street

sweeping, alongside with sensitization of the local population. As a major actor in the viability of Sangmelima through the collection of household waste, hysacam inevitably plays an important role in the environmental management of Sangmelima.

Other ministries such as the Ministry of Basic and the Ministry of Secondary education through their schools are promoting environmental education and proper environmental management through the different environmental clubs and classes. For example the "Club des amies de la nature du Lycée Classique et Moderne de Sangmelima" and "Environmental club of Government Bilingual High School Sangmelima". Environmental education is being taught as a subject in Government bilingual primary school Sangmelima and "SVT" (Science de la vie et de la tere) taught in all the high schools has a chapter for environmental education.

The Ministry of Agriculture is interested in organic fertilizers from composting municipal solid waste.

All these actors are supposed to work hand in gloves in order to protect the environment. **(table 14)**.

Table 14: Actors of environmental management in Sangmelima

Intervention Domain	Actors								
	MINDUH	MINEPDED	MINSANTE	MINPMESA	MINFOF	MINAT	Council	Households	Hysacam
Coordination of intervention and definition of responsibilities	✓	✓	✓		✓	✓			
Definition of objectives	✓	✓	✓		✓				
Information capitalization	✓	✓	✓	✓	✓	✓	✓	✓	✓
Development of regulations and standards	✓	✓	✓		✓				
Technical control	✓		✓		✓		✓		
Sensitization of the population	✓	✓	✓	✓	✓	✓	✓		✓
Pre-collection								✓	✓

2.2: Actors of socioeconomic development in the town of Sangmelima

The range of actors of SED in Sangmelima has increased including the local government (the council), the central government, Non-governmental organizations, and economic agents and their associations.

2.2.1: The local government (the council)

The local government is key in leading SED in the town of Sangmelima. The advent of decentralization gave local authorities the powers to fully initiate development and generate growth in their localities. According to article 55(2) of the Cameroon constitution, local governments have the duty to promote the economic, social, health, educational, cultural and sports development of their localities. This role is further articulated in articles 156, 158, 160, 161 and 162 of law no 2019/024 of 24th December 2019 relating to local and regional authorities in Cameroon. According to these articles, the council is responsible for:

- The promotion of council agricultural, pastoral, artisanal and fish farming activities
- The development and management of council tourist sites;
- The construction, equipping, management and maintenance of markets, motor parks and slaughterhouses;
- The organization of local trade fairs;
- supporting income-generating and job-creating micro-projects;
- The Exploitation of mineral substances that cannot be given out as concession.
- The creation and development of urban spaces;
- The preparation and implementation of council investment plans;
- signing, in conjunction with the State or the region, of performance contracts for the achievement of development goal;
- The preparation of land use plans, town planning, concerted development, land consolidation and urban renovation documents;
- The organization and management of urban public transport;
- Development operations;
- The issuance of town planning certificates, land parceling authorizations, location permits and building and demolition permits;
- The creation and maintenance of council road networks and execution of related works;
- Developing and servicing of habitable areas;

- public street lighting;
- Addressing and naming of streets, squares and public buildings;
- The creation and maintenance of unclassified rural roads and ferries;
- The creation of industrial zones;
- The contribution to the electrification of needy areas;
- The authorization for temporary land occupation and various works on public roads.
- setting up, equipping and managing and maintaining council health centres, in keeping with the health map;
- recruiting and managing nursing staff and paramedics of integrated health centres and sub-divisional health centres;
- providing assistance health facilities and social welfare centres;
- Setting up, managing, equipping, tending and maintaining council nursery and primary schools as well as preschool establishments, in keeping with the school map;
- Recruiting and managing the teaching and support staff of the said schools;
- acquisition of school supplies and equipment;
- Participating in the management and administration of State and regional secondary and high schools through dialogue and consultation platforms.
- Promoting and coordinating sports and youth activities;
- Supporting sports associations;
- Constructing and managing municipal stadiums, sports centres, fitness course
- Swimming pools, playgrounds and arenas;
- Identifying and participating in the equipment of sports associations;
- Participating in the organization of competitions;
- Creating and operating leisure parks;
- Organizing socio-cultural events for leisure purposes.

As such in the town of Sangmelima, the council initiates socioeconomic development projects which are materialized through road constructions, renovations, market constructions amongst others.

2.2.2: The central government

The central government is characterized by public services, offered by the government. Through this, the government is responsible for the social and economic development of the people both at the local and national level. At the center of all decisions taken by the central government is the question of socioeconomic development. The importance of the role of the government lays on the fact that, the services she offers have a direct impact on socioeconomic development. Amongst these services are:

- Energy related services;
- Educational services;
- Road development and transportation;
- Housing services;
- Planning services;
- Financing services and economic services.

In Sangmelima, the public sector (government) is the second largest employer and the largest landowner. Despite the advent of decentralization, the central government just like in other towns in Cameroon, plays an important role in driving SED in the town of Sangmelima, through its deconcentrated entities. This is done through the Divisional delegation of the Ministry of Small and Medium Enterprises, Social Economy and Handicrafts and the divisional delegation of the Ministry of Agriculture and Rural Development which give economic opportunities to the population, through the granting of subsides and incentives. The contribution of the central government is also done through the construction of health centers like the referral hospital, schools like the interstate university and social houses. Again, the central government through its supervisory power on the local authorities guarantees socioeconomic development.

Again, the central government promotes development through laws regulation, the management of state owned properties, the elaboration of visions and strategies, the allocation of funds for development, redistribution of resources, facilitation of development through investment and advancing innovation, provision of the necessary infrastructures and the offering of a stable and safe environment for business to operate. Again the central government in the town of Sangmelima impulses socioeconomic development by supporting the private sector through the provision of incentives and grants.

2.2.3: The Special Council Support Fund for Mutual Assistance (FEICOM)

Feicom is one of the most important actors of SED in Cameroon at the Local level. It is a public establishment created by law no 74/23 of 5th December 1974 organizing councils in Cameroon. The main mission of FEICOM is to contribute to the harmonious development of all decentralized local authorities on the basis of national solidarity and inter-municipal balance in connection with the concerned administrations. As such FEICOM:

- Centralizes and proceeds with the redistribution of regional taxes subject to the equalization, as well as additional municipal and regional taxes subject to equalization in accordance with the regulations in force;

- Makes available to regions, councils, unions of councils and urban councils the corresponding quotas of the general dotation of decentralization fixed by the government;

- Proceeds to the remuneration of the presidents and members of the offices of regional councils as well as municipal magistrates;

- Participates in financial operations aimed at promoting local economic development, in conjunction with other administrations and structures concerned, in particular: the mobilization of national and international resources as well as financial intermediation in research and management of resources from decentralized cooperation, in favor of decentralized local authorities.

In sum, FEICOM provides technical and financial assistance to local councils for the realization of their development missions. Again, through its principles of perequation, its redistributes resources among councils there by contributing to their development, as it is the case for Sangmelima.

2.2.4: Households, Economic agents and their associations

Public participation is essential for development. It requires access to information and equal rights for all. Households, economic agents and their associations directly contribute to SED in the town of Sangmelima. The need for better standards of living is the main motivation for this. These actors drive SED by investing in social and economic activities such as schools, health centers, hotels, recreational grounds, sawmills and market activities. Again, economic agents through their enterprises (Small and Medium sized) contribute to employment there by attracting people in town. Economic agents equally generate value added to the town and will tend to gradually contribute to the growth of big enterprises in the town.

2.2.5: Non-Governmental organization (NGOs)

NGOs are one of the most important actors of socioeconomic development today, they are critical change in promoting socioeconomic development. They include; private voluntary organizations, civil society organizations *and* nonprofit organizations. Although their history is short their importance accentuated during the second half of the 21st century. Among the ways through which they gained international attention was organizing large-scale protests, lobbying and direct actions. NGOs greatly contribute to social development, community development, economic development and sustainable development.

NGOs play an important role in bringing social change and development. NGOs ensure development which essentially involves the equal participation of the people. They play an important role in motivating people to fight for their rights. NGOs actively work for promoting education particularly among the weaker sections of the population, which is a factor of development. This is equally done through the education of girls and other deprived groups and by creating awareness. More and more women in the town of Sangmelima are working for their rights and involving themselves actively in the social and economic sphere. NGOs equally play a major role in the cause of rehabilitation and are performing commendable jobs in this direction.

In the town of Sangmelima, they constitute one of the actors of SED. In effect, law no 90/53 relating to freedom of association in Cameroon gives NGOs and associations the right to initiate development either social or economic. A variety of NGOs and associations operate in Sangmelima, amongst which we have JEURAC, an NGO whose activities are aimed at impulsing development at the local level.

2.3: Conclusion

Socioeconomic development and the environment in the town of Sangmelima are two sides of the same coin managed by different actors. Each of these actors have a distinct role and individually contribute to the wellbeing of the environment and development. The actors of socioeconomic development however in the exercise of their duties with the aim of ameliorating the standards of living of the population and the growth of the town negatively impact the environment. The more a town is provided with services and activities, the more it attracts people who want to establish either temporally of permanently. Such is the case with

the town of Sangmelima which is today characterised of a cosmopolitan town with a population coming from different parts of the country and interacting differently with the natural environment.

CHAPTER 3

THE NEGATIVE IMPACTS OF SOCIOECONOMIC DEVELOPMENT ON THE PHYSICAL ENVIRONMENT IN SANGMELIMA

Introduction

The issue of agglomeration of population into urban areas leads to the quest for more basic utilities and facilities to commensurate with the demographic structure (Ogundele et al, 2011) which negatively impacts on the environment. The relationship between socioeconomic development and the environment in the town of Sangmelima is complex, just like it is in other towns of Cameroon. This chapter, identifies the impacts of socioeconomic development on the environment of Sangmelima and examines these impacts of socioeconomic development on the environment of Sangmelima.

3.1: Identification of impacts

As the philosopher Spinoza said, from a determined cause necessarily results an effect, and vice versa, if no determined cause is given it is impossible for an effect to occur (kwadja, 2020). For Kant, "all changes occur following the law of connection of cause and effect" and if two elements are correlated, then there is a cause and effect link between both (law of causality), (Eric W. 2004). This is the case between socioeconomic development and environmental degradation in Sangmelima. Table 14 identifies the impact of socioeconomic development on the environment of Sangmelima.

Table 16: Matrix of Impact Identification

Socioeconomic activities (Source of impacts)	Environmental Component						
	vegetation	Soil quality	water	Water courses	Relief	Air quality	Aquatic life
Markets	✓	✓					
Housing/ human settlement	✓	✓	✓	✓	✓	✓	✓
Agriculture	✓	✓				✓	
Transport	✓			✓	✓	✓	✓
Reconstruction	✓	✓	✓	✓	✓	✓	✓
Hospitals	✓						
Schools	✓	✓	✓	✓			✓
Hotels	✓	✓	✓	✓	✓		✓
Sawmills	✓	✓	✓	✓	✓	✓	✓
Road construction	✓	✓	✓	✓	✓	✓	✓
Households	✓	✓	✓	✓	✓	✓	✓
Recreational centers	✓	✓				✓	

Source: Fieldwork 2021

From the different interviews conducted, satellite image analyzed, direct observation on the terrain and informal discussions held during the survey, five principal impacts of SED on the environment have been identified and summarized in the interaction matrix above. In this process, it is first necessary to identify the activities (Cause) which have an impact on the environment. To do this, all the components of the environment susceptible to impacts are first listed. Then, activities which are sources of impacts are listed, (**Table 16**).

3.2: Description of the negative impacts of socio-economic development on the environment of Sangmelima

Socio economic development has several negative impacts on the environment of Sangmelima, they include: increasing waste and poor waste management practices, Air pollution, soil pollution, water pollution, loss of biodiversity, deforestation and degradation and erosion.

3.2.1: Increasing waste and poor management practices

In Sangmelima, municipal solid waste is not only increasing in quantity but also changing in composition (from less organic matter to more paper, packing materials, plastics, glass, metal and other substances), which is exacerbated by low collection rates. Municipal Solid Waste (MSW) is defined to include refuse from the households, non-hazardous solid waste discarded by the industrial, commercial and institutional establishments, market waste, yard waste and street sweepings which are collected by the municipal authorities for disposal (Jain, 2007). Waste storage is under the direct responsibility of the waste producer; in residential areas waste is stored in different types of containers, e.g. plastic bags, old plastic buckets, baskets, boxes, open piles, **(photo 1)**, but invariably some people discharge waste without even any storage facility, indiscriminately dump waste in open spaces, storm water drains, rivers and along the roads.

Assea photo, 2020

Photo 1: Waste storage methods in Sangmelima

The picture shows the different waste storage methods in Sangmelima. These storage methods differ from one household to the other.

SED directly contributes to waste generation, and unscientific handling of urban waste is source of environmental degradation. As the result of rapid increase in production and consumption, Sangmelima produces solid material regularly which leads to considerable increase in the volume of waste produced from several sources such as, domestic wastes, commercial wastes and institutional wastes. Wastes produced in Sangmelima comprises of garbage, rubbish (package materials), construction and demolition wastes, leaf litter and electronic wastes. Monthly average waste collected in Sangmelima ranges between 1100 -1500 tons giving an annual average of 13200 - 18000 tones (Sangmelima Council, 2020).

Not all the waste generated is properly disposed and treated, 139 households (45%) dispose their waste in public bins, 34 households (11%) in nearby forest, 13 households (4%) in rivers, 112 households (37%) in streets, 5 households (2%) burn and 3 households (1%) in gutters. Treatment is done either by recycling through composting, systematic burial of waste in controlled landfill. Table 15 shows waste disposal in Sangmelima.

Table 17: Waste disposal site and mode of treatment in Sangmelima

Neighborhoods	Public bins	Nearby forest	Rivers	Street	Burn	Gutters
Akon 1	14	2	1	10	0	0
Akon 2	13	2	0	14	0	0
Akon 3	8	6	4	6	0	0
Akon x	3	0	0	6	0	0
Basse	9	0	0	0	0	0
Bissono	13	2	0	7	0	0
Centre Adm.	3	0	0	0	0	0
Ebolengbwang	9	0	0	5	0	0
Lobossi	23	12	6	29	5	2
Mbeli'i	7	0	0	0	0	0
Monavebe	6	0	0	3	0	0
Nkolguet	3	0	0	0	0	0
Nylon	10	0	0	9	0	1
Campchic	2	0	0	1	0	0
Sang.Village	7	10	2	22	0	0
Source	2	0	0	0	0	0
Otoakam	7	0	0	0	0	0
Total	**139**	**34**	**13**	**112**	**5**	**3**
Percentages (%)	**45**	**11**	**4**	**37**	**2**	**1**

Source: Field work, 2020

Solid waste management services are provided by the council and Hysacam, governed by the *law no 96/12 of 5th august 1996 relating to Environmental management*.

Generally, solid waste is disposed of in low-lying areas, outskirts of neighborhoods, alongside roads and streets, in street gutters, near-by bushes and forest, in rivers and streams and public dust bins or any vacant place wherever waste collectors find that they will not be seen or objected by anybody.

In Sangmelima, 10% of households separate their waste while the remaining 90% do not. Waste is usually mixed whether degradable or non-degradable **(cf. photo 2)**, which causes problems especially during treatment

Assea photo, 2020

Photo 2: Mixed waste in Sangmelima

The picture shows an open dump with mixed waste in Sangmelima at Akon X neighborhood. One can clearly identify biodegradable and non-biodegradable waste. Plastics, boxes, plastic bottles, papers, plantain peels and weed are mixed together.

In cases when bins are far away from the household, the waste is deposited along the road side or street which not only contributes to environmental degradation but is also a threat to the esthetic of the place in particular and the town in general. In total 51 illegal dumps were identified in the town during field survey. **Figure 14** shows the distribution of illegal dumps and legal dumps in the town of Sangmelima.
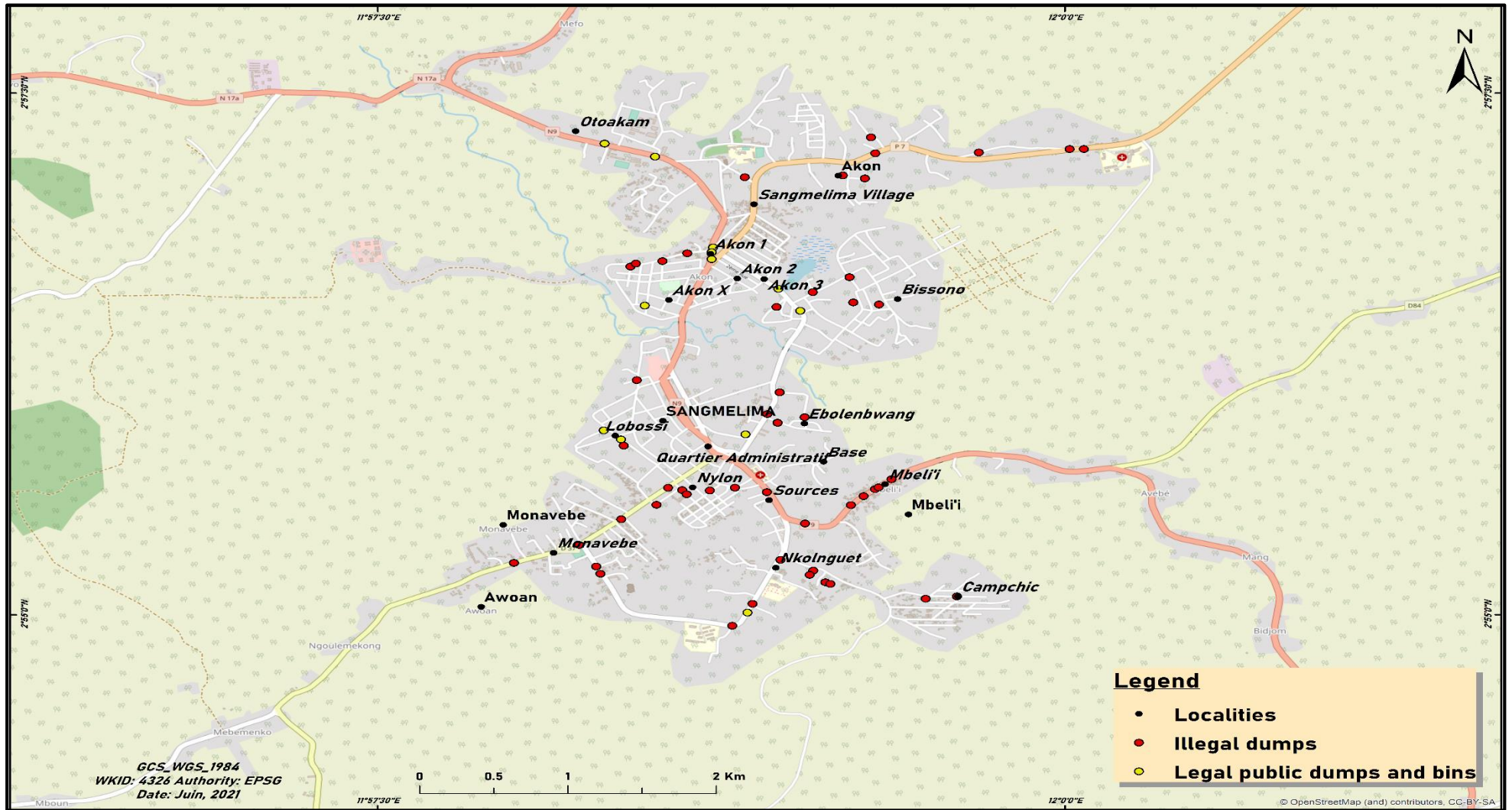
Source: INC, *Openstreetmap***, June 2021 and Fieldwork, 2020**

Figure 14: Distribution of illegal dumps, legal dumps and public bins in Sangmelima town

Legal dumps are unevenly distributed in the town. However, despite their presence and that of receptacles in all neighbourhoods, illegal dumps develop every day. Sangmelima Village (10), Nylon (6) and Mbeli'i (6) have the highest number of illegal dumps while Centre Adm, Base and Otoakam have none.

3.2.2: Air pollution

According to a report of the World Health Organization (WHO) Expert Committee (1991), about 500 million people in developing countries are exposed to the risks of air pollution in urban areas. Among the sources of this pollution are gas exhausts resulting from the anaerobic fermentation of organic matter. These gases are more or less charged with methane, sulphur or nitrated gases capable of causing explosions. Incineration method is commonly practiced in Sangmelima usually by some households in informal waste dumps, sometimes in garbage bins, causing air pollution; seriously damaging the environment. In addition to smoke, the incineration of waste releases mineral fibers (nitrogen, hydrocarbons, hydrochloric acids, etc.) which are harmful to the environment (**photo board 1**).

Photo board 1: Incineration of waste in Sangmelima

Assea photo, 2020

Photo board 1a: solid waste types after fire has been light up

Assea photo, 2020

Photo board 1b: Emission of carbon dioxide and other gases

Assea photo, 2020

Photo board 1c: Post Incineration in Sangmelima

*The photo board illustrates incineration in Sangmelima. In **photo board 1a** we can clearly identify various solid waste types (plastics, papers, clothes, old shoes and plantain stems). **Photo board 1b** shows how the fire has grown and emits carbon dioxide (**CO_2**) **as well as nitrous dioxide (NO_2), oxides of nitrogen (NO_X), and ammonia (NH_3),** all greenhouse gases (GHG), which contribute to the destruction of the ozone layer. Again, **photo board 1c** shows post incineration in Sangmelima-village neighborhood. After and even during incineration, waste is deposited at the same spot, it is a continuous process.*

Field investigations show that waste incineration represents around 19% of household waste management methods in the town of Sangmelima when the collection agency does not pass. Table 16 shows waste incineration in Sangmelima per neighbourhood.

Table 16: Waste incineration in Sangmelima per neighbourhood

Neighborhoods	Number of questionnaires administered	Incineration
Akon 1	27	0
Akon 2	29	7
Akon 3	24	9
Akon x	9	6
Basse	9	-
Bissono	22	4
Centre Adm.	3	-
Ebolengbwang	14	4
Lobossi	77	20
Mbeli'i	7	1
Monavebe	9	0
Nkolguet	3	0
Nylon	20	0
Campchic	3	0
Sang. Village	41	8
Source	2	-
Otoakam	7	-
Total	**306**	**59**
Percentages (%)	**100**	**19**

Source: Field work, 2020

Lobossi is the neighbourhood where incineration is mostly practiced, followed by Akon 3. This method leads to atmospheric pollution through the gas released in it. It constitutes a source of destruction of the ozone layer because the waste produces methane. The open-air burning of combustible waste produces odor nuisance. This act is strictly prohibited by *law no 96/12 of 5th august 1996* relating to Environmental management in Cameroon.

Among the waste often burnt in the town of Sangmelima, we have rubbers (old worn tires, toys and sports articles), plastics (bottle bags, utensils, containers, shoes), textile waste (clothes, sheets, blankets , hats, etc.), wood residue (furniture, beds, toys, packaging), paper and cardboard (old newspapers, magazines, stationery, packaging of various products, etc. The lack of recycling industry and the lack of efficient collection of this waste are two major reasons why the population is always tempted to burn their waste.

3.23: Soil Pollution

Despite the presence of public bins, in some neighborhoods, people continue to dispose waste on the ground and along the streets which pollutes the soil and eventually river bodies. The acidification of the soil by toxic non-biodegradable waste leads to the death of many species (plants and animals). The consequences of SO_2, NO_3, and CO_2 are not limited to pollution of the atmosphere. For example, the accumulation of NO_3 in the soil and in crops intended for consumption can affect the entire food chain. Some plants, after assimilation of substances from waste by their roots, contaminate humans. It is, therefore, necessary to prevent this by focusing on their effective management. It should be noted that plastics take about 100 to 400 years to degrade. (**photo board 2**).

The accumulation of waste here causes saturation and clutter of the soil in non-biodegradable materials. Biodegradable waste when dumped in waste disposal points decomposes under uncontrolled anaerobic conditions. This gas contains methane, a greenhouse gas that is more dangerous than carbon dioxide.

Photo board 2: Waste thrown on the ground and open dumping in Sangmelima

Assea photo, 2020

Photo board 2a: Waste deposited on the ground

Assea photo, 2020

Photo board 2b: Open dumping of waste

Photo board 2 *illustrates waste deposited on the ground in Sangmelima. On **photo board 2a**, it is noticed that the waste is deposited on the ground despite the presence of the receptacle, this is in the neighborhood of Quartier-chic. Same for **photo board 2b** in the neighborhood of Akon 1*.

The reasons for such attitude according to respondents are numerous. (Table 17).

Table 17: Household opinion on why waste is thrown on the ground

Neighborhoods	Nbr. of questionnaires (3% sample)	Incivility	Difficult to put waste inside the bin due to its height	Difficult to put the waste inside the bin due to waste and litter spread around the bin
Akon 1	27	12	10	5
Akon 2	29	12	14	3
Akon 3	24	13	10	1
Akon x	9	3	4	2
Basse	9	7	0	2
Bissono	22	10	5	7
Centre Adm.	3	3	0	0
Ebolengbwang	14	9	5	0
Lobossi	77	33	23	21
Mbeli'i	7	6	1	0
Monavebe	9	5	4	0
Nkolguet	3	3	0	0
Nylon	20	10	9	1
Campchic	3	2	1	0
Sang. Village	41	13	21	7
Source	2	2	0	0
Otoakam	7	7	0	0
Total	**306**	**150**	**107**	**49**
Percentages	**100**	**49**	**35**	**16**

Source: Fieldwork, 2020

According to 107 households (35%), people dispose their waste on the ground while the bin is empty because of the height of the bin. Generally, in 95% of the households in Sangmelima children ranging from 6-15 years are the ones in charge of the waste. This is not only the cause of poor waste management practices but can also be a cause to health problems and severe skin diseases.

On the other hand, for 150 households (49%), the main reason while people dispose their waste on the ground instead of putting it in the bin is linked to their education and morality. They agreed that people do this because they are either of bad faith or they lack manners, for because an educated person will never think of throwing his waste on the ground when there is an empty bin available. This therefore puts education at the center of environmental concerns and management.

49 households (16%) attributed this act to the waste and litter spread around the bin, this is because of the low frequency rate of the sanitation agency in some neighborhoods. The table below shows the frequency rate of the collection agency in Sangmelima.

Table 18: Waste collection frequency rate in Sangmelima

Neighborhoods	N⁰. questionnaires (3% sample)	Every day	Twice a week	Once a week	Never
Akon 1	27	18	3	6	0
Akon 2	29	17	9	3	0
Akon 3	24	14	7	3	0
Akon x	9	0	0	4	5
Basse	9	9	0	0	0
Bissono	22	0	14	8	0
Centre Adm.	3	3	0	0	0
Ebolengbwang	14	10	3	1	0
Lobossi	77	0	34	20	23
Mbeli'i	7	2	0	5	0
Monavebe	9	0	7	2	0
Nkolguet	3	0	3	0	0
Nylon	20	13	0	7	0
Campchic	3	0	0	3	0
Sang. Village	41	15	6	20	0
Source	2	2	0	0	0
Otoakam	7	7	0	0	0
Total	**306**	**110**	**86**	**82**	**28**
Percentages	**100**	**36**	**28**	**27**	**9**

Source: Field work 2020

According to 110 households (36%), in their neighborhoods, the sanitation agency passed every day. For 86 households (28%), it passed twice a week. While for 82 households (27) it passed once a week and for 28 households (9%), the sanitation agency never pass in their

neighborhood. This is due to the fact that accessibility to these households is not easy. Some households are located in very accessible neighbourhoods and others are found near the road network, and as such, the sanitation agency easily reaches such neighbourhoods and households. Where the sanitation agency does not pass, households find other means to dispose of their waste, means which are not always advantageous to the environment.

3.2.4: Water Pollution

In some neighborhoods, households get rid of their waste along the river bank and in the river, constituting a treat to the environment. Landfilling waste produces percolating water called leachate that pollutes groundwater and streams. These liquid in contact with surface water and groundwater is a source of pollution. The deposition of waste in water is a common practice in the town of Sangmelima. These are acts carried out daily by people living near rivers in the town of Sangmelima (**photo board 3**).

Photo board 3: Floating waste along the banks of river Afamba (a) and river Lobo (b)

Assea photo, 2020

Photo board 3a: Floating waste along the banks of river Afamba

Assea photo, 2020

Photo board 3b: Floating waste along the banks of river Lobo

*The **photoboard 3a** shows floating waste (cartons, package materials, plastic waste and bottles) along the banks of river afamba. On the other hand, on photo board **3b** one can identify gabbage, old clothes and plastic waste.*

This practice leads to eutrophication. Biologically, eutrophication results in the excessive growth of algae and cyanobacteria (Rio et al, 2001). The algae on the surface of the water, capture the sun's rays, thus producing a large quantity of oxygen by the mechanism of photosynthesis. When algae die, they deposit in the depth of the water where they break down. Their decomposition by bacteria is accompanied by the consumption of oxygen and thus creates an anaerobic zone in the depth (Garland et al, 1991). Some species of algae produce toxins that negatively affect the health of aquatic ecosystems through the food chain (Baddi et al, 2004). (**figure 15**).
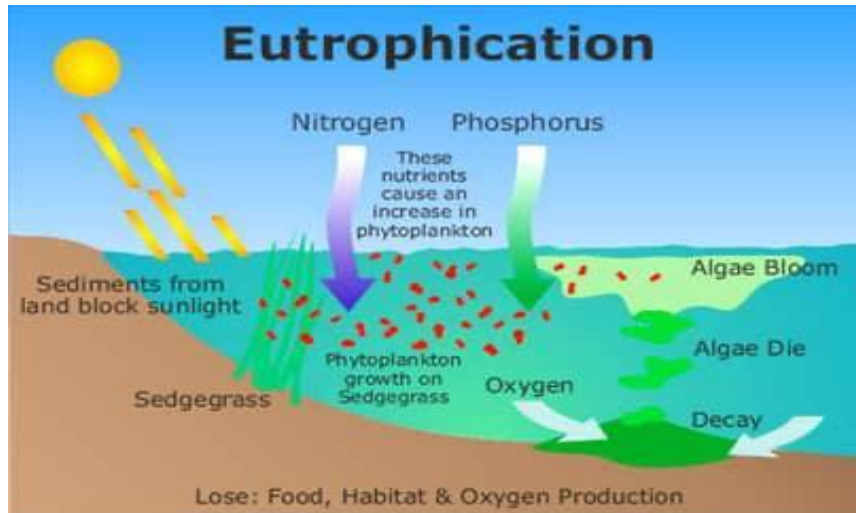
Source: Onlinesciencenotes.com, retrived on the 13/01/2021

Figure 15: The process of eutrophication

The physical effects of eutrophication are manifested by the deterioration of the physical quality of water. Indeed, it causes the change of the color of the water which prevents the penetration of the solar rays in the depth. When organic matter is broken down by aerobic bacteria, the process is accompanied by the consumption of oxygen (Baddi et al, 2004). The lack of oxygen in aquatic environments as a result of the decomposition of waste inside, could cause the disappearance of many biological species, **(photo 3)**.

The presence of toxic waste such as electric batteries increases the concentration of metal ions and heavy metals, the presence of which, even in tiny doses, can prove to be catastrophic for soil, water and therefore for the environment. In the town of Sangmelima, waste is thrown into rivers without control. The photo 3 shows eutrophication in part of the lobo river in Sangmelima.

Assea photo, 2020

Source: Field work, 2020

Photo 3: Eutrophication in river Lobo in Sangmelima

Photo 3 *shows eutrophication in river Lobo in Sangmelima. The green color of water accounts for the excessive growth of algae. After the death of the algae, the bacterial degradation results in oxygen consumption, thereby creating the state of hypoxia.*

In Sangmelima, this phenomenon decreases the value of the river and aesthetic beauty, decreases the water transparency and we notice the reduction and loss of some fish species. Added to this, it gives the water a stinky odor making it not only an environmental issue but also a human issue.

The deposit of waste in rivers and ponds in Cameroon is prohibited by law no 96/12 of august 5, 1996 in its article 42, relating to environmental management. Unfortunately this law is not respected in some urban centers. However, household waste, from the point of view of its nuisance, must be collected and evacuated in order to spare the environment from its negative effects. Following these effects on the environment, various environmental management policies must be implemented in the town of Sangmelima.

3.2.5: Deforestation and degradation of the forest

Deforestation and degradation of the forest are direct impacts of SED on the environment. Deforestation and degradation of forest are two different phenomena. Deforestation refers to the conversion of forested areas to non-forest land use such as arable land, urban use, logged area or waste land (Giri Tejaswi, 2007). According to the Food and Agricultural organization (FAO), deforestation is the conversion of forest to another land use or the long-term reduction of three canopy cover below the 10% threshold.

Forest degradation on the other hand is a process leading to a temporary or permanent deterioration in the density of structure of vegetation cover or its species composition. It is a change in forest attributes that leads to a lower productive capacity caused by disturbances (FAO, 2007). These phenomena can be observed in Sangmelima located in a fragile ecosystem and undergoing development. The question that triggers us is whether we are going to preserve the forest at the detriment of SED that contributes to the wellbeing of the people in particular and the country in general? Or shall we destroy the forest at the advantage of SED? An ecological dilemma. Figure 16 illustrates land use/land cover dynamics in Sangmelima for the year 2001, 2011 and 2019 in Sangmelima.
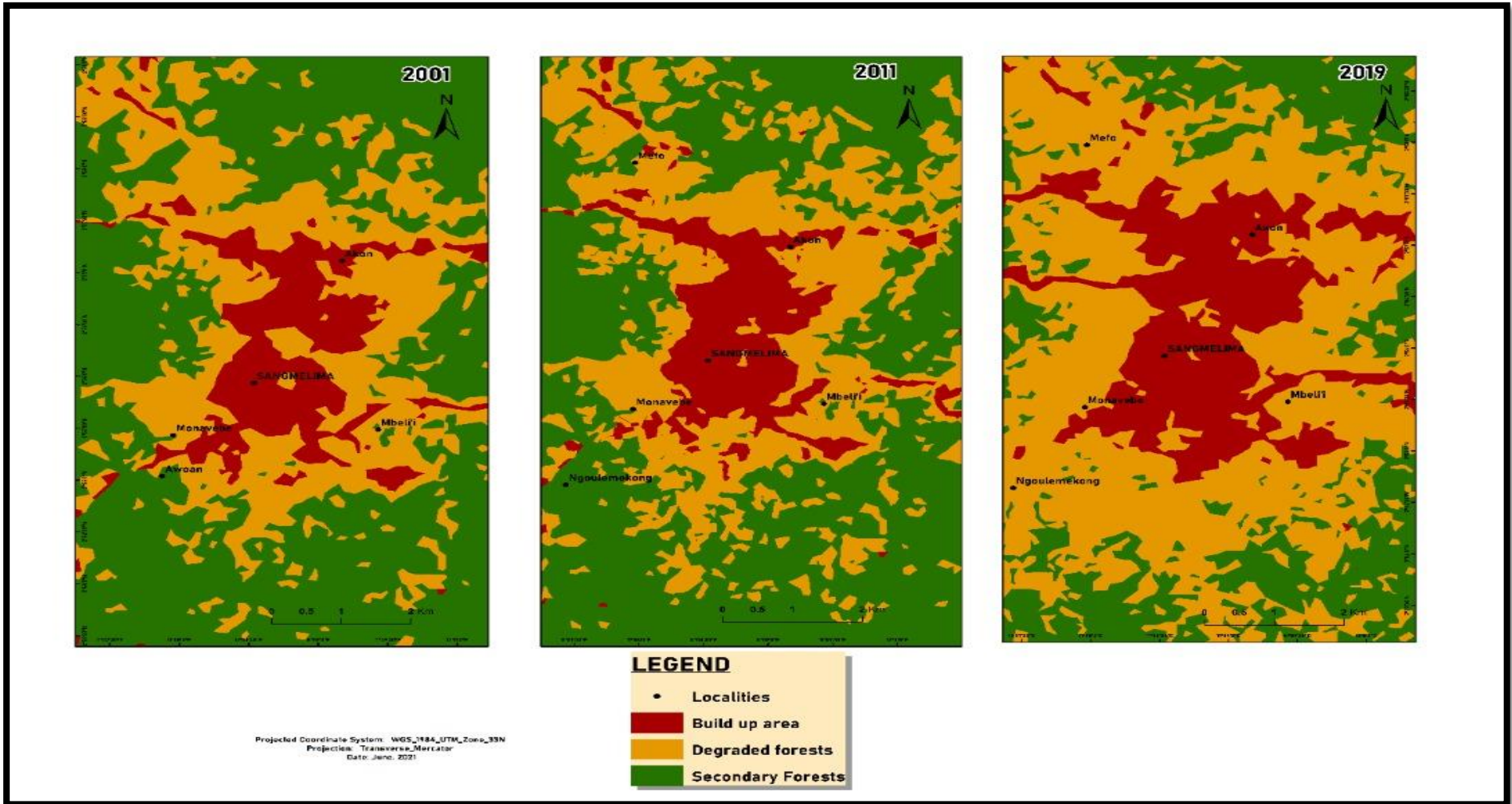
Source: INC, *Openstreetmap***, June 2021**

Figure 16: Land cover / land use dynamics in Sangmelima for the year 2001, 2011 and 2019

Table 19: Forest cover dynamics in Sangmelima for the year 2001,2011 and 2019

Year	2001		2011		2019	
Surface area	ha	%	ha	%	ha	%
Forest	139465.646	94.17	127663.173	86.2	120686.88	81.5

In 2001, forest cover was 139,465,646 hectares corresponding to 94.17%. In 2011 forest cover decreased to 127,663,173 hectares representing 86.2%, with a percentage decrease rate of 7.97% and in 2019, it decreased to 120,686,88 hectares corresponding to 81.5% of the total surface area.

Table 20: Evolution rate of forest cover in Sangmelima for the year 2001, 2011 and 2019

2001-2011		2001-2019		2011-2019	
Surface Area	**Percentage (%) decrease**	**Surface Area**	**Percentage (%) decrease**	**Surface Area**	**Percentage (%) decrease**
11802.473	7.97	-18778.766	-12.67	-6976.293	-4.7

Between 2001 and 2011, spatial decrease of forest cover is 118,024,73 hectares in ten (10) years averaging 1180.2473 hectares each year, between 2011 and 2019 spatial decrease is -6976.293 hectares in seven (8) years. This means that, during this interval, forest lost was 996.613 hectares annually. This was -187, 787, 66 between 2001 and 2019, meaning a decrease of 1104.633 hectares annually within this interval (18 years).

Among the key factors affecting deforestation and degradation in Sangmelima is the rising demand for forest products and exploitable forest resources such as building materials, animal fodder, seeds, fruit, bush meat and medicinal plants, due to increasing population in the rural, urban, and peri-urban zones. The increasing wood demand is also exacerbated by the limited access to alternative energy materials (e.g., electricity, solar panels, etc.) and alternative nonwood construction materials (e.g., steel, concretes, etc.). These limitations force the population in Sangmelima to largely rely on surrounding forests both for energy and

construction. Below is a table which shows household cooking energy source per neighbourhood in Sangmelima.

Table 21: Household cooking energy source per neighbourhood in Sangmelima

Neighborhoods	Nbr. of questionnaires (3% sample)	Gas	Wood	Charcoal
Akon 1	27	15	10	2
Akon 2	29	11	18	0
Akon 3	24	9	10	5
Akon x	9	3	5	1
Basse	9	6	3	0
Bissono	22	14	8	2
Centre Adm.	3	2	1	0
Ebolengbwang	14	6	8	0
Lobossi	77	25	45	7
Mbeli'i	7	2	4	1
Monavebe	9	3	6	0
Nkolguet	3	2	1	0
Nylon	20	7	10	3
Campchic	3	1	2	0
Sang. Village	41	8	31	2
Source	2	2	0	0
Otoakam	7	4	2	1
Total	**306**	**120**	**162**	**24**
Percentages	**100**	**39**	**53**	**8**

Source: Field work, 2020

Results from table 20 show that 162 households (39%) rely on fuel wood for cooking, 120 (39%) and 24 households(8%) rely on gas and charcoal respectively as main source of energy used in cooking. Added to that, commercial logging contributes significantly to forest loss in Sangmelima. Again, most infrastructure projects have been in forested areas, the Sangmelima-Ouesso road for example, opens up the way to the forest and facilitates logging and bushmeat trade. This is due to limited surveillance of the forest and the corrupt nature of some state and local agents.

The "Economic Man" (*homo economicus*) seeking to maximize personal satisfaction prefers SED at the expense of the forest. In order to have a habitat land must be available and this ultimately means the destruction of the forest. Fulfilling the resource requirements of a growing population ultimately requires some form of land-use change:

- to provide for the expansion of food production through forest clearing,
- to intensify production on already cultivated land, or
- to develop the infrastructure necessary to support increasing human numbers.

All these inevitably contributes to deforestation and degradation of the forest leading to a competition of land use (SED versus Forest). We ask ourselves if we will ever see a parcel of forest in the next 50 years.

3.2.6: Loss of animal species

The loss of animal species is common during the construction of human settlement. Socio-economic development through the construction of social and economic infrastructures, like the Sangmelima referal hospital, the Sangmelima Municipal market, the interstate university and road infrastructures, constitute a factor of environmental degradation. These activities have resulted in the discontinuity of the natural habitat causing population fragmentation and ecosystem decay, hence, the loss of animal and plant species. During their construction natural habitats are often fragmented and in some cases destroyed. Large pieces of forest land are often cleared especially for the construction of large linear infrastructures constituting a barrier and threat for natural life. Habitats which were continuous become divided in to separate fragments. Below is a picture of infrastructures encroaching in the forest in Sangmelima.

Source: MINSANTE, 2016

Photo 4: The Sangmelima municipal market encroaching in the forest

Photo shows an aerial view of the municipal market of Sangmelima when it was still under construction advancing or encroaching in the forest. Today, the market is completed and has contributed to the clearing down of large pieces of forest land which was a breeding ground to various animal species.

Prior to the construction of the Sangmelima municipal market, this piece of forest land was continuous and constituted a single habitat in equilibrium. Later, came the project of the

construction of the market which had to be linked to the town by a road, consequently the emergence of discontinuities. It saw the loss of several plants and animal species, population fragmentation, thereby putting the remaining ones in danger. A market which to date is less or not operational, (**photo 5**).

Assea photo, 2020

Source: Field work 2020

Photo 5: Habitat fragmentation in Sangmelima

*This photo shows fragmentation (**a** and **b**) and the reduction of suitable habitat available for organisms in Sangmelima, from the Municipal market project.*

Another example is the construction of the Sangmelima-Bikoula road which led to the deforestation of large piece of forest, (**photo 6**)

Source: CRTV, 2021

Photo 6: Construction works of the Sangmelima-Bikoula road after deforestation

Photo 6 shows construction works of the Sangmelima-Bikoula road after a series of deforestation took place.

Besides, the demand for economic infrastructures, social infrastructures such as hospitals considerably alter land use practices and degrades the environment. Photo 7 below shows the encroachment of this infrastructure in the forest.

Source: MINSANTE, 2019

Photo7: The Sangmelima referral hospital

The photo shows the encroachment of the referral hospital in the forest which was constructed after a series of deforestation that obviously led to the destruction of plants and animal species.

Increasing demand for land from the growing population places added stress on already stretched resources. Land is always in short supply and subject to increasing competition by different users. Urban growth leads to increasing demand for land for industrial and domestic use, which conflicts with environmental demands. As time went on it became difficult to provide land especially to the poorest people, many people therefore began to settle in the marshy zones which are environmentally fragile and subject to flooding.

3.2.7: Soil erosion and degradation

Erosion is the process of degradation and transformation of the relief. Soil erosion is the displacement of the upper layer of soil. Before the process of erosion, there are phenomena that precede erosion like vegetation clearance. Deforestation, and the various land uses resulting from it are the causes of this in the town of Sangmelima, in regard to their effect in stimulating erosion. After deforestation, the landscape is scalded, the soils are naked and vulnerable to the process of erosion. Surface runoff and wind on a surface will produce four main types of erosion: splash erosion, sheet erosion, rill erosion and gully erosion. Splash erosion is generally

seen as the first and least severe stage in the soil erosion process, which is followed by sheet erosion, then rill erosion and finally gully erosion (the most severe). Gully erosion occurs when runoff water accumulates and rapidly flows in narrow channels during or immediately after heavy rains, removing soil to a considerable depth.

Gully erosion is observed in Sangmelima as a result of the deforestation of a piece of land during the construction of the Sangmelima municipal market. **(photo board 4).**

Photo board 4: Gully erosion in Sangmelima

Photoboard 4a: gully erosion in Sangmelima

Assea photo, 2020

Photo board 4b: gully erosion in Sangmelima

Photo board 4a and *b* show gully erosion in Sangmelima. These gully were excavated by runoff in less than two years. All most all the vegetation has been stripped, in an area with very heavy rains, severe erosion occurs.

Vegetation acts as an interface between the atmosphere and the soil. It increases the permeability of the soil to rain water, thus decreasing runoff, it shelters the soil from winds

erosion, as well as advantageous changes in micro climate. The roots of the plants bind the soil together, and interweave with other roots, forming a more solid mass that is less susceptible to both water and wind erosion. The removal of vegetation increases the rate of surface erosion. As the population has expanded, more and more land has been cleared for agriculture and other pursuits that degrade the soil and make erosion more likely to occur. Urban developments can cause severe soil erosion if the land is unsuitable to be built on and developments run through existing drainage lines. Road and track-butimen and concrete readily produce runoff. To build roads, the land has to be disturbed, so erosion and siltation can occur if special stabilizing techniques are not used.

Soil represents a crucial element in both rural and urban environments. And in both cases, proper land management is key to maintaining soil quality. Even if soil erosion on construction sites usually affects a relatively small area of land, as part of the watershed, it's still a major cause of sediment. Erosion and land degradation can occur both on and off the construction site. When it comes to urban areas in particular, the loss of topsoil due to construction activity can have major negative on-site effects. Soil erosion left unchecked on slopes and channels adjacent to buildings, roadways and other infrastructures can undermine and destabilize foundations and road bases, causing those structures to fail. Soil erosion from constructions also has off-site environmental costs. Such erosion can result in two major water quality problems, both surface waters and drainage systems. These are nutrient and sediment pollution. These two issues have significant adverse economic and environmental effects on water bodies as well as the surrounding communities.

Soil erosion is not only an environmental issue. It also causes huge losses to the economy. One study estimated that global economic loss from soil erosion was about 8 billion dollars due to reduce soil fertility. Soil erosion is a global problem. Today, soil is eroding more quickly than it is being formed, causing land to be unsuitable for agriculture (a particular) serious concern in a world where the population is expected to top 9 billion by midcentury. Smarter land management is a necessity. Soil erosion degrades land, which means it can support fewer plants that can take the climate warming carbon dioxide. Soils themselves could potentially sequester enough greenhouse gases in a year to **equal about 5%** of all annual human-made GHG emissions (World Bank, 2018). Better land management can help keep soils intact so they can grow more carbon sucking vegetation.

Conclusion

Economic and social activities are bound to operate where ever humans gather for the purpose of increasing standards of living and wellbeing in the society. The creation of the town of Sangmelima as the head quarter of the Dja and Lobo division saw the rise and development of various administrative offices and educational centers that attracted a lot of civil servants and scholars.

The chapter analyzed the negative impacts of SED on the environment of Sangmelima. Air pollution, soil pollution, water pollution, deforestation and degradation, loss of animal species and soil erosion and degradation, providing a background of the actual in the town. From the above analyses, we conclude that, current socioeconomic and ecological changes in Sangmelima require a new pattern of urban land use in particular and an environmentally responsible behavior in general.

CHAPTER 4

MASTERING THE IMPACTS OF SOCIO-ECONOMIC DEVELOPMENT ON THE ENVIRONMENT OF SANGMELIMA TOWN

Introduction

The impacts of socioeconomic development on the environment of Sangmelima are in constant evolution as the town continuous to grow. The safeguarding of the urban areas from human injurious physical, social, economic and political activities should be man's paramount responsibility. Everyone could be tempted to think that the miracle year 2000 AD and beyond will bring along easy life to all the populace with the "Health for All", "Housing for all" and "Education for All" by the year 2000 AD syndrome (Ogundele et al, 2011).The different strategies and efforts put in to place by the town stakeholders have proven to be efficient, but however these should be duplicated, complemented and innovative strategies should be applied. To master the impacts of socioeconomic development on the environment of Sangmelima, this chapter thus in the first place analyses the strategies put in place by local actors in order to curb the growing impacts of SED on the environment and in the second place, proposes some strategies which have proven their efficiency in other towns and countries.

4.1: Local actors in Sangmelima and environmental Management

Local actors in the town of Sangmelima have been fully engaged in environmental management as they have developed strategies to curb the impacts of SED on the environment of Sangmelima, however these actors are subjected to some problems that greatly limit their efficiency.

4.1.1: Methods used to curb the growing effects of SED on the environment

The council alongside with the other actors of EM in the town greatly work hand in hand in order to sustainably manage the environment of Sangmelima town. This is through the sensitization of the population, the promotion of participation, the project "green city", the construction of cement skips, "Clean Wednesday" and the promotion of biodegradable plastics.

4.1.1.1.: Sensitization of the population

Environmental sustainability is one of the priority of Sangmelima Stakeholders. To attain this objective, the Sangmelima council invested a lot of resources (human and technical) to sensitize the local population.

However, the opinion of the population vary as far as sensitization is concerned. According to 64% of the respondents corresponding to 196 households, local authorities sensitized and raised environmental awareness, while 36% or respondents corresponding to 110 households think contrarily, (**table 22**).

Table 22: Household opinion on sensitization on environmental protection

Neighborhoods	Nbr. questionnaires (3% sample)	Yes	No
Akon 1	27	19	8
Akon 2	29	17	12
Akon 3	24	19	5
Akon x	9	6	3
Basse	9	7	2
Bissono	22	16	6
Centre Adm.	3	3	0
Ebolengbwang	14	12	2
Lobossi	77	40	37
Mbeli'i	7	7	0
Monavebe	9	5	4
Nkolguet	3	3	0
Nylon	20	10	10
Campchic	3	3	0
Sgma.Village	41	20	21
Source	2	2	0
Otoakam	7	7	0
Total	**306**	**196**	**110**
Percentages (%)	**100**	**64**	**36**

Source: Field work, 2020

During our field work it was noticed that, sensitization on the subject was done through the municipal radio **Colombe FM** and in some cases the private one, **Zen** radio. Sensitization is also done in schools with the creation of environmental clubs especially in secondary schools. For 221 households, the television is the main mass media which generated their environmental awareness and for 56 households, it is the radio. According to 8 of the households, it is the journal (written) which generated their environmental awareness and for 21, it is social media. (**table 23**).

Table 23: Efficiency rate of mass media on household environmental awareness

Neighborhoods	Nbr. of questionnaires (3% sample)	Television	Radio	Journal (written)	Social media
Akon 1	27	20	5	2	0
Akon 2	29	17	9	0	3
Akon 3	24	15	6	0	3
Akon x	9	7	1	0	1
Basse	9	6	3	0	0
Bissono	22	14	1	4	3
Centre Adm.	3	3	0	0	0
Ebolenbwang	14	10	2	0	2
Lobossi	77	60	15	0	2
Mbeli'i	7	6	0	0	1
Monavebe	9	4	3	2	0
Nkolguet	3	3	0	0	0
Nylon	20	15	3	0	2
Campchic	3	3	0	0	0
Sang. Village	41	30	8	0	3
Source	2	2	0	0	0
Otoakam	7	6	0	0	1
Total	**306**	**221**	**56**	**8**	**21**
Percentages	**100**	**72**	**18**	**3**	**7**

Source: Field work, 2020

It is obvious that the television will generate more awareness than other mass media. The television is more demonstrating (showing videos and actions) which makes the auditors to easily grasp what they see and be conscious of environmental realities. The radio even though not demonstrative is easily accessible and covers a wider geographical sphere. However, rare are those people who listen to the radio today. The journal (written) on the other hand is less accessible due to its price and the very limited sphere it covers. Social media nowadays are more accessible than ever. More and more people are connected to social media which offer a variety of options demonstrative in nature. There is reason to believe that social media in the near future will be the number one tool in generating people's awareness because of its accessibility and the ability it has to easily diffuse information.

4.1.1.2: The promotion of Participation

With the aim to achieve good governance and a sustainable environment in Sangmelima, local authorities decided to put participation at the top of their objectives, given that participation consist a pillar of sustainable development. The principle of participation is contained in Article 9(e) of *law no 96/12 of 5ᵗʰ August 1996 relating to environmental management in Cameroon.*

Under this law, the principle is reflected through three points: access to information, the duty to protect the environment and consultation or public debate before certain decisions are taken. This is to ensure the participation of every citizen to decision making processes that will shape their lives.

For this to be effective in Sangmelima, local grounds at the level of neighborhoods were created for discussions, where the population could give their point of view of actual environmental problems they face. Following this, initiatives were taken by the population, for example, in the neighborhood of Nylon, the population proposed an annual waste tax (1000 frs FCFA) per household, in order to adequately manage the waste in the neighborhood. This initiative was widely embraced by the town stakeholders, as Nylon is one of the cleanest neighborhood in town.

However, opinions of households on participation greatly vary. According to some households, there exist no participation of the local population while for other households there is effective participation. Table 24 below shows household opinion on the promotion of participation by local stakeholders

Table 24: Household opinion on the promotion of Participation by stakeholders

Neighborhoods	Nbr. questionnaires (3% sample)	Satisfied	Not satisfied
Akon 1	27	19	8
Akon 2	29	16	13
Akon 3	24	10	14
Akon x	9	7	2
Basse	9	8	1
Bissono	22	18	4
Centre Adm.	3	3	0
Ebolengbwang	14	12	2
Lobossi	77	46	31
Mbeli'i	7	5	2
Monavebe	9	7	2
Nkolguet	3	3	0
Nylon	20	16	4
Campchic	3	3	0
Sang. Village	41	27	14
Source	2	2	0
Otoakam	7	7	0
Total	**306**	**209**	**97**
Percentages (%)	**100**	**68**	**32**

Source: Field work, 2020

Of the 306 households, 209 of them (68%) believe stakeholders effectively promote the participation of the local population. On the other hand, 97 households (32%) have a contrary view.

4.1.1.3: Project "Ville verte"

The project *ville verte* or *green city* is one of the most prominent measure undertaken by Sangmelima local authorities to sustainably manage the environment. The project consists of planting trees and creating green spaces or grounds all over the town, in schools (primary, secondary and higher) and in hospitals and health centers.

These green spaces offer a public access to all the population and constitutes the number one destination in town for nature lovers. The project has been a successful one as it has enhanced many people to plant trees and flowers in their compounds. **Photo 8** shows a picture of a green space in Sangmelima town.

Assea photo, 2020

Source: Field work 2020

Photo 8: A green space in Sangmelima

This green space is located in the Administrative neighborhood opposite the court of Sangmelima. In it, we have concrete public benches and a variety of plant species. We equally have a statues of a golden lion.

4.1.1.4: Construction of Concrete trash receptacles

Given the limited financial resources to purchase public plastic and iron skips in the town, the local government adopted the idea of cement skips in order to solve the problem of poor waste disposal in Sangmelima. The skips are gradually been constructed all over the town, the

innovation has been adopted by the population in the different neighborhoods where the waste is deposited by households for proper treatment.

Assea photo, 2020

Source: Field work 2020

Photo 9: Concrete receptacles in Sangmelima

Photo 9 shows a concrete receptacle in the neighborhood of Akon 1, in Sangmelima. It is daily emptied by the collection agency and is a sign of the engagement of the local authority to ensure a healthy environment in Sangmelima.

This is in line with the National Waste Management Strategy adopted in 2008 by the government which has as main objective to improve the living environment of the population through efficient management of waste produced in the country. The specific objectives of the National waste management strategy (to improve access to pre-collection and waste collection services in built-up areas, improve waste management by promoting appropriate methods of waste treatment, recycling and recovery) are those that stakeholders in Sangmelima try to achieve.

4.1.1.5: "Keep Sangmelima Clean"

The municipal council of Sangmelima has set aside every first Wednesday of each month for clean up, and the council makes sure that this exercise is respected by the population. The exercise came into existence through a ministerial text signed by the Minister of Territorial Administration and Decentralization and has been existing for over 15years. During this day, the population engage in clean ups including in certain related sanitation and hygienic activities. And to this matter economic activities in the town of Sangmelima are closed till 10am.

4.1.1.6: Promotion of biodegradable plastics

Plastic materials have are hazardous to human and animal health. For this reason, the Cameroon government in its ambition to sauvegard health and prevent environmental degradation, signed an order (order no.004/MINEPDED/MINCOMMERCE of 24 October 2012, relating to the prohibition of plastic packages inferior to 61 microns) prohibiting the use of non-biodegradable plastics in the entire territory. Local authorities in Sangmelima, conscious of the necessity to sauvegard health and the environment, as the principal asset of mankind is working hard to put an end to non-biodegradable plastics.

4.1.1.7: Recycling of waste (Composting)

Aware of the environmental impacts of activities, hysacam-Sangmelima is committed to material recovery. The sanitation agency practices recycling through composting. This is the process of decomposition of organic matter. The process recycles various organic materials (waste) to produce a soil conditioner (the compost) for agricultural uses. Valorisation by compost, although it has not reached its cruising speed in the company, it is part of a desire to raise awareness among populations, in particular farmers, on the advantages of composting. The compost is distributed to farmers who want it. They are then introduced not only to the methods of making compost but also to its use.

The objective here is to get the farmers abandon chemical fertilizers whose deleterious impact on the soil has been scientifically established. Farmers who have been experimenting with the compost produced by hysacam for several years have seen its positive impacts in terms of improving soil quality and productivity. **Photo 10** below shows a compost unit in Sangmelima.

Source: Hysacam 2020 and Fieldwork 2020/ Photo 10: A compost unit in Sangmelima

Photo 10, shows a hysacam compost unit in Sangmelima. Here various organic materials (waste products) are recycled.

4.1.1.8: Promotion of renewable energy

The general objective with this project is to create a green town, an ecological town. To set the ground in order for Sangmelima to become a green town with eco-neighbourhoods, habitat with high environmental quality using clean energy, solar in particular leaving behind fossil energy (gaz and petrol). As an example, Sangmelima city hall receives a stable power supply through non-utility power generation using 96 solar panels and the Sangmelima modern market which has a solar plant. **photo 11** shows a picture of the Sangmelima modern market solar plant.

Source: Sangmelima Council and Field work 2020

Photo 11: Sangmelima modern market solar plant

Photo 11 shows the solar plant of the Sangmelima modern market. This solar plant has a capacity of 63 KW/t.

4.1.2: Problems associated with environmental management in Sangmelima

Environmental Management is now a problem not only of urban areas but also in semi-urban and rural areas. Poor waste management, deforestation and forest degradation, soil degradation and soil pollution, soil erosion, poor land use, water and air pollution not only have serious environmental impacts but also in the long run affect human health.

Major challenges associated with EM in Sangmelima include;

- open dumping and burning are commonly pursued to eliminate remaining household waste;

- less than 10% of population in informal settlements and slums have access to waste collection service;
- inadequate space for solid waste storage;
- inadequate storage facilities;
- open air incineration of waste;
- river and stream pollution through floating waste;
- Ecosystem decay
- Poor land use

Environmental problems and their management particularly when related to urban ecosystems are becoming increasingly challenging, especially in the town of Sangmelima which has a fragile ecosystem. Overcoming these challenges is an imperative to the local authorities. Nonetheless, their performance is being limited by a certain number of factors.

4.1.3: Factors affecting the performance of local actors in EM in Sangmelima

Municipalities, usually responsible for environmental management in the cities, have the challenge to provide an effective and efficient system to the inhabitants. However, they often face problems sometimes beyond the ability of the local actors to tackle. These problems are the barriers to local actor's efficiency in managing the environment in Sangmelima. They include the following:

4.1.3.1: Mixed Waste

In Sangmelima, all waste whether it is biodegradable, recyclable, construction, hazardous or solid are mixed together. No system of segregation at the source level exists here. Though in rural areas earlier, it was practiced that kitchen waste was used to feed animals but with increasing income, changing lifestyles, use of more packaging and plastic material, all waste are mixed now and put into one dustbin which makes the problem of waste management more complex.

4.1.3.2: Rapidly increasing population and waste

Now the population of Sangmelima is 51,305 (BUCREP, 2005) and is rapidly increasing. The expansion of urban development to urban fringes poses a threat to sustainable development and management of environmental resources. Central and peripheral neighborhoods are already feeling the burden of population and accordingly civic services and waste management are coming as a challenge. There is no system of Integrated Waste Management (IWM) here and

waste is increasing day by day with increase in population and increase in per capita waste generation rate due to changing lifestyles, increase in income and consumerism. For instance, in 2016, annual waste production collected by Hysacam was 13503 tons, while in 2017, it was 15913.68 tons (Sangmelima council, 2020).

4.1.3.2: Limited of Resources

As civic bodies give very low priority to SWM accordingly, very less budget is assigned for it. Whatever funds are assigned they are only for waste collection and transportation and not for treatment or recycling. Monthly average waste collected in Sangmelima is 1100 tons and according to one estimate 90% of total fund are assigned for collection and rest for transportation and treatment of waste, which is relatively insufficient if we consider the quantity of waste produced.

4.1.3.3: Defiant equipment

There are only three vehicles available for the collection and transportation of waste of which only one is functional for the entire town. This greatly reduces the ability of the sanitation agency to effectively do its work.

4.1.3.4: Societal Apathy

Since the social status assigned to SWM is very low and people think it as a degraded task, they tend to throw their waste wherever they find a vacant and lonely place, outside bins, alongside road etc. So the work of collecting staff increases manifold and the result is waste scattered here and there. Even if it is cleaned one day people again fill it in few days converting it to dumpsite.

4.1.3.5: Inaccessibility of some neighbourhoods

Adequate environmental management greatly depends on accessibility. In Sangmelima, some neighbourhoods are less accessible especially by vehicles such as trucks and in such situations it becomes very difficult for the sanitation agency to do its work efficiently. Sectors in the neighbourhood of "Sangmelima village" such as "11eme" rue, in "Lobossi", such as "quartier latin" and in "Akon x" such as "Saint james" are good examples.

4.1.3.6: Local population reluctance and incivility

One of the major problems faced by local authorities in environmental management is the reluctance of the local population. A good number of Households and individuals are reluctant

on environmental decisions and act by the local authorities. For instance, in the sector of waste management, even with the creation of cement skips to resolve the problem of poor waste disposal, some individuals still get rid of the waste directly on the ground, others on non-authorised sites.

4.1.3.7: The poor road network to the Waste treatment Centre (WTC)

The road that leads to the WTC is not tarred and as such is seasonal. So it becomes very difficult for the sanitation agency to access especially during the rainy season where they often get stuck. Therefore, during the rainy season, when Hysacam faces difficulties to access the zone, it has no other choice than to keep the truck parked at the office sometimes with waste in it, (**photo 12**).

Assea photo, 2020

Photo 12: Parked truck containing waste at HYSACAM office in Sangmelima

Photo 12 *shows the pictures of a truck parked at Hysacam office in Sangmelima as a result of the inaccessibility of the WTC. On this photo, we can see two hysacam workers trying to cover the waste with a tarpaulin, in order to prevent the rain from littering it.*

4.1.3.8: Limited technology

Technology and innovation are important features for environmental management, especially for sustainable forest management. The limited technological advancement of the local authorities as environmental management is concerned limits their performance. ICT is needed to monitor and map forest resources and in communicating and raising awareness of key issues. However their use is limited in the town of Sangmelima, consequently, there exist limited data on biodiversity, environmental conditions and in addition, the available data is rarely updated.

4.1.4: Future projects on Environmental management in the town of Sangmelima

In order to adequately manage the environment of Sangmelima, the town authorities have outlined a number of future projects to be carried out in the next years.

4.1.4.1: Regular collection of waste in all neighbourhoods

With population increase and rapid urbanisation in Sangmelima, the amount of waste produced by the town increases at a geometrical rate. Not all the waste generated is collected and the effects of this is felt on the physical environment. To solve this, the Municipal council together with Hysacam intend to cover all the whole town in the next five years. Inaccessible neighbourhoods shall be made accessible or alternative measures shall be implemented. Human, technical and financial resources shall be improved and local participation promoted.

4.1.4.2: Production of "eco-friendly" paving slabs (green pavers)

Plastics waste has become a major problem. It blocks drains, pollutes rivers and wreaks havoc on the environment. To curb this situation, Sangmelima local government in partnership with the sanitation agency Hysacam intend to join the race of production of green pavers. For them, green pavers are not only a means of preserving the environment but are also income saving and have a longer life span. Traditional asphalt and concrete pavers are nonporous, rain water cannot seep into them and instead runoff, which have negative consequences (erosion and pollution) on the environment. Additionally, traditional asphalt gets very hot, creating a "heat island" in urban environments. On the other hand, green pavers are highly porous water seeps in, which promotes the natural water cycle.

4.1.4.3: Valorisation of municipal lake

Contamination of water from human activities has serious consequences. Not only does it cause environmental degradation and destruction of the eco-system, it also affects the quality of water and air. In order to preserve the ecological system and the environment, local authorities in Sangmelima intend to restore the municipal lake, victim of urbanization. This restoration will improve the water quality and the water supply security. It will benefit the quality of the ecosystem through re-engineering channels that improve the ecology and reduce flood risk. It will also enhance biodiversity in the area by restoring natural functions.

This project is in line with the National Action Plan for Integrated Water Resources Management (PANGIRE) which seeks to promote rationality and sustainability in the use of water and aims to ensure that water is used to enable economic and social development in

Cameroon. Apart from PANGIRE, there is the National Strategy on the Sustainable Management of Water and Soils (SNGDES), the objective of which is to constitute a framework to harmonize initiatives for the sustainable management of water and soils in order to meet the objectives of sustained production in the agro-sylvo-pastoral sector, as set in the Rural Sector Development Strategy Document (DSDSR). This strategy highlights the problem of water and soil control as well as the related constraints and solutions, particularly in terms of promoting the integrated management of these resources.

4.1.4.4: Increase sensitization and participation

For the sustainable management of the environment in the town of Sangmelima in particular and the council in general, local authorities plan to increase level of sensitization and participation of the local population.

This shall be done through the creation of a radio program on the environment, organisation of seminars, discussion grounds in neighbourhoods, creation of environmental clubs in all secondary schools and open-door days on the environment. Given the importance of sensitization and participation in environmental management, if this action is effectively and efficiently carried out, then, the environmental quality of the town of Sangmelima shall be improved. The population will be educated on the subject, they will have pro-environmental attitudes and will eventually proper manage the environment.

4.2: Suggested strategies to master the impacts of SED on the physical environment of Sangmelima

Despite the efforts made by the local actors to curb the growing impacts of SED on the physical environment of Sangmelima.

4.2.1: Strategies for integrating the environment in developmental policies in Sangmelima

In order to curb the impacts of SED on the environment, various strategies have been developed so as to integrate the environment in to developmental policies. They include:

4.2.1.1: The city development strategy

The city development strategy is defined as an action-oriented process developed and sustained through participation to promote equitable growth in cities and their surrounding regions to improve the quality of life for all citizens. The strategy is oriented to help cities create a vision of 20-30 years in the future and to identify the necessary strategies and actions to achieve this. They are unique and context specific but tend to address five main themes:

Lively hoods, Environmental quality, Service delivery and Energy efficiency, spatial form and infrastructure, financial resources and Governance. In addition they explicitly try to empower urban managers often in cases where these have been traditionally marginalized. Conducting a city development strategy involves 8 steps:

• Initiating the process

• Establishing the initial parameters and the scope of the City development strategy

• Making an assessment

• Formulating a vision

• Identifying the strength, weaknesses, opportunities and threats

• Sorting strategic directions

• Building awareness

• Starting the implementation process

However the city development strategy varies in the way that the environment is treated in relation to development. In some case managing the environment appears to be portrayed as a constraint to development, for example; in highlighting the need for rigorous Environmental impact assessment. Although these are conducted well, they can lead to development plans that sustainably reduce environmental impacts. The city development strategy has been used in a range of cities with the support of a network of international alliances, the approach has generated substantial environmental improvements in many cities and can be seen as an adequate approach to integrate the environment of Sangmelima in development policies. The strategy is seen as an engine straitening urban governance more broadly through the creation of spaces to discuss future visions and to enhance working relationships between different stakeholders.

4.2.1.2: Environmental mainstreaming

Environmental mainstreaming can also be considered as an approach that lends structures to understanding how the environment can be integrated in to development policies. It is often used to assess the incorporation of environmental concerns in development policies, especially in urban planning and management. It refers to "the informed inclusion of relevant environmental concerns in to decisions of institutions that drive national, local and sector specific development policies, rules, plans investment and actions". Environmental mainstreaming is about much more the inclusion of key "green" words in plans and strategy documents but rather reflects a longer term process of institutional and behavioral change

involving many path ways driven by the civil society as well as government including economic, technical and environmental concerns.

 An environmental mainstream approach can therefore help to assess the ways in which present and future environmental concerns in Sangmelima can be incorporated in the key decisions and institutions that govern and will govern urban planning and development in the town. It can also help to find integrated solutions that avoid development versus environmental agreements. We should note that the conflict between development and environment is usually amplified when environmental costs and benefits are not factored in to economic planning and vice versa. We will observe that a successful environmental mainstreaming eventually leads to the following outcome.

- Greater participation and collaboration between development and environment stakeholders
- Integrated environment-development policy and associated political leader ship
- Inclusion of development environment in budgets and fiscal instruments
- Increase municipal, national and international investment in environmental priorities
- Strengthened institutions and capacities to mainstream environment
- Sustained behavioral change by individuals, institutions and societies
- Development impact demonstrated through improved productivity of use of environmental assets and better management of risk from environmental hazards

4.2.1.3: The green economy approach

In the Rio+20 United Nations conference on sustainable development held in 2012, the green economy was one of the two overreaching themes with cities deemed to be one of the seven areas needing priority attention. The United Nations Environmental Program defines a green economy as one that *"result in improved human wellbeing and social equity while significantly reducing environmental risk and ecological scarcity"*. By this we mean an economy in which incentives encourage people and enterprises to use natural resources and ecological systems with care and with due considerations for the wellbeing of others. In a green economy, growth in income and employment is driven by public and private investment that reduce carbon emissions, enhance energy and resource efficiency and prevent the loss of biodiversity and ecosystem services. Cities are usually critical to the transition to a green economy because they are key sites of economic productions, grass roots collective actions and formal state regulations and coproduction. From an environmental perspective, they are

among the principal places where local negotiations can help to ensure that development is both economically advantageous and socially equitable.

What does this mean in the context of Sangmelima? Sangmelima is highly dependent on natural resources and integrating a green economy to the development processes of the town is thus critical to the economic activities and to the livelihoods of thousands of people who depend on the fertile soil, forest, fishing, hunting and other resources, which have fostered rates of economic growth but in the long run will obviously have devastating effects. Thus, capturing the environmental, social and economic benefits of development as well as its economic potential is critical to the global transition to a green economy. Taking advantage of the environmental and social opportunities of density, investing in green urban infrastructures, greening the urban economy with taxes and subsidies, fostering urban social and environmental innovation and the competition and green urban governance for a green economy are the specific areas in which urban directions are important to achieve a green economy. We should note that the most important however are the local variations that help to determine what the leading social and environmental challenges are and how they can be overcome. A single most important factor shaping whether environmental concerns should be a central priority in the planning and development processes is the level of political social support and commitment. Generally, broad participation and enthusiasm from the population as well as from elected officials is an essential point on addressing environmental challenges and priorities. Traditional models of development have often not adequately taken this in to account. In deed plans that do not draw on the knowledge of citizens and plans that are ignored by elected leaders have been identified as being critical reasons for policy failure. Effective participation of citizens in planning decisions generate important social benefits around rights and engagements. Where political support and commitment to address environmental priorities are present, this is seen as a key contribution towards these issues been taken seriously by a broader range of stakeholders.

SED should therefore be guided by principles of sustainable development. Divers use of partnerships should be used to create SED that protects historic, cultural and environmental resources. Policymakers, regulators and developers should support sustainable site planning and construction technics that reduce pollution and create a balance between built, natural and cultural systems

4.2.2: Which type of Governance is needed to mitigate the impacts of SED on the environment of Sangmelima?

4.2.2.1: Ameliorating the waste system in Sangmelima

Waste treatment options should be envisaged. Waste-to-energy plants are not being adequately explored in the town. The immense scope of treatment is not being exercised due to reasons such as lack of know-how, technical manpower and most importantly financial constraints faced by the Municipal authorities. During the survey, the Municipal authorities itself accepted that they are ill-equipped to handle and effectively manage the large quantum of waste generated per day in the town. The authorities face constraints in terms of technology, know-how, manpower and most importantly adequate funds to tackle the menace. Present level of service in many neighborhoods is so low that there is a threat to environmental quality.

Characterization and quantification of waste should also be developed. Through a pilot study we can find the characteristics of waste in any specific area and quantity of each waste type biodegradable, recyclable, hazardous, construction etc. and with projected annual increase in population future quantum of waste can be estimated in any area and accordingly plan can be finalized for disposal of various types of waste. Where quantity of any type of waste is less 2-5 neighborhoods can be clubbed together and a central facility can be developed for disposal of waste of all these areas.

Door to door collection system should be encouraged with optimum frequency so that waste should not be accumulated or thrown here and there by the residents. Proper bins or waste disposal pits within proper reach of residents can be developed in each and every area to avoid throwing of waste at any place, roadside and water bodies. A financial burden or fine can be levied in those areas where these facilities are developed properly for throwing the waste outside the bin. Proper vehicles especially designed for this purpose should be deputed for transportation of waste to landfill site so that no waste may be scattered in between before reaching to landfill sites.

Waste should be disposed only at scientifically designed landfill sites where no leachate to soil is there. Since agriculture is one of Sangmelima major economic activity, and people are fond of fresh food and vegetables so kitchen waste or biodegradable waste is more here and composting can be best method for utilizing this waste and converting into resource. It should be popularized among people. Biodegradable waste should be treated at the source level itself by converting it into manure.

Active campaigns against waste incineration and promoting safe and responsible burning of waste to generate clean energy should be envisaged.

Recycling must be encouraged, during the International Environmental day competions should be organized and prizes distributed to the laureate. The production of bio-gas should also be encouraged and envisaged. Recyclables if not in sufficient quantity should be given to recyclers to recycle them likewise every waste should be treated. Items that can be used again should not be disposed of; things made of paper, glass, aluminum and the like should be recycled.

4.2.2.2: Intensify the sensitization campaigns

Sensitization should be effectively done and intensified. While not daily and not only through the radio station but also through various social media, on the terrain, in the different neighborhoods especially those located on fragile environments (swamp, besides rivers …). There is the need for a hype just like what is done for the Covid19. Everyone must talk and must be aware of the implications of environmental management, because it is an affair of all. The organization of seminars, open-door days and the production and distributions of fliers should be envisaged.

4.2.2.3: For an effective participation and collaboration of all actors

Since the past decades there has been the rise of a good number of actors especially at the local level particularly in developing countries through their missions and interventions in local development processes with the aim of promoting economic, social and environmental wellbeing in a geographically defined area. Since then it has become imperative to establish a good coordination of actions so as to minimize conflicts and maximize results, thus the elaboration of participative modules and grounds. Participation is both a pillar of government and a fundamental principle of sustainable development. It refers to the procedures done in other to give a role to the different actors in the decision making processes and the elaboration of projects. The implication of the various parties is a fundamental principle when it comes to environmental management. Taking in to considerations the voices and ideas of people affected and interested by the initiatives make us assure that the decisions are taken with equity and justice. The inclusion of participation is very vital in environmental studies and particularly to achieve a sustainable state.

It becomes thus necessary for us to include the notion of "participation" rather than "representation" which is common and not reflecting the actual needs of the population.

Generally, the population is represented by elites that are usually guided by political, tribal and even gender interest and priorities usually living aside the real issues to be defended. Public institutions are here called to formalize, institutionalize and promote a real participative platform for the population concern and affected By including the population of Sangmelima in its environmental-developmental process, our main objectives should be to inform the different parties on the implications of both processes to their lives and interests, to take in to consideration the ideas and information of the various parties in the participation, bring together the local and traditional knowledge that could be used during the decision making process, make sure that the important aspects have not been neglected, reduce possible conflicts by identifying the most vital points, promote transparency and responsibility in decision making and to preserve the interest of all.

Effective participation and collaboration should thus be promoted. No environmental management program can be successful without the help of the people because ultimately they are the principal actors in environmental management. Proper help should be taken from the effective local population to sensitize and educate the people regarding environmental management. Even private sector help can also be taken to manage the waste mitigate air, soil, water pollution forest degradation and erosion. Social status should be provided to SWM activity and waste management workers so that they may also feel that they are providing useful service to the society. Households should actively participate in environmental management processes and should be vectors of sensitization and pro-environmental attitudes.

The most important points in participation not to be neglected in Sangmelima include the proper diffusion of information and the existence of trust between the various parties. Nevertheless, some features such as; the local culture and traditions, the confidential character of certain data and information, accessibility of certain neighborhoods and the financial and time cost may negatively impact participation.

4.2.2.4: The promotion of environmental education and gender equality

Environmental education should be effective at all levels that is from the household to the work place and the administrative office. The role of the woman is primordial in environmental education especially at the level of the household where she is the main educator. The Sustainable Development Goals 5 and 11, *"Gender equality and Sustainable cities and communities"* clearly bring a complementary approach on the relevance of women in our societies. Ending all forms of discrimination against women and girls is not only a basic human right but it is also a crucial tool in accelerating sustainable development. We observe that

empowering women and girls has a multiplier effect, and helps drive up economic growth and development across the board. With time we shall not only observe significant progress on the implication of women in the planning and management decisions but also remarkable changes in development and land tenure. Nowadays, we observe a significant increase in women heading households. For women, the environment is often not only a place to live, but where they raise their children and work to earn their living. Prioritizing this strategy will go a long way contributing to curbing the growing impacts of SED on the environment.

4.2.2.5: Enforce already existing laws and put in place other laws

Stringent laws and their implementation should be enforced in this regard to prevent these problems from increasing at a large level. Taking advantage of decentralization to put in place community laws against poor environmental management will be a great step. For example; a new charge based on 'Polluters Pay Principle' can be levied on people. Local authorities can take this responsibility on themselves or can transfer this responsibility on the people themselves or they can adopt a Public Participation Program (PPP) approach to manage their environment themselves. Again, existing policy responses to deforestation can be enforced, including sustainable forest management, forest monitoring and diversification of livelihoods. Efforts focused on illegal timber with enhanced responses related to agriculture as primary driver of deforestation can be complemented.

4.2.2.6: Proper Urban land use planning

Whenever any plan is passed by local authorities for any neighborhood, market area or administrative zone it must check that there should be proper provision of waste disposal and treatment in it so that its waste should be treated at its source level and it should not scatter here and there and money spent by local authorities on its collection, transportation and treatment can be reduced. This will help in reducing the much burden of the local bodies and the saved resources can be utilized elsewhere. Promote land-use planning should be done taking in to account high conservation value areas to prevent allocation of prime forest areas for industrial development.

4.2.2.7: Encourage pro environmental enterprising

Encourage enterprises of all sizes to take in to account environmental management in their agenda and encourage cooperate social responsibility so as to mitigate the effects of economic activities on the environment. Also small and medium size enterprises can be encouraged to

engage in recycling, by financing them and creating platforms so as to showcase and promote environmental jobs.

Conclusion

Mastering the impacts of SED on the environment in general is a difficult task but when it comes to an area with a fragile environment such as Sangmelima, we the planners, economists, socialists and environmentalists face several challenges which when are not overcame lead to a failure in our objectives and exacerbates the actual situation. It is therefore vital to properly rethink our politics of, development and environmental management so as to curb the impacts of SED in Sangmelima and prevent future ones, making Sangmelima a sustainable town. All this can be possible if we respect, include and implement all the dimensions of the environment in to our developmental practices and promote the notion of Good governance and participation.

GENERAL CONCLUSION

Environmental degradation in general and its threat to human wellbeing has become one of the most unavoidable topics in international and domestic discourse. One of the major issue in environmental discourse is how to balance the offsets between development and protection of the environment. It is true that each state has the sovereign right to design and pursue her development objectives as she deems fit but in recent years, the mode of development opted for by each state is no longer a thing reserved within her exclusive purview, but one that attracts the general attention of states that make up the international community. (Tamasang &Tchoffo, 2018). Within the context of developing countries like Cameroon, this sort of new trend which comprises international scrutiny of domestic development becomes a bit delicate because development needs are hoisted in urgency meanwhile international concerns for environmental protection constitutes the rope with which the length of the said development is measured.

This study on Socio-economic development and the environment in Sangmelima had as main aim to analyze the physical impacts of socioeconomic development on the environment of Sangmelima town. To achieve this aim specific questions were enunciated. These specific research questions, objectives and hypothesis helped us to structure the study and to establish relationships between socioeconomic development and the environment and to draw conclusions. Research findings have shown that the diversified social and functional characteristics of Sangmelima have been major factors of its development. Poor waste management practices, forest degradation and deforestation, soil pollution, water pollution, ecosystem decay and air pollution have been observed in the town as major impacts of SED on the environment. However, local authorities have proven their efficiency as their actions are reflected in the town. Sensitization, the promotion of pro-environmental attitudes through hygiene and salubrity campaigns, the creation and valorization of green spaces, promotion of composting, and the promotion of renewable energy are some actions that have been employed by local authorities so as to curb the growing effects of SED in the town of Sangmelima. Nevertheless, these efforts are not enough as more than half of the population do not have access to proper disposal services, incineration is very common among households, illegal forest exploitation persist and urban stream pollution observed. Added to this, local actors face technical, human and financial challenges. Following these analyses, we confirm the hypothesis that SED has a negative impact on the physical environment of Sangmelima town.

The town of Sangmelima is growing and with its growth comes the various urban-environmental challenges. In a time when Cameroon is aiming to become an emerging country and has made sustainable environmental management one of the objectives (objective 3) of its National Development Strategy (NDS30), it will be important to adequately address and strengthen actions relating to sustainable environmental management in all spheres of the national territory. There is thus need for an inclusive participation and an effective cohesion between the various actors so as to ensure environmental management that assures sustainable and inclusive economic growth and social development in the town of Sangmelima in particular and Cameroon in general, for *"There is no planet B"*, Mike Berners-Lee (2019).

BIBLIOGRAPHY

Books

A. Mareck F. (2010). *Acquiring Biospheric Literacy*: Discursive Tools, Situated Learning, and the Rhetoric of Use. In Goggin, P.N. (2010).Rhetorics, Literacies, and Narratives of Sustainability. Routledge. 18p.

Adriano D.C. (1986). Trace Elements in the Terrestrial Environment. Springer, Verlag, New York. 533p.

Anguis .E. & .S. Busutil (1998). Future generations and international law. London, Routledge. 226p.

Bain J.S. (1973). Environmental Decay: Economic Causes and Remedies. England, Little Brown and Co. Inc. 235p.

Barrow (1995). Developing the environment: Problems and management. Routledge, Taylor and Francis group. London and New York. 305p.

Barrow (1998). Environmental management and development. Routledge, Taylor and Francis group. London and New York. 287p.

Barrow (2005). Environmental management principles and practice. Second edition. Routledge, Taylor and Francis group. London and New York. 336p.

Barrow (2006). Environmental Management for Sustainable Development. Second edition. Routledge, Taylor and Francis group. London and New York. 465p.

Bowling A. (2020). Research methods in Health: investigating health and Health Services. Second edition. Open University press Maidenhead. 544p.

Brown RL., Lenssen N & Kane H. (1995). Vital Signs: The Trends That Are Shaping Our Future, 1995-1996. Earthscan Publications, London. 152p.

Christopher .F. Tamasang & Felix Martial Tchiffo (2018). Principles of Environmental Management in Cameroon. In, Olivier.C. Ruppel & Emmanuel .D. Kam Yogo (2018). Environmental law and policy in Cameroon-Towards making Africa the tree of life. Konrad-Adenauer-Stifting, Germany. 961p.

Creswell J.W. (2003). Research design: Qualitative, quantitative and mixed methods approaches. Second edition. Thousand Oaks; CA:Sage. 342p.

Efobi & K.O (1994). Studies in urban planning. Enugu, Fidelity publishers and Printers Co. Ltd.

Evrett M. Rogers (1983). Diffusion of innovation. Third edition. Macmillan, New York. 236p.

Gottlieb RS. (2003). This Sacred Earth: Religion, Nature, Environment, Routledge, New York. 784p.

Haas & Peter M. (1990). Saving the Mediterranean, The politics of international environmental cooperation, New York: Columbia University press. 303p.

Hornback K. & Eagles P. (1999). Guidelines for Public Use Measurement and Reporting at Parks and Protected Areas Cambridge, UK, Gland, Switzerland. 86p.

Jesse .C. Ribot (2002). La décentralisation démocratique des ressources naturelles: Institutionnaliser la participation populaire. Institut des ressources Mondiales. 38p.

Lars Rydén (2006). In order to become sustainable the world needs education; In, Taina Kaivola & Lisa Rohweder (2007). Towards sustainable development in higher education-Reflections: Ministry of education, Department for education and science policy. Finland 2007. 136p.

Mihalopoulos (2011). A new environmental Foundation. 3rd edition, Routledge, Taylor and Francis Group. 21p.

Mike Berners-Lee. (2019). There is no planet B. Cambridge university press United Kingdom. 330p

Najam et all (2007). Environment and globalization: Five propositions. International institution   for sustainable development. Winnipeg, Manitoba. 54p.

Nwana O.C. (1981). Introduction of Education research. Ibadan: Heinemann Educational Books Ltd. 343p.

Olley .J. Wilson DC & Read .A. (2006). Getting results: realizing the benefits of community participation in strategic planning for municipal waste management. 103p.

O'Riordan T. (1995). Environmental Science for Environmental Management. Addison Wesley Longman, Harlow.538p.

R. Bechtel & Churchman A. (2003). Handbook of environmental psychology. John Wiley & Sons. 736p.

Richard Peet & Nigel Thrift (2001). New models in geography. Volume 1. Routledge, London.   418p.

S. Clayton & Myers G. (2015). *Conservation Psychology*: Understanding and Promoting Human Care for Nature. John Wiley and Sons. 344p.

Sukop, M.C. & Thorne D. (2006).Lattice Boltzmann Modeling: An Introduction for Geoscientist and Engineers. Springer Heidelberg. 174p

Sunkin .M. et al (2002).   Source book on Environmental law. 3rd edition, Cambridge, Cambridge university press. 978p.

Theodore.L. et al (1998). Environmental Management: Problems and Solutions. CRC Press, Boulder, CO and Springer. New York.352p.

Todaro M. & Smith S. (2009). Economic development. (10th ed.). Boston: Addison Wesley. 896p.

Trilochan S. Bakshi & Zer Naveh (1980). Environmental education: Principles, methods and applications. Plenum press, New York. 277p.

Theses and Projects

Judi Inglis. (2008). Using human-environment theory to investigate human valuing in Protected area management. Victoria University. 376p**.**

Kwadja Igor. (2020). Processus d'exploitation de l'or et les impacts négatifs sur l'environnement physique de Bétaré-Oya et Ngoura. Université de Yaoundé 1, Faculté des Arts, Lettres et Science Humaines, Département de Géographie. 169p.

Pamela Jo Hatley (2013). Preserving space: A grounded theory for citizen participation in community-based planning. University of south Florida, Department of geography, environment and Planning. 229p.

Ribot J.C (2002). Democratic decentralization of Natural resources: Institutionalizing popular participation. WRI, Washington DC. 35p.

Somlanaré Remuald Kinda (2013). Essays on environmental degradation and economic development. Université d'Auvergne-Clermont Ferrand 1, Department of Economics and Finance. 222p.

Articles

Achuo Chi (1998). Human interference and environmental instability: Assessing the environmental consequences of raid urban growth in Bamenda, Cameroon. Journal of Environment and Urbanization, Volume 10(2). p 161-174.

Adam Rome (2005). "Give earth a chance": The environmental movement and the sixties. Journal of American history, Volume 90(2). p 525-554.

Adededji Daramola & Eziyi O. Ibem (2010). Urban environmental problems in Nigeria: Implications for Sustainable development. Journal of sustainable development in Africa, Volume 12 (1). p 124-142.

Agrawal A. & Clark C. Gibson (1999). Enchantment and disenchantment: The role of community in natural resource conservation. Journal of world development, Volume 27. p 629-649.

Ahmed .S.A. & Ali .M. (2004). Partnerships for solid waste management in developing countries: linking theories to realities. Habitat Inter, Volume 28(3). p 467-469.

Alec Liu, Fei Ren , Wenlin Yvonne Lin & Jing-Yuan Wang. (2015). A review of municipal solid waste environmental standards with a focus on incinerator residues. International Journal of sustainable built environment, Volume 4. p 165-188.

Asase M., Yanful E.K., Mensah M., Stanford J. & Amponsah, S. (2009). Comparison of municipal solid waste management systems in Canada and Ghana: a case study   of the cities of London, Ontario, and Kumasi, Ghana. Journal of Waste Management, Volume 29. p 2779-2786.

Bain & J.S. (1973). Environmental decay: Causes and remedies. Little Brown and Co Inc. 9p.

Ball J. Waste management in developing countries: seven characteristics and seven principles. In: Proceedings WASTE. (2006). Journal of Sustainable Waste & Resource Management; 2006. p 687-696.

Barry Commoner et al (1971). The causes of pollution. Journal of environment: Science and Policy for sustainable development, Volume 13(3). p 2-19.

Bonnie Campbell. (2011). Corporate Social responsibility and development in Africa: Redefining the roles and responsibilities of public and private actors in the mining sector. Journal of resource policy, Volume 37(2). p 138-143.

Brechine SR. & Kempton W. (1994). Global Environmentalism: A challenge to the post materialism thesis?. Journal of Social Science Quarterly, Volume 75. p 245-269.

Bord R. and O'connor R. (1997). The gender gap in Environmental attitudes: The case of perceived Vulnerability to risk. Journal of Social Science quarterly, Volume 78(4). p 830-840.

Boulatoff and Jenkins (2010). Long-term nexus between openness, income and environmental quality. Journal of international Advances in Economic research, Volume 16 (4). p 410-418.

Burntley, S.J. (2007). A review of municipal solid waste composition in the United Kingdom. Journal of Waste Management, Volume 27 (10). p 1274-1285.

Christina H. Drew & Timothy L. Nyerges (2004). Transparency of environmental decision making: A case study of soil clean up inside the Hanford 100 Area. Journal of Risk research, Volume 7(1). p 33-71.

Chung S. & Lo C. (2008). Local waste management constraints and waste administrators in China. Journal of Waste Management 28 (2). p 272-281.

C.M Lakshama (2013). Population, Development, and environment in India. Chinese journal of population resources and Environment, Volume 11(4). p 367-374.

David I. Stern et all (1996). Economic growth and environmental degradation: The environmental Kuznets curve and sustainable development. Journal of world development, Volume 24(7). p 1151-1160.

Darlene E. Clover (2003). Environmental adult education: Critique and creativity in a globalizing world. Wiley periodicals,Inc, Volume 2003(99). p 5-15.

Dewaram A.N. (1992). Population growth and environmental degradation in India. Asia Pac J. Environ Dev, Volume 14. p 1-22.

Dunlap RE., Gallup GH.Jr. & Gallup AM. (1993). Of Global concern : Results of the Health of the planet Survey. Journal of Environmental Science and Policy for Sustainable development, Volume 35(9). p 7-15.

Dunlap R.E. & Mertig A.G. (1995). Global environmental Concern: An anomaly for post materialism. Journal of Social Science quarterly, Volume 78(1). p 24-29.

Edwin Zaccai (2009). Pour protéger l'environnement faut-il abattre la croissance? In Heering et Leyenss (2009). Strategies de développement durable: Développement; Environnement ou Justice Social?. Presse Universitaire de Nammur. p 55-82.

Ekere W., Mugisha J. & Drake L. (2009). Factors influencing waste separation and utilization among households in the Lake Victoria crescent, Uganda. Journal of Waste Management, Volume 29(12). p 3047-3051.

Elijah A. Akintunde (2017). Theories and concepts in Human Behavior in Environmental preservation. Journal of Environmental Science and Public Health, Volume 1(2). p 120-133.

Emmanuel Kwesi Boon (1996). An Overview of Sustainable development in Africa, AREA STUDIES-AFRICA. Regional Sustainable Development Review, Volume l. p 1-22.

Eric Watkins (2004). Kant's modelof Causality: Causal powers, laws and Kant's reply to Hume. Journal of the History of Philosophy, Volume 42 (4). p 449-488.

Esty D.C. & Porter M.E. (2005). National Environmental Performance: An empirical

analyses   of policy results and determinants. Journal of Environment and Development, Volume 10. p 391-434.

Figgis P. (1999). Protected Areas of the 21st Century. Habitat Australia, Volume 27(5). p 24-26.

Francesco Burchi (2009). Identifying the role of Education in socio-economic development, In; International conference of Human and Economic Resources report, Izmir 2006. p 193-206.

Franco Romerio & Milad Zarin Nejandan (2012). Environnement, Developpement et Cooperation: Enjeux et moyens d'action. Annuaire Suisse de Politique de Developpement, No 16. p 181-201 .

Frazen A. & Diekmann A. (1999). The Wealth of Nations and Environmental concern. Journal of Environmental Behavior, Volume 31. p 540-549.

Franzen A. & Meyer R. (2010). Environmental attitudes in Cross-National perspective: A multi-level Analysis of the International Social survey program 1993-2000. European Sociological review, Volume 26 (2). p 219-234.

Franzen A. & Vogl D. (2013). Two decades of measuring environmental attitudes: Acomparative analyses of 33 countries. Journal of Global environmental change, Volume 25(5). p 1001-1008.

G. Venkata Ramaiah1 & S.Krishnaiah. (2014).Characterization of Contaminated Soil and Surface Water/Ground Water Surrounding Waste Dump Sites in Bangalore. International Journal of environmental research and development, Volume 4(2). p 99-104.

Gonzalez-Torre, P.L. & Adenso-Diaz B. (2005). Influence of distance on the motivation and frequency of household recycling. Journal of Waste Management. Volume 25(1). p 15-23.

Grossman M.G. & Aland B. Krueger (1995). "Economic growth and the Environment". The quarterly journal of economics, Volume 110(2). p 353-377.

H. Belevi & P. Baccini. (1989). Long term behavior of municipal solid waste Landfills. Journalof Waste Management and Research, Volume 7(1). p 34-56.

Hazra T. & Goel S. (2009). Solid waste management in Kolkata, India: practices and challenges. Journal of Waste Management 29. p 470-478.

Hatthachan Phimphan Thavong (2013). The impact of economic growth on environmental conditions in Laos. International Journal of Bussiness Management and Economic Resource, Volume 4(5). p 766-774.

Henry RK, Yongsheng Z, & Jun D. (2006). Municipal solid waste management challenges in developing countries-Kenyan case study. Waste Manage Vol 26(1). p 92-100.

Holtz-Eakin D. & Seldon T.M. (1995). Stoking the fires? CO2 emissions and economic growth. Journal of public economics, Volume 57(1). p 85-101.

Iris Alkaher & Nurit Carmi (2019). Is population Growth an Environmental problem? Teachers' Perceptions and Attitudes towards including it in their Teaching. Journal of Sustainability, Volume 11(7). p 1-24.

J. Liu, Yang W., Dietz T., Kramer D. & Ouyang. (2015). An integrated approach to understanding the linkages between ecosystem services and human wellbeing. Journal of ecosystem health and sustainability, Volume 1(5). p 1-12.

James W. Dearing (2009). Applying Diffusion of Innovation Theory to Intervention Development. Journal of research on social work practice, Volume 19(5). p 503-518.

Jenkins C.J., Ehrhardt M.K. & Crenshaw M.E. (2002). Deforestation and the Environmental Kuznets Curve: A Cross-National investigation of intervening Mechanisms. Journal of Social Science Quarterly, Volume 83(1). p 226-243.

Jephias Mapuva (2015). Citizen Participation, Mobilization, and Contested Participatory Spaces. International journal of political Science and Development, Volume 3(10). p 405-415.

Jesse C. Ribot (2003). Democratic decentralization of Natural resources: Institutional choice and discretionary power transfers in Sub Saharan Africa. Journal of public administration and development, Volume 23. p 53-66.

Jody M. Hines, Harold R. Hugarford and Audrey N. Tomera (1987). Analysis and Synthesis of Responsible Environmental Behavior: A Meta-Analysis. The Journal of Environmental Education, Volume 18 (2). p 1-8.

Jona Razzague (2006). Public participation in environmental decision making. Environmental law for sustainability. p 165-194.

Jian Guo Liu (2001). Integrating ecology with human demography, behavior and socioeconomics: Need and approaches. Journal of ecological modeling, Volume 140. P 1-8

Kalantari .K., Shabanali .H., Asadi .A. & Movahed .H. (2007). Investigating Factors Affecting Environmental Behavior of Urban Residents: A Case Study in Tehran City Iran. American Journal of Environmental Sciences, Volume 3 (2). p 67-74.

Kalipeni E. (1992). Population growth and environmental degradation in Malawi. Africa Insight, Volume 22(4).p 273-282.

Karishnamurti R. & Naidu R. (2003). Solid-solution equilibria of cadmium in soils. Geoderma 113. p 17-30.

Katja Vintar Mally (2007). Linking Socio-economic Development and Environmental Pressures. Dela, Volume 27. p 149-162.

Kemmelmeier M., Krol G. & Kim JH. (2002). Values, Economics and Pro-environmental attitudes in 22 societies. Journal of Cross-cultural research, Volume 33(3). p 256-285.

Kjellstrom T. & Mercado S. (2008). Towards action on Social Determinants for Health Equity in Urban settings. Journal of Environment and Urbanization, Volume 20 (2). p 5551-574.

Lane M.B. & Mc. (Donald G 2005). Community based environmental planning: Operational dilemas planning principles and possible remedies. Journal of environmental policy and management, Volume 48. p 709-731.

Larson A.M. & Soto F. (2008). Decentralization of Natural Resource governance regimes. Annual review of environment and resources, Volume 33. p 213-239.

Lilliana Abarca Guerrero, Ger Maas & William Hogland. (2013). Solid waste management challenges for cities in developing countries.Jpurnal of Waste management, Volume 33. p 220-232.

M. Bodur & Sarigollu E. (2005). Environmental Sensitivity in a Developing Country: Consumer Classification and Implications. J. Environment and Behavior, Volume 37 (4). p 487-510.

M. Floyd. (1999). Race, Ethnicity, and Use of the National Park System. Social Science Research Review. Volume 1(2). p 1-24.

Madhuri Parikh (2017). Public participation in environmental decision making in India: A critique. Journal of Humanities and Social Science, Volume 22(6).p 56-63.

Maria Carmen Lemos & Arun Agrawal (2006). Environmental governance. School of Natural resources and Environment. An annual review of environment and resources, Volume 31(1).p 297-325.

Marie Claude Maurel (2009). Local actors facing environmental issues: Lessons from a bottom-up approach. Archives-ouvertes.fr. https://halshs.archives-ouvertes.fr. p 148-176.

Matete N., Trois C. (2008). Towards zero waste in emerging countries-A South African experience. Journal of Waste Management, Volume 28. p 1480-1492.

Mattheus F.A. Goosen (2012). Environmental management and sustainable development. Procedia engeneering, Volume 3.p 6-13.

Mba et al (2010). Urban environmental problems in Nigeria: Implications for sustainable Development. Journal of Sustainable Development in Africa, Volume 12(1).p 124-142.

Mebratu, D. 1998. 'Sustainability and Sustainable Development: Historical and Conceptual Review', Environmental Impact Assessment Review, volume 18(6).p 493-520.

Mccright A.M. (2010). The effects of gender on climate change knowledge and concern in the American public. Journal of Population and Environment, Volume 32. p 66-87.

Michel Dourousseau (2006). La décentralisation de l'environnement : Territoire et gouvernance. Revue juridique de l'environnement, Volume 4. p 780-782.

Michel Litwinski (2017). The evolution of the idea of Socioeconomic Development. Journal of Economics and Law. University of Pozan, Department of Sociology and Business Ethics. Ekonomia, Volume 16(4). p 449- 458

Minghua, Z., Xiumin, F., Rovetta, A., Qichang, H., Vicentini, F., Bingkai, L., Giusti, A., Yi, L. (2009). Municipal solid waste management in Pudong New Area, China. Journal of Waste Management, Volume 29(3). p 1227-1233.

Moghadam M., Mokhtarani, N. & Mokhtarani, B. (2009). Municipal solid waste management in Rasht City. Iran Journal of Waste Management, Volume 29(1).p 485-489.

Mrayyan, B. & Hamdi, M.R. (2006). Management approaches to integrated solid waste in industrialized zones in Jordan: a case of Zarqa City. Journal of Waste Management, Volume 26(2). p 195-205.

Napawan Panya, Chamlong Poboon & Wisakha Poachinda (2017). The performance of the environmental management of local governments in Thialand. Kesertsart Journal of Social Sciences, Volume 39(1). p 33-41.

Nelson RR. & Phelps E.S. (1966). Investment in Humans, Technological Diffusion and Economic Growth. American review, Volume 56(2). p 69-75.

Ndi Roland Akoh, Kometa Sunday Shende & Prof C.M Lambi (2017). The efficiency of

urban planning regulations on environmental management in Bamenda, North West Cameroon. Journal of Environment and Earth Science, Volume 7(10). p 104-113.

Nissim I., Shohat T. & Inbar Y. (2005). From dumping to sanitary landfills -Solid waste management in Israel. Journal of Waste Management, Volume 25(3). p 323-327.

Olli E., Grendstand G. & Wollebaek D. (2001). Correlates of Environmental Behaviors: Bringing back social context. Journal of Environment and Behavior, Volume 33(2). p 181-208.

Oosterveer P.J.M. & Vliet B.J.M.V. (2010). Environmental systems and local actors: Decentralizing environmental policy in Uganda. Journal of environmental Management, Volume 45(2). p 284-295.

Panya N., Phoochinda W. & Teungfung R. (2017). The performance of the environmental management of Local governments in Thailand. Journal of social Science, Volume 39 (1). p 1-9.

Paul C. Stern (2000). Towards a coherent theory of environmentally significant behavior. Journal of social issues, Volume 56 (3). p 407-424.

Pervez Alam & Kafeel Ahmade (2016). The impact of solid waste on health and the environment. https://www.researchgate.net. p 165-168.

Peterson .J. (2008). The precautionary principle: Practical reason, regulatory decision making and judicial review in the context of functional differentiation. Oxford University press, Volume 20(3). p 496-499.

Phillip G. Payne (2006). Environmental education and curriculum theory. Journal of environmental education, Volume 37(2). p 25-35.

Pradip Kumar Das (2016). An introduction to the concept of environmental Management: Indian context. International Journal of Innovation and Economic Development, Volume 2(4).p 25-34.

Qinghua Zhu, Joseph Sarkis & Keehung Lai. (2008). Confirmation of a measurement model for a green supply chain management practices implementation. International Journal of Production economics, Volume 111(2). p 261-273.

Rajkumar M., Ae N., Prasa Mny & Freitas H. (2010). Potential of Siderophore-producing bacteria for improving heavy metal phytoextraction. Journal of Trends Biotechnology, Volume 28. p 142-149.

Roberts J.F. & Grimes P.E. (1997). Carbon intensity and Economic development 1962-1991: A brief exploration of the Environmental Kuznets Curve. Journal of World Development, Volume 25(2). p 191-198.

Ronal Inglehart (1990). Culture shift in Advanced Industrial Society. Journal of European Sociological review, Volume 8(1). p 95-98.

Sachs W. (2000). Development: The rise and decline of an Ideal. Wuppertal papers. Nº 108. P 1-30.

Sarbapriya Ray & Ishita Aditya Ray (2011). Impact of population growth on environmental degradation: Case of India. Journal of Economics and Sustainable development, Volume 2(8). p 72-77.

Saffa Riffat et al (2016). Future cities and environmental sustainability. Open Access. p 1-23.

Seng B., Kaneko H., Hirayama K. & Katayama-Hirayama K. (2010). Municipal solid waste management in Phnom Penh, capital city of Cambodia. Journal of Waste Management and Research, Volume 29. p 920-930.

Scheinberg A., Spies S., Simpson M.H. & Mol A.P. (2011). Assessing urban recycling in low-and-middle income countries: Building on modernised mixtures. Habitat International, Volume 35(2). p 188-198.

Sharholy M., Ahmad K., Vaishya C. & Gupta R. (2007). Municipal solid waste characteristics and management in Allahabad, India. Journal of Waste Management, volume 27(4). p 490-496.

Sharholy M., Ahmad K., Mahmood, G. & Trivedi C. (2008). Municipal solid waste management in Indian cities. A review. Journal of Waste Management, Volume 28(2). p 459-467.

Shaw .R. Paul. (1976). Government Perceptions of Population Growth. Journal of Population Studies, Volume 30(1). p 77-86.

Sherbinin et al. (2007). The vulnerability of global cities to climate hazards. Journal of Environment and Urbanization, Volume 19(1). p 1-21.

Singh R.P., Singh P., Arouja F., Ibrahim M.H. & Sulaiman O. (2011). Management of urban solid waste: vermicomposting a sustainable option. Journal of resource conservation and recycling, Volume 55. p 719-729.

Smith C.J., Hopmans P., & Cook F.J. 1996. Accumulation of Cr, Pb, Cu, Ni, Zn and Cd in soil following irrigation with treated urban effluent in Australia. Journal of Environmental Pollution, Volume 94 (3). p 317-323.

Smyth R., Vinod Mishra & Xiaolei Qian (2008). Environmental surroundings and personal well-being in urban China. Journal of Ecological Economics, Volume 68(1). p 547-555.

Stern et al. (1999). A value-Belief-Norm theory of support for social movements: The case of Environmentalism. Human Ecology Review, Volume 6 (2). p 81-87.

Stewart Barr (2007). Factors influencing environmental attitudes and behaviors. Journal of environmental behavior, Volume 39 (4). p 435-473.

Sujauddin, M., Huda M.S. & Rafiqul Hoque. (2008). Household solid waste characteristics and management in Chittagong, Bangladesh. Journal of Waste Management, Volume 28. p 1688-1695.

Syeda Maria Ali, Aroma Pervaiz, Beenish Afzal, Naima Hamid & Azra Yasmin. 2014. Open dumping of municipal solid waste and its hazardous impacts on soil and vegetation diversity at waste dumping sites of Islamabad city. Journal of King Saud University science, Issue 26(1). p 59-65.

Tamasang .C.F. (2008). Sustainable Development: Some reflections with regard to the new constitutional dispensation in Cameroon. African law review, Volume 15(1).

Vairis Landams (2013). How actors of local society (community) influence the development of decentralized general education and their attitude to it. Procedia-Social and behavioral sciences. p 570-575.

Victor H. Argentino de Marais Vieira & Dacio R. Matheus (2018). The impact of socioeconomic factors on municipal solid waste generation in Sao Paulo, Brazil. Journal of waste management and research, Volume 36(1). p 79-85.

Vidanaarachchi K., Yuen S. & Pilapitiya, S. (2006). Municipal solid waste management in the Southern Province of Sri Lanka: problems, issues and challenges. Journal of Waste Management, Volume 26(8). p 920-930.

Vincent de Briant (2013). La Coadministration dans le domaine de l'environnement : Un levier pour la clarification des compétences. Revue juridique de l'environnement, Volume 5, No special. p 27-40.

Voutsa D., Grimanis A. & Samara C. (1996). Trace elements in vegetables grown in an industrial area in relation to soil and air particulate matter. Journal of Environmental Pollution,Volume 94. p 325-335.

Wilhelm A. Kiwango et al (2015). Decentralized environmental governance: A reflection on its role in shaping wildlife management areas in Tanzania. Journal of Tropical conservation Science, Volume 8 (4). p 1080-1097.

Wilson DC, Velis C., & Cheeseman .C. (2006). Role of informal sector recycling in waste management in developing countries. Habitat Inter, Volume 30(4). p 797-808.

Yong Ren (2000). Japanese approaches to environmental management: Structural and institutional features. International review for environmental strategies, Volume 1(1). p 79-96.

Zurbrügg C., Drescher S., Rytz I., Sinha M. & Enayetullah, I. (2005). Decentralised composting in Bangladesh, a win-win situation for all stakeholders. Journal of Resources,   Conservation and Recycling, Volume 43. p 281-292.

Webography

Arsene Nkituanhanga Yenamau. (2010). Problématique de la gestion des ordures ménagères dans la ville de Kinshasa. Université de Kinshasa, Faculté des sciences agronomiques, Département de gestion des ressources Naturelles. www.memoireonline.com. retrived on 20/092021

Christopher Tamasang & Andre Tchoffo. (2018). Environmental Law policy in Cameroon. www.jstor.org. retrived on 12/09/2020

Developing countries and the concept of development.10 p. https://www.assets.cambridge.org.   retrived on the 05/05/2018

Food and Agricultural organization. (2007). State of the world's forests. www.fao.org. retrived   on 18/03/2021

Giri Tejaswari. (2007). In FAO. (2007). A Manual on Deforestation, Degradation and Fragmentation using remote sensing and GIS. www.fao.org. retrived on 21/10/2020

Ian .D.Wilson, Mark Ware & J. Andrew Ware. (2003). A genetic Algotithm approach to Cartographic Map generalization.

Jain Minti. (2007). Mumbai's solid waste management plans expensive, Dangerous. www.downtoearth.org. retrived on 20/09/2020

Joseph J. Spengler (1949). Theories of Socio-economic growth. https://www.nber.org. retrived   on 21/03/2018

Lauren Auclair (2004). La déforestation dans les Pays du Sud : Interactions entre population et   développement. In : Domenach Hervé(Dir) & PIcouet Michel(Dir).

Environnement et   Population : La durabilité en question. Paris: l'Harmattan. http://www.documentation.ird.fr. retrieved on the 18/03/2020

Le Développement Socioéconomique régional: Un choix a raffermir en Education. 65 p. https://www.cse.qc.ca. retrieved on the 07/08/2018 Kathryn S. Quick and John Bryson. (2016).

Les Indicateurs du Développement Socioéconomique et d'une authentique réforme de L'Etat en Afrique. https://www.hcp.ma. retrieved on the 06/05/2018

R. Godfrey & J. Risky. (2008). Messages to who?: Understanding our toleration for risk through an examination of values. www.proquest.com. retrieved on 11/06/2021

Ralph Heimlich & William .D. Anderson. (2001). Development at the Urban fringe and Beyond: Impacts on agriculture and Rural Land. www.researchgate.net. retrieved on 11/11/2020.

Robert Bakiika (2013). An overview of Non-state actors in environment and natural resource management in Uganda. https://www.bwaisefacility.org. retrieved on 17/03/2020.

Safer Khadidja. Environnement et Développement Durable. https://www.pf-mh.uvt.rnu.tn. retrieved on the 28/04/2018 UNCED (1992). Agenda 21, United Nations Conference on   Environment and Development. New York: UN.

Shaylor H., McBride M. & Harrison E., 2009. Sources and Impacts of contaminants in Soil. Cornell Waste Management Institute. http://cwmi.css.cornell.edu.   retrieved on 02/11/2021.

Swason T. (2008). Economic growth and environmental regulation: A discussion of international experiences. Scholar.google.com. retrived on 06/02/2021

Theories of Public particicpation in Governance. https://www.researchgate.net. retrieved on 08/12/2018.

Toby A. Gardner et all (2012). A framework for integrating biodiversity concerns in to national   REDD+ programs. https://www.elsevier.com. retrieved on the 10/01/2020

United Nations. (1992). Human Development Report 1992. Hdr.undp.org. retrieved on 05/11/2020

USEPA, 2002. What is Integrated Solid Waste Management? Retrieved from http://www.epa.gov/climatechange/wycd/waste/downloads/ overview.pdf retrieved on 01/11/2021.

World Bank Group Central Committee. Strategy for Socio-economic development. https://www.siteresources.worldbank.org. retrived on the 07/04/2018

Word Health Organization. (1991). Ambient (out door) pollution. www.who.int. retrieved on 12/08/2020

Zuber Angkasa Wazir. (2017). Effects of Socioeconomic status and institution on the environmental concern level. www.matec-conferences.org. retrieved on 03/10/2020

Laws, International and Professional bodies Reports

African Union. (1991). Bamako conference on the Ban of Import to Africa and the Control of Trans boundary movement and management of Hazardous wastes within Africa.

Auer & Matthew (1999). "Rescaling environmental affairs". Paper presented at the 40th annual conference of the International Studies Association. Washington DC.

Bekure Woledesemait. (1999). 'For men urbanized Ethiopia', in Beyene Doilicho, Mekete Belachew and Tegegn G. Egziabiher (eds.), *Migration and Urbanization in Ethiopia: Proceedings of the Second Annual Conference*. Addis Ababa: Association of Ethiopian Geographers.

European Union. (2008). Directive 2008/98/EC of European Parliament and of the Council of 19 Nov 2008 on Waste and repealing certain directives.

European Union (2014). A healthy and sustainable environment for present and future generations.

International Organization for Standardization (2004). Environmental management systems: Requirements with guidance for use. Second edition. 23p.

Grossman M.G. and Krueger A.B. (1991). Environmental impacts of a North American Trade Agreement. Working paper 3914. National bureau of Economic research.

Law N^0 1996/012 of 5th August 1996 relating to Environmental Management in Cameroon.

Law N^0 2019/024 OF 24th December 2019 relating to the General Code of Local and Regional Authorities in Cameroon.

Richard Price (2010) in Tim Evrett et all (2000). Economic growth and the environment. Munich Personal RepEc Archive. 52p.

Sangmelima Council. (2015). Sangmelima Community Development Plan 2015

Scheinberg A., Wilson D.C. & Rodic L. (2010). Solid waste management in the World's Cities. UN-Habitat's Third Global Report on the State of Water and Sanitation in the World's Cities. EarthScan, Newcastle-upon-Tyne, UK. 256p.

Singer H.W. (1961). Education and Economic Development. Final report on the conference

of   African States on the Development of Education in Africa. Addis Ababa, 12-15 of May1961. Addis Ababa: United Nations Economic Commission for Africa and United Nations Educational, Scientific and Cultural Organization.

United Nations (1994). "Human Development Report". New York Oxford University press. UNDP.

United Nations (1987). Our common future: A report on the world commission on environment   and development.

United Nations. (2011). The Millennium Development goals

United Nations. (2012). The millennium development goals report. New York.

United Nations economic and social commission for Asia and the Pacific (2009). Eco efficiency indicators: Measuring resource-use efficiency and the impacts of economic activities on the environment.

United   Nations   Educational   Scientific   and   Cultural   Organization   (UNESCO) (2012).Education   for Sustainable development in action: Learning and training tools No 4.

United Nations Environmental Program et all (1997). Global Environmental Outlook. New York, Oxford University Press.

United Nations Environmental program (2002). Africa environmental outlook: Past, Present and Future perspectives. UNEP, Nairobi.

United Nations Statistics Division. (2001). Glossary of environmental statistics.

United States Environmental Protection Agency (2002). Community culture and the environment: A guide to understanding a sense of place. Washington DC.

Wilson DC, Pow .S., & Read .A., Kolganov .D. (2005). Regional waste management planning   in the Kaliningrad Oblast of Russia-a case study of technical assistance to achieve   sustainable improvements in waste management. In: Proceedings Sardinia. (2005).   Tenth International Waste Management and Landfill Symposium

World   Bank   (2000).   Entering   the   21st   century: world   development   report.   Oxford university press

World Bank Social Development Department (Nov 2006). Understanding Socioeconomic and   political factors to impact policy change.

World Commission on Environment and Development (1987). Our Common Future. London, Oxford University Press.

APPENDICES

I- **Questionnaire**
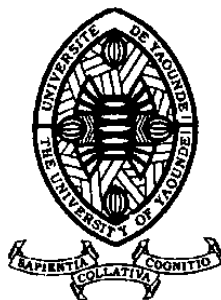
REPUBLIQUE DU CAMEROUN	REPUBLIC OF CAMEROON
Paix- Travail- Patrie	**Peace- Work- Fatherland**
**********	**********
UNIVERSITE DE YAOUNDE I	**THE UNIVERSITY OF YAOUDE I**
**********	**********
CENTRE DE RECHERCHE ET DE FORMATION DOCTORALE EN SCIENCES HUMAINES, SOCIALES ET EDUCATIVES	**POST GRADUATE SCHOOL FOR SOCIAL AND EDUCATIONAL SCIENCES**
**********	**********

HOUSEHOLD SURVEY QUESTIONNAIRE

Topic: *The impacts of socioeconomic development on the environment of Sangmelima town- south Cameroon*

Name of investigator:

Date of survey:

Questionnaire N^0:

Neighborhood:

The survey is intended to undertake a research for the partial fulfillment of the award of Masters of Science in Geography. I would like to know about the socio demographic status, economic status, state of sanitation, solid waste management in the town. Results of information collected during this survey will be completely confidential and strictly for academic purpose.

Just enter the number corresponding to your response

Section A: Socio demographic status

Question N^O	Question	Answer		Responses
Q01	Sex of respondent	1. Male 2. Female		
Q02	Age of respondent	1. 20-30 2. 31-40 3. 41-50	4. 51-60 5. 61-70 6. 70-+	☐
Q03	Education background	1. Primary 2. secondary	3. University	
Section B: Economic status				
Q4	Sector of activity	1. Public sector 2. Private sector	3. Independent 4. unemployed	☐

Q5	Income range of respondents	1. less than the SMIG(36277frs 2. SMIG-50000 3. 50000-100000 4. 100000-200000	5. 200000-300000 6. 300000-400000 7. 400000-500000 8. 500000-+	☐
Q6	Duration of stay in the respondent	1. 0-5years 2. 6-10years 3. 11-20years	4. 21-30years 5. 31-40years 6. 41-+	☐
Q7	Reason for living in the neighborhood	1. Near to family 2. Near to working place	3. Low cost of rent and land 4. Near to socioeconomic services	
Q8	Cooking source of energy	1. Bottle gas 2. Electricity 3. Firewood	4. Solar energy 5. Petrol 6. Others	☐
Section C: Waste generation and disposal				
Q9	Where do you dispose your waste?	1. Lake 2. Public bin/dump 3. Nearby forest	4. Streets 5. Street gutters 6. Burn	☐
Q10	Do you separate household waste?	1. Yes 2. No	If yes cont. to Q11	☐
Q11	Would you do it if you were told to?	1. Yes 2. No		☐
Q12	Are they any large bins in the neighborhood?	1. Yes 2. No		☐
Q13	Distance between the house and the waste disposal point	1. 5m-10m 2. 10m-20m 3. 20m-30m	4. 30m-50m 5. 50m-100m 6. 100m-+	☐
Q14	Frequency and waste disposal	1. Once a week 2. Twice a week 3. Once a month	4. Never 5. Others	☐
Q15	Satisfied with the waste collection service?	1. Yes 2. No		

Q16	Reason for satisfaction of dissatisfaction	1. Unreliable 2. Improper collection	3. Reliable 4. Cooperative 5. Others	☐
Q17	Do people dump their waste out of the garbage bin?	1. Yes 2. No	If yes cont. to Q18	☐
Q18	Why in your opinion people behave like this?	1. Height of the bin 2. Waste and litter spread around the bin	3. The bin is full 4. others	☐
Q19	Treatment mode used when the collection agency does not pass	1. decomposition on the site 2. incineration	3. Agricultural use 4. others	☐
Q20	Satisfied with the towns waste management policy?	1. Yes 2. No		☐
Section D: Environmental perception and awareness				
Q21	Have you ever heard of environmental protection?	1. Yes 2. No	If yes cont.to Q22	☐
Q22	Where did you hear it?	1. Media 2. school	3. Others	☐
Q23	Which media component was more effective in generating your awareness?	1. Radio 2. television	3. news paper 4. Social media	☐
Section E: Generalities on socioeconomic development and environmental management				
Q24	Do you think socioeconomic development has a negative impact on the environment?	1. Yes 2. No 3. indifferent		☐

Q25	Is the population included in decision making when it comes to environmental management?	1. Yes 2. No 3. indifferent	If yes cont.to Q25	☐
Q26	Have you being sensitized on the issue of environmental management and degradation?	1. Yes 2. No		☐

Thanks for your collaboration and time!

I-   Interview guide
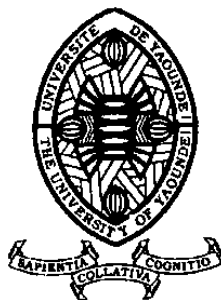
<table>
<tr><td>

REPUBLIQUE DU CAMEROUN
Paix- Travail- Patrie
****
UNIVERSITE DE YAOUNDE I
****
CENTRE DE RECHERCHE ET
DE FORMATION DOCTORALE
EN SCIENCES HUMAINES,
SOCIALES ET EDUCATIVES
****

</td><td>

REPUBLIC OF CAMEROON
Peace- Work- Fatherland
****
THE UNIVERSITY OF
YAOUDE I
****
POST GRADUATE SCHOOL
FOR SOCIAL AND
EDUCATIONAL SCIENCES
****

</td></tr>
</table>

Name of investigator: [   ]

Date of survey: [   ]

Interview guide N⁰: [   ]

Administrative structure: [   ]

A: Generalities on socioeconomic development and the environment

1. What do you think of sustainable development in your town………………………………..

2. What are the environmental specificities in the town?...

3. What do you think about the question of environmental degradation?...................................

4. What are your strategies for environmental management?...

5. Do you have partners for environmental governance?...

6. What do you think about the concept of participation in environmental governance?............

7. Is there population sensitization, mobilization and information on the issue of environmental management and degradation?

- o   Yes
- o   No, Indifferent, (If yes go to question 14)

8. Through which measures has the sensitization, mobilization and information been done?.......

9. Have these measures been efficient?

- o   Yes
- o   No

10. What are the main difficulties you face in the environmental management process?

- o   Financial
- o   Human
- o   Material

    o Technical

    o Local population reluctance

B. Projects and perspectives on environmental management

11. Which environmental projects have been realized in the town?...

12. Do they exist a project with regard to environmental valorization in the town?...................

13. What are your future projects with respect to environmental management?.........................

14. What do you propose for a better environmental management in the town?.........................

15. What are your perspectives for an efficient management of the environment?.....................

16. Which are the measures employed to respond to the question of environmental degradation?

17. What are your measures vis-à-vis the sensitization, mobilization and information of the population?..

Thanks for your time and Collaboration!

II-   GPS Points

Table 1: GPS points of illegal dumps

Longitudes	Latitudes
2.92017988	11.98474441
2.91984201	11.98452882
2.91925440	11.98547494
2.91911761	11.98577050
2.91793026	11.99155844
2.91812027	11.99345851
2.92612826	11.98779462
2.92612826	11.98779462
2.92668667	11.98848000
2.92683236	11.98870458
2.92748418	11.98948207
2.92541750	11.98703146
2.92395160	11.98424374
2.92644944	11.98193100
2.92079367	11.96659450
2.92223878	11.97055044
2.92051333	11.97158458
2.91993272	11.97183306
2.92104511	11.98275500
2.93269146	11.98196219
2.93200258	11.98256742
2.93198464	11.98258655
2.92428197	11.97309728
2.92543500	11.97523949
2.92657922	11.97846848
2.92681032	11.97999517
2.94447024	11.97365571
2.94470778	11.97398333
2.94490485	11.97560138
2.94552934	11.97709910
2.93016185	11.97324898
2.92680333	11.97593634
2.92661417	11.97679583
2.92628625	11.97706667
2.94161232	11.98717098
2.94144593	11.98872263
2.94362603	11.98693410
2.94242979	11.98471188
2.94124556	11.98252333
2.93442657	11.98270276
2.93244158	11.98421295
2.91752670	11.98105871
2.91577305	11.97983509
2.93539694	11.97403448
2.95175450	11.98653739
2.95150980	11.98787216
2.95479500	11.98824667
2.95358961	11.99478167
2.95386098	12.00028426
2.95385833	12.00115500
2.95160759	11.98058481
2.95352152	11.98851180

Source: Mobile Topographer and fieldwork 2020

Table2: GPS points of legal dumps and bins

Longitudes	Latitudes
2.92059596	11.98323504
2.92721057	11.98142239
2.92774444	11.98115333
2.92966561	11.97825222
2.92942123	11.98022833
2.92988133	11.98063500
2.92020923	11.97183069
2.91993696	11.98230837
2.92453400	11.98274600
2.93145167	11.98149333
2.93193352	11.98160889
2.94600667	11.97866833
2.93138833	11.97203500
2.93065475	11.97308667
2.94506500	11.97858333
2.94135449	11.97452192
2.94269495	11.98262250
2.94562350	11.97857600
2.94094228	11.98395378
2.91682441	11.98074745
2.93106048	11.98062646
2.95325230	11.97514095
2.95429679	11.97209036

Source: Mobile Topographer and Fieldwork 2020

Table 3: GPS points of Neighborhoods in Sangmelima

Neighborhood	Longitude	Latitude
Campchic	2.91812007	11.99350781
Mbeli'i	2.92708000	11.98909667
Lobossi	2.93096500	11.97273500
Monavebe	2.92160083	11.96899417
Nkolnguet	2.92041750	11.98247167
Sources	2.92581419	11.98207100
Quartier Administratif	2.93009887	11.97836117
Nylon	2.92682917	11.97742836
Akon 1	2.94549154	11.97851065
Akon X	2.94180083	11.97597956
Bissono	2.94188667	11.98986200
Akon 3	2.94347627	11.98176230
Akon 2	2.94351317	11.98014041
Ebolenbwang	2.93192766	11.98421128
Sangmelima Village	2.94945038	11.98115161
Otoakam	2.95528541	11.97032965
Base	2.92887795	11.98536892

Source: Mobile topographer and Feildwork 2020

TABLE OF CONTENTS