Pan African University
Institute of Water and Energy Sciences

PAN-AFRICAN UNIVERSITY

INSTITUTE FOR WATER AND ENERGY SCIENCES

(including CLIMATE CHANGE)

Master Dissertation

Submitted in partial fulfillment of the requirements for the Master degree in

WATER POLICY

Presented by

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Assessment of Programs and Progress in Achieving Sustainable Development Goals: Case Study of Goal 6 (Clean Water and Sanitation in Goma township in Democratic Republic of Congo).

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DECLARATION AND RECOMMENDATION

I hereby declare that this thesis is the original outcome of my research, has been realized to the best of my knowledge and ability. This work has not been submitted for any previous degree or an award. The work is almost entirely my own work; the collaborative contributions have been indicated clearly and acknowledged. Due references have been provided on all supporting literatures and resources.

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DEDICACE

To my beloved aunt Aimée NASHASHI and my spiritual father Marc SAFARI NYANGE and all relatives who gone away early;

To my parents and all my family;

I dedicate this work.

ACKNOWLEDGEMENTS

My deepest thanks to God Almighty for his grace and special love from my birth to this day.

My sincere gratitude goes to the African Union Commission for the scholarship and research grant allocated for this research and all the staff of PAUWES without whom this work would not exist.

My sincere gratitude goes to my supervisor, Prof Bolaji Abdulfatai SULE for his guidance, his constructive criticism, teaching and support during the research period.

I would also like to thank all the people who contributed to this work, especially Ir Ernest BASEMENANE MUNYAMBI from the CNAEHA Executive Secretariat, Mr MASUDI from OCDD, Jérome from the Water Resources Directorate and Mrs NGONGO from the Régodeso-SA.

Finally, I express my profound gratitude to my family, my colleagues, and my friends for their support and their encouragements throughout my academic journey and more so, in realising my dream of attaining my Masters in Water Policy.

ABSTRACT

Safe and adequate water has a crucial role in the economy, the health of populations as well as the maintenance of a healthy environment. Indivisible from sanitation and hygiene, together these three words constitute the three pillars of Sustainable Development Goal 6. The goal aims to ensure access to water and sanitation for all the world's population by 2030. According to the United Nation report, in 2019, more than 2.1 billion of the world's population did not have access to safe drinking water services and 2.3 billion lacked basic sanitation facilities, of which 892 million people still practice open defecation. In the Democratic Republic of Congo, in 2018, the rate of access to safe water and basic sanitation was 59% and 22% respectively.This study constitutes an assessment of the Water Sanitation and Hygiene sector in the DRC, of the programmes and actions undertaken in the framework of the achievement of SDG 6, as well as the assessment of the level of achievement of indicators 6.1.1, 6.2.1. and 6.3.1. in the city of Goma, more precisely in the Ndosho district. In order to do this, we proceeded through a literature review of documents and reports, interviews with officials in the ministries, agencies and non Ggovernment organizations working in the sector, and a survey conducted in the Ndosho district. A total of 317 households participated in the survey. For indicator 6.1.1, the results revealed that although 100% of households have access to safe drinking water, 90.22% of households still use unimproved water supply services compared to 5.36% and 4.42% that use basic and limited services respectively. The breakdown of indicator 6.2.1 revealed that, on one hand, 67.5% of households use unimproved sanitation services, 29.34% use basic services, 1.58% have no toilets and the remaining 1.58% use limited services. On the other hand, 61.20% do not have handwashing facilities, 34.70% use basic facilities and 4.10% use limited facilities. For indicator 6.3.1, the results revealed that no households, or 0.00% of households, treat their wastewater. Compared to the national averages for 2018, these results show a positive but slow trend towards the achievement of SDG 6 by 2030.

Key words: SDG, Program, Goma town, DRC

RESUME

L'eau propre joue un rôle crucial dans l'économie, la santé des populations ainsi que le maintien d'un environnement sain. Non détachable de l'assainissement et l'hygiène, ensemble ces trois mots constituent les trois piliers de l'objectif 6 du développement du durable. L'objectif ambitionne d'assurer l'accès à l'eau et l'assainissement à toute la population mondiale d'ici 2030. Une ambition qui est loin d'être atteinte car selon le rapport de l'ONU, en 2019, plus de 2,1 milliards de la population mondiale n'avaient pas accès à des services d'eau potable et 2,3 milliards ne disposaient pas d'installations sanitaires de base, dont 892 millions de personnes pratiquant encore la défécation à l'air libre. En République Démocratique du Congo, en 2018, le taux d'accès à l'eau potable et celui d'accès aux services d'assainissement élémentaire étaient respectivement de 59% et 22%. Cette étude constitue une évaluation du secteur de l'eau potable, hygiène et assainissement en RDC, des programmes et actions entrepris dans le cadre de la réalisation de l'ODD6 ainsi que l'évaluation du niveau de réalisation des indicateurs 6.1.1, 6.2.1. et 6.3.1. dans la ville de Goma plus précisément dans le quartier Ndosho. Pour ce faire, nous avons procédé par la revue littéraire des documents et rapports, des interviews avec des cadres dans les ministères, agences et organisations non gouvernemental intervenant dans le secteur ainsi qu'une enquête menée dans le quartier Ndosho. Au total 317 ménages ont participé à cette enquête. Pour l'indicateur 6.1.1, les résultats ont révélé que, bien que 100% de ménages ont accès à l'eau potable, 90.22% de ménages utilisent encore des services d'approvisionnement en eau non-améliorés contre 5.36% et 4.42% qui utilisent respectivement des services basiques et limités. La ventilation de l'indicateur 6.2.1 a révélé d'une part que 67.5% de ménages utilisent des services d'assainissement non-améliorés, 29.34% utilisent des services basiques, 1.58% n'ont pas de toilettes et le 1.58% restant utilisent des services limités. D'autre part 61.20% n'ont pas d'équipements pour laver les mains, 34.70% utilisent d'équipements basiques et 4.10% utilisent des équipements limités. Pour l'indicateur 6.3.1, les résultats ont révélé qu'aucun ménage, soit 0.00% de ménages traitent leurs eaux usées. Comparativement aux moyennes nationales de 2018, ces résultats font preuve d'une évolution positive mais lente vers la réalisation de l'ODD 6 d'ici 2030.

Mots clés : ODD, Programme, Goma, RDC

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ABBREVIATIONS

UN: United Nations

MDG: Millennium Development Goals

SDG: Sustainable Development Goals

DRC: Democratic Republic of Congo

WASH: Water, Sanitation and Hygiene

NGO: Non-Governmental Organization

WHO: World Health Organization

UNICEF: United Nations Children's Fund

IWRM: Integrated Water Resources Management

OECD : Organization for Economic Co-operation and Development

SDSN : Sustainable Development Solutions Network

UNESCAP : United Nations Economic and Social Commission for Asia and the Pacific

PNEHA: National Water-Hygiene-Sanitation Program

CNAEA: National Water and Sanitation Action Committee

ONHR: National Office of Rural Hydraulics

OCDD: Congolese Observatory for Sustainable Development

CNAEHA: National Water, Hygiene and Sanitation Action Committee

CPAEHA: Provincial Committee for Water, Hygiene and Sanitation Action

CTAEHA: Territorial Committee for Water, Hygiene and Sanitation Action

OD : Open Defecation

ToR : Terms of References

PNEVA: Sanitized School and Villages National Program

1. INTRODUCTION

1.1. Background of the Study

Water is life, is a phrase that synthesizes thousands of studies to demonstrate the importance of water in all aspects of life on earth. Water has been a preoccupation of researchers, given its crucial role in the economy, the health of populations as well as the maintenance of a healthy environment. For several decades the international community has put water at the heart of its policy. Indeed, it was in 1977 that the first UN conference dedicated to water was organized in Mar del Plata, Argentina. This was followed by the International Drinking Water and Sanitation Decade from 1981 to 1990. Two years later, in 1992, there was the International Conference on Water and the Environment in Dublin and the Earth Summit in Rio de Janeiro, both of which dealt with this vital resource and which resulted in the development of the Dublin Principles and the Rio Principles respectively (Angela, Melvyn, & Stefan, ; UN, International Decade for Action on Water for Sustainable Development, 2018-2028, 2018). In 2002, the United Nations reinforced its affirmation of the value of water and sanitation to human existence and dignity by deciding to solemnly recognize access to basic water and sanitation services as a human right (Chitonge, Mokoena, & Kongo, 2020).

In an attempt to address global challenges, including the challenge of water and sanitation, the United Nations launched the eight Millennium Development Goals in 2000, to be achieved by 2015. Following a review of the different targets and indicators attributed to each MDG, it was found that these were not comprehensible or universal and did not take into account all three pillars of sustainable development. So in 2015, with the lessons learned over the past 15 years as an asset, the international community launched the sustainable development agenda with an integrated and indivisible set of 17 universal goals to be achieved by 2030. These new goals complement the MDGs and are broader, deeper, more ambitious, and more oriented towards the overall achievement of sustainable development (Roopnarine, et al., 2019). "Halve the proportion of people without access to safe drinking water and basic sanitation" was target C of Millennium Development Goal 7 (ensure environmental sustainability) (MDG 7: ensure environmental sustainability, 2013). In 2015, this target was taken up, reworded, and complemented as Sustainable Development Goal 6, which aims to ensure the availability and

sustainable management of water and sanitation for all people in the world. Today, it is the responsibility of each government of all 193 member countries of the United Nations General Assembly to integrate SDG 6 into planning processes, policies, and strategies based on the specific development realities and priorities of the country (UN-Water, 2018).

Given its water resources, the Democratic Republic of Congo-DRC is a very special country in the world. Indeed, unlike many countries where fresh water is unevenly distributed both spatially and temporally, the Democratic Republic of the Congo (DRC) contains 35% of the world fresh water reserves with the second worldwide largest equatorial forest and high groundwater potentialities assessed based on its climate and geology (Chishugi & Xu, 2015). DRC has one of the most extensive river systems in the world with more than 20,000 km of shoreline (Society, 2003). Covering approximately 86,080 km^2, lakes and rivers account for 3.5 percent of the country's land area. DRC has the most abundant water resources in Africa: its surface water represents about 52% of Africa's water reserves, while its reserve represents 23% of the continent's renewable water resources (UNEP, 2011).

Unfortunately, the political crises and armed conflicts that the country has experienced since the 1990s have left the water and sanitation sector in an alarming state: an extremely weak institutional framework, collapse of infrastructure, manque de fonds, the absence of regulations and policies, and the lack of clarity in the remit and responsibilities of different actors hindered the improvement of the Water, Sanitation and Hygiene-WASH sector (Mosello, Chambers, & Mason, 2016). Thus, despite these abundant water resources, 86.8 million (THE WORLD BANK, 2020) Congolese citizens stay thirsty and vulnerable to several diseases.

Over the past two decades, the city of Goma has hosted thousands of people fleeing armed conflict in their villages, which has increased pressure on the city's only water resource (Lake Kivu) (Statistiques démographie, s.d.). In some areas, due to the scarcity and high cost of water, most citizens do not allow themselves to use water in their many daily activities. Some have only one choice: rainwater (Ahadi, Nene, & Aloys, 2020). Without any treatment plant, wastewater is transported directly into the lake via a weak and open sewerage system.

1.2. Problem Statement

Water is a crucial resource not only for human life but also for the entire ecosystem. Indeed, the maintenance of a healthy environment and the good health of human beings depend largely

on access to water. This is only possible if there is a good supply of water in adequate quantity and acceptable quality. Otherwise, as is the case in some regions, poor water supply is the source of many waterborne diseases such as cholera, hepatitis A, amoebiasis, typhoid fever and many other parasitic, bacterial and viral diseases (Thomas, 2020) and causes the death of millions of people worldwide.

From a slight shortage to water crisis, the concerns are real and specific from one region to another (Dustin E, Michael, & Cameron, 2020). Water crisis in the world is becoming more and more acute. According to (Matti, Philip J, Moel, & Olli, 2010), the global population experiencing severe water scarcity has increased from 32 million people in 1900 to a projected 3.1 billion people by 2050.

Coupled with lack of sanitation services in some regions, the achievement of Sustainable Development Goal number 6 (SDG 6) is becoming a challenge for many countries. According to a UN report, in 2019, more than 2.1 billion of the world's population did not have access to safe drinking water services and 2.3 billion lacked basic sanitation facilities, of which 892 million people still practice open defecation (UNESCO, 2019). The lack of adequate water supply and poor sanitation is a situation that leads to the death of millions of people every year especially in developing countries.

The Democratic Republic of Congo (DRC) is a typical example: in 2015, 50 millions of Congolese, or 75% of the population, had no access to drinking water and approximately 80-90% of the population had no access to improved sanitation (Water and Sanitation Program, 2010). This situation continues to cause economic, environmental and social damages. According to a report by the Water and Sanitation Program (WPS), in 2012, as a result of poor water quality and lack of sanitation and hygiene, 90,400 Congolese, including 74,300 children under the age of five, die each year from diarrhoea. In addition, inadequate sanitation is an aggravating factor through its impact on malnutrition, malaria, severe respiratory diseases and measles, which are the main causes of child mortality. Economically, this leads to a loss of US$ 183 million each year (Toni & Sylvia, 2012). Today, due to other driver's parameters such as climate change, income and population growth, the situation is deteriorating further and without clever intervention and implementation these challenges will continue to intensify and spread as demand grows (Jaegera, et al., 2017).

Despite the abundant water resources in DRC, the lack of Water, Sanitation and Hygiene

(WASH) infrastructures leaves these 86.8 million (THE WORLD BANK, 2020) Congolese citizens thirsty and vulnerable to several diseases.

It is therefore with this in mind that we decided to carry out this study, the theme of which is Assessment of Programs and Progress in Achieving Sustainable Development Goals: Case Study of Goal 6: Clean Water and Sanitation in the Democratic Republic of Congo, specifically in the Goma township.

It is important to specify that the choice of our research theme is by no means a matter of chance, but rather the result of a long process of reflection. The reality is that for several years now, everywhere in the Democratic Republic of Congo, whether in urban or rural areas, and more specifically in Goma township, there have been long queues of people, mostly women and children, searching for drinking water days and nights.

In Goma township, located in the province of North Kivu where for several decades armed conflicts have never ceased to have negative consequences such as the loss of human life, thousands of displaced persons and, above all, the technical and institutional collapse of water and sanitation services, the demand for drinking water has only increased. Unfortunately, the national water supply company (REGIDESO) is unable to meet the demand, leaving many parts of the city without water (Ahadi, Nene, & Aloys, 2020). This places the city not only at high risk of diseases such as cholera, but also in a climate where water is seen more as an economic good than a social good (Cluster l'Eau, Hygiène et Assainissement RDC, 2017).

Thus, improving water supply and sanitation services is more than a necessity. This cannot be done without assessing the various efforts made so far by the different stakeholders in the sector. This will also allow the boosting and accelerating progress towards the achievement of this goal before the end of the last decade (2021-2030) of the Sustainable Development Goal Agenda.

1.3. Research Objectives

1.3.1. **Overall Objective**

This research aims to assess various initiatives and programs undertaken by the government and other key development partners to ensure equitable provision of safe drinking water and access to basic sanitation as stipulated in SDG 6 to the populations in the Democratic Republic

of Congo and more particularly in Goma township.

1.3.2. Specific Objectives

Specifically, this study aims to :

1. To draw up a report on the state of drinking water supply and access to basic sanitation in the DRC;
2. Analyse the administrative organisation of the water and sanitation sector in the DRC in order to draw up a hierarchical organisation chart for the sector;
3. Identify programs and projects taken to improve the water and sanitation sector in DRC;
4. To propose evaluation criteria for these programs;
5. To analyse and measure the activities undertaken in Goma township towards achieving SDG 6;
6. To assess the progress of SGD 6 in Goma township and make a time projection on the overall results by 2030.

1.4. Research Questions

1.4.1. Overall Question

In what ways are the existing programs and projects are contributing to the achievement of SDG 6 in DRC and particularly in Goma township?

1.4.2. Specific Questions

2. What is the status of drinking water supply and access to basic sanitation in the DRC?
3. How is the WASH sector organised in DRC?
4. What programs and projects have been undertaken by the different stakeholders to meet the targets for Goal 6 in DRC?
5. What criteria should be used to assess these programs?
6. What criteria are used to assess the progress of SDG 6?
7. Is measurement of indicators by agencies possible with available data?
8. Could a procedure to estimate the indicators for selected town be developed?

1.5. Significance of the Study

This work was designed to allow us to:

- Know the efforts and plans of the DRC in relation to the achievement of SDG 6;
- To understand the organizational structure of the drinking water, hygiene and sanitation sector;
- To know the level of achievement of SDG 6, especially indicators 6.1.1, 6.2.1, 6.2.2 and 6.3.1 in Goma and the Ndosho district.

1.6. Scope and Limitations

The aim of this work is to assess the achievement of SDG 6, and it deals with programs and actions undertaken since the launch of the 2030 Agenda, at the end of 2015. This study has not gone as planned. Indeed, several challenges stood in our way, including: the Covid-19 pandemic, which directly or indirectly caused not only a great delay in the planning of this study but also the cost; a Congolese administrative system that is highly bureaucratic, which unfortunately did not allow us to interview the ministries and target agencies involved in the drinking water, hygiene and sanitation sector in the DRC. To this list we can add the non-cooperation of NGOs operating in the city of Goma. These situations did not allow us to obtain all the information necessary to achieve certain objectives of this work.

2. LITERATURE REVIEW

2.1. The 2030 Agenda for Sustainable Development

The member states of the UN General Assembly in 2015 unanimously recognized the 2030 Agenda for Sustainable Development. The agenda is an action plan to solve the major challenges facing humanity such as: to provide facilities of clean water and sanitation, eradicate poverty and hunger, protect biodiversity, and ensure peace and prosperity around the world. It is an inclusive plan of action that seeks the participation and involvement of all people in equity, fairness, and equality of race, sex, and gender without leaving anyone behind. The program emphasizes the roles not only of governments but also of all citizens, civil society, researchers, and other stakeholders in providing solutions to these challenges (UN, Transforming our world: the 2030 Agenda for Sustainable Development, 2015; Ibrahim & Gulseven, 2020).

The 2030 Agenda has established 17 Sustainable Development Goals (SDGs), 169 targets to be achieved by 2030 (Allen, Metternicht, & Wiedmann, 2018). Each target is associated with one or more monitoring indicators, most of which have been approved by the UN Statistical Commission, designed to assess and measure progress towards the targets according to a standardised methodology. In total there are 244 indicators (UN, Travaux de la Commission de statistique sur le Programme de développement durable à l'horizon 2030).

According to (Obrecht, et al., 2021), the aim of the 17 goals of the 2030 Agenda for Sustainable Development is to meet the need of people and the need of nature. These objectives cover all three dimensions of sustainable development, including the economic, social and environmental dimensions (UN, Sustainable Development Goal 6 Synthesis Report 2018 on Water and Sanitation, 2018). The Agenda is a global benchmark for the transition to sustainability. They have been designed to be integrated and indivisible. Indeed, there are direct and/or indirect links between the SDGs so that the achievement of one implies the achievement of the other or the delay of one implies the delay of the other. For example, the targets of SDG 3 ('good healthand wellbeing') are also the targets of other SDGs, such as SDG 1 ('no poverty'), SDG 2 ('zero hunger'), SDG 6('clean water and sanitation'), and SDG 10 ('reduced inequalities') (Sabine, Thomas, Markus, Jens, & Sandra, 2021).

To implement this agenda, the international community relies on a global partnership that will operate in a spirit of global solidarity and facilitate a universal commitment to the achievement of all the goals and their various targets (UN, Transforming our world: the 2030 Agenda for Sustainable Development, 2015). To achieve the SDGs by 2030, a significant acceleration in the pace and scale of implementation is essential, as well as a genuine adoption of the principles of inclusion and sustainability, including sustainable finance (Chantal & Hannah, 2020). The achievement of this agenda depends crucially on humanity's ability to maximize synergy and resolve the different trade-offs between the SDGs (Christian, Anne, & Prajal, 2019). Furthermore, the success of this program is conditioned by the degree to which it is located and integrated into the national, regional and local strategic plans in each country because although it is universally applicable, it is up to each government to find ways to include the targets in the national planning processes, policies and strategies based on specific realities, level of development and priorities of the country (UN, Sustainable Development Goal 6 Synthesis Report 2018 on Water and Sanitation, 2018).

In the UN's 2020 Report on the SDGs, UN Secretary General António Guterres highlights that since the launch of the program in 2015, there have been some improvements and changes, such as a decline in many communicable diseases, increased access to education for children and young people, improved drinking water services and an increase in the number of women in leadership positions. However, there has also been an increase in the number of food insecure people, an alarming deterioration of the environment and the persistence of dramatic inequalities in all regions. This shows that change is not happening at the required speed and that there is still a long way to go to achieve the SDGs (UN, The Sustainable Development Goals Report 2020, 2020).

Although the SDGs have been energetically proclaimed by the UN, it is worth nothing that critics who say that the SDGs have been built on the "wrong premise" by ignoring the environmental constraints on the achievement of social and economic goals and because of the unquantifiable nature of some of the goals (especially goals 12-15). Furthermore, in Africa and other low-income countries, collective actions and partnerships to support sustainable development are not translating into tangible results on the ground (Chitonge, Mokoena, & Kongo, 2020).

2.2. SDG 6

Commonly referred to as the "water goal", SDG 6 is one of 17 SDGs established by the United Nations and it is to "Ensure availability and sustainable management of water and sanitation for all". This goal reflects a particular focus on water and sanitation issues in global policy and takes into account the importance of all the different aspects of the water cycle in development as well as the direct and indirect role that water can play in achieving the other SDGs (Angela, Melvyn, & Stefan, 2018; UN, Sustainable Development Goal 6 Synthesis Report 2018 on Water and Sanitation, 2018).

The ambition of this goal is therefore to ensure that every human being has access to safe drinking water and adequate sanitation. It thus encourages a global vision based on the universal provision of sustainable services:

For water, the goal is not only limited to the issue of access but also aims to ensure availability, accessibility, quality of services and sustainable management of water resources.

For sanitation, the improvement of the service goes beyond the presence of a toilet or a latrine, and is considered at the scale of the sanitation sector, i.e. by taking into account the upstream, intermediate and downstream links: access, collection, transport, treatment, elimination of excreta and wastewater, and even their reuse (Les Objectifs de Développement Durable pour les services d'eau et d'assainissement Décryptage des cibles et indicateurs, 2017). The objective includes 8 targets measurable through 11 specific indicators (Angela, Melvyn, & Stefan, 2018).

Water and sanitation issues have obvious direct or indirect consequences for the three dimensions of sustainable development. Targets and indicators of the SDG 6 have provided a framework for comprehensive assessment and goals to capture water security through clean water and sanitation by 2030 (Duminda, Nidhi, & Vithanage, 2019). From their ambitions, the targets of SDG 6 can be classified into two groups: six on water and sanitation outcomes, and two on the means of implementation of the targets. Given the importance of monitoring progress to ensure the success of SDG 6, the identification and application of specific, measurable and action-oriented indicators was therefore of paramount importance. It was in this context that UN-Water proposed to the UN and External Expert Group on SDG Indicators

(IAEG-SDGs) a set of key indicators for monitoring SDG 6 at the global and national levels (UN-WATER, 2016).

2.2.1. Target 6.1

« By 2030, achieve universal and equitable access to safe and affordable drinking water. »

Five years before the end of the MDG program, the world had already reached the target of halving the proportion of people without sustainable access to safe drinking water. Between 1990 and 2010, more than 2 billion people gained access to an improved water source. However, despite these improvements, many people around the world do not have access to safe drinking water. Indeed, according to the World Health Organization and UNICEF, the proportion of the world's population with access to safe drinking water from an improved source was 91% in 2015, leaving 663 million people lacking this vital resource for their lives and dignity (Assessing Access to Water & Sanitation, 2017). Today the number of people without access to safe water is estimated at 2.2 billion (UNICEF&WHO, The Measurement and Monitoring of Water Supply, Sanitation and Hygiene (WASH) Affordabilitya: missing element of monitoring of Sustainable Development Goal(SDG) Targets 6.1 and 6.2, 2021).

Indicator 6.1.1 assigned to this target defines the proportion of the population with access to safely managed drinking water services. The custodian agencies for this indicator are WHO and UNICEF.

2.2.2. Target 6.2

"By 2030, ensure equitable access to adequate sanitation and hygiene for all, and end open defecation, with particular attention to the needs of women and girls and those in vulnerable situations".

Unlike the target on access to safe drinking water, the target on sanitation had not been met by the end of the MDGs. In 2015, only 68% of the world's population had access to improved sanitation services, leaving 2.4 billion without access to improved sanitation facilities, including 946 million practicing open defecation (UNICEF&WHO, 2015). 6 years later, this number has risen to 4.2 billions.

To measure progress towards this target, indicator 6.2 based on the proportion of the population using safely managed sanitation services, including hand-washing facilities with soap and water is used (UN-WATER, 2016) .

This indicator is divided into two sub-indicators which are: 6.2.1.a.: Proportion of the population using safely managed sanitation services and 6.2.1.b: Proportion of the population using a handwashing facility with available soap and water. (Angela, Melvyn, & Stefan, 2018).

2.2.3. Target 6.3

"By 2030, improve water quality by reducing pollution, eliminating waste dumping and minimizing emissions of chemicals and hazardous materials, halving the proportion of untreated wastewater, and significantly increasing the safe recycling and reuse of water globally".

In the background of this work, we have mentioned the crucial role that safe adequate water plays in achieving sustainable development. Therefore, knowing the quality of water in rivers, lakes and groundwater is essential. It allows to detect areas where water resources are vulnerable to pollution or not and to understand the temporary evolution of the impact of socio-economic development on the quality of freshwater reserves. Today, due to the increase in socio-economic activities, water resources are under threat. Indeed, the latter have become the final destination of hundreds of kilograms of industrial, agricultural and domestic pollutant loads. This situation is worsening as the population grows and the ecosystem is unable to assimilate all this waste. Several space-time parameters such as land use, climate and geological characteristics can influence water quality. Understanding these parameters allows to decode their effects on society and climate change (Environnement, 2018).

Two indicators have been assigned to this target:

Indicator 6.3.2 defined as the "proportion of water bodies with good ambient water quality" and indicator 6.3.1 which refers to the "proportion of wastewater treated safely". The latter comprises two sub-indicators (WHO&UN-HABITAT, 2018) :

- 6.3.1 a: the percentage of domestic wastewater treated safely ;

- 6.3.1 b: the percentage of industrial wastewater treated safely.

2.2.4. Target 6.4

"By 2030, significantly increase the efficiency of water use in all sectors and ensure the sustainability of freshwater withdrawals and supplies to address water scarcity and significantly reduce the number of people who lack water".

From a slight shortage to water crisis, the concerns are real and specific from one region to another (Dustin E, Michael, & Cameron, 2020). Water crisis in the world is becoming more and more acute. According to (Matti, Philip J, Moel, & Olli, 2010), the global population experiencing severe water scarcity has increased from 32 million people in 1900 to a projected 3.1 billion people by 2050.

This target addresses the efficient use of water resources and water stress. It also aims to ensure deliberate management of water resources to ensure that these resources are sufficient for all users. Two indicators have been created to monitor progress towards this target (FAO, Progrès relatifs à l'efficacité de l'utilisation des ressources en eau - Cadre de référence mondial pour l'indicateur 6.4.1 des ODD, 2018):

6.4.1 Change in water resource use efficiency;

6.4.2 Level of water stress: freshwater withdrawals as a proportion of available freshwater resources.

2.2.5. Target 6.5

"By 2030, ensure integrated water resources management at all levels, including through transboundary cooperation as appropriate".

Increasing human activity due to population growth, environmental degradation and global warming are putting increasing pressure on water resources. Integrated water resources management is an approach and framework for sustainable and effective water management that balances the use of this limited resource between different user sectors (Maija, et al., 2018).

Progress on this target is measured by two indicators: SDG indicator 6.5.1 on the degree of implementation of IWRM, and indicator 6.5.2 on the proportion of transboundary basin area with an operational arrangement for water cooperation (Hussein, Filippo, & Francesca, 2018).

2.2.6. Target 6.6

"By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes among the world's most biologically diverse environments, there are Water-related ecosystems, such as lakes, rivers and vegetated wetlands that provide diverse products and services that are crucial for human well-being".

Although they occupy only 0.8% of the earth's surface and account for only 0.01 of the world's water reserves, these ecosystems constitute the habitat of almost 10% of the world's known species.

The indicator 6.6.1 tracks changes in the extent of water-related ecosystems over time

2.2.7. Target 6.a

« By 2030, increase international cooperation and support for capacity building in developing countries in water and sanitation activities and programs, including water harvesting, desalination and efficiency, wastewater treatment, recycling and reuse technologies »

Indicator 6.a.1 Amount of water- and sanitation-related official development assistance disbursements

2.2.8. Target 6.b

« Support and strengthen local participation in improved water and sanitation management »

Indicator 6.b.1 Participation of local communities in water and sanitation management.

2.3. Sustainable Development Assessment

Sustainable development remains a sensitive and controversial topic. This is probably due to the existence of several approaches to dealing with sustainable development which leads to a vague general knowledge of the subject. The increased rate of poverty in the world and the realization that natural resources are limited while population growth seems unlimited have been at the origin of sustainable development. It was in its report in 1987 that the World Commission on Environment and Development defined sustainable development as

"... development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Although widely used throughout the world, this definition was considered incomplete. And to complete it, three basic parameters were added which are impacted by the development itself. These three parameters, which are now considered to be the pillars of sustainable development, are: the social, ecological and economic aspects. Thus, the *Sustainable development can be seen as an improvement of at least one of the categories economic, social and environmental, without having negative impacts on any of the others*.

This new approach, fulfilling the Pareto criterion, makes it possible to assess sustainable development and consequently to evaluate the sustainability of a project. To do this, specific criteria are associated with each parameter, then indicators are assigned to these criteria and finally the measurement of these indicators allows the evaluation of the sustainable development of projects. It is essential to assign at least one indicator to each criterion. Finally, the evaluation of the indicators makes it possible to gather the impacts of the project, comparing it to a target figure to classify the projects according to social, economic and ecological categories (Martin, 2006).

For the Sustainable Development Agenda (2030 Agenda) launched in 2015, the global framework of indicators attributed to the SDG targets establishes a set of measurement tools to assess performance at the national level in a comparative manner as well as to assist in the identification of appropriate policy actions for the realization of the agenda. Indicators help to reduce complexity and facilitate communication. The process by which indicator information is interpreted and synthesized to assess progress and produce clear messages for policy makers, the public and other stakeholders is called Indicators-based assessment (Cameron, et al., 2017).

Today, several methods are applied to assess the success or failure of these targets. This leads to different and sometimes contradictory results, causing confusion among the different stakeholders and decision-makers, who are then unable to base their decisions on solid and coherent assessments (Gennari & D'Orazio, 2020). Thus, the biggest challenge is to find an inclusive method appropriate to local realities to assess progress. As of 2019, the UN, which is the ultimate custodian of the SDGs, has agreed to assess both the level of achievement and the evolution over time of progress towards the various targets.

2.3.1. Measuring the level of achievement

This evaluation consists of measuring the distance between the last available value and the ideal value defined by the indicator. To do this, different methods can be applied depending on the nature of the indicators themselves. The assessment of the level of achievement of an SDG indicator becomes simpler when the ideal value of the indicator is explicitly defined in the formulation of the relevant target. In this case it is important to standardize the appropriate measures to allow comparison across indicators as well as their aggregation at the target or goal level.

In the case where the target is expressed in relative terms with respect to the base year without an explicit ideal value, the assessment of the level of achievement of an SDG indicator is done through "statistical targets" obtained through a series of procedures proposed by different agencies such as OECD, SDSN, UNESCAP...

2.3.2. Measuring progress over time

It consists of assessing the likelihood, based on observed trends, that a country or region will achieve the SDG targets by 2030. To do this, different methodologies can be used: from simple methods that ensure the presence of the desired trend, to appropriate forecasting methods that predict the value of the indicator in the target year.

2.4. Progress Towards SDG 6

In 2015, 7 out of 10 people worldwide were using safely managed water services while only 2 out of 5 (or 4 out of 10) were using well-managed sanitation services. Although they are combined under the same goal, the water-related targets show better progress than the sanitation-related targets in achieving Millennium Development Goal 7c. It is also important to highlight the disparity between and within developed countries that were well above the global average and developing countries that were below the average as shown in Figures 2.1 and 2.2 (WHO&UNICEF, 2017).

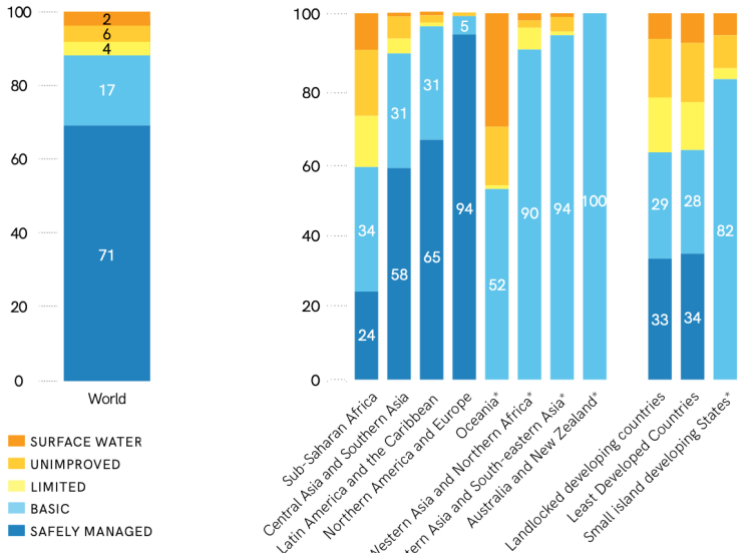

Figure 2. 1: Global and Regional Drinking Water Coverage in 2015

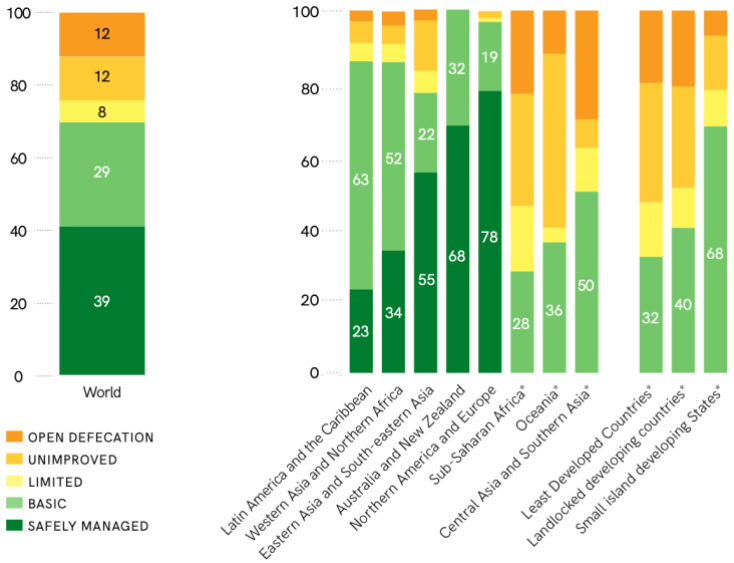

Figure 2. 2: Global and Regional sanitation coverage 2015

The SDG 6 Synthesis Report emphasizes that the world is far from achieving Sustainable Development Goal 6. Despite improvements since the launch of the Millennium Agenda, much remains to be done to achieve this goal. If there is no acceleration in the current process, the goal will not be achieved by 2030 (UN, Sustainable Development Goal 6 Synthesis Report 2018 on Water and Sanitation, 2018).

In the Sustainable Development Report published by the Cambridge University Press in 2020, it is noted that OECD countries score the highest on all the SDG 6 indicators, while Sub-Saharan Africa and Oceania rank second to last and well below the global average respectively. The report also mentions the level and trend of achievement of SDG 6: only 3 countries in the world (Czech Republic, Finland and Croatia) have already achieved the goal. The majority of OECD countries are either on track or making moderate progress, while the majority of sub-Saharan countries face major challenges and show a stagnant trend in achieving the goal (Figure 2.3). A situation that will certainly deteriorate following the pandemic crisis of COVID-19 that the world is experiencing since the end of 2019 (Sachs, et al., 2020).

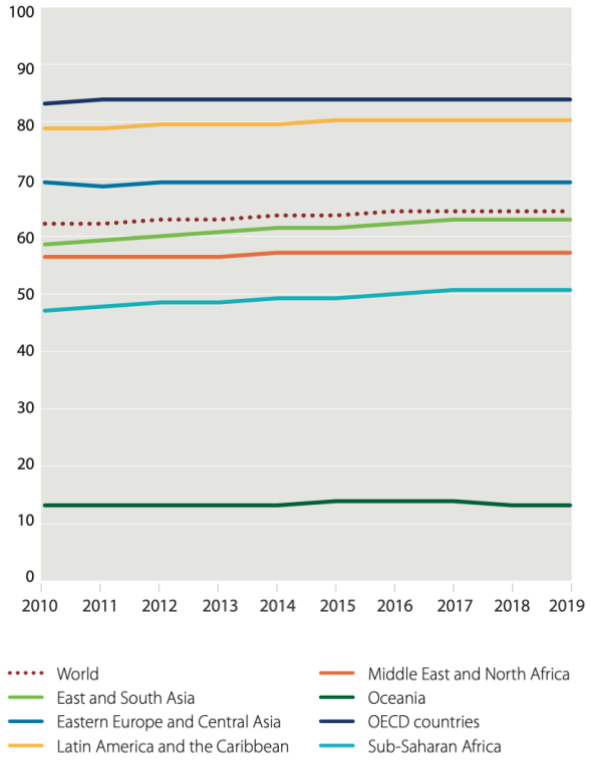

Figure 2. 3: Global and regional SDG 6 Score

UN-Water has identified four steps for progress on SDG 6: first, adapting enabling environments for action as a means of implementation; second, making progress on implementation; third, measuring progress through monitoring and evaluation; and fourth, assessing progress, with monitoring and review (Lisa, Praem, & Manzoor, 2019).

2.5. Assessment of the Water, Hygiene and Sanitation Sector in the DRC

2.5.1. **Water Resources in DRC**

Situated in Central Africa region, the DRC is the second largest country in Africa (2,345,000 km^2). It borders the Central African Republic and South Sudan on the North; Uganda, Rwanda, and Burundi on the East; Zambia and Angola on the South; the Republic of the Congo on the West; and it is separated from Tanzania by Lake Tanganyika on the East. Unlike many African countries where fresh water is scarce and unevenly distributed both spatially and temporally, the Democratic Republic of the Congo (DRC) contains 35% of the world fresh water reserves with the second worldwide largest equatorial forest and high groundwater potentialities assessed based on its climate and geology (Chishugi & Xu, 2015).

DRC also enjoys considerable autonomy in water, with 70 percent (900 m3 / year) of its current renewable water resources (estimated at 1,283 km3 / year) coming from precipitation on the national territory (FAO, Computation of long-term annual renewable water resources (RWR) by country (in km3/year, average) Congo, 2017). The average annual rainfall for the whole country is over 1,200 mm, rising to more than 2,000 mm in the central basin, and falling to a minimum of around 850 mm at the western coast. The abundant water resources are linked to its vast forests, which extend over more than 155.5 million hectares. In fact, the majority of the population depends on sources supplied by dense forests, thus emphasizing the importance of forest ecosystem services for the supply of water to local communities (Chishugi, Birikomo, Upton, BÉ, & Bellwood-Howard, 2018).

Surface water includes all rivers, lakes and streams on the surface throughout DRC. DRC has one of the most extensive river systems in the world with more than 20,000 km of shoreline (Society, 2003). Covering approximately 86,080 km^2, lakes and rivers account for 3.5 percent of the country's land area. The surface waters of the DRC are shared between 3 hydrographic basins: the Congo, the Nile and the Shiloango bassins. the most important is the Congo River basin that holds 98% the country's surface water. 75% of the Congo River basin lies within the DRC. DRC has the most abundant water resources in Africa: its surface water represents about 52% of Africa’s water reserves, while its reserve represents 23% of the continent’s renewable water resources (UNEP, 2011).

Despite the abundance of surface water, the vast majority of the Congolese population depend on groundwater and sources to obtain drinking water. Groundwater is estimated to account for almost 47 percent (421km^3 / year) of the DRC's renewable water resources. Information on the extent and quality of underground water reserves and spring water is scarce and, when available, often obsolete and covering a limited geographic area. Springs in dense forests are the main source of water for the majority of the population. Simple captured sources are commonly used for water supply in scattered villages and peri-urban areas (UNEP, 2011).

2.5.2. WASH Sector in DRC

The long years of political crises and wars had plunged the WASH sector in the DRC into a problematic and chaotic state: the collapse of the institutional framework of the sector, the abandonment and/or destruction of the weak existing infrastructure and the freezing of investments. From 1990 to the early 2000s, the rate of access to safe drinking water had fallen from 34% to 22% (Michelle & Sarah, 2012).

Drafted in 2006 and revised in 2011, the Growth and Poverty Reduction Strategy Paper (GPRSP) sets out the strategic objectives formulated by the Congolese government in relation to the drinking water and sanitation sector. Like the MDG program, these targets aim to halve by 2015 the proportion of the population without sustainable access to safe drinking water and to make significant efforts to provide full sanitation services and to end unsafe practices (Document de la Stratégie de Croissance et de Réduction de la Pauvreté-DSCRP 2, 2011).

In order to achieve these objectives, certain improvements have been made in the sector, leading to a slight increase in the rate of access to drinking water to 24% in 2008, with 17% in rural areas compared to 38% in urban areas (Table 2.1). On the other hand, the rate of access to sanitary infrastructures has remained too low (between 10-20%).

Table 2. 1: Access rate for safe water and improved sanitation

	1990			2004/05			2008		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Access rate (DSCRP/UNDP)									
Safe water	68%	21%	34%	37%	12%	22%	38%	17%	24%
Improved sanitation	10%	11%	11%	9%	10%	10%	9%	11%	10%

(UNEP, 2011)

In 2015, 50 million of Congolese, or 75% of the population, had no access to drinking water and approximately 80-90% of the population had no access to improved sanitation (Water and Sanitation Program, 2010). Despite the many efforts made by the Congolese government and other development partners, the situation seems almost static due to population growth.

The MDG targets for water supply and sanitation for the DRC was to reach 70 percent of the population with access to safe drinking water and 55 percent with access to sustainably managed sanitation services. Unfortunately, at the end of the program this was not the case. In 2015, the rate of access to drinking water facilities was only 52% (81% in urban areas and 31% in rural areas), less than 29% for access to improved sanitation and only 3% of households have handwashing facilities with soap. This means that the DRC had not achieved MDG target 7c (WB, 2017).

In spite of these enormous water resources, the population in DRC lacks adequate clean drinking water and its cost is high. Nevertheless, using the production of drinking water as an indicator, it has been noted that access to clean water has firstly improved from 2010 to 2016 with a positive difference of 47.02 million m^3 and also a growth of 34.70% between 2011 and 2018. raising the rate of access to drinking water in the country to 59%. There after a regression due to the drop in production in 2018 (Ministre du Plan, 2020).

Likewise, access to sanitation remains a major problem in DRC. In fact, from 2017 to 2018, access to sanitation decreased by 8% reducing the rate of access to basic sanitation to 22%. 12% of households practice open defecation, which leads to harmful consequences for health and the environment. Several challenges that make it difficult in the provision of safe drinking water and sanitation, including traditional practices, natural disasters, increasing epidemics and growing displaced population due to armed and political conflicts (Ministre du Plan, 2020).

2.5.3. Legal and Regulatory Framework

At the end of the twentieth century, the texts governing the drinking water and sanitation sector were out of date. Most of them, dating from the colonial period, were obsolete and needed to be revised. This is why, since the beginning of the twenty first century, the efforts made by the Congolese government have been more focused on reforming the law and drafting national policies on water and sanitation:

1**. Order n ° CAB.MIND / IND / CJA / 003/03/2020** of March 16, 2020 establishing the Inspection, Control and Monitoring Committee for compliance with national or international standards relating to industrial wastewater. This decree establishes within the Ministry of Industry. Thus, the Ministry of Industry subcontracts to the company HYDRAC-CD the inspection, control and monitoring service for compliance with national or international standards relating to industrial wastewater.

2. **Ordinance n ° 71-079** defining the action of the state in terms of rainwater and wastewater networks.

In localities with a separate rainwater evacuation network, the maintenance and operation of all the works intended to ensure this evacuation in the right-of-way of the route of roads of general interest, are the responsibility of the State. Apart from this case, the State only supports the maintenance and operation of the general collectors.

3. **Ministerial Order No. 073 / CAB MIN-ENER / 2006** setting the conditions for the approval of consultancy firms and companies in the water sector.

This decree sets the conditions for the approval of consulting firms and companies in the water sector, as well as independent researchers and / or hydrologists. The approval is granted by the Minister having energy in his attributions.

4. Ministerial Decree No. 072 / CAB MIN-ENER / 2006 setting the conditions for obtaining the authorization for the production, distribution and marketing of water intended for human consumption, mineral water, thermal water and others of the same nature.

This decree sets the conditions for obtaining the authorization for the production, distribution and marketing of water intended for human consumption, mineral water, thermal water and others of the same nature. The authorization is granted by the Minister having energy in his attributions.

5. **Ministerial Order No. 070 / CAB MIN-ENER / 2006** amending and supplementing Ministerial Order No. E / SG / 0/0133 / C2 / 93 of March 17, 1993 laying down the conditions for obtaining the authorization for water exploitation natural surface or underground.

This decree sets the conditions for obtaining the authorization to operate natural surface or underground water for industrial, commercial, domestic, hydroelectric or mixed purposes. The authorization is granted by the Minister having energy in his attributions.

6. Ministerial decree nº 071 / CAB MIN-ENER / 2006 setting the conditions for granting the authorization to explore mineral and thermal waters.

This decree sets the conditions for the granting of the authorization to explore mineral and thermal waters. The authorization is granted by the Minister having energy in his attributions.

In addition, in 2013, under the leadership of the Ministry of Environment, Nature Conservation and Tourism, the National Sanitation Policy was drafted. Through this policy, the Congolese government aims to improve the standard of living of the Congolese people by ensuring access to adequate sanitation services and infrastructure, by having a national policy, an appropriate law, and related sectoral and sub-sectoral programs and strategies. (Politique Nationale d'Assainissement, 2013).

In 2016, the National Assembly and the Senate adopted the principal law for water supply (Law n°15/026 of 31 December 2015 related to water) which has several objectives including: setting the rules for sustainable and equitable management of water resources, Set rules of responsibilities relating to water and sanitation public services by adapting them to development requirements of the country, Determine the necessary instruments for rational and balanced management of water resources according to a multisectoral approach that take into account present and future needs, Solve the problem of legal framework and inadequate institutional as well as the low rate access to drinking water, Protect the water resources, regulate its use and make the water sector efficient and Attract, through security measures

$, investors to the sector and promote national water emergence through recourse to public/ private partnership formula (Loi n° 15/026 du 31 décembre 2015 relative à l'eau, 2016).

At the end of 2019, under the initiative of Water and Sanitation for All, DRC adopted the National Water-Hygiene-Sanitation Program (Programme National Eau-Hygiène-Assainissement- PNEHA), which aims by 2030: to increase access to drinking water from 33% to 80%, to promote sanitation and hygienic conditions for all and to eradicate open defecation for poor people (Republique Democratique du Congo Country Overview, 2020)

2.5.4. Governance of Wash Sector

In Democratic Republic of Congo, governance of the water sector is structurally weak and characterized by a lack of regulations and policies and the presence of diverse ministries and institutions often with unclear, overlapping and / or conflicting mandates and none of them are in the position to coordinate policies or take an overview of all ongoing programs. (TRAORE, et al., 2007; UNEP, 2011).

The sectoral coordination is provided by the National Water and Sanitation Action Committee (CNAEA). Created in 1981, this inter-ministerial committee is responsible for drawing up and monitoring the implementation of rehabilitation and development program in the drinking water and sanitation sector. It is chaired by the Ministry of Planning; the first vice-chair is the Ministry of Environment and the second vice-chair is the Ministry of Energy. A total of 20 ministries (Ministry of Planning, Ministry of Environment, Ministry of Energy, Ministry of Agriculture, Ministry of Interior, Decentralization and Security, Ministry of Foreign Affairs and International Cooperation, Ministry of Infrastructure, Public Works and Reconstruction, Ministry of Finance, Ministry of Budget, Ministry of Rural Development, Ministry of Scientific Research, Ministry of Public Health, Ministry of Urban Planning and Housing, Ministry of Hydrocarbons, Ministry of Industry, Ministry of Women's Affairs, Ministry of Mines, Ministry of Higher Education and Universities, Ministry of Transport and Communication Routes, Ministry of Scientific Research) and 10 institutions (the water distribution company REGIDESO, the National Rural Hydraulic Service (SNHR) ; Société Nationale d'Electricité (SNEL), Office Congolais de Contrôle, Programme National d'Assainissement (PNA), Commission Nationale de l'Energie (CNE), Office des Voiries et Drainages (OVD), Centre de Recherche Universitaire (CRU), Centre de Recherche Géologique et Minier (CRGM), METELSAT) are involved in the management of the committee (Mosello, Chambers, & Mason, 2016; GOUVERNEMENT Cabinet du Premier Ministre Décret n° 07/12 du 20 novembre 2007 portant création, organisation et fonctionnement d'un Comité National d'Action de l'Eau et de l'Assainissement, C.N.A.E.A., en sigle. , 2007).

These ministries and institutions are divided into the following committee structures according to their field of expertise:

- the Steering Committee
- the Executive Secretariat

- Technical Commissions (Drinking Water Commission, Sanitation Commission, and Hydrological and Hydrogeological Studies Commission)
- Provincial Committees

The Drinking Water and Sanitation sector is subdivided into four sub-sectors, namely

¬ The "Urban Drinking Water Supply (UDWS)" sub-sector: With REGIDESO as the main actor, this sub-sector is active in the cities on a small scale and 20% of its network is inactive in the secondary cities. REGIDESO works under the administrative and financial supervision of the Ministry of State in charge of the portfolio, but also under the technical supervision of the Ministry of Energy, which is in charge of the policies of the sub-sector (Water Supply and Sanitation in the Democratic Republic of CongoTurning Finance into Services for 2015 and Beyond, 2011).

¬ the "Urban Sanitation" sub-sector: It is characterized by a lack of adequate infrastructure and regional administrative structures. The sub-sector is handled by two main institutions: the Office des Voiries et Drainage (OVD) created in 1987 under the Ministry of Public Works and Land Management and the Programme National d'Assainissement (PNA). However, other actions are carried out by the Health Zones and NGOs (TRAORE, et al., 2007; Olivier, 2011) ;

¬ the "Drinking water supply in rural and peri-urban areas" sub-sector: this is under the responsibility of the Ministry of Rural Development through the Service National d'Hydraulique Rurale (SNHR), which was created in 1983 and is responsible for inventorying water resources in rural areas. In addition to the Ministry of Rural Development, several other actors are involved in this sub-sector, including the Ministry of Public Health through the Health Zones, which integrates sanitation and hygiene education in the program, as well as various national and international NGOs. (Sarah, s.d.);

¬ The "Rural sanitation" sub-sector: there is no specific body in charge of this sub-sector. Responsibilities are shared between the Ministry of Environment and Nature Conservation and the Ministry of Public Health. There are also actions undertaken by NGOs (TRAORE, et al., 2007).

The latter two sub-sectors receive less attention from the Congolese government, resulting in inadequate institutional organization and a lack of funding. Both sub-sectors are confronted with coordination problems between the various stakeholders and low awareness and support

from the rural populations who are the beneficiaries of the actions undertaken. This explains the disparity in water supply and sanitation services between urban and rural areas (Olivier, 2011; Michelle & Sarah, 2012).

Long time managed at the central level, the sector will undergo a considerable reshuffle following the implementation of the 2008 decentralization law which consists of transferring competences, means and resources from the central to the local level (Didier, 2013).

In addition to the efforts led by the Congolese government, actions are taken by several partners to improve the WASH sector in DRC. Their efforts are reflected in the implementation of projects, technical and financial support. These partners include: the UK Department for International Development (DFID), the United States Agency for International Development (USAID), the Swedish International Development Agency (SIDA), and the Belgian Technical Cooperation BTC, UNICEF, World Bank, UNEP, World Vision, WHO, FAO, GIZ, etc (Mosello, Chambers, & Mason, 2016).

2.5.5. Financing

The funds allocated to the water and sanitation sector remain insignificant and do not allow for the construction of new infrastructure. In the years 2007 and 2008, only about 2.3% of public expenditure, including aid flows, was injected into the sector. This constituted 0.6% of gross domestic product (GDP) at the time. Thus, public spending on the sector during this period was estimated at around US$65 million per year, of which 95%, or US$62 million, came from external aid.

3. MATERIALS AND METHODS

3.1. **Study** A**rea**

Located at an altitude of 1453m within latitude 1°35‟ 15”- 1°42‟15” S and longitude 29° 06‟ 45” – 29 15‟ 45” E, Goma is the capital of the North Kivu province in the eastern part of the DRC. It is a city of 66.45 km^2 with an estimated population of 867,164 in 2014 (Statistiques démographie, s.d.). The town borders:

- to the north the territory of Nyiragongo where the two still active volcanoes (Nyiragongo and Nyamulagira) of the Virunga volcanic chain are found. The recent eruption of Nyiragongo in May 2021 caused the death of dozens of people and the displacement of more than 400,000 people towards Sake and Masisi;
- To the east, the town of Gisenyi in the Republic of Rwanda;
- To the south, the Lake Kivu which forms a natural border between the city and the province of South Kivu;
- To the west, the Virunga National Park in the Masisi territory.

The distance between the city of Goma and Kinshasa, the capital of the country, is 1572 km.

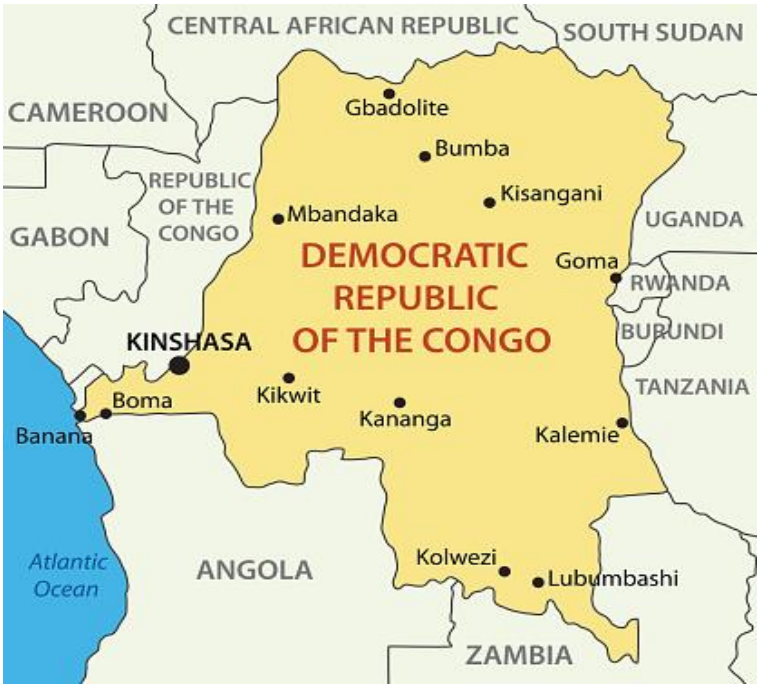

Figure 3. 1: Map of DRC showing major towns and cities

Source: https://clipart.me/free-vector/democratic-republic-of-congo

3.1.1. **Administrative Subdivision**

Goma township is divided into 2 Communes: the Commune of Karisimbi in its north and the Commune of Goma in the south. The division of the city seems to be evenly split in two as according to (Michellier et al., 2016), the 2 communes occupy the same surface area each (Figure 3.2). In turn, these two municipalities are subdivided into 18 quarters for administrative purposes. The Commune of Karisimbi has 11 quarters namely: Kahembe, Bujovu, Murara, Virunga, Mabanga Sud, Mabanga Nord, Majengo, Kasika, Katoyi, Ndosho, and Mugunga; while the Commune of Goma has 7 quarters namely: Les Volcans, Mapendo, Mikeno, Katindo, Himbi, Kyeshero and Lac Vert. Each commune is headed by a burgomaster, assisted by an assistant burgomaster, and each quarter is divided into an avenue and a cell. Both communes are coordinated by the mayor of the city, who is in turn assisted by the assistant mayor. The quarters differ by their standings and their densities with the lowest observed in the western quarters of Goma township.

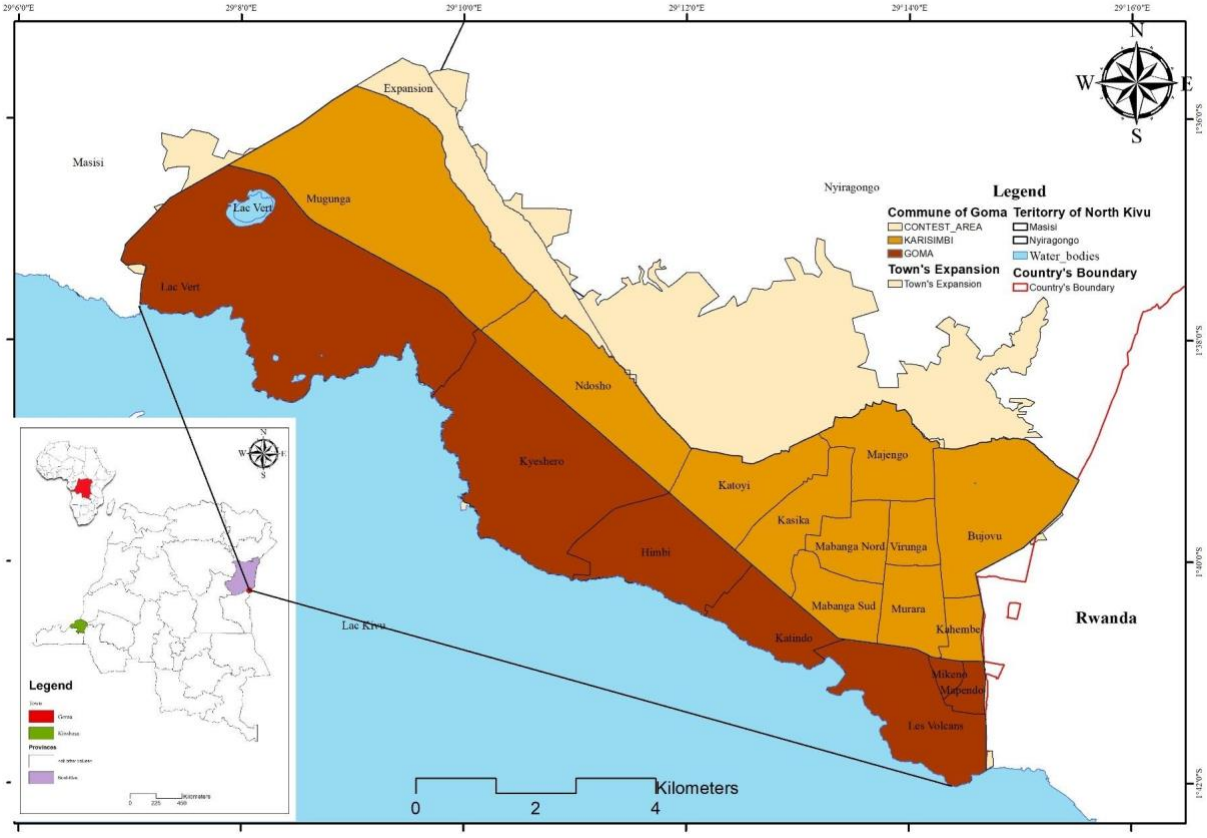

Figure 3. 2: Goma township

Data Sources: *("Geofabrik Download Server," 2020; Michellier et. al, 2016)*

3.1.2. **Hydrography**

The absence of a river, spring or stream, the hydrography of Goma township is dominated by Lake Kivu. This is linked, according to (CHAPITRE I. PRESENTATION DU MILIEU D'ETUDE, 2012), to the volcanic eruption which in the 1800s covered the entire city with lava, thus making almost all the city's water disappear, except for Lake Kivu. Lake Kivu with an estimated volume of 500Km^3 is the main source of water supply for the city. Lake Kivu is one of the African Great Lakes and one of three meromictic lakes in Africa. It is a natural reserve of methane gas and is characterised by a strong thermal and chemical stratification. In addition to Lake Kivu, there is also a small crater lake in the city: Lake Vert. Besides that, numerous water bodies are found in the surrounding territories of the township and could serve as alternative sources for the drinking water utility in Goma.

3.1.3. **Topography**

The town is entirely covered by volcanic soils with a low relief. Its altitude varies between 140l m at the edge of Lake Kivu and 2000m at the point of adjunction with the community of BUKUMU. The city has one highest point, Mount Goma. The vegetation of Goma is characterized by a grassy savannah, which grows on sandy volcanic rocky areas, thus favoring better agricultural production from market gardens, food crops, fruit tree plantations, etc. (MINISTERE DE L'AMENAGEMENT DU TERRITOIRE, 2017).

3.1.4. **Climate**

The city of Goma is located in a tropical region. Its high altitude and proximity to the Virunga volcanic range, gives it a moderate tropical climate with temperatures varying between 13.6 to 25.9°C. In the region, the rainy season is largely long, at 10 months, compared to the dry season which lasts only two months throughout the year. This is a major source of water replenishment in the region. The average rainfall varies between 41mm in July and 174mm in October (Weather Atlas, 2020).

3.1.5. **Demography**

The city of Goma is one of the cities in the DRC where the population is growing too fast. The rural exodus and armed conflicts are the main causes of this growth. With a predominantly young population, the city's age pyramid has a very broad base compared to its peak. According to the city hall of Goma, from 2008 to 2014, the population increased as shown in Table 3.1 (PASAG, 2016):

Table 3. 1: Population of Goma (2008-2012)

Year	Male	Female	Boys	Girls	Total
2008	132,576	135,971	167,097	183,644	619,288
2009	142,940	152,779	162,525	181,129	639,373
2010	136,068	153,060	177,892	192,943	659,963
2011	140,094	157,582	184,677	203,933	686,276
2012	167,799	188,663	220,977	243,759	821,198

Each year the number of female persons, i.e., women and girls, slightly exceeds that of men and boys.

Table 3.2 presents the more elaborate demographic data mentioning the number of inhabitants in each district from 2014 to 2016 and the projection in 2020 and 2030.

Table 3. 2: Demography of Goma by districts Adapted from (Nord-Kivu, 2016)

N°	**Administrative Subdivision**	**2014**	**2015**	**2016**	**2020**	**2030**
1. **Goma Commune**						
1	Q. LES VOLCANS	15,810	16,998	16,523	19,705	26,482
2	Q. MIKENO	36,583	35,469	34,927	41,118	55,260
3	Q. MAPENDO	34,335	35,473	35,534	41,123	55,266
4	Q. KATINDO	30,563	31,626	32,384	36,663	49,272
5	Q. HIMBI	54,768	55,982	56,617	64,898	87,218
6	Q. KESHERO	93,824	98,565	118,093	114,264	153,561
7	Q. LAC VERT	52,941	24,781	25,273	28,728	38,608
TOTAL 1		**318,824**	**298,894**	**319,351**	**346,500**	**465,667**

2. **KARISIMBI COMMUNE**						
1	Q. MURARA	37,169	37,546	37,615	43,526	58,495
2	Q. KAHEMBE	26,628	28,228	28,347	32,725	43,980
3	Q. BUJOVU	40,258	43,988	45,736	50,994	68,532
4	Q. MAJENGO	71,030	77,844	68,423	90,243	121,278
5	Q. VIRUNGA	19,833	21,473	21,303	24,893	33,454
6	Q. MABANGA NORD	42,740	41,642	43,328	48,274	64,877
7	Q. MABANGA SUD	57,808	63,102	63,215	73,153	98,311
8	Q. KASIKA	54,798	55,858	57,928	64,755	87,025
9	Q. KATOYI	100,030	110,639	113,755	128,261	172,372
10	**Q. NDOSHO**	**74,138**	**80,254**	**120,346**	**93,036**	**125,033**
11	Q. MUGUNGA	71,030	20,669	22,109	23,961	32,202
TOTAL 2		**544,134**	**581,244**	**622,105**	**673,821**	**905,559**
GENERAL TOTAL		**889,362**	**880,138**	**956,090**	**1,020,321**	**1,371,226**

It is important to recognize that without reliable census data coupled with observed large population flow to Goma, it impossible to know the exact number of people in the city. In the city there is an intercultural diversity consisting of several indigenous and foreign tribes. The Ndosho district, in green, was projected to be the second populous district in Goma in 2020.

3.2. Methodology

The realisation of this research work, both on the theoretical and practical level, requires the use of methods and techniques.

In order to provide answers to our problem, we used a descriptive approach. The tools used in the collection of data were: the literary review, interviews, observation and questionnaires.

3.2.1. The Research Processes

In order to lay the foundations and to have a good understanding of the problematic that is the subject of our research, it was essential to start with a literature review.

The second step was to verify the validity (or otherwise) of all the principles identified in the literature, based on field observations. These observations were made, as in any exploration, through interviews with representatives of different governmental and non-governmental institutions involved in the WASH sector, but also through questionnaires that were distributed to households in one district of the Goma township.

3.2.2. Data Collection

Two sources of data were used:
On the one hand, a primary source through:

1. Interviews following a previously developed interview guide. Through this technique, we collected, in a more precise and complete way, information on ministries, agencies and departments involved in WASH sector, their role and the major programs undertaken by the Congolese government to achieve SDG 6. The ministries interviewed are: the Ministry of Environment and Sustainable Development, the Ministry of Rural Development, the Ministry of Planning and the Ministry of Hydraulic Resources and Energy through respectively their following department/office/agencies: the Directorate of Water Resources, the National Office of Rural Hydraulics (Office National de l'Hydraulique Rurale-ONHR), the Congolese Observatory for Sustainable Development (Observatoire Congolais du Développement Durable-OCDD), REGIDESO-SA.

2. To complete the first wave of interviews, a second wave of interviews was conducted with representatives of various national and international NGOs that are assisting the Congolese government in the achievement of SDG 6. The purpose of these interviews was to collect data on the different programs related to SDG 6 undertaken by these NGOs in Goma. Unfortunately, among the three targeted NGOs including Tearfund, MercyCorps and Unicef, only Tearfund accepted to open its doors for the interview. As for others, the unavailability of their WASH experts didn't allow to do interviews.

3. Survey Questionnaires: Through this technique data on SDG 6 indicators were collected in Ndosho district. Addressed to households, and the national water agency,

these questionnaires will measure the current level of progress towards the achievement of SDG 6 in Goma township.

With a projected population of 93,036 in 2020 (see table), Ndosho district is divided into 31 avenues.
The formula used to calculate the sample size is as follows:

$$\text{Sample size} = \frac{\frac{z^2 \times p\,(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p\,(1-p)}{e^2 N}\right)}$$

With:

- N (population size) = 93,036
- e (Margin of error) = 0.055
- z (z-score) = 1.96
- p = 0.5

A total of 317 questionnaires were distributed and collected from households in the district.

On the other hand, a secondary source: literature review of both the UN reports on SDG 6, as well as documents related to the provision of safe drinking water and sanitation in Goma.

3.2.3. Data Analysis

Qualitative content analysis of the speeches and interviews conducted were our main data analysis tool. A Statistical Package for Social Science (SPSS) package was used to analyse data collected through questionnaires in order to obtain the breakdowns of SDG 6 indicators in Ndosho district.

3.3. To Assess the Progress of SGD 6

To assess progress towards SDG 6 in Goma, we used the indicators proposed by the United Nations in the 2030 Agenda. The household questionnaire was designed around indicators

6.1.1, 6.2.1 and 6.3.1. Thus, the assessment was made following the methodology and breakdown proposed by UN WATER in its Guide to Integrated Monitoring of Sustainable Development Goal 6 on access to water and sanitation published in 2017.

Understanding these targets and their indicators is an essential step in this assessment.

a) **Target 6.1: "By 2030, achieve universal and equitable access to safe and affordable drinking water for all"**

Normative interpretation of target 6.1

By 2030, achieve universal: Implies all exposures and settings including households, schools, health-care facilities and workplaces. This work was focused on households only.

And equitable: Involves the reduction and progressive elimination of inequalities between demographic sub-groups

Access: Implies sufficient water to meet domestic needs is reliably available close to home

To safe: safe drinking water is free of pathogens and does not have high levels of contamination by toxic substances.
And affordable: Payment for services does not represent a barrier to accessing water or prevent people from meeting other basic needs

drinking water: Water used for drinking, food preparation and personal hygiene

For all: Suitable for use by men, women, girls and boys of all ages, including people with disabilities.

Indicator 6.1.1 "Percentage of population using safely managed drinking water services"

Refers to the population using an improved drinking water source that is located on-site, available on demand and meets standards for fecal matter and priority chemicals.

This indicator is disaggregated by level of service:

1. If all of the above conditions are met, the service is said to be "safely managed"
2. If the drinking water, although from an improved source, does not meet the above criteria but the full journey, including waiting time, does not exceed 30 minutes round trip, the service is said to be "basic".
3. If the round trip to the improved water source takes longer, it is considered a "limited" service
4. If the water does not come from an improved source, the service is said to be "unimproved".
5. And finally the last breakdown is "No service".

An improved drinking water source can be: house, yard or field connections; public taps or standpipes; tube wells or boreholes; protected wells; protected springs and rainwater; bottled or sachet water.

b) Target 6.2: "By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations"

Normative interpretation of the target

Table 3. 3: Normative interpretation of the target 6.2

Text of the target	**Normative interpretation of the target**
By 2030, achieve access	Involves facilities close to home that can be easily reached and used in times of need
To adequate	Involves a system that hygienically protects people from human contact with excreta and also allows for the safe reuse/treatment of excreta on site, or transport and safe treatment off site
and equitable	Involves reducing and progressively eliminating inequalities between population subgroups

sanitation	Sanitation is the provision of facilities and services to manage and dispose of human urine and feces
And hygiene	Hygiene represents the conditions and practices that contribute to the preservation of health and prevent the spread of disease, including hand washing, menstrual hygiene management and food hygiene.
For all	Can be used by men, women, girls and boys of all ages, including people with mobility impairments
And ending open defecation	And ending open defecation Adult and child excreta are deposited (directly or after being covered with a layer of soil) in the bush, field, beach or other open space, dumped in a drainage ditch, river, sea or other body of water, or wrapped in temporary material before being disposed of
Paying particular attention to the needs of women and girls,	involves reducing the drudgery of water collection and enabling women and girls to manage sanitation and hygiene needs with dignity. Special attention should be paid to the needs of women and girls in 'high use' places such as schools and workplaces, and 'high risk' places such as health facilities and detention centers
And people in vulnerable situations	Involves attention to specific WASH needs encountered in 'special cases', including refugee camps, detention centers, mass gatherings and pilgrimages

Indicator 6.2.1 "Percentage of population using safely managed sanitation services, including handwashing facilities with soap and water

Two sub-indicators are used to monitor this indicator, including the percentage of the population using safely managed sanitation services and the percentage of the population with basic handwashing facilities at home.

The percentage of the population using safely managed sanitation services is the proportion of the population using an improved household sanitation facility that is not shared with other households and whose excreta are treated and disposed of on site, or transported and disposed of off-site. Improved sanitation facilities include flush toilets (manual or not) connected to sewers or septic tanks, pit latrines, ventilated pit latrines, pit latrines with slab or ventilation and composting toilets.
Sanitation facilities that do not meet the above criteria for excreta treatment are classified as 'basic' sanitation services. If the sanitation facilities are shared with other households, they are considered 'limited' sanitation services.

The existence of handwashing facilities is used as a proxy indicator to assess the handwashing behavior of the population. Households with handwashing facilities at home with soap and water meet the criteria for a 'basic' handwashing facility. Households with handwashing facilities at home without soap and/or water meet the criteria for a 'limited' handwashing facility Handwashing facilities refer to devices that can hold, transport or regulate the flow of water to facilitate handwashing.

c) **Target 6.3: "By 2030, improve water quality by reducing pollution, eliminating waste dumping and minimizing emissions of chemicals and hazardous materials, halving the proportion of untreated wastewater, and significantly increasing the safe recycling and reuse of water globally. "**

Indicator 6.3.1 "Proportion of wastewater treated safely"

This involves the percentage of wastewater generated by households (sewage and fecal sludge) and economic activities that is treated safely. In this work we have limited ourselves to domestic wastewater. The household component of the indicator, which is monitored as part of the sanitation chain, is directly linked to indicator 6.2.1.

Data can be broken down by treatment technology used (primary, secondary, tertiary), source in some countries (household, economic activity) and receiving element (freshwater, sea, land).

3.4. Analyze of the survey questionnaire

As mentioned above, the survey questionnaire was designed to assess the indicators of SDG 6 and more specifically indicators 6.1.1, 6.2.1 and 6.3.1. For this purpose, the questionnaire was divided into 5 parts:

a) General information in which we find different information such as: the number of people in the household, the number of men and women, the gender of the head of the household as well as the main activity of the head of the family.

b) Proportion of population using safely managed drinking water services: Reflecting indicator 6.1.1, the set of questions in this section aims to provide information to disaggregate the indicator, such as the main source of water supply, location of the main source of water in relation to households, availability of water, etc.

c) Proportion of population using safely managed sanitation services: Comprising a total of 16 questions, like the previous section, this section sought to disaggregate indicator 6.2.1.

d) Proportion of the population with on-site handwashing facilities with soap and water: This section asked about the handwashing behavior of the survey population and the number of households with handwashing facilities.

e) Proportion of domestic wastewater treated safely: This section asked about the proportion of households that treated their wastewater before reusing it.

Apart from the information provided in the General Information section, the questionnaire contains a total of 41 questions spread over the 4 sections.

4. RESULTS AND DISCUSSION

4.1. Introduction

In DRC, the launch of the Sustainable Development Goals coincided with two major events that have brought about changes in the drinking water, hygiene and sanitation sector:

Firstly, the promulgation of the water law of 15 December 2015. A law which, although incomplete, as we said in the literary review, has nevertheless brought innovations to the water, hygiene and sanitation sector, which was previously governed by a dozen or so often incoherent and temporary decrees and orders. The law provides guidelines on the management of the country's water resources, priority water uses and emphasises the liberalisation of the sector by encouraging public-private cooperation.

Secondly, in addition to the water law, on 14 December 2015, through a decree, the DRC carried out reforms within the inter-ministerial organisation that manages the water, hygiene and sanitation sector. Among these reforms, the name of the organisation was changed from CNAEA-Comité National d'Action de l'Eau, de l'Hygiène et de l'Assainissement to CNAEHA-Comité National d'Action de l'Eau et de l'Assainissement. This reform has brought the structure into line with the expectations of Goal 6 of the 2030 Agenda by integrating the water, hygiene and sanitation components.

4.2. The Administrative Organisation of the Water and Sanitation Sector in the DRC

The decree of creation of the CNAEHA, made available to me during my internship at the Executive Secretariat of the CNAEHA, brought more clarification and completed what was said in the literary review on the organisation of the water, hygiene and sanitation sector in DRC.

Divided into 4 titles and 35 articles, the decree describes:

4.2.1. The mission and the different tasks attributed to CNAEHA

The CNAEHA is a strategic structure that is responsible for developing and ensuring the implementation of rehabilitation and development programs in the drinking water, hygiene and sanitation sector. More specifically, it is responsible for:

- Coordinating the reform of the drinking water, hygiene and sanitation sector;

- Define the main options, priorities and strategy for sector development;
- Align all sector interventions with government priorities;
- Plan and program sectoral studies, project selection and master planning;

- Mobilizing resources, seeking capital and developing financial and technical capacity; - Increasing the absorption capacity of financial means by strengthening the institutional infrastructure.

4.2.2. The organization and functioning of the CNAEHA

The crucial role of water in the social, economic and environmental frameworks of life on earth, makes the field of drinking water, hygiene and sanitation a multi-sectoral field. This makes the organization of CNAEHA somewhat complex due to the involvement of almost all ministries in the sector.

The CNAEHA comprises the following bodies:

a) The Steering Committee: This is the decision-making body of the CNAEHA It is composed of a chairman who is the Minister in charge of Planning, three vice-chairmen who are successively the Minister in charge of Environment, the Minister in charge of Water Resources and Energy and the Minister in charge of Public Health as well as 21 members including 19 ministries, 1 representative of the office of the President of the Republic and 1 representative of the office of the Prime Minister.

b) The Executive Secretariat: It ensures the regular monitoring of actions undertaken and to be undertaken by CNAEHA. It is headed by an Executive Secretary and his Deputy. It has a staff of about thirty.

c) Technical Commissions: responsible for developing CNAEHA's programs in the areas of their competence, they are three in number including: the drinking water commission, the hygiene and sanitation commission as well as the hydrological and hydrogeological studies commission. Each commission is composed of a President, a Vice-President and members.

d) Provincial Committees: At the level of each province, the Provincial Committee for Water, Hygiene and Sanitation Action-CPAEHA is established. Chaired by the Governor of the province, the CPAEHA has almost the same organization as the CNAEHA with some differences.

e) Territorial Committees: as at the provincial level, a Territorial Committee for Water, Hygiene and Sanitation Action-CTAEHA is established in each territory (Minister, 2015).

Thus, we note that:

The organization of the sector exists on three levels: at the national level (CNAEHA), the provincial level (CPAEHA) and the territorial level (CTAEHA);

As CNAEHA is the structure that coordinates the sector at the national level, CPAEHA and CTAEHA are part of CNAEHA's organs.

The organization chart shown in Figure 4.1 can be proposed:

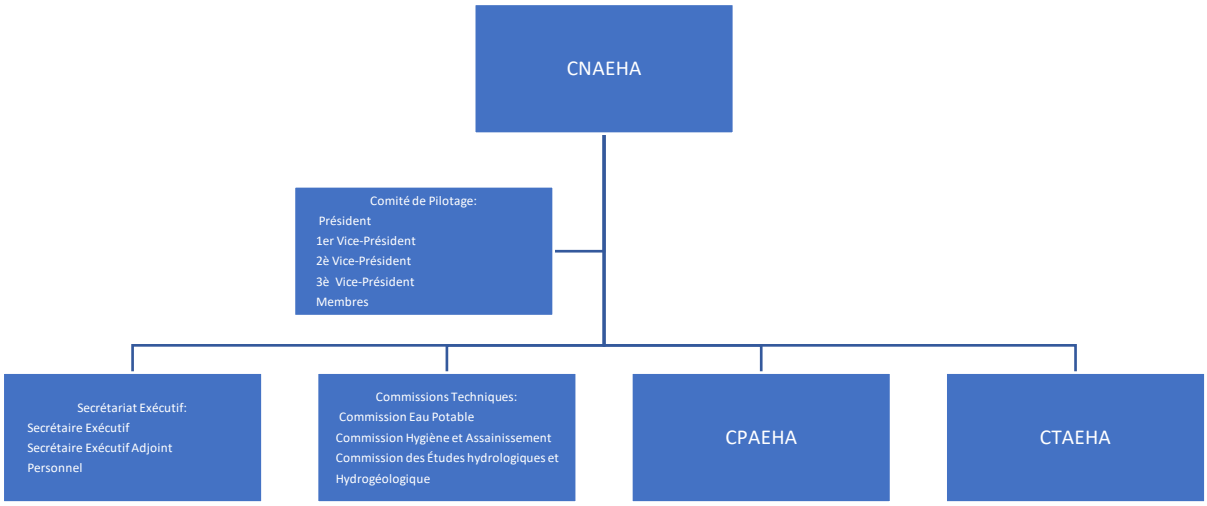

Figure 4.1: Organizational chart of CNAEHA

4.3. The Creation of the OCDD and the Contextualization and Prioritization of the SDGs in DRC

In order to meet the expectations of the 2030 Agenda, the DRC created the Observatoire Congolais du Développement Durable-OCDD in April 2016. The OCDD is a technical structure of the Ministry of Planning and Revolution of Modernity whose mission is to monitor and evaluate the implementation of the SDGs.

As such, it is responsible for:

- technically validate the terms of reference of studies, surveys, evaluations and other technical work
- proposing and chairing ad hoc steering committees for surveys and technical work
- proposing development targets and indicators;
- monitoring and evaluation of SDGs, the Human Development Index (HDI) and other development indicators
- Produce annual reports, technical notes and related newsletters;
- Integrate results into national and provincial policies and strategic plans

As emphasized at the UN level, it is up to each country to implement the SDGs according to its national realities and specificities. To do so, the country must choose its priorities in terms of the SDGs through the process of contextualization and prioritization of the SDG targets at both national and provincial (localization) levels. Led by OCDD, this process culminated in October 2016 with the publication of a national report.

Only 105 out of 169 targets were concerned by the prioritization process, taking into account 43 targets related to means of implementation, the 19 targets related to partnership and the 2 targets that do not apply to developing countries. As a result of this process, 17 SDGs, 38 targets and 58 indicators were prioritized for the first five-year period (2016-2021) of the 2030 Agenda.

For the SDG 6, only 2 targets were prioritized, namely target 6.1 ("By 2030, achieve universal and equitable access to safe and affordable drinking water for all") and target 6.2 ("By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations"). This means that, during the period 2016-2021, all plans and actions of the Congolese government should be focused on these two targets.

4.4. Programs Undertaken to Improve the Water, Hygiene and Sanitation Sector in DRC

During my internship, the Executive Secretariat of CNAEHA had made available to me documents related to ongoing programs and plans initiated by the Congolese government and other partners in order to achieve SDG 6.
These programs are: The National Water-Hygiene-Sanitation-PNAEHA Program, the Multisectoral Strategic Plan for the Elimination of Cholera-PMSEC, and the Roadmap of Open Defecation eradication.

4.4.1. National Water-Hygiene-Sanitation Program

In the race to achieve the SDGs, and in particular SDG6, the DRC, on the initiative of the President of the Republic, through its structure in charge of coordinating the WASH sector (CNAEHA) and in the Global Partnership "Sanitation and Water for All" (SWA), has drawn up the National Water-Hygiene-Sanitation Program in 2019. This program aims to contribute to the improvement of the living conditions of the population in the DRC. To do this, it intends to organize, boost and accelerate the actions of various stakeholders in the sector in order to ensure that the Congolese population has access to safe drinking water supply and sanitation services.

Covering the period from 2020 to 2030, the program, subdivided into 4 sub-programs including the water resources sub-program (1), the water supply sub-program (2), the sanitation sub-program (3) as well as the hygiene sub-program (4), constitutes a cross-cutting and pragmatic framework declining all the actions to be carried out not only in the 4 sub-programs but also in the reinforcement of the human capacities. In addition, the program includes the different implementation strategies, the monitoring mechanism as well as the cost and financing required for its implementation.

A total of 83 actions are foreseen in the whole program, of which 10 actions for sub-program (1), 18 actions for sub-program (2), 33 actions for sub-program (3), 17 actions for sub-program (4) and 5 actions for capacity building.

The total budget for the implementation of the program is estimated at USD 7,722,735,420.00. Taking into account the timeframe for implementation, these actions are classified as short,

medium and long term.

The expected results of this program are numerous, including:

a. The DRC's water resources are managed in a sustainable manner;
b. Leadership in the continent and in the world is ensured on the scale of its potential;
c. Rates of access to water, sanitation services and good hygiene practices are increased with equity;
d. Rates of water-related diseases, lack of good hygiene practices and poor sanitation are reduced;
e. Institutional capacity of the water sector on governance, regulation, coordination, planning, monitoring and evaluation and reporting on sector progress is strengthened and adapted;
f. Private operators invest in the water, sanitation and hygiene sector;
g. Private operators invest in the water, sanitation and hygiene sector; In harmony with the public finance law, the mechanisms for self-financing of water and sanitation services are operational;
h. The management of household, industrial, mining, radioactive and municipal waste, etc. is improved in a sustainable manner;
i. Hygiene services are operational at all levels (schools, hospitals, etc);
j. Infrastructure, equipment and materials for hygiene services are improved at all levels;
k. Local production of water treatment inputs is ensured;
l. The skills of EHA sector actors are strengthened;
m. EHA trade schools are operational;
n. Watercourses are protected from pollution.

(CNAEHA, Le Programme National Eau-Hygiène-Assainissement « PNEHA » 2020-2030, 2019)

4.4.2. Multisectoral Strategic Plan for Cholera Elimination in DRC 2018-2022

4.4.2.1. Introduction

In the period from 2008 to 2012, the total number of cholera cases in 69 endemic countries, mainly located in Sub-Saharan Africa and South-East Asia, was estimated at between 1.3 and 4 million, leading to the death of between 21,000 and 143,000 people each year (WHO, 2018). From 2013 to 2017, the number of reported cases was 624188 including 8057 deaths (i.e. a case fatality rate of 1.29%). During this period, Africa was the most affected with approximately 48.68% of the global total (i.e. 303850 cases) and 73.81% of global deaths (i.e. 5947 deaths).

The cases per country in Africa are unevenly distributed: more than 60% of the total number of cases notified each year on the whole continent is concentrated in only 3 to 4 countries. The DRC is the only country in the world that was in the top five most affected countries by cholera from 2013 to 2016 each year. From 2013 to 2017, the DRC alone has continuously reported approximately 151010 cases of cholera and 3034 deaths (38% of the total cases and deaths reported by the entire African continent), representing a case fatality rate of 1.97%.

This shows how worrying the situation is in the DRC. Indeed, the main cause of cholera epidemics is the lack of access to safely managed water supply, hygiene and sanitation services, exacerbated by the political conflicts that have persisted in the country for over 20 years. These conflicts drastically reduce access to health services not only because of the flight of health workers but also because of the destruction of health infrastructures. To weaken the population, the belligerents also destroy basic infrastructure, including water supplies. In addition, when fleeing the conflicts, the populations live in very precarious conditions in terms of water, hygiene and sanitation, which encourages cholera epidemics. Malnutrition, poverty, low state funding for the health sector and demographic growth are also catalysts for cholera epidemics in the DRC.

Faced with the resurgence of several cholera epidemics and the failure of previous strategies to tackle the problem of cholera epidemics, the Ministry of Public Health (MSP) decided in July 2017 to set up the current National Program for the Elimination of Cholera and the Fight against Other Diarrheal Diseases (PNECHOL-MD).

4.4.2.2. Multisectoral Strategic Plan for Cholera Elimination in DRC 2018-2022

In general, this Plan seeks to contribute to the improvement of the health status of the population of the DRC through the reduction of morbidity and mortality attributable to cholera and other diarrheal diseases. Specifically, it seeks to:

- Combat the recurrence of cholera outbreaks in epidemic and endemic areas throughout the DRC;
- Reduce the annual incidence rate to less than 1 confirmed case per 1000,000 inhabitants, i.e. less than 50 confirmed cases per year at the national level;
- Reduce to 0 culture-confirmed cases in the areas that have benefited from the intervention package by the end of 2022;
- Reduce by 50% the incidence of other diarrheal diseases in DRC.

The plan is based on 7 strategic axes which are :

- ✓ Strengthening global surveillance activities;
- ✓ Curative care;
- ✓ Implementation of sustainable interventions related to improving access to safe water, hygiene and sanitation in cholera sanctuary areas
- ✓ Implementation of interventions linked to the improvement of access to drinking water, hygiene and sanitation conditions in areas affected by cholera epidemics (endemic and epidemic) at the level of care structures and the community.
- ✓ Implementation of preventive vaccination activities in sanctuary areas and reactive vaccination in eligible epidemic areas according to the context;
- ✓ Operational research;
- ✓ Coordination, communication and advocacy.

In addition to the expected results in 2022, the plan outlines the logical framework, the detailed budget, the institutional framework within which the plan will be implemented, and the monitoring and evaluation plan. For a total of 45 expected results, the estimated budget is USD 100 851 220 (Plan, 2020).

4.4.3. Roadmap for the Eradication of Open Defecation in DRC 2020-2030

On 19 November each year, the United Nations celebrates World Toilet Day. The Day emphasises the importance of sanitation and advocates for access to clean and safe toilets for all. In other words, eradicating open defecation is the ultimate goal of the Day.

It is in this same perspective that this roadmap, emanating from the PNEHA, has been elaborated. Indeed, it sets out the various actions that the Congolese government must carry out in the period from 2020 to 2030 to ensure the end of open defecation on the national territory. According to the MICS reports, from 2010 to 2018, the percentage of the population practising open defecation (OD) had fallen from 14.5% to 12% at the national level, with a disparity between the urban environment (from 3.1% to 4%) and the rural environment (18% to 19.1%).

The roadmap constitutes a programmatic framework describing the objectives, envisaged results, strategies and broad lines of action necessary for the eradication of OD throughout the country by 2030, with the results matrix.

The three (3) specific objectives of this Road Map are :

1. Develop an enabling environment for open defecation eradication at national, provincial and local levels;

2. To improve community hygiene and sanitation practices and increase household access to basic and improved infrastructure;

3. Accelerate change in social norms regarding Open Defecation.

The following activities will contribute to the achievement of the above objectives at all state levels: national, provincial and local. They are:

- Securing secure and continuous funding;

- Advocacy to increase political will;

- Development of better policies, strategies and regulations at local and national levels;

- Sanitation marketing to increase demand and supply of sanitation services and products;

- Cross-sectoral coordination and alliance building with civil society for communication and social mobilisation and behaviour change;

- strengthening relevant institutions and knowledge management.

At the community level, to improve hygiene and sanitation, the main activities will be :

- Triggering and accompanying communities to end OD themselves, on their own initiative;

- Post-program accompaniment of the community to reduce faecal contamination and reinforce good habits. These activities will include an initial triggering of the whole community and selected groups in rural or urban areas;

- Training and support to a sanitation committee, possibly included as part of the Community Animation Cell (CAC);

- Facilitation and follow-up visits;

- Technical support for the construction of family and institutional latrines.

To support behavioural change and make it sustainable, in each affected Province, a series of communication activities will be developed to change social norms towards Open Defecation which will include:

- Political advocacy

- Social mobilisation;

- Mass communication which includes awareness campaigns;

- Interpersonal communication, use of opinion leaders etc.

Thus, the operational coordination unit will be the territory or the commune.

The activities will be mainly implemented by the communities with the support and facilitation of government services.

The ToR will be implemented jointly by the Ministries of Environment and Sustainable Development and Public Health in accordance with their missions.

Other ministries, civil society and the private sector will also be involved according to their prerogatives.

The implementation of the ToR will be done in 2 Phases:

- **Phase 1 (2020 - 2023)** will progressively integrate the 9 provinces with the highest LAD rates in the DRC over a 4-year period. These provinces are: Lomami (40%), Haut Lomami (39.6%), Lualaba (39.6%), Kasai (36.6%), Kasai Cen- tral (30.4%), (Equateur 27.7%), Mai-Ndombe (23.4%), Kongo Central (22%) and Sankuru (21.6%).

- **Phase 2 (2024- 2030)** will consist of working mainly in the remaining 17 provinces. The last 2 years of this Phase will be dedicated to consolidation and the programme will focus on backward communities and the consolidation of social norms regarding Open Defecation.

This implementation will first require:

1. Obtaining the necessary funding for the operation of each geographical area of intervention;

2. The organisation, planning and implementation of preparatory activities;

3. Identifying and training the intervention teams;

4. Capitalization of villages certified as sanitized by PNEVA;

5. Progressive implementation of strategic and community activities in the 9 priority provinces;

6. The organisation of mid-term evaluations;

7. The progressive integration of the remaining 17 provinces;

8. Accompanying the communities in delay to consolidate the Ending of Open Defecation and to change the social norms related to the Open Defecation.

In fact, a monitoring system will be implemented at the local level to transmit monthly information to the National Coordination so that the latter can ensure the good functioning of the programme.

The budget for this Road Map has been estimated at 63,798,346 US dollars (USD) (CNAEHA, Feuille de Route pour l'éradication de la Défécation à l'Air Libre, 2020).

4.4.4. Discussion

Despite the ambition shown through these programs to boost progress towards the achievement of SDG 6, it should be recognized that challenges to be overcome are also enormous and make the implementation of the programs less likely. The major challenge is the availability of funds. As it can be seen from the programs budget, the implementation of actions in the water, hygiene and sanitation sector requires a lot of resources that the Congolese government is not able to make available. The program provides for certain measures to alleviate this problem, such as the introduction of taxes... measures that have not yet been implemented**.**

Again, through these different documents that were available as well as the different interviews, it was found that the biggest problem in the DRC is not the lack of knowledge of what to do but rather the lack of a favorable climate for the execution of what needs to be done. This will require adequate institutional organization, development of strategies and action plans, availability of funds and monitoring program. These are major challenges facing the implementation of these different programs.

The field of drinking water, hygiene and sanitation is multisectoral due to its vital importance in life. To realize this, one has to look at the number of ministries, agencies and other stakeholders involved mentioned in the decree creating the CNAEHA. This makes the organization of the sector and the alignment of actions undertaken very complex.

The CNAEHA, which is an inter-ministerial institution, is not organizationally, financially and technically capable of meeting the needs of the Congolese population in terms of water, hygiene and sanitation. Limiting itself to the strategic aspect, it creates a gap between what should be done according to the programs and the reality on the ground (operational aspect).

Most of the members of CNAEHA are not permanent. The steering committee, which is the decision-making body, is composed of ministers who, overwhelmed by their agendas, do not have adequate time to devote to CNAEHA. The Technical Commissions composed of Chairpersons, Vice-Chairpersons and dozens of members are not permanently attached to CNAEHA and meet once in two months. The Executive Secretariat which ensures the permanence of CNAEHA is technically less equipped. With such an institutional set-up, it is

downright impossible to meet the challenges facing the country in the field of water, hygiene and sanitation.

4.5. To Analyse and Measure the Actions Undertaken in Goma Township in Favour of SDG 6;

The actions undertaken in the city of Goma in the drinking water, hygiene and sanitation sector are numerous and varied. This is due to the presence of several national and international NGOs in the city. Indeed, due to its situation of insecurity and political unrest, the city has attracted a number of humanitarian partners who are trying to alleviate the negative consequences that these long years of unrest can have on the living conditions of the population. In total, according to Cluster Wash DRC, which also has the mission of coordinating our actions, orienting our actions and monitoring our actions on the ground, there are a total of 9 partners intervening in the said sector in Goma, including: 4 international NGOs (Tearfund, WHH-AAA, HEKS-EPER Malteser), 3 national NGOs (BDRInt, DEBUHSE, ARDE RDC), one state organization (CPAEHA) and one agency of the United Nations system (UNICEF). In addition, there are the efforts made by REGIDESO-SA, the only company that supplies drinking water to the Goma population.

I have not found an official document from NGOs or state agencies that mentions the different projects undertaken in the sector in Goma. However, their actions, according to the different interviewees, vary from simple technical assistance to financial assistance as well as field work such as the construction of standpipes, the construction of sanitary toilets in schools and awareness campaigns on good hygiene practices.

More specifically,

1. In its mission to improve access to WASH services in order to reduce the incidence of waterborne diseases and to strengthen WASH management systems to make them more sustainable in order to meet the 2030 Agenda, Tearfund, an NGO working in Goma since 2008, is carrying out the following actions:

- Construction/ Rehabilitation of drinking water systems

- Supporting communities to improve their sanitation and hygiene services

- Establishing sustainable WASH governance

- Institutional support in the WASH sector for the sustainable support of beneficiaries

-Improving community WASH knowledge through mass sensitization and specific training.

2. REGIDESO, for its part, is trying to take up the great challenge of meeting the population's need for drinking water supply. A challenge which until now has been insurmountable because of the faster than expected growth of the population. Over the past six years, the company has been working to increase its production capacity by building new catchment stations and pumps, expanding the water supply network and equipping its plants with new pumps. These actions have increased the production of clean water from 23,000 cubic meters to 42,000 cubic meters from 2015 to 2020.

4.6. To Assess the Progress of SGD 6 in Goma Township and Make a Time Projection on the Overall Results in 2030.

4.6.1. Studied Population

The survey was conducted in the Ndosho district. The number of questionnaires distributed and collected in the households was 317 for a total of 2364 individuals registered (Table 4.1). Of the 317 households, only 281 gave the exact gender composition of their members, with 997 males and 1073 females recorded (Table 4.1). This corroborates the data from the National Institute of Statistics, which shows that women outnumber men in Goma town.

Table 4. 1: Number and sex of studied population

	N	Minimum	Maximum	Sum	Mean
	Statistic	Statistic	Statistic	Statistic	Statistic
People in the household	317	1	25	2364	7.46
Male in the household	281	0	11	997	3.55
Female in the household	281	0	14	1073	3.82

4.6.2. Assessment of Indicator 6.1.1.

a. Sources of water

Table 4. 2: Main source of water supply

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Tap household	17	5.4	5.4	5.4
	Public tap	14	4.4	4.4	9.8
	Storage tank	286	90.2	90.2	100.0
	Total	317	100.0	100.0	

As can be seen in the table, the most commonly used water source is the tank (90.2%), followed by the tap (5.4%) and finally the standpipe (4.4%). The latter two sources are considered improved water sources. However, for the tank, its classification as an improved source may lead to a thousand reflections. The tank is not included in either the improved or unimproved water sources in the definition given by WHO (see "Improved water sources").

However, among the sources of unimproved drinking water supply is the tanker supply. Since the tanks in question found in the Ndosho district are not connected to a water distribution network, the only way to fill them is by tanker. From this, it can be concluded that the tank is an unimproved source of water supply.

Thus, 90.2% of the surveyed population use an unimproved water source and only 9.2% use an improved source.

b. **Distance between the main water source and the household**

Table 4. 3: Is the main source located in your property?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	33	10.4	10.4	10.4
	NO	284	89.6	89.6	100.0
	Total	317	100.0	100.0	

89.6% of the surveyed population is obliged to move outside their residence to get water.

Table 4. 4: if NO, Time spent on collection of water home

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		33	10.4	10.4	10.4
	Less than 30 minutes	235	74.1	74.1	84.5
	30minutes to 1hour	44	13.9	13.9	98.4
	More than 1 hour	5	1.6	1.6	100.0
	Total	317	100.0	100.0	

74.1% of the population who are obliged to go outside their plots to get water take less than 30 minutes to return home with this precious commodity. 13.9% travel between 30 minutes and an hour and 1.6% travel more than an hour.

c. Availability of water when needed

Table 4. 5: Water is always available when needed

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	18	5.7	5.7	5.7
	NO	299	94.3	94.3	100.0
	Total	317	100.0	100.0	

Only 5.7% of the surveyed population attest that they find water when they are in need. As for the rest, they attest that water is available every day but not at all times of the day when they need it.

d. **Breakdown of water supply services in Ndosho district.**

From table 4.2. we already know that 90.2% of the studied population use an unimproved water source which implies an unimproved water supply service.

Table 4. 6: Safely managed water supply services

Is the main source located in your property?	Water is always available when needed			Frequency	Percent	Valid Percent
YES	YES	Valid	Storage tank	6	100.0	100.0
	NO	Valid	Storage tank	27	100.0	100.0
NO	YES	Valid	Tap household	1	8.3	8.3
			Storage tank	11	91.7	91.7
			Total	12	100.0	100.0
	NO	Valid	Tap household	16	5.9	5.9
			Public tap	14	5.1	5.1
			Storage tank	242	89.0	89.0
			Total	272	100.0	100.0

The table above shows that none of the conditions required for the service to be qualified safely managed are met. Thus, we can conclude that in Ndosho district none of the households use safely managed water supply services.

Table 4. 7: Basic and limited water supply services

Main source of water supply	if NO, Time needed to go-collect water-and reach home			Main source of water supply	if NO, Time needed to go-collect water-and reach home
Tap household	Less than 30 minutes	N	Valid	14	14
			Missing	0	0
	30minutes to 1hour	N	Valid	3	3
			Missing	0	0
Public tap		N	Valid	1	1
			Missing	0	0
	Less than 30 minutes	N	Valid	2	2
			Missing	0	0
	30minutes to 1hour	N	Valid	11	11
			Missing	0	0
Storage tank		N	Valid	32	32
			Missing	0	0
	Less than 30 minutes	N	Valid	219	219
			Missing	0	0
	30minutes to 1hour	N	Valid	30	30
			Missing	0	0
	More than 1 hour	N	Valid	5	5
			Missing	0	0

Only 17 out of 317 households (5.36%) use basic water supply services and 14 out of 317 households (4.42%) use limited water supply services.

Thus, in conclusion:

90.22% of households use unimproved services
5.36% of households use basic services

4.42% of households use limited services

0.00% of households use improved services

These figures show how target 6.1 is far from being achieved in the Ndosho district.

4.6.3. Assessment of Indicator 6.2.1.

a) Assessment of indicator 6.2.1.a

Table 4. 8: Availability of Toilet

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	311	98.1	98.1	98.1
	NO	6	1.9	1.9	100.0
	Total	317	100.0	100.0	

Out of 100% of the surveyed population, 98.1% have toilets and 1.9% do not.

Table 4. 9: How many households use the available toilets

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		5	1.6	1.6	1.6
	Alone	275	86.8	86.8	88.3
	shared with other households	37	11.7	11.7	100.0
	Total	317	100.0	100.0	

Of the 317 households, 275 or 86.8% claim to have their own toilet, while 37 or 11.7% share their toilet with other households.

Table 4. 10: Types of toilets

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		5	1.6	1.6	1.6
	flush toilet	6	1.9	1.9	3.5
	Traditional	214	67.5	67.5	71.0
	Septic tank	22	6.9	6.9	77.9
	Pit toilet	70	22.1	22.1	100.0
	Total	317	100.0	100.0	

The table above shows the proportions of different types of toilets used in the Ndosho district. In total 5 types of toilets were recorded. These can be classified into two categories: improved toilets 30.9% (flush toilet, septic tank, pit toilet) and unimproved toilets 67.5% (traditional toilet).

Table 4. 11: Proportion of households that treat and dispose their excreta

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		5	1.6	1.6	1.6
	YES	2	.6	.6	2.2
	NO	310	97.8	97.8	100.0
	Total	317	100.0	100.0	

Excreta treatment is almost non-existent in the Ndosho district. As there is no domestic sewage system, each household manages to empty their toilets once they are full. Some do it themselves, others hire private individuals to do it. Emptying is simply moving and burying the excreta in the ground to another location other than where the toilet is located but still within the plot. Thus, we can conclude that in the Ndosho district no household uses improved sanitation facilities.

Table 4. 12: Breakdown of Indicator 6.2.1.a

If YES, what type of toilet it is	Do you use it alone or it is shared by many households			If YES, what type of toilet it is	Do you use it alone or it is shared by many households
		N	Valid	5	5
			Missing	0	0
flush toilet	Alone	N	Valid	5	5
			Missing	0	0
	shared with other households	N	Valid	1	1
			Missing	0	0
Traditional	Alone	N	Valid	182	182
			Missing	0	0
	shared with other households	N	Valid	32	32
			Missing	0	0
Septic tank	Alone	N	Valid	20	20
			Missing	0	0
	shared with other households	N	Valid	2	2
			Missing	0	0
Pit toilet	Alone	N	Valid	68	68
			Missing	0	0
	shared with other households	N	Valid	2	2
			Missing	0	0

The table above compares the results between the types of toilets and their personal or group use. After summation, we find that firstly 93 households (or 29.34% of the study population) have improved toilets that they use alone and secondly 5 households (or 1.58%) share their improved toilet with other households.

Thus, the breakdown of indicator 6.2.1.a for Ndosho district is as follows:
Unimproved sanitation services: 67.5%

Basic sanitation services: 29.34%

Limited sanitation services: 1.58%

No services: 1.58%

Improved sanitation services : 0%.

b) Assessment of Indicator 6.2.1.b

Table 4. 13: Proportion of household with handwashing equipment

Do you have handwashing equipment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	123	38.8	38.8	38.8
	NO	194	61.2	61.2	100.0
	Total	317	100.0	100.0	

Of 317 households surveyed, only 123, or 38.8%, had handwashing facilities.

Table 4. 14: Avaibility of water in the handwashing equipment

If YES, is water also available when needed

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		194	61.2	61.2	61.2
	YES	116	36.6	36.6	97.8
	NO	7	2.2	2.2	100.0
	Total	317	100.0	100.0	

Of the 123 households with handwashing facilities, only 116 report that they also have water available whenever they need it.

Table 4. 15: Households using soap

If YES, do you use also soap

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	199	62.8	62.8	62.8
YES	112	35.3	35.3	98.1
NO	6	1.9	1.9	100.0
Total	317	100.0	100.0	

Table 4. 16: Breakdown of the indicator

Do you have washing hand equipment	If YES, is what also available when needed	If YES, do you use also soap			Do you have washing hand equipment	If YES, is what also available when needed
NO			N	Valid	193	193
				Missing	0	0
YES	YES	YES	N	Valid	110	110
				Missing	0	0
		NO	N	Valid	6	6
				Missing	0	0
	NO		N	Valid	5	5
				Missing	0	0
		YES	N	Valid	2	2
				Missing	0	0

Comparing the 3 tables above and based on the definition proposed by WHO that households with handwashing facilities at home with soap and water meet the criteria for a 'basic' handwashing facility. Households with handwashing facilities at home without soap and/or water meet the criteria for a 'limited' handwashing facility, we retain that:

34.70% of households use basic handwashing facilities

4.10% of households use limited handwashing facilities

61.20% of households have no handwashing facilities.

4.6.4. Assessment of indicator 6.3.1.a:

Table 4. 17: Proportion of domestic wastewater safely treated

Do you threat your wastewater

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid NO	317	100.0	100.0	100.0

No household in the studied population treats its wastewater.

4.6.5. Discussion

Compared to the national averages for 2018, which set the rate of access to drinking water and to basic sanitation at 59% and 22% respectively, these results show a positive trend towards the achievement of SDG 6.

For indicator 6.1.1, the survey revealed that 100% of the surveyed population has access to safe water. However, the improvement of water supply services is still a major concern as 90.22% of the population still use unimproved services. Water quality also remains a controversial issue. The two REGIDESO-SA agents interviewed stated that the water supplied by REGIDESO-SA is regulated according to WHO standards. This statement is difficult to accept, especially for the city of Goma where chlorine is the only ingredient used to treat water. In the survey, a question allowed us to know that 67.9% of the population think that the water is not of good quality against only 19.5% who think the opposite. As for affordability, almost 100% of the population stated that the price of water is high and called for a reduction.

For access to basic sanitation, only a 7% increase has been achieved since 2018. This is a positive development, but it is still slow compared to the ambitions of the 2030 Agenda. In 2015, the global average rate of access to basic sanitation was 29%, as the survey just revealed. This means that, assuming a linear evolution, the city of Goma is 6 years behind the global trend in achieving this target.

The Congolese government still has a lot to do to achieve SDG 6. Improving water supply services means increasing REGIDESO-SA's production and expanding its network. Unfortunately, despite the efforts made by the various actors, production is still lower than the demand for water because of the rapid increase in the population.

The city of Goma is far from reaching the SDG6 target because it lacks an adequate sewage system for the evacuation of wastewater and a wastewater treatment plant. The challenges to be met are enormous suggesting that the DRC will not be able to achieve SDG 6 within the remaining time to 2030.

The table below shows the difference between the survey results and the 2015 sub-Saharan and global averages. We observe that unlike the global averages where improved services have large percentages, in the Ndosho district it is the unimproved services that are used in the majority.

Table 4. 18: Comparison of results

Types of services	Ndosho district in 2021	Sub-Saharian Countries average (2015)	World average (2015)
1. Access to drinking water			
Improved	0.00%	24%	71%
Basic	5.36%	34%	17%
Limited	4.42%	18%	4%
Unimproved	90.22%	16%	6%
No services	0.00%	8%	2%
2. Access to sanitation			
Improved	0%	0%	39%
Basic	29.34%	28%	29%
Limited	1.58%	18%	8%
Unimproved	67.5%	30%	12%

5. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

In regards to specific objectives outlined in Chapter One; the study concluded that:

i. The long years of political crises and wars had plunged the WASH sector in DRC into a problematic and chaotic state: the collapse of the institutional framework of the sector, the abandonment and/or destruction of the weak existing infrastructure and the freezing of investments. The drinking water, hygiene and sanitation sector in the DRC faces several challenges that make the achievement of SDG 6 difficult or impossible.

ii. The CNAEHA, which is an inter-ministerial institution, is not organizationally, financially and technically capable of meeting the needs of the Congolese population in terms of water, hygiene and sanitation. Limiting itself to the strategic aspect, it creates a gap between the various programs it (CNAEHA) drafts and the operational aspect, i.e., the execution of these programs on the ground.

iii. Through three main programs, the Congolese government shows its huge ambition for the achievement of SDG 6. Unfortunately, the unavailability of funds is a major challenge. This makes it difficult to carry out the actions planned in the various programs.

iv. The actions undertaken in the city of Goma in the drinking water, hygiene and sanitation sector seem to be numerous and varied. Nine partners are present including: four international NGOs (Tearfund, WHH-AAA, HEKS-EPER Malteser), three national NGOs (BDRInt, DEBUHSE, ARDE RDC), one state organization (CPAEHA) and one agency of the United Nations system (UNICEF). In addition, there are the efforts made by REGIDESO-SA, the only company that supplies drinking water to the Goma population. Their actions vary from simple technical assistance to financial assistance as well as field work such as the construction of standpipes, the construction of sanitary

toilets in schools and awareness campaigns on good hygiene practices.

v. The level of achievement of SDG 6 in the city of Goma, more specifically in the Ndosho district, does not augur well for the future. Indeed, the survey conducted gave the following results:

a) For indicator 6.1.1:

Unimproved water supply services: 90.22%
Basic water supply services: 5.36%
Limited water supply services: 4.42%
Improved water supply services: 0.00%

b) For indicator 6.2.1.a:

Unimproved sanitation services: 67.5%
Basic sanitation services: 29.34%
Limited sanitation services: 1.58%
No services: 1.58%
Improved sanitation services: 0%.

c) For indicator 6.2.1.b:

34.70% of households use basic handwashing facilities
4.10% of households use limited handwashing facilities
61.20% of households have no handwashing facilities.

d) For indicator 6.3.1.a

100% of domestic wastewater is not treated.

vi. As noted in the scope and limitations of this study, we were not able to achieve all of our objectives due to situations that were beyond our control. We hope that future research will continue where we left off.

5.2. Recommendations

For the achievement of SDG 6, the government of DRC need to take decisive measures as follows:

i. Replace the CNAEHA by the DNAEHA (Direction Nationale d'Action de l'Eau, de l'Hygiène et de l'Assainissement) which will be an autonomous public institution and will have within its jurisdiction the strategic and operational coordination of all activities in the sector. All DNAEHA staff will be permanent staff attached only to the services of the said Directorate;

ii. Build well-equipped technical infrastructure to house the Directorate and its various Sub-Directorates and Commissions. The Directorate could bring together REGIDESO, OVD, ONHR and DAS.

iii. Extension of the existing water production facilities to mitigate the rapid growing difference between the water demand and the production capacities on a long-term horizon;

iv. Find a self-financing mechanism for the WASH sector by implementing a decree requiring each Congolese household to pay a monthly sum calculated according to the income of each active member of the household, as well as creating national NGOs in the sector;

v. Provide the city of GOMA with water treatment plants and an adequate sanitation system.

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7. APPENDIX

7.1. HOUSEHOLD SURVEY QUESTIONNAIRE

Date : _____/____/_____

Numéro de fiche : _____

Nom de l'enquêteur : _____

1. Information Générale

1. Commune :
2. Quartier :
3. Avenue :
4. Nombre de personnes dans le ménage :
   4.1. Enfants (0-15ans) : filles : Garçons :
   4.2. Jeunes (15-35ans) : Hommes : Femmes :
   4.3. Plus de 35ans : Hommes : Femmes :
5. Sexe du chef de ménage : 1. Homme□. 2. Femme□
6. Activité principale du chef de ménage : 1. Commerçant□. 2. Enseignant□ 3. Fonctionnaire□. 4. Entrepreneur□ 5. Mécanicien□ 6. Chauffeur □ 7. Pêcheur□ 4. Autre□_____

2. Proportion de la population utilisant des services d'eau potable gérés en toute sécurité

1. Quelle est votre source principale d'approvisionnement en eau : 1. Robinet□. 2. Borne fontaine□ 3. Tank□. 4. Camion-citerne□ 5. Vélo□ 6. Eau de surface □ 7. Eau de pluie□ 4. Autre□ _____

2. Nommez vos trois sources secondaires d'approvisionnement par ordre d'accessibilité si possible :

3. La source principale est-elle située dans votre propriété ? : 1. Oui□. 2. Non□

   3.1. Si oui, l'utilisez-vous seul ou avec d'autres ménages ? 1. Seul□ 2. Avec d'autres ménages□

   3.2. Si non,

      3.2.1. Quelle est la distance entre la maison et le point d'eau le plus proche ? 1. moins de 50 m□ 2. 50 m à 100 m□. 3. 100 m à 150 m□ 4. 150 m à 200 m□ 5. Plus de 200 m□

      3.2.2. Combien de temps vous faut-il pour apporter de l'eau au foyer (Aller - Tirer - Retourner) ? 1. moins de 30minutes□ 2. Entre 30minutes et 1heure□. 3. Plus d'une heure□

      3.2.3. Quels types de récipients sont utilisés pour recueillir l'eau ? 1. Bidons□ 2. Bassins□. 3. seaux□ 4. Autres□……

      3.2.4. L'eau collectée est-elle couverte pendant le transport ? 1. Oui□. 2. Non□

      3.2.5. Quels sont les moyens de transport de l'eau dont vous disposez ? 1. Vélos□ 2. Véhicule□. 3. Pieds□ 4. Moto□

      3.2.6. Qui sont responsables de la collecte de l'eau dans votre foyer ? 1. Enfants□ 2. Femmes□. 3. Hommes□

4. Quelle est la taille du récipient de stockage de l'eau dont dispose votre ménage ? 1. 50 litres□ 2. 100 litres□. 3. 200 litres□ 4. 400 litres□ 5. > 400 litres

5. L'eau est-elle toujours disponible à votre principale source d'approvisionnement lorsque vous n'en avez besoin ? 1. Oui□. 2. Non□

   5.1. Si non,

5.1.1. À quelle fréquence est-elle disponible ? 1. Tous les jours mais pas à tout moment□ 2. Trois fois par semaine□. 3. Deux fois par semaine□ 4. Une fois par semaine□

5.1.2. Que faites-vous pour avoir l'eau ? 1. Aller à une autre source plus éloignée□ 2. Acheter chez les revendeurs□. 3. Aller chercher l'eau au lac□ 4. Collecter l'eau de pluie□ 5. Autres……

6. Rencontrez-vous des difficultés pour accéder à l'eau dans votre avenue ? 1. Oui, Lesquelles□. 2. Non□

7. Êtes-vous satisfait de la quantité de votre approvisionnement en eau ? 1. Oui□. 2. Non□

8. Quelle quantité d'eau recueillez-vous par jour en moyenne ? 1. Inférieur à 50 litres□ 2. 50 à 100 litres□. 3. 100 à 200 litres□ 4. 200 à 300 litres□ 5. > 300 litres□

9. Quelle quantité d'eau utilisez-vous en moyenne par jour ? 1. Inférieur à 50 litres□ 2. 50 à 100 litres□. 3. 100 à 200 litres□ 4. 200 à 300 litres□ 5. > 300 litres□

10. La quantité d'eau utilisée répond-elle à tous vos besoins quotidiens ? 1. Tout à fait d'accord □ 2. D'accord □. 3. Pas d'accord □ 4. Pas du tout d'accord□ 5. Je ne sais pas□

11. Pensez-vous que l'eau que vous utilisez est de bonne qualité ? 1. Tout à fait d'accord□ 2. D'accord□. 3. Pas d'accord □ 4. Pas du tout d'accord□ 5. Je ne sais pas□

12. Utilisez-vous un traitement supplémentaire de l'eau ? 1. Oui□. 2. Non□

12.1. Si oui, lequel ? 1. Bouillir□ 2. Ajouter l'eau de javel□. 3. décantation□ 4. Filtration□ 5. Autres□……

13. L'eau que vous utilisez pour boire et préparer vos aliments provient de quelle(s) source(s) ?

14. Combien de robinets y a-t-il dans votre avenue ?

15. Combien dépensez-vous par semaine pour l'eau ? 1. Moins de 500FC □ 2. 500 à 1000FC□. 3. 1000 à 1500 FC □ 4. 1500 à 2000 FC □ 5. > 2000 FC □

16. Que pensez-vous du prix de l'eau ? 1. Moins cher □ 2. Cher□. 3. Adéquat□

17. Combien êtes-vous capable de payer un bidon de 20 litres pour avoir assez d'eau dans votre maison ?

18. Achetez-vous de l'eau en bouteille ? 1. Jamais□ 2. Parfois□. 3. Souvent□ 4. Toujours□ 5. Seulement quand je suis malade□

19. En cas d'amélioration du système d'alimentation en eau potable dans votre avenue, êtes-vous prêt à participer à cette solution technique ?

19.1. Si non, pourquoi ?

19.2. Si oui, quel type de participation ? 1. Main d'œuvre□ 2. Argent□ (combien) 3. Autre□…….

3. Proportion de la population utilisant des services d'assainissement gérés en toute sécurité

1. Avez-vous des toilettes ? 1. Oui□. 2. Non□

1.1. Si non, où faites-vous vos besoins ? 1. Brousse□ 2. Drainage□. 3. Bord de la route□ 4. Ruisseau□ 5. Autres□…….

1.2. Si oui,

1.2.1. De quel type de toilettes s'agit-il ? 1. Moderne (avec la chasse d'eau)□ 2. Traditionnel□. 3. Fosses septiques□ 4. Latrines à fosse avec dalles□ 5. Latrines à fosse améliorée et ventilées□. 6. Autres□…….

1.2.2. Les utilisez-vous seul ou avec d'autres ménages ? 1. Seul□ 2. Avec d'autres ménages□ (préciser le nombre de personnes)

1.2.3. Vos toilettes sont-elles reliées à un système d'égouts ? 1. Oui□ 2. Non□.

Si non,

1.2.3.1. Comment videz-vous vos toilettes ?

1.2.3.2. Combien payez-vous pour le faire ?

1.2.3.3. Comment évaluez-vous ce prix ? 1. Moins cher □ 2. Cher□. 3. Adéquat□

1.2.3.4.Combien de fois par an videz-vous vos toilettes ? 1. Une fois par an □ 2. Deux fois par an□. 3. Autres□…….

1.2.3.5. Êtes-vous satisfait des services de vidange ? 1. Oui□ 2. Non□.

1.2.3.6. Où sont rejetés les excréments ?

1.2.4. Depuis combien de temps la latrine est-elle construite ?

1.2.5. A quelle fréquence la latrine est-elle nettoyée ?

1.2.6. Avez-vous des problèmes avec l'évacuation des excréments ? 1. Non□ 2. Oui, lesquels ?□

1.2.7. Êtes-vous satisfait de l'état sanitaire de vos toilettes ? 1. Non□ 2. Oui□

2. Vous arrive-t-il de devoir payer pour utiliser les toilettes ? 1. Non□ 2. Oui, Combien ?□

4. Proportion de la population disposant d'une installation de lavage des mains avec eau et savon sur place.

1. Vous lavez-vous les mains avec du savon après avoir quitté les toilettes ? 1. Jamais□ 2. Rarement□. 3. Parfois□ 4. Souvent□ 5. Toujours□. 6. Oui mais sans savon□

2. Disposez-vous d'un équipement destiné uniquement au lavage des mains à la sortie des toilettes ? 1. Non□ 2. Oui□

2.1. Si oui, de l'eau est-elle également disponible ? 1. Non□ 2. Oui□

2.1.1. Si oui, utilisez-vous également du savon pour vous laver les mains ? 1. Non□ 2. Oui□

2.1.2. Si non, pourquoi ?

2.2. Si non, pourquoi ?

3. Au cours de l'année écoulée, combien de personnes dans le ménage ont attrapé : le paludisme, le choléra, la fièvre typhoïde, l'hépatite A ?

5. Proportion d'eaux usées domestiques traitées de manière sûre

1. Quelle quantité d'eaux usées produisez-vous par jour ?

2. Traitez-vous vos eaux usées pour une utilisation ultérieure ? 1. Non□ 2. Oui□

2.1. Si oui,

2.1.1. Quelle est la proportion d'eau traitée que vous obtenez par rapport aux eaux usées traitées ?

2.1.2. Quelles techniques utilisez-vous ?

2.2. Si non, où évacuez-vous ces eaux usées ? 1. Dans la rue□ 2. Puits perdu□. 3. Canalisation des eaux usées□ 4. Autres□…….

3. Avez-vous des problèmes d'évacuation des eaux usées domestiques ? 1. Non□ 2. Oui□

3.1. Si oui, veuillez en citer trois principaux.

7.2. RESEARCH GRANT USE

S/No.	Item	Unit	Quantity	Amount* USD	Date	Link to Research Activity**	Comment*** (For Evaluator Only)
1	Covid test			**9500DZ= 72,17USD**	17/07/2021	Before I took my flight from Algiers to Kinshasa	
2	Flight ticket: Algiers-Kinshasa				18/07/2021	For my research	
3	**Covid test**			**45USD**	19/07/2021	Once at Kinshasa airport, it was mandatory for international flight passengers to do a covid test.	
4	Taxi from Kinshasa airport to the accommodation			**15USD**	19/07/2021	The accommodation was located in KITAMBO-MAGASIN (27Km)	
5	Internet recharge	Gb	65	**50USD**	22/07/2021		
6	**Printing and photocopies**	Pages	24	**6800 CDF= 3.5USD**	3/08/2021	Presentation letters, internship demand	
7	Face masks and gel		10 masks 1gel	**5500CDF = 2.83 USD**	12/08/2021		
8	Internet recharge	Gb	22	**20USD**	22/08/2021		
9	Face masks		10	**2500CDF = 1.5 USD**	24/08/2021		

10	Internet recharge	Pages	22	**20 USD**	03/09/2021		
11	Covid test			**45 USD**	06/09/2021	Before my flight from Kinshasa to Goma	
12	Flight ticket : Kinshasa-Goma			**243 USD**	07/09/2021	For the second part of my research	
13	Taxi : From the accommodation to Kinshasa airport			**30 USD**	07/09/2021		
14	Taxi : from Goma airport to home			**10USD**	07/09/2021	From the airport to my home MUGUNGA (14km)	
15	Face masks		10	**5000CDF = 3 USD**	08/09/2021		
16	**Printing questionnaires**	Pages	1328	**664000 CDF=** **341.7USD**	14/09/2021		
17	Internet recharge	Gb	35	**35 USD**	20/09/2021		
18	Face masks		10	**5000CDF = 3 USD**	27/09/2021		
19	Internet recharge	Gb	35	**30 USD**	14/10/2021		

20	Covid test			**40 USD**	18/10/2021	Before my flight from Goma to Kinshasa	
21	Taxi : from home to Goma airport			**10USD**	19/10/2021	From the airport to my home MUGUNGA (14km)	
22	Flight from Goma to Kinshasa			**213USD**	19/10/2021	After my research in Goma, I had to go in Kinshasa to apply for Algerian visa.	
23	Taxi : from Kinshasa airport to the accommodation			**15USD**	07/09/2021	From the airport to BARUMBU-DODOMA (21km)	
24	Internet recharge	Gb	35	**30 USD**	02/11/2021		
24	Covid test			**45USD**	08/11/2021		
25	Taxi : from the accommodation to Kinshasa airport			**30USD**	09/11/2021	From BARUMBU-DODOMA to the airport (21km)	
26	Flight Kinshasa-Goma			**213USD**	09/11/2021	Unfortunately, once in Kinshasa, my return ticket in Algeria was cancelled so I had to come back home in Goma.	

27	Taxi: from Goma airport to home			**10USD**	09/11/2021	From the airport to my home MUGUNGA (14km)	
28	Face masks		10	**5000CDF = 3 USD**	12/11/2021		
29	Internet Recharge	Gb	39	**30**	27/11/2021	Internet for final work and publishing	
30	Renting an apartment	month	2	**130**		During my stay in Kinshasa	
31	Data collection			**150**			
32	**TOTAL**	**1902.7 USD**					

To this total amount, it should be added the flight ticket cost from Algeria to Kinshasa bought by the institute administration.