

# Assessment of Water Availability and Hygiene and Sanitation Measures in Schools: A Descriptive Study in Schools in the City of Kisangani, DRC

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**How to cite this paper:** Eya-Bashuma, F.B., Kikwata, G.A., Lwanga, L.K., Tepungipame, A.T., Longembe, E.B., Malumba, Z.-A.K. and Kitronza, J.P.L. (2025) Assessment of Water Availability and Hygiene and Sanitation Measures in Schools: A Descriptive Study in Schools in the City of Kisangani, DRC. *Health*, 17, 624-636.

<https://doi.org/10.4236/health.2025.175040>

**Received:** April 10, 2025

**Accepted:** May 27, 2025

**Published:** May 30, 2025

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## Abstract

**Introduction:** The lack of school water supply infrastructure, handwashing facilities and toilets in good condition makes the school environment a high-risk area for diseases. This study aimed to assess the availability of water and hygiene and sanitation measures in schools in the Makiso Commune in the city of Kisangani. **Methods:** A descriptive study was conducted in 10 schools in the commune of Makiso, with 422 students and 120 teachers, during the period from September 1 to November 30, 2024. Descriptive statistics were performed using proportion and mean  $\pm$  SD. **Results:** Water was available in 93% of schools, connection to the REGIDOSO distribution network was the dominant source (74%) and 19% had water outside the school grounds. In 36% of schools, handwashing facilities were available, water and soap were present in 25%; 98% of schools had toilets, the most represented number being 3 to 4 toilets and 48% had urinals. The sanitation brigade existed in 25% of schools and the people responsible for maintaining toilets and the playground were daily laborers (41%). School waste was more often disposed of by open burning (86%) and 48% of schools did not have farming equipment for sanitation work. **Conclusion:** The availability of Water, Hygiene and Sanitation services is lacking in schools in the Makiso Commune in the city of Kisangani in terms of quality and quantity.

## Keywords

Water Availability, Hygiene and Sanitation, School Environment,

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Kisangani, DRC

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## 1. Introduction

Education is at the heart of Goal 4, which aims to “ensure inclusive and equitable quality education for all and promote lifelong learning opportunities” [1].

Safe and adequate water supplies in schools are prerequisites for the right to basic education for schoolchildren and for the achievement of Goals 4 and 6 of the Sustainable Development Goals. According to WHO standards. Each school must have a drinking water point accessible to all students in less than five minutes. Water points must be maintained regularly and protected against contamination; which would explain the need to reduce the distance to the minimum possible [2].

Students are less likely to drink enough water if they have to travel long distances to get it. This can lead to dehydration, which can affect concentration, academic performance, and overall health [2].

In the world, according to the World Health Organization WHO (2022), many schools are located in communities where there is a high prevalence of diseases due to unsafe drinking water. Globally, only 70% of schools have drinking water services and 29% of schools do not [3].

In 2021, the joint WHO and UNICEF report shows that 546 million children did not have access to a basic drinking water supply service at school; 258 million children did not have access to basic sanitation services at school, others among them had access to an improved drinking water point but without available water; 288 million still did not have access to a water supply service in their schools [4].

One in three primary schools and one in four secondary schools lack basic sanitation services and 539 million schoolchildren lack access to safe drinking water [4].

A previous UNICEF assessment of 49 resource-limited countries found that only 51% of schools had adequate access to water and 45% had adequate toilets. The findings of these studies showed that a range of gender-related and socioeconomic consequences are likely to result from insufficient attention to water, sanitation, and hygiene issues [5].

In Sub-Saharan Africa, nearly half of schools (49%) do not have access to safe drinking water, 44% of schools do not have latrines, and 27% do not have hand-washing facilities in schools. Regarding menstrual hygiene, only 36% of schools have menstrual hygiene facilities [5].

In a study conducted in Bamako schools (2020) on hygiene and sanitation, 86.7% of latrines were observed, 55.8% of water stations/jars were present and 67.3% of hand washing facilities were observed [6].

In Benin (2020), a study conducted in the communes of Zé and Lalo showed that 53% of schools in the commune of Zé and 46% of schools in the commune of

Lalo do not have a water source; 100% of schools in the commune of Zé have at least one latrine module, 23% of schools in Lalo do not. 68% of schools in the commune of Zé have hand-washing facilities, while it is 53% in the commune of Lalo [7].

In the Democratic Republic of Congo, the water, hygiene and sanitation (WASH) situation in schools is worrying and presents many major challenges. A large number of schools, especially in rural areas, do not have drinking water points.

The results of a study conducted in 2019 in Kinshasa, DRC, showed that only 33.8% of schools had a drinking water point, 74.2% of schools had staff responsible for hygiene and sanitation and that 90.04% of garbage cans did not exist in schoolyards [8].

The recent study conducted in 165 schools in the peri-urban area of the city of Kinshasa showed more alarming results on the WASH situation in schools: 10.9% of schools had a water point, 98.2% had functional latrines, of which 3.6% were found to be hygienic, 43% of schools had handwashing facilities, the functionality of which was significantly associated with the presence of water points in the school courtyard, and 2.4% of schools had bushes for menstrual hygiene management [9].

Studies on the availability of WASH services in schools in Tshopo province are not found in current literature.

In Kisangani, the water treatment plant (REGIDESO) built in 1953 and rehabilitated in 1979 produces 30,000 m<sup>3</sup> per day, a quantity considered insufficient compared to the needs of the current population of the city of Kisangani. This is why the water supply is irregular with an unequal distribution in the different municipalities of the city of Kisangani, which leads to personal or even local initiatives to meet the need for water.

There is also a proliferation of educational establishments with galloping student numbers with very little rigor in operating authorizations on WASH aspects in light of global challenges.

It is in this context that this study is conducted to take stock of the Water, Hygiene and Sanitation service in schools with a view to preparing a broader and more analytical study.

The objective of this study was to assess the availability of water and hygiene and sanitation measures in schools from the commune of Makiso in the city of Kisangani.

## **2. Materials and Methods**

### **2.1. Study Site**

This study was conducted in the urban commune of Makiso, one of the six communes of the city of Kisangani. The commune of Makiso alone has 125 primary schools (including 40 official, 26 denominational and 59 private), 140 secondary and vocational schools (including 37 state, 27 denominational and 76 private).

## 2.2. Study Population

It was made up of schools in the commune of Makiso, in the city of Kisangani in the province of Tshopo, represented by students and teachers.

## 2.3. Type and Period of Study

This is a cross-sectional study with a descriptive aim conducted in schools in the commune of Makiso during the period from September 1 to November 30, 2024.

## 2.4. Sampling

To determine the number of subjects to be included in the study, we used the SCHWARTZ formula as follows:  $n = Z^2 \cdot p \cdot q / d^2$ .

Considering the coefficient  $Z = 1.96$ ;  $p$  at 50% (proportion of students attending a school with availability of Water, Hygiene and Sanitation service which is unknown) and the margin of error ( $d$ ) estimated at 0.05; the calculated sample size was:  $n = (1.96)^2 \cdot 0.50 \cdot 0.50 / (0.05)^2$  or 384.

With an anticipated non-response rate of 10% (38 subjects), the total sample size was 422 subjects corresponding to the students. For convenience, we decided to take two teachers per class and per school, for a total of 120 teachers for 10 schools.

The schools were selected randomly from the exhaustive list of schools in Makiso commune, regardless of their network of affiliation. The 422 students were distributed equally among the 10 schools, with 42 students selected randomly.

Included in our study were any student or teacher selected at random, present at school on the day of the survey and expressed an interest in participating voluntarily in our study.

## 2.5. Data Collection Technique

Data collection was carried out using guided interview techniques with students and teachers using an interview guide and direct observation of water, hygiene and sanitation facilities and equipment, using an observation grid. These tools were pre-tested in 4 schools in a municipality neighboring the one where our study was conducted for their validation.

## 2.6. Data Analysis Technique

The collected data were organized in an Excel database that was exported to STATA 5 for analysis. Descriptive statistics were performed as proportions for categorical variables and mean  $\pm$  standard deviation for quantitative variables with symmetric distribution. The search for factors associated with WASH services was done using Pearson's chi-square test at the 5% threshold.

## 2.7. Ethical Considerations

This study was authorized by Field trip to the Faculty of Medicine and Pharmacy of the University of Kisangani and the educational subdivision of Kisangani. Par-

ticipation in the study was voluntary with informed consent. Anonymity was guaranteed from data collection to dissemination of the work.

### 3. Results

**Table 1** shows that students from the religious network and teachers from the private network were in the majority. The gender of the students was evenly distributed, but male teachers were dominant. The average age of the students was  $16.5 \pm 1.2$  years and that of the teachers was  $39.1 \pm 10.9$  years. 3rd year students in humanities and teachers at the bachelor's level of study were more represented.

**Table 1.** Characteristics of the respondents.

Variables	Terms and conditions	Frequency	Percentage
<b>Students N = 421</b>			
School's membership network	Official	84	20
	Confessional	295	70
	Private	42	10
Age (Mean $\pm$ SD) Years	16.5 $\pm$ 1.2		
Sex (N = 421)	Male	202	48
	Female	219	52
Level of study	1st Humanity	60	14
	2nd Humanity	66	16
	3rd Humanity	174	41
	4th Humanity	121	29
<b>Teachers N = 120</b>			
School's membership network	Official	12	10
	Confessional	48	40
	Private	60	50
Age (Mean $\pm$ SD)	39.1 $\pm$ 10.9		
Sex	Male	100	83
	Female	20	17
Qualification	State Diploma	10	8
	Graduated	36	30
	Licensed	74	62
Function	Head of establishment	3	3
	Director (Study/Discipline)	3	3
	teacher	114	94

**Table 2** shows that the vast majority of students reported the availability of water at school, where the connection to the Regideso distribution network was dominant; nearly a quarter had water outside the school grounds. Nearly 1/3 of schools had hand-washing facilities and a quarter had soap and water.

**Table 2.** Students' assessment of the availability of water and handwashing facilities in schools.

Variables (N = 421)	Terms and conditions	Frequency	Percentage
Availability of water at school	Yes	391	93
	No	30	7
Types of water sources	REGIDESO	312	74
	Improved source	72	17
	Unimproved source	34	8
	Rainwater	0	0
	Other	3	1
Location of water sources	In the enclosure	337	81
	Outside the enclosure	79	19
Does the school have hand washing facilities?	Yes	153	36
	No	268	64
Water and soap are available N = 421	Yes	105	25
	No	316	75

**Table 3** shows that a quarter of schools had a sanitation brigade. Almost all schools had toilets, the majority of which were 3 to 4. Nearly half of schools had no urinals, and no school had ramps for students with disabilities nor devices for menstrual hygiene. School waste was mostly disposed of by open burning and almost half of schools did not have farming equipment for sanitation work.

**Table 3.** Assessment of toilet availability and sanitation organization in schools.

Variables	Terms and conditions	Frequency	Percentage
Existence of sanitation brigade (N = 120)	Yes	30	25
	No	90	75
Toilet availability (N = 120)	Yes	118	98
	No	2	2
Number of toilets per school (N = 118)	1 to 2	47	40
	3 to 4	57	48
	5 to 8	14	12

**Continued**

Presence of urinal (n = 120)	Yes	58	48
	No	62	52
Existence of ramps for students with disabilities (n = 120)	Yes	0	0
	No	120	100
Waste disposal techniques (n = 120)	Open air burning	103	86
	Burial	17	14
Menstrual hygiene devices	Yes	0	0
	No	120	100
Availability of agricultural equipment for maintenance (n = 120)	Yes	58	48
	No	62	52

**4. Discussion****4.1. Characteristics of the Respondents**

In our study, students from the religious network (70%) and teachers from the private network (50%) were in the majority (**Table 1**).

The plurality of actors involved in the organization of education is a reality in the DRC. In sub-Saharan Africa, as elsewhere, some studies have disaggregated data by network affiliation, while others have not. This confirms the diversity of educational systems, with the possibility of different senses of responsibility and commitment from one network to another, which must be taken into account for greater representativeness. These are networks of public, religious, and private schools.

In developing countries, 11% of primary school students and 24% of secondary school students attend private schools, with significant variations across countries. In Bangladesh, for example, nearly 40% of primary school students and 96% of secondary school students attend private schools. Many of the buildings and facilities in these schools are in a similar condition to those of public schools and would benefit from the same WASH interventions [10].

A study conducted in Bangladesh showed differences in access to WASH services by school network. In public primary schools, toilets were used by 143 students, while in private English-medium schools, 30 students had used them. On the other hand, soap for handwashing was only provided in 14% of public primary schools but 100% in private English-medium schools [11].

The inclusion of schools from all education sector networks is important to take into account the specificities of each sector in terms of the organization of WASH services.

**4.2. Assessment of the Availability of Water, Handwashing Facilities in Schools and Sanitation Brigades**

A healthy school is one that has access to drinking water, has separate hygienic

latrines for girls/boys/staff members in sufficient number in relation to the number of students, hand-washing stations in front of each block of latrines and in front of each classroom; and an operational sanitation brigade [12].

#### 4.2.1. Access to Drinking Water

This study showed that 93% of students had confirmed the availability of water in their schools by connection to the REGIDESO distribution network (Table 2).

The 2022 UNICEF & WHO annual report reports that sub-Saharan Africa is the only region covered by the SDGs where coverage of basic drinking water services remained below 50%; 2 out of 3 primary schools (67%) and 3 out of 4 secondary schools (76%) had basic drinking water service [13]. These statistics are lower than those observed in our study.

In 2023, the JMP (Progress on Wash School) report revealed progress in the coverage of water availability at school level, estimated at 77% globally and 45% in Sub-Saharan Africa [14].

The results from a study conducted in peri-urban schools in the city of Kinshasa in the DRC during the COVID-19 epidemic indicate a significant increase in the prevalence of water points in schools from 10.9% to 22.5%, handwashing facilities from 43% to 60.1% with an average number of handwashing facilities from one to two. These results are lower than those observed in our study [15].

In the DRC, as in many sub-Saharan African countries, access to drinking water is unevenly distributed between rural and urban areas. The recent Demographic Health Survey (EDS-DRC 2024) showed that the average coverage of access to basic water services is 43%, including 81% in urban areas and 21% in rural areas. This coverage is 34% in the Tshopo province. Data on access to water in schools are not reported [16].

REGIDESO is the DRC's Urban Water Distribution Authority, and the National School and Village Sanitation Program (PNEVA) is the rural water supply strategy. The high water coverage of schools in our study is justified by the fact that the Makiso commune is the most urbanized part of the city of Kisangani, it is the seat of almost all of the city's public and commercial institutions; water and electricity connections are higher there than in all other communes of the city. Looking ahead, an analytical study will be important to compare the situation between schools in the different communes of the city of Kisangani and those in the peri-urban and rural areas.

Access to safe drinking water is crucial for students' health and well-being, and the distance to a drinking water source in a school can have a significant impact on its use and health. Time spent searching for drinking water is time lost for learning. This can negatively impact students' academic performance. A lack of safe drinking water on school grounds can encourage students to drink contaminated water sources, increasing the risk of diarrheal diseases, parasitic infections, and other infections.

A study conducted in Kenya had shown that Improved access to water, sanitation and hygiene at school was associated with a reduced likelihood of diarrhea

among students (OR = 0.44) [17].

Among the WASH motivations in the 2030 agenda, it is said “No child should die or become ill because they have drunk contaminated drinking water, come into contact with other people’s excreta, or lack access to handwashing facilities” and “No child should miss school because of the lack of clean toilets and privacy” [18].

All efforts must converge towards improving school coverage in water, hygiene and sanitation services for guaranteed education.

#### **4.2.2. Hand Washing**

Nearly 1/3 of schools (36%) had hand washing facilities and 25% had soap and water (Table 2).

Similar results were observed in a study conducted in public primary schools in Ethiopia where it was found that the availability of water and soap for hand hygiene practice was 28.8% and 37% of students practiced hand hygiene. The availability of handwashing facilities, water and soap was one of the contributing factors [19].

The results of this research highlight the inadequacy of handwashing facilities in schools, which could impact the systematic practice of hand hygiene at critical moments in a context of poor access to drinking water in the community, in general, and in schools, in particular.

#### **4.2.3. School sanitation brigade**

This study shows that 25% of schools had a sanitation brigade (Table 3).

The results of a study conducted in schools in Bangladesh showed that basic drinking water services increased from 78% in 2014 to 90% in 2018; basic sanitation services increased from 19% in 2014 to 52% in 2018 and students’ access to water and soap increased from 21% in 2014 to 35% in 2018, with associated factors being hygiene promotion visits and the existence of hygiene brigades in schools, managed by students [20].

A study to assess the functioning and sustainability of water, sanitation and hygiene services in schools in the Nabdam district of Ghana indicated that water, sanitation and hygiene were poorly managed, even though schools had installed WASH facilities. The main challenges were inadequate toilets and handwashing facilities, lack of funds and ineffective sanitation brigades. The latter lacked the means to mobilize funds and carry out their duties in accordance with the guidelines for implementing water, sanitation and hygiene in schools [21].

The results of a study conducted in a peri-urban school environment in the city of Kinshasa showed the very low presence of school sanitation brigades, the prevalence of which increased from 4.8 to 11.8% respectively before and during the COVID-19 epidemic [15].

The functional school sanitation brigade is an essential structure to propel WASH activities at the school level; however, further research is needed to better understand the factors that influence their presence and effectiveness.

#### 4.2.4. Access to Toilets and Ramps

Almost all schools (98%) had toilets, the most common number being 3 to 4 toilets (48%); 48% of schools did not have urinals and no school had ramps for students with disabilities nor appropriate facilities for menstrual hygiene (Table 3).

WHO/UNICEF recommended standards stipulate 1 cubicle for every 25 girls and 1 cubicle for every 50 boys. Latrines must be accessible to all students, including children with disabilities. Latrines must provide adequate privacy and security for students, with lockable doors and lighting, sufficient. They must be kept clean and hygienic, with an adequate water supply for hand washing and waste disposal [2].

Students with disabilities are a diverse group of people who respond in different ways to disability, incapacity, and societal barriers. They often have “invisible” and episodic disabilities, meaning they sometimes alternate between periods of well-being and incapacity. All students with disabilities have the same right to equal opportunity under the Code, whether their disability is visible or not [22].

The lack of ramps for students with disabilities is an inequality that must be eliminated. A study conducted by UNESCO (2021) found that students with disabilities who have access to accessible schools, including ramps, are more likely to attend school and have better academic results and that ramps can improve the participation of students with disabilities in academic and social activities [23].

In sub-Saharan Africa, the World Bank’s study on inclusive education found that sub-Saharan African countries that invested in building school ramps saw an increase in the number of students with disabilities enrolled in school and that ramps can reduce absenteeism rates for students with disabilities [24].

Scientific work exploring the precise impact of access ramps on the educational path of disabled students is relatively new and the results obtained can be heterogeneous depending on the parameters of each study.

Unlike our results, it was observed that menstrual hygiene practices were good in 53.5% of schools in Ethiopia, among the contributing factors: parents’ education level, access to basic water and sanitation service, being older among school-girls, having open discussions with sisters, having friendly discussions on menstrual hygiene with school friends and residing in urban areas [25].

Proper practice of Menstrual Hygiene is challenged by the availability of water in schools and inadequate infrastructure. Bangladesh has about 17,000 secondary and middle schools, most of which have a serious lack of adequate and functional water and sanitation facilities. Under these conditions, it becomes extremely difficult for girls to manage their menstruation during their periods. It has been proven that girls’ attendance increases when hygiene and water sanitation facilities are available [26].

#### 4.2.5. Waste Disposal

In 86% of cases, school waste was disposed of by open burning (Table 3).

Open burning of school waste is a widespread practice in many parts of the world, but its impact on health and the environment is a growing concern.

Uncontrolled dumping and open burning of waste are the main methods available for the majority of African cities where it is estimated that up to 90% of waste is dumped, and often burned, in the open. Open burning of waste can release hazardous air pollutants, such as dioxins, furans and fine particles, which can be harmful to the health of students and the environment and can pose a fire hazard, especially during dry seasons with strong winds [27].

Open burning of waste poses health risks for those directly exposed to the smoke. This particularly affects people with sensitive respiratory systems, as well as children and the elderly [28].

Therefore, it is essential to consider the construction of incinerators as a mandatory ancillary work to ensure the elimination of combustible waste with less risk of air pollution.

## 5. Limitations of the Study

The small number of schools surveyed does not allow us to generalize the conclusions to the entire city of Kisangani but gives an idea of the situation in the city's schools with a view to preparing a more extensive study in several schools and the use of an analytical approach to identify the causes of the problems observed. Also, the weighting of schools by membership status was not done for good representativeness.

## 6. Conclusions

Schools in Makiso Municipality operate in an environment characterized by limited access to drinking water and poor sanitation. It is important to strengthen sanitation brigades, improve infrastructure, and reduce inequalities in access. It is also recommended that the government and partners popularize the reference and regulatory framework, align their policies, structures and practices with the principles of inclusion and equity, and revitalize the WASH programs in schools, to develop public-private partnerships or targeted investment strategies to ensure quality education.

A reflection on the gender and inclusion issues, particularly regarding the lack of menstrual hygiene management and facilities for students with disabilities, must maintain the ideal for an inclusive WASH program.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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