



Development Aid for Water and Sanitation in Primary Education Sector in the Department of Man, West Côte d'Ivoire

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Abstract: This study examines donations of water, sanitation and hygiene (WaSH) facilities in public primary schools in Côte d'Ivoire's Man Department. Findings from interviews and school visits suggest that latrines are primarily (69.8%) funded by international organizations, particularly multilateral institutions such as the African Development Bank (ADB), the Islamic Development Bank (IsDB) and the United Nations Children's Fund (UNICEF), as well as civil society organizations such as Save the Children, Rescue, Care and Caritas. Multilateral institutions were the most involved, having built 53.5% of latrines: 41.9% by UNICEF, 9.3% by ADB, and 2.3% by IsDB. Civil society organizations contributed 16.3%, including 9.3% from Save the Children and 2.3% each from the other three organizations (Rescue, Care and Caritas). The government's contribution was estimated at 30.2%, equating to 4.7% during construction, 16.3% from the Local School Management Committee, and 9.3% from the government's social programme. To safeguard donors' investments, it is essential to promote awareness regarding proper latrine use and to allocate maintenance budgets to schools. Effective collaboration between these organizations, local communities, and government agencies is essential to ensure the long-term success of WaSH initiatives in schools.

1. Introduction

In developing countries, particularly in sub-Saharan Africa (SSA), development aid has always been welcomed across all sectors (including agriculture, the economy, education, energy, livestock, culture, health and the environment), thereby improving living conditions for populations (FAO, 2012; Herrero *et al.*, 2012 ; Rhode & Stitteneder, 2020). However, the monopoly on development aid, once held by developed countries (traditional donor countries) in America (Munganga, 2017; Yan 2024) and Europe (Bountagkidis *al.*, 2015; Dipama, 2025), came to an end in the 1990s with the emergence of a multitude of civil society organizations (CSOs) that proliferated in all industrialized countries and now account for a considerable share of North-South transfers (Severino & Ray, 2009). The most significant of these

organizations, including CARE and Save the Children, have become pivotal in fostering international solidarity, with their contributions increasing year on year. Nevertheless, other significant actors have emerged, including multilateral institutions such as the World Bank, the International Monetary Fund and the United Nations, emerging donors such as China, India and Brazil, the private sector through foreign direct investment, regional organizations such as the African Union and regional economic communities, and philanthropic organizations including foundations (Martorano *et al.*, 2020; Atitianti & Asiamah, 2023; Zickafoose *et al.*, 2024).

The development assistance provided by these organizations, i.e., multilateral institutions, civil society organizations, and, increasingly, new donors and the private sector, takes various forms. They provide a wide range of support, including financial aid, technical expertise and humanitarian aid, to promote economic growth, reduce poverty and achieve other development goals in the region. These initiatives particularly aim to improve infrastructure, strengthen government capacity, empower communities, and promote education and economic development (Atitianti & Asiamah, 2023; Zickafoose *et al.*, 2024; Mallek *et al.*, 2024). In terms of infrastructure, development aid is crucial for the economic growth and development of sub-Saharan Africa. Various actors, including development banks, governments, and international organizations, have established several initiatives and programs to finance and support infrastructure projects in sectors such as transport, energy, water and sanitation, and information and communication technologies (African Union Development Agency – NEPAD, 2023 ; Lu & Wilson, 2024). These initiatives have recently helped develop infrastructure in Africa, particularly in transport, electricity, ICT, and water and sanitation. This has reduced poverty and mitigated the effects of income inequality, urbanization, education, employment, and environmental quality (Ibragimova *et al.*, 2021; Mallek *et al.*, 2024).

In the education sector, particularly for young children, there is growing concern about the quality of school environments in relation to children's vulnerability (Morgan *et al.*, 2017; Sharma *et al.*, 2024; Zickafoose *et al.*, 2024). For many children in sub-Saharan Africa, a quality education remains out of reach. Zickafoose *et al.* (2024) identified several barriers, including physical barriers such as inadequate sanitation facilities, which are particularly problematic. However, adequate access to water, sanitation and hygiene (WaSH) in schools impacts health, academic performance and gender disparities. Several studies, including those by Morgan *et al.* (2017) in Ethiopia, Kenya, Mozambique, Rwanda, Uganda and Zambia; Kouamé *et al.* (2021) in Côte d'Ivoire; Bah *et al.* (2022) in Guinea; Akanzum and Pienaaah (2023) in Ghana; Addie (2025) in Nigeria; Eya-Bashuma *et al.* (2025) in the Democratic Republic of the Congo (DRC); and Radebe *et al.* (2025) in South Africa, agree that a lack of safe drinking water, poor sanitation and hygiene can have a detrimental effect on children's health and well-being, as well as their attendance at school. These findings justify the actions taken by international organizations to promote the establishment of WaSH facilities in schools in sub-Saharan African countries, especially since education is a fundamental human right and an essential tool for the sustainable development of human capacities and economic growth. However, the various actions taken by these organizations to improve access to safe drinking water, sanitation facilities and hygiene education in schools are poorly documented in scientific journals. Nevertheless, these actions effectively contribute to creating a healthy school environment that is conducive to children's learning and well-being (JMP, 2022; UNICEF & WHO, 2024).

In Côte d'Ivoire, following a decade of political crisis and conflict (2002–2011) marked by a deadly war in 2011, the government made significant efforts to restore peace and social cohesion, as well as reviving the country's various sectors of activity (Babo, 2019). In the education sector, for example, classrooms were built and teachers were recruited for young children. Efforts were also made to

improve the school environment, notably through the construction and donation of latrines (Oyeniran, 2017; UNICEF-CI, 2020). According to MENET (2017), in 2016, only 39% of public primary schools had access to drinking water and 41% had latrines. However, these proportions have increased, as shown by recent data from UNICEF-CI (2020), with 41.4% of primary schools having a water source and 52.7% having sanitation facilities. These improvements would not have been possible without the support and assistance of international organizations, which should be documented, particularly in regions of Côte d'Ivoire such as the west, including the Department of Man, which has been severely affected by a decade of socio-political crisis. Documenting international aid is crucial for understanding its impact and effectiveness, and for identifying best practices for future interventions, particularly in areas that have experienced periods of crisis. Against this backdrop, the present study aims to examine the support provided by international organizations in terms of WaSH (water, sanitation and hygiene) facilities in public primary schools in the Department of Man. The study will identify the donors, the completion date, and the characteristics of the infrastructure built, and assess its functionality.

2. Methodology

2.1 Study Area

This study was conducted in the capital of the Tonkpi region, the Department of Man, which is located between latitudes 7° 24' North and 7° 33' West (see Figure 1). The Department of Man comprises 11 sub-prefectures: Bogouiné, Fagnampléu, Gbangbéguiné-Yati, Logoualé, Man, Podiagouiné, Sandougou-Soba, Sangouiné, Yapleu, Zagoué and Ziogouiné. These sub-prefectures cover an area of 2,630 km² and have an estimated population of 388,448 (RGPH, 2021). The city of Man, the capital of the department of the same name, is located 564 km from the country's economic capital, Abidjan, and 376 km from its political capital, Yamoussoukro.

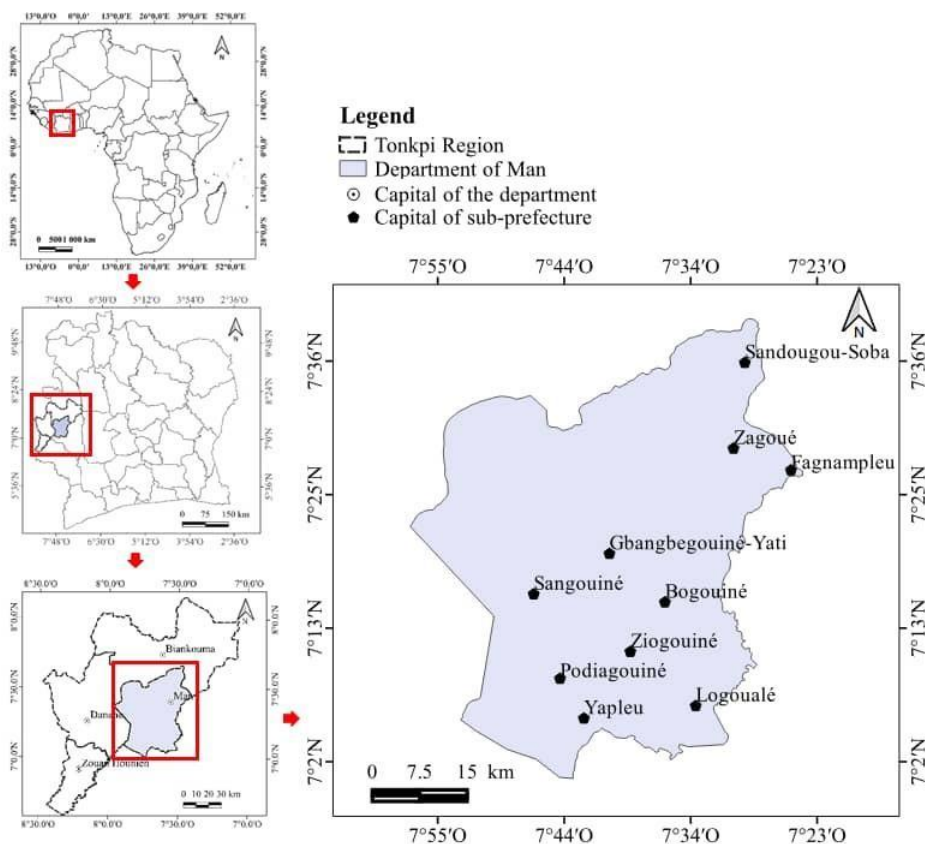


Figure 1. Map showing of the study area.

2.2 Study Population Sample Size

This study covered public primary schools in the eleven sub-prefectures of the Man Department, including the city of Man. However, only the main towns in these sub-prefectures were considered, namely Bogouiné, Fagnampléu, Gbangbéguiné-Yati, Logoualé, Man, Podiagouiné, Sandougou-Soba, Sangouiné, Yableu, Zagoué and Ziogouiné. A total of 46 schools on separate sites, divided into 36 school groups (comprising at least two schools on the same site) and 10 single schools (i.e., a single school on the same site), were visited. **Table 1** shows the distribution of the number of schools in the sub-prefectures, and Supplementary material Table S1 presents the complete list of these schools, classified by sub-prefecture and with their geographical coordinates.

Table 1. Distribution of schools in the sub-prefectures of the Man Department and their associated school groups and/or single schools (*Source: Man Regional Education Office*).

Sub-prefecture capitals of the department of Man	Educational institutions:	Type of educational institution	
		Schools groups	Single schools
Bogouiné	1	1	0
Fagnampléu	1	1	0
Gbangbéguiné-Yati	2	1	1
Logoualé	4	4	0
Man	23	19	4
Podiagouiné	2	2	0
Sandougou-Soba	1	1	0
Sangouiné	6	4	2
Yableu	2	1	1
Zagoué	2	1	1
Ziogouiné	2	1	1
Total	46	36	10

2.3 Data Collection

The data for this study were collected in the eleven sub-prefectures of the Department of Man between July and August 2023. This collection was punctuated by interviews conducted by the research team with the regional directorate of national education in Man city, then in the various towns, with the principals of the 46 primary schools in the Department. The purpose of the interview with the regional education authority was to present the project to the relevant authorities, with the aim of enabling and/or facilitating meetings with the school principals in the Department, which falls under their authority. The interviews with the school principals provided information on the availability of latrines and water points in the schools, as well as details of the donors, the types of latrine installed, how functional they are, and an assessment of the provided latrines. Guided tours were also conducted to observe existing latrines and water points in schools. Photographs and geographical coordinates of the schools, water points and latrines were taken during these visits to illustrate the situations observed.

2.4 Data Analysis

The collected data were coded. Next, the qualitative and quantitative data were grouped together. The relative frequencies of each variable were then calculated in relation to the number of schools

involved in each case in the capitals of the ten sub-prefectures of the Department of Man, using the following formula:

$$F = \frac{X}{Y} \times 100 \tag{1}$$

F: Frequency (%).

X: Number of establishments of the type in question (*e.g.* water point, latrine).

Y: The total number of establishments of the type in question (*i.e.* the total number of establishments in the department).

However, in order to better assess the origins of aid in schools, information on donors has been grouped into three entities: the state through the government; multinational institutions; and civil society organizations (NGOs and other humanitarian organizations). Each entity has then been further refined to identify the organizations truly involved in aid activities in schools. Information on the nature and functionality of latrines was concerned with latrines provided by external development aid, *i.e.* those from multilateral institutions and civil society organizations. This included information on the type of latrine (dry or flush), its completion date and the number of cubicles, as well as details on gender separation and functionality. The total number considered, however, was based on the number of schools equipped with latrines provided by donations from organizations.

In order to create maps showing the distribution of latrines built by various donors in public primary schools in the sub-prefectural capitals of the Man department, a GPS device was used to record the geographical coordinates of the latrines during visits to these schools. These coordinates were then entered into QGIS 3.14.16 software, which created georeferenced maps using the WGS 84 coordinate system.

3. Results

3.1 Availability of WaSH facilities in schools within the Department

Table 2 shows the proportion of schools with and without water, sanitation and hygiene facilities. Interviews conducted in 46 public primary schools in sub-prefectural towns in the Department of Man revealed that most have water, sanitation and hygiene facilities. Overall, 33 schools (71.7%) have a water source and latrines, and 35 schools (76.1%) have hand-washing facilities.

Table 2. Availability of water, sanitation and hygiene (WaSH) facilities in public primary schools in the capitals of the sub-prefectures in the Department of Man.

WaSH facilities	Status	Number of school establishments <i>n</i> = 46	Percentage
Water point	Present	33	71.7 %
	Absent	13	28.3 %
Latrines	Present	33	71.7 %
	Absent	13	28.3 %
Hand washing	Present	35	76.1 %
	Absent	11	23.9 %

However, WaSH facilities, particularly water points, consist of wells, taps and boreholes. Well water predominates in 51.5% of schools with water points in the department (**Figure 2A**). These

facilities have been established through the efforts of parents and teachers via the school management committee (COGES), i.e. the Local School Management Committee (LSMC), with government support. A total of 43 latrines were found across the 33 establishments, some of which had more than one. These were flush pit and dry pit latrines, with the latter predominating in most cases (76.3%) (**Figure 2B**). The latrines were built by the government, multilateral institutions and civil society organizations. However, most of the latrines identified as government donations, either through the LSMC or government programs, were out of service or under construction (**Figure 3**). Observations made during the visits show that the hand-washing facilities are made of masonry or plastic drums. Most of these were donated by the government in response to the global Coronavirus pandemic. **Figure 4** illustrates some of the hand-washing facilities located in schools within the sub-prefectural capitals of the Man Department.

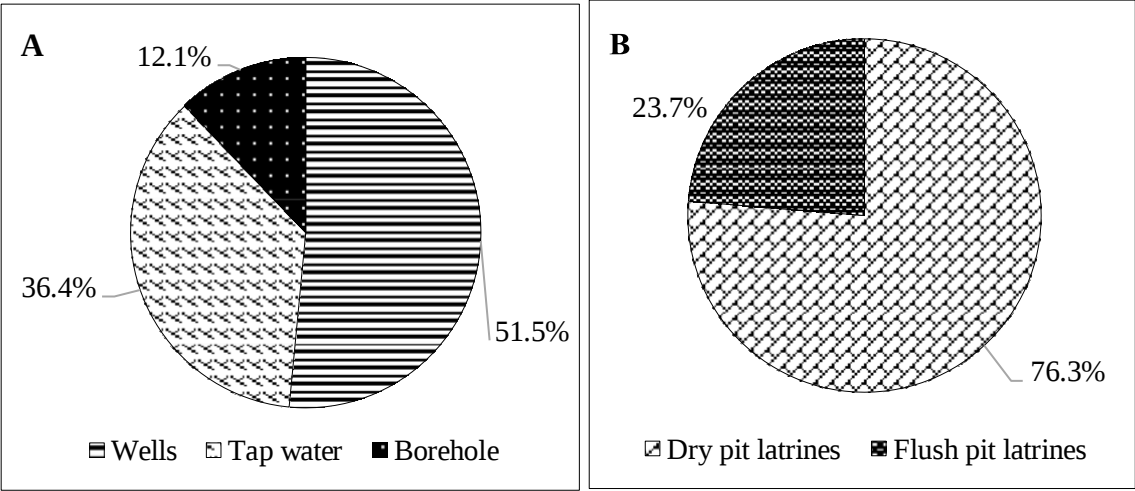


Figure 2. Types of water points (A) and latrines (B) built in schools in the sub-prefecture capitals of the Department of Man.



Figure 3. Illustration of latrines built by the Côte d'Ivoire government in schools in the sub-prefecture capitals of the Man department.



Figure 4. Illustration showing some of the hand-washing facilities registered in schools in the sub-prefectural capitals of the Man Department.

3.2 Donors of water, sanitation and hygiene (WaSH) infrastructure in schools

In terms of WaSH facilities, achievements were limited to latrines in schools in the Department of Man, funded by external organizations. A multinational institution, notably the United Nations International Children's Emergency Fund (UNICEF), provided only one hand-washing facility in a school group in the town of Sangouiné (**Figure 5**).



Figure 5. Illustration showing the hand-washing facilities provided by UNICEF at a school in Sangouiné, in the Man Department.

Table 3 shows that the majority of latrines surveyed in schools in the sub-prefectural capitals of the Man department were provided through external aid, accounting for 69.8% of cases. This includes 16.3% provided by civil society organizations and 53.5% by multinational institutions. The state's contribution was only 30.2%. Of the state's contribution, 16.3% was provided by the Local School Management Committee (LSMC) and 9.3% by the government's social programme (Gouv SP). However, the state built 4.7% of latrines at the time of school construction in the department. **Figure 6** shows the distribution of latrines built by the State of Côte d'Ivoire in the main towns of the Man department. These projects were carried out in seven main towns in sub-prefectures: Fagnampléu, Gbangbegouiné-Yati, Logoualé, Man, Yapleu and Zagoué. Regarding latrines provided through external aid, particularly from multilateral institutions (**Table 3**), this includes funding from the African Development Bank (ADB), the Islamic Development Bank (IsDB) and UNICEF. Of these, UNICEF is the most involved in donating latrines, accounting for 41.9% of those provided in the Department of Man, followed by the ADB with 9.3% and the IsDB with 2.3%.

Table 3. Percentage of latrines in public primary schools in the capital cities of the Department of Man and its associated donors

Donors		Percentage of latrines by structure <i>n</i> = 43	Percentage of latrines by entity <i>n</i> = 43
Entities	Structures		
Multinational Institutions	ADB	9.3 %	
	UNICEF	41.9 %	53.5 %
	IsDB	2.3 %	
Civil Society Organization	Save the Children	9.3 %	
	Rescue	2.3 %	
	Care	2.3 %	16.3 %
	Caritas	2.3 %	
State	Origin of the school	4.7 %	
	LSMC	16.3 %	30.2 %
	Gouv SP	9.3 %	

ADB = African Development Bank, UNICEF = United Nations International Children's Emergency Fund, IsDB = Islamic Development Bank, LSMC= Local School Management Committee, Gouv SP = Government social programme

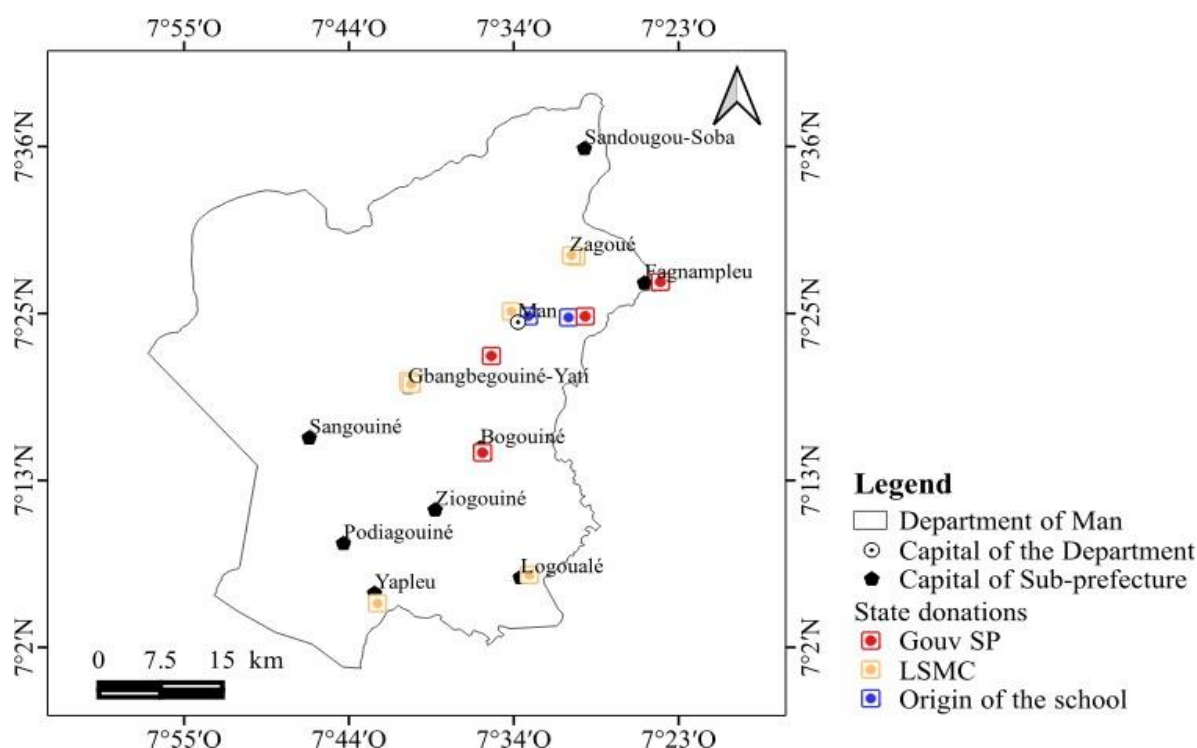


Figure 6. Map showing the distribution of latrines built by the State of Côte d'Ivoire in the main towns of the department of Man.

Figure 7 shows the distribution of these latrines in the Department, highlighting the areas of Logoualé, Man, Podiagouiné, Sandougou Soba, Sangouiné and Zagoué, with the largest number of latrines built in the city of Man. Notably, in addition to providing a significant number of latrines, UNICEF has also intervened in over half of the sub-prefectures within the Department of Man.

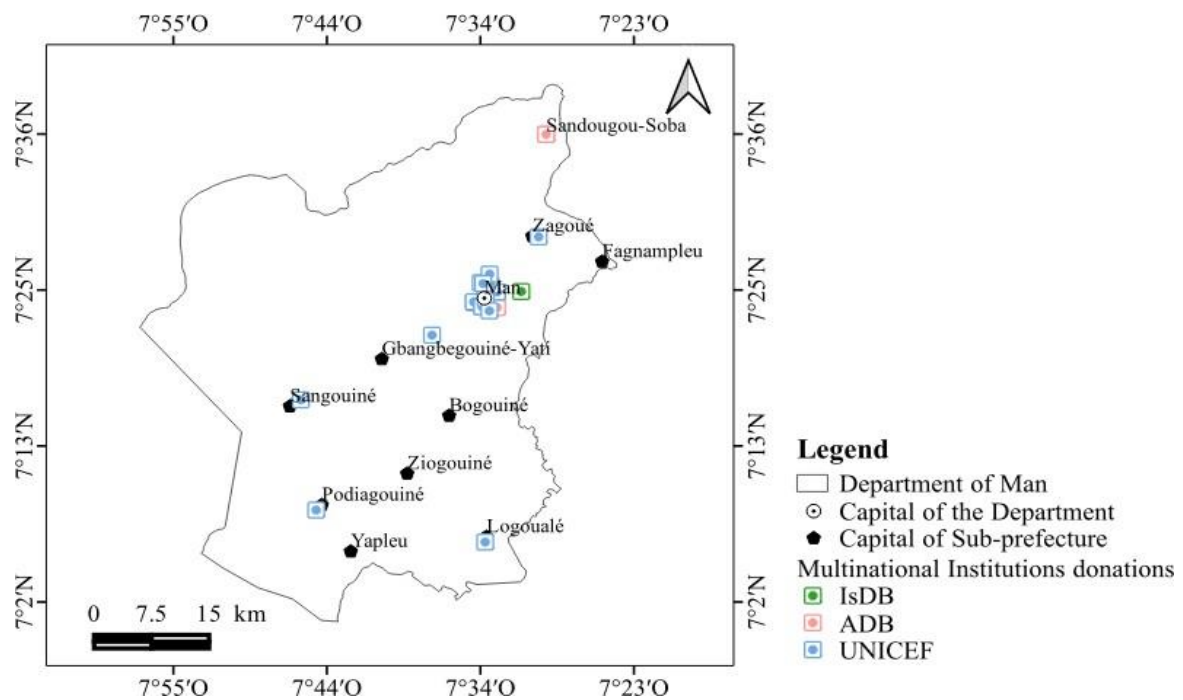


Figure 7. Map showing the distribution of latrines built by multilateral institutions in the main towns of the department of Man.

The latrines provided by civil society organizations include those provided by organizations such as Save the Children, Rescue, Care and Caritas (see [Table 3](#)). Save the Children was involved in constructing 9.3% of the latrines in the department's schools, while the other three organizations were each involved in constructing 2.3%. These organizations' work is particularly visible in the towns of Logoualé, Man, Podiagouiné and Yapleu ([Figure 8](#)).

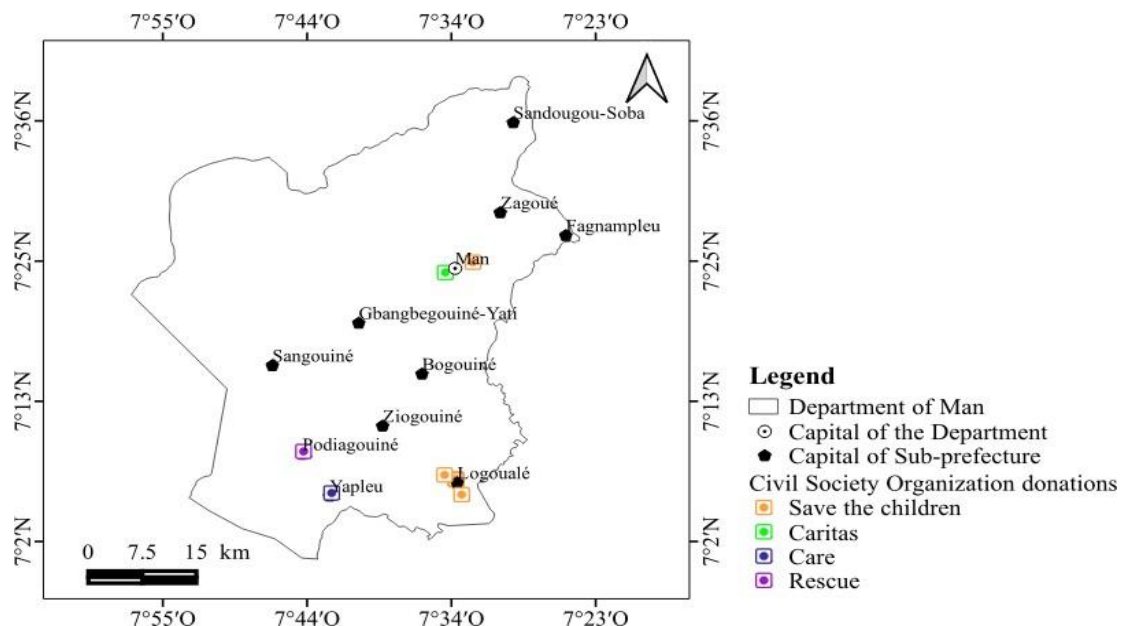


Figure 8. Map showing the distribution of latrines built by civil society organizations in the main towns of the Department of Man.

3.3 Characteristics, completion date, and functionality of latrines provided by external aid

Table 4 shows the characteristics of latrines built by organizations in public primary schools in the main towns of the Man Department, including their construction date and current status. The survey reveals that there are two types of latrine: dry pit and flush. The majority are dry pit (80%). The built latrines have between three and more than ten blocks. However, the survey revealed that the majority of latrines (53.3%) have between six and ten blocks. Nevertheless, all latrine blocks are gender-segregated in schools that have benefited from the organizations' actions. It should also be noted that the majority of latrines (73.3%) were constructed between 2011 and 2020. Only 27.6% of latrines were built before 2011. Currently, 20% of the latrines provided by these organizations are out of service in all beneficiary schools (see Table 4). **Figure 9** shows some of the latrines built by the organizations in schools in the Man department.

Table 4. Characteristics, date of construction and operational status of latrines provided by organizations in schools in the Department of Man.

Findings	Proportion (%) <i>n</i> = 30
Type of latrine	
Dry pit latrines	80%
Flush pit latrines	20%
Number of latrine blocks	
[3-6[	30%
[6-10[	53.3%
[10-plus]	16.7%
Gender-based segregation of latrine blocks	
Gender segregated latrines	100%
Gender-neutral latrines	0%
Date of latrine construction	
[1998-2010]	27.6%
[2011-2020]	73,3%
Functionality of latrines	
Non-functional latrines	20%
Functional latrines	80%

4. Discussion

An examination of the support provided by international organizations for water, sanitation and hygiene (WASH) facilities in public primary schools in the Department of Man revealed that most schools have these basic amenities. Specifically, 33 schools (71.7%) have a water source and latrines, while 35 schools (76.1%) have hand-washing facilities. This is linked to general lifestyle changes, as well as government and organizational efforts to promote environmental protection and the well-being of young children in schools in recent decades (United Nations, 2018; Singh & Jayaram, 2022). Several studies, including those by Desye (2021), Giné-Garriga *et al.* (2021), and Amraeni and Fajriah (2022), also agree that the awareness of hygiene and environmental cleanliness raised by the many awareness campaigns carried out during the pandemic has been a consequence of the global impact of the SARS-CoV-2 virus. However, the situation in the Man district is more concerning, with over 20% of schools still lacking access to improved water sources, adequate sanitation facilities and hand-washing

facilities. This hinders the provision of healthy and safe living and working conditions ([Adams et al., 2009](#); [McMichael, 2019](#)).



Figure 9. Illustration showing the latrines built by African Development Bank (A) in Sandougou Soba, by Save the Children in Logoulé (B) and by UNICEF in Sandougou Soba (C).

The main water sources in schools are wells, although there are also taps and boreholes. The prevalence of wells can be explained by how easily this type of water source can be constructed, at low cost and with the help of local craftsmen. In many developing countries, wells are indeed the most common water source in schools, surpassing alternatives such as taps and boreholes. This is often due to factors such as the cost and maintenance of water supply networks, as well as the availability of groundwater ([Adams et al., 2009](#); [Hossain et al., 2022](#); [Addie, 2025](#)). Local school management committees (LSMCs), supported by the government, are involved in the construction of almost all water points in schools in the department of Man, rather than the installation of latrines, which requires more resources. This explains why multilateral institutions and civil society organizations donate latrines to schools. However, the latrines identified in schools are of the 'flush pit' or 'dry pit' type. Dry pit latrines predominate in most cases (76.3%). This is linked to the lack of running water in most of these schools, since dry pit latrines do not necessarily require water ([Mamera et al., 2021](#)).

Regarding latrines provided through external aid, the majority (69.8%) of those in schools in the Man Department were financed by civil society organizations (16.3%) and multinational institutions (53.5%). The latter included the African Development Bank (ADB), the Islamic Development Bank (IsDB), and the United Nations Children's Fund (UNICEF). Their support enabled the construction of 9.3%, 2.3%, and 41.9% of the provided latrines, respectively. Multinational institutions play an active

role in donating latrines to primary schools, particularly in regions where access to safe sanitation facilities is limited. These initiatives aim to improve hygiene, health and academic performance among students. They play a key role in this effort by partnering with local communities and governments to provide clean, safe and decent sanitation facilities ([Adams et al., 2009](#)). The development aid provided by these institutions can be seen in communities and school environments through various programs and projects focusing on water, hygiene and sanitation in sub-Saharan African countries such as the Central African Republic, Mali, Niger, Kenya, Madagascar, Burkina Faso, Uganda and South Africa ([Salami et al., 2014](#); [Ofori-Kuma, 2018](#)). UNICEF's involvement is particularly significant, with the organization installing 41.9% of latrines in six sub-prefectures of the Man department. UNICEF was created with the aim of improving and promoting the condition of children. In the education sector, UNICEF is initiating WaSH programs in sub-Saharan African countries due to their low economic status, which makes children more vulnerable. Lack of financial resources is one of the main barriers to education ([UNICEF, 2018](#); [Zickafoose, 2024](#)).

The civil society organizations involved in donating latrines in the Department of Man include Save the Children, Rescue, Care and Caritas. Save the Children participated in the construction of 9.3% of the latrines in the department's schools, while the other three organizations each contributed 2.3%. This involvement is directly linked to their mission ([Ghaus-Pasha, 2005](#)). The mission of civil society is to promote good governance through policy analysis and advocacy, the regulation and monitoring of government performance and the behavior of civil servants, the strengthening of social capital, and enabling citizens to identify and express their values, beliefs, civic norms and democratic practices. It also mobilizes certain groups, particularly vulnerable and marginalized segments of the population, to participate more fully in political life and public affairs, and carries out development activities aimed at improving community well-being. It is precisely this latter role that justifies their involvement in constructing latrines in schools in the Department of Man. Several studies highlight the role of civil society organizations as catalysts for change, mobilizing resources, raising awareness among the population and encouraging community participation. These efforts have significantly improved access to safe drinking water, sanitation facilities, and hygiene education in schools, resulting in better health, increased attendance, and improved academic performance among students ([Grant et al., 2023](#); [Anushya et al., 2024](#); [Mustapha, 2024](#)). However, ensuring the sustainability of WaSH initiatives requires collaboration between these organizations, local communities, and government agencies.

Most of the latrines built by multilateral institutions and civil society organizations have between six and ten blocks (53.3%), and are all separated by gender (100%). However, 20% of these facilities are out of order. This corroborates the view of [Anushya and Subramaniyan \(2024\)](#), who advocate ongoing collaboration between communities receiving donations and donor organizations. This is particularly important since primary schools generally lack grants or funds for latrine maintenance. Indeed, a literature review on this subject indicates that inadequate funding and budgeting are identified as major obstacles to integrating effective and sustainable WaSH programs in schools in developing countries ([McGinnis et al., 2017](#)). In the Department of Man, most of the latrines provided by organizations were built between 2011 and 2020. This period falls within the decade following the political crisis and conflict that shook the country from 2002 to 2011. These actions may therefore be the result of government efforts to normalize public life throughout Côte d'Ivoire ([Babo, 2019](#)). Numerous initiatives have been implemented, including free primary education, the distribution of school kits, and the introduction of concepts such as 'child-friendly schools' and 'the 3-star approach to water, sanitation, and hygiene in schools' ([UNICEF_CI, 2020](#) ; [MENETFP, 2020](#)).

Conclusion

This study, which was conducted in the sub-prefecture capitals of the Man Department, identified the donors of water, sanitation and hygiene (WaSH) equipment in public primary schools in these areas. Water points include boreholes and taps, as well as wells in most cases. These were built by the government, as were the hand-washing facilities, consisting of plastic drums or masonry structures. The majority of latrines were provided through external aid (69.8%), including 16.3% by civil society organizations (e.g. Save the Children, Rescue, Care, and Caritas) and 53.5% by multinational institutions (e.g. the African Development Bank [ADB], the Islamic Development Bank [IsDB], and the United Nations Children's Fund [UNICEF]). The state's contribution amounted to only 30.2%, primarily through the Local School Management Committee (16.3%) and the government's social programme (9.3%). However, the state built 4.7% of latrines at the time of school construction in the department.

Latrines provided by external aid, particularly from multilateral institutions, account for 9.3% from the ADB, 2.3% from the IsDB and 41.9% from UNICEF. UNICEF is therefore the organization most involved in donating latrines in the Department of Man. Conversely, 9.3% of latrines provided by civil society organizations were donated by Save the Children, and 2.3% each by the other three organizations (Rescue, Care, and Caritas).

The latrines built by organizations in schools fall into two categories: dry pit or flush. The majority are dry pit latrines (80%). Most of the latrines built have between six and ten blocks (53.3%). However, all latrine blocks are gender-segregated in all schools. The majority of latrines were built between 2011 and 2020 (73.3%). Nevertheless, 20% of the latrines provided by these organizations are out of service in all the beneficiary schools. The main challenge lies in ensuring the sustainability of WASH initiatives through collaboration between donor organizations, local communities, and government agencies.

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Disclosure statement: *Conflict of Interest:* The authors declare that there are no conflicts of interest.

Compliance with Ethical Standards: This article does not contain any studies involving human or animal subjects.

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Supplementary material

Table S1. Distribution of primary schools according to their type (SG = school group, SS = single school) and their geographical coordinates in the main towns of the Department of Man.

Cities	Schools	Nature	Geographical coordinates (UTM WG84)	
			Nord	West
LOGOUALE	EPP BADOULE 1 LOGOUALE	SG	7.09921	-7.56020
	EPP BADOULE 2 LOGOUALE			
	PRESCOLAIRE BADOULE LOGOUALE			
	EPP BAIN DE BRETAGNE 1 LOGOUALE	SG	7.10578	-7.55466
	EPP BAIN DE BRETAGNE 2 LOGOUALE			
	EPP BAIN DE BRETAGNE 3 LOGOUALE			
	PRESCOLAIRE BAIN DE BRETAGNE LOGOUALE			
	EPP DOUA ETIENNE 1 LOGOUALE	SG	7.11483	-7.54319
	EPP DOUA ETIENNE 2 LOGOUALE			
	EPP SOUAN JOLIE 1 LOGOUALE	SG	7.11653	-7.55509
	EPP SOUAN JOLIE 2 LOGOUALE			
	PRESCOLAIRE SOUAN JOLIE 1 LOGOUALE			

ZIOGOUINE	EPP 1 Ziogouiné	SG	7.19167	-7.64193
	Prescolaire EPP 1 Ziogouiné			
	EPP 2 Ziogouiné	SS	7.19482	-7.63816
SANGOUINE	EPP 1 SANGOUINE	SG	7.27215	-7.78191
	EPP 2A SANGOUINE			
	Préscolaire EPP 1 & 2A SANGOUINE			
	EPP 2B SANGOUINE	SS	0727180	00778199
	EPP 3 SANGOUINE	SG	7.27882	-7.77114
	Préscolaire EPP 3 SANGOUINE			
	EPP 4A SANGOUINE	SG	7.27249	-7.78243
	EPP 4B SANGOUINE			
	Préscolaire EPP 4 A et B SANGOUINE			
	EPP 6 SANGOUINE	SS	7.27262	-7.78211
	EPP Plateau 1 SANGOUINE	SG	7.26819	-7.77387
	EPP Plateau 2 SANGOUINE			
PODIAGOUINE	EPP Podiagouiné 1	SG	-7.15447	7.74506
	EPP Podiagouiné 4			
	EPP Podiagouiné 2	SG	7.14370	7.75369
	EPP Podiagouiné 3			
GBANGBEGOUIN E-YATI	EPP 1 Gbangbegouine	SS	7.33580	-7.67509
	EPP 2 Gbangbegouine	SG	7.33268	-7.67243
	Préscolaire			
FAGNAMPLEU	EPP FAGNAMPLEU 1	SG	7.44843	-7.40014
	EPP FAGNAMPLEU 2			
	PRESC. FAGNAMPLEU			

ZAGOUÉ	EPP ZAGOUÉ-1	SG	7.47755	-7.49244
	PRESC. ZAGOUÉ-1			
	EPP ZAGOUÉ-2	SS	7.47917	-7.49777
SANDOUG OUSOBA	EPP Sandougou Soba 1	SG	7.60286	-7.48307
	EPP Sandougou Soba 2			
YAPLEU	EPP 1 Yapleu	SG	7.09432	-7.71045
	EPP 2 Yapleu			
	Prescolaire Yapleu			
	EPP 3 Yapleu	SS	7.08259	-7.70960
BOGOUINE	EPP 1 BOGOUINE	SG	7.25406	-7.59451
	EPP 2 BOGOUINE			
	PRESCOLAIRE BOGOUINE			
MAN	EPP MONT GLAS 1	SG	7.39780	-7.56773
	EPP MONT GLAS 2			
	EPP MONT GLAS 3			
	EPP MONT GLAS 4			
	EPP MONT GLAS 5			
	EPP MONT GLAS 6			
	EPP MONT GLAS 7			
	PRESCOLAIRE MONT GLAS 1	SG	7.39288	-7.55869
	PRESCOLAIRE MONT GLAS 2			
	EPP DOYAGOUINE 1			
	EPP DOYAGOUINE 2			
	PRESCOLAIRE DOYAGOUINE 1	SG	7.392263	-7.5406719
	PRESCOLAIRE DOYAGOUINE 2			
	EPP OUSMANE COULIBALY	SS	7.3792263	-7.5406719

EPP DOMAINE MISTROT 1	SG	7.4107451	-7.5410254
EPP DOMAINE MISTROT 5			
EPP DOMAINE MISTROT 2			
EPP DOMAINE MISTROT 3			
EPP DOMAINE MISTROT 4			
MATERNELLE MISTROT			
EPP GRAND GBAPLEU 1	SG	7.4111698	-7.5333893
EPP GRAND GBAPLEU 2			
EPP GRAND GBAPLEU 3			
EPP GRAND GBAPLEU 4			
MATERNELLE GRAND GBAPLEU			
EPP KOKO 1	SG	7.409389	-7.5445778
EPP KOKO 2			
EPP KOKO 3			
EPP KOKO 4			
MATERNELLE KOKO			
EPP KPANGOUIN 2	SG	7.410917	-7.5122678
EPP KPANGOUIN 2B			
EPP KRICOUMA 1	SG	7.4083579	-7.5005559
EPP KRICOUMA 2			
EPP BAD QT 13	SG	7.4030731	-7.5543719
EPP PERALDI 1		7.4025249	-7.5541183
EPP PERALDI 2			
EPP PERALDI 3 ET 6 POUR LATRINE			
EPP PERALDI 4 ET 9 POUR LATRINE			
EPP PERALDI 5			

EPP PERALDI 6			
EPP PERALDI 7			
EPP PERALDI 8			
EPP PERALDI 9			
MATERNELLE PERALDI ET 2			
MATERNELLE 2 PERALDI			
EPP PETIT PARIS	SS	7.3833644	-7.5415469
EPP QT LYCEE 1	SG	7.3873498	-7.549312
EPP QT LYCEE 2			
EPP QT LYCEE 3			
EPP QT LYCEE 4			
MATERNELLE QT LYCEE			
EPP QT LYCEE CLUB 1	SG	7.391706	-7.5412547
EPP QT LYCEE CLUB 2			
EPP QT LYCEE CLUB 3			
EPP VOUNGOUE	SS	7.4093997	-7.4823713
EPP MUNICIPAL	SS	7.3785342	-7.5701567
KASSIAPLEU 1	SG	7.3576811	-7.6172531
KASSIAPLEU 2			
EPP DIOULABOUGOU1	SG	7.4187844	-7.5483869
EPP DIOULABOUGOU2			
EPP DIOULABOUGOU3			
GEBPLEU 1	SG	7.4138955	-7.5736053
GEBPLEU 2			
GEBPLEU 3			
GEBPLEU MATERNELLE 1			
GEBPLEU MATERNELLE 2			

EPP HKB 1	SG	7.4150056	-7.5629124
EPP HKB 3			
EPP HKB 2			
EPP HKB PRESCOLAIRE 1			
EPP HKB PRESCOLAIRE 2			
BLOSCOSSO 1	SG	7.421306	-7.5601685
BLOSCOSSO 2			
BLOSCOSSO 3			
BLOSCOSSO A Maternelle			
BLOSCOSSO B Maternelle			
EPP GLONGOUIN 1	SG	7.4320626	-7.5497084
EPP GLONGOUIN 2			
EPP GLONGOUIN 3			
EPP GLONGOUIN PRESCOLAIRE 1			
EPP GLONGOUIN PRESCOLAIRE 2			
ZELE 1	SG	7.3644733	-7.5846781
ZELE 2			
ZELE 3			
ZELE MATERNELLE			
PETIT CBAPLEU 1	SG	7.4193088	-7.5486941
PETIT CBAPLEU 2			
PETIT CBAPLEU 3			
PETIT CBAPLEU 4			
PETIT CBAPLEU 5			
PETIT CBAPLEU 6			
PETIT CBAPLEU 7			
PETIT CBAPLEU 8			

PETIT CBAPLEU 9			
PETIT CBAPLEU 10			
EPP LIBREVILLE 1	SG	7.4208913	-7.5573101
EPP LIBREVILLE 2			
EPP LIBREVILLE 3			
EPP LIBREVILLE 4			
EPP LIBREVILLE 5			
EPP LIBREVILLE 6			
EPP LIBREVILLE 7			
EPP LIBREVILLE 8			
EPP LIBREVILLE 9			
EPP LIBREVILLE 10			
EPP LIBREVILLE MATERNELLE 1			
EPP LIBREVILLE MATERNELLE 2			

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