

Vol. 11. No.1. 2022

©Copyright by CRDEEP Journals. All Rights Reserved.

Contents available at:

<http://www.crdeepjournal.org/wp-content/uploads/2022/01/Vol-11-1-1-IJES.pdf>

International Journal of Environmental Sciences (ISSN: 2277-1948) (CIF: 3.654)

A Peer Reviewed Quarterly Journal



Full Length Research Paper

Environmental Sanitary Conditions of Primary Schools in Lindi Municipality Tanzania

Irene A. Tarimo

The Open University of Tanzania, Tanzania.

ARTICLE INFORMATION

Corresponding Author:

Irene A. Tarimo

Article history:

Received: 16-09-2021

Revised: 01-11-2021

Accepted: 20-01-2022

Published: 27-01-2022

Key words:

Environmental,
sanitation, Hygiene,
Schools education,
Tanzania.

ABSTRACT

The research established environmental sanitary conditions of Schools in Lindi Municipality, Tanzania. The questions answered: Are there enough functioning environmental sanitary facilities in Ruaha School? What was awareness level on proper environmental hygiene practices among School children? Which environmental sites have high levels of faecal matter contamination? The research design utilized cross sectional survey with mixed qualitative and quantitative methods. Data was collected from 147 selected out of 550 populations by questionnaires and observational tools as well as documentary and internet for secondary data. Data analysis was done at Sokoini Regional referral hospital Microbiological laboratory using Membrane Filtration Method and computer program STATA v.16 & Excel 2007. The results revealed (82%) awareness of environmental hygiene practices among school students with 2 (33%) holes out of 6 for girls, and 2 (40%) holes out of 5 for boys. About (78%) were not washing hands after toilets, while (88%) were not using soap and water. About (48%) chew fingers, (59%) chew pen caps and (24%) not wash hands before eating, thus, 76% wash hands before eating. Environmental sites with high fecal matter contamination were around bushes near the school compound due to lack of enough latrines holes and environmental sanitation education to students. It is recommended to stakeholders: LGAs and Ministries of Education, Environment, Health, Water, Gender and Children to collaborate and ensure one latrine for every 20 girls and one latrine for every 25 boys in all schools. Emphasize on installation of water and hand wash facilities to all schools and provision of environmental sanitation education to students in Tanzania.

Introduction

School children require safe and healthy learning environments to safeguard their health as well as the environment itself. This implies that the school environment has to be supplied with necessary requirements particularly environmental sanitary facilities that include hygiene toilets, water, soaps and hand wash facilities. However, faecal matter contamination to several environmental surfaces of school areas may be a major issue of concern to various health stakeholders. For example, Koopmans (2002) in Columbia related about 44% of diarrhea disease cases to unhygienic toilets condition in primary schools. The most environmental contaminated places with faeces includes toilets doors, hands, washing facilities, carpets, sanitary sinks, student desks, books, pens and others (WHO, 2009). This situation increases the risk of exposure to faecal ingestion especially to individuals who wash their hands improperly. Some of the reasons behind are being inadequate water or unavailable washing facilities. Faecal matter contamination and poor sanitary condition contribute much too diarrheal diseases. Following faecal matter contamination on environmental surfaces including water, human beings can contact infections especially Gastro Intestinal Tract (GIT) infections.

World Health Organization (WHO, 2009) estimated about 3.3 million deaths have occurred due to diarrheal diseases and many cases are still hospitalized. On the study done by Mara *et al.* (1995) revealed that, ingestion of faecal matter that contain pathogens of diarrheal diseases continued to be a public health problem in England. Many primary schools and day care centers have been affected with the outbreaks. Based on the United Nations (UN, 2008) Water report, it has been

indicated that five children die every day due to diarrheal diseases and the common contributing factor being inadequate environmental sanitation. Like other places, diarrhea is still a poor environmental sanitation based disease in Lindi Municipality. It is contributed by poor hand washing after visiting the toilets which amount to the proportion of over 36% of the Lindi residents Health Information Management System (HIMS, 2013). On the report by Partnership for Children Development (PCD, 2000) had been suggested that hygiene promotion in schools is a primary intervention because of the potential high risk of diseases transmission. Understanding the pattern of faecal contamination in relation to environmental hygiene practice and knowledge by primary schools is crucial to public health intervention. The proportion of people who have access to improved sanitation has risen by 13 percentage points since 1990, but today the overall figure stands at just 20 percent. The overall slow progress in the WASH sector hinders human development and poverty reduction strategies (World Bank, 2018). In Tanzania, free education policy resulted increase in primary schools enrolment since year (2015) has been related to increased challenges of the supply of Water and Sanitation Hygiene (WASH) facilities.

The Government of Tanzania has been implementing Primary Education Development Programme (PEDP I) 2002 -2006 and Secondary Education Development Program (SEDP I) since 2004 -2009. The main objectives been making education more accessible and improving its quality to all school children and significant success has been made in extending access, but improving quality remains a challenge. The increase of number of schools is inversely proportional with the increase of sanitation facilities in Tanzania. The Ministry of Education and Vocational Training (MoEVT) has defined clearly the standards for school sanitation facilities which include setting latrines with the ratio of one drop hole per 20 girls and one per 25 boys. In 2009, UNICEF, Water Aids and SNV carried out a survey (2009) to find out the existence situation and standards of WASH facilities in schools which revealed that most of the schools have not met these standards. This situation prompted the MoEVT to join effort with Development Partners to design a School Wash and Hygiene (SWASH) program in scaling up the sanitation facilities in schools. In order to embark in this situation and bring effective implementation of the SWASH program strategic plan was developed. The SWASH Strategic plan aim at enhancing the provision of adequate safe water, sanitation and hygiene facilities as well as improving the academic performance, school attendance and overall health of school children. The plan acts as a guide to various stakeholders including the Government, Development Partners, NGOs, Civil Society Organizations Communities, parents and others to work together towards attainment of better healthy learning environment among school children.

Across Tanzania it is estimated that 93 % of the population has access to a latrine but when assessing access to improved hygiene and sanitation that figures drops to 24 % (Jacqueline, *et al.* 2013). Mafuru *et al.* (2018) found inadequate coverage of water and sanitation facilities in primary schools, thus, increases the chances of faecal matter ingestion among school children. Some mortality diseases emanating from lack of environmental sanitation and hygiene include diarrhea, cholera, and typhoid fever, skin and eye infections, parasitic infections like malaria and filariasis, helminthes, schistosomiasis, taenia, oral gum infections, some viral infections such as dengue and yellow fever. This study therefore, established the environmental sanitary conditions of primary schools in Lindi Municipality in Tanzania. Faecal matter contamination is linked to several Gastro Intestinal Tract (GIT) infections and infestations by contaminate the environmental surfaces and hence enhance the continuation on GIT diseases in primary children (Kaltenthler *et al.*, 1995).

Data availability statement

Data available in Lindi Municipality annual health report (2013) revealed the trend of GIT diseases of 3 years consecutively. The report shows that, in 2011 GIT reported cases were 33% of all cases encountered, while in 2012 the cases were 32.6% and in 2013 the coverage increased to 36%. This increasing trend created a gap for this study. GIT infections has disadvantages and effects to school children as they cause poor health and directly reduce cognitive potential and indirectly undermine the schooling through absenteeism, attention deficits and early drop out. Additionally, lack of adequate segregated sanitation facilities for boys and girls at school discourages girls from attending full time and affecting their academic performance and perpetuating gender equity. The aim of this study is thus to fill the gap by characterizing environmental sanitary hygiene practices among school children and the level of faecal contamination in various environmental sites in primary school children in Tanzania at Ruaha primary school in Lindi Municipality.

The general objective is to establish the environmental sanitary conditions in schools in Lindi Municipality in Tanzania. This then gives the three specific objectives to deal with namely: to identify the availability of environmental sanitary facilities in Ruaha primary school; to determine awareness level of proper environmental hygiene practices among children of Ruaha primary school and to establish the environmental sites with high levels of faecal matter contamination at Ruaha primary school in Lindi municipality. From the findings, the necessary information was obtained for the purpose of improving the environmental school health program specifically on increasing the effort to ensure that the minimum standards of healthy environmental requirements are attained. This can help the schools in Lindi Municipality in particular and Tanzania at large to have one latrine for every 20 girls and one latrine for every 25 boys in all schools and emphasizing on the installation of hand wash facilities to each primary school by the year 2030 as stipulated in the Sustainable Development Goals. Rationale

International Journal of Environmental Sciences

of the findings of this work was established as the entry point for further research activities on this ground of environmental sanitation and hygiene in the schools. Furthermore, the findings of this study may stimulate and make changes of bad environmental sanitary health practices among various groups/stakeholders in the community of Tanzania. These include parents, teachers and children towards environmental sanitary positive health practices and hence decreasing of faecal-oral communicable diseases. Lastly, the findings from this study may be useful to Ministries of Education, Environment, Water and Health to campaign on observation of environmental sanitary health standards in the schools and other organizations. Policy Makers may ensure the formulation of the policy that school pupils/students adhere to good environmental sanitary health practices. With the specific objectives aforementioned, this study generally generated the summary of the whole problem of the study in a picture of reality as can be narrated in the conceptual framework Figure 1 below.

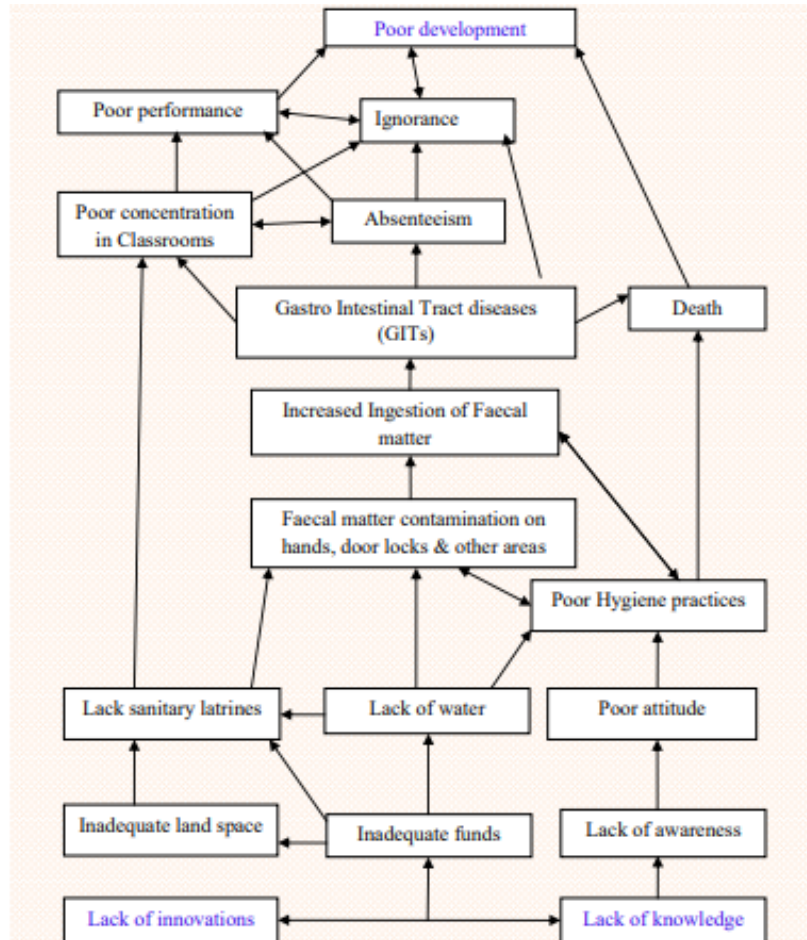


Fig. 1: Problem Tree Analysis-Conceptual Framework (Source: This study, 2019)

The conceptual framework indicates lack of the bottom cluster requirements, which results into the complexity of the middle cluster of the problems and ultimately increased ignorance, poor performance schools and also poor environmental-sanitation development of the individuals and the nation at large. Most of the school children suffer from diarrhea diseases because of faecal ingestion due to poor environmental sanitary practices. The study by Kaltenthaler *et al.* (1995) discovered that faecal ingestion has important health and economic implications for both the schools and the families. Inadequate hand washing and sanitation facilities have contributed to Gastro-Intestinal Tract (GIT) infections where by most of these are grouped into Diarrheal diseases. The knowledge of patterns and degree of faecal matter contamination in the school environmental surfaces is of paramount important, Laborde Weigle *et al.* (1989). This can identify important sources of entero-pathogens to be targeted by the Hygienic Interventions. Faecal Coli-forms occur in large number in human faeces and can be presumptively identified on differential culture media. School health programs including deworming and environmental sanitation activities through Health Education and improvement of sanitation conditions in the school have potential to health and environmental education for school children (Ulukanligil and Seyrek 2003). Poor environmental sanitation conditions, unavailability of soaps on basins and presence of garbage piles around the schools provide suitable conditions for the transmission of certain contagious infections and intestinal helminthes infections to school children. On a report by Partnership for Children Development (PCD, 2002) written that, environmental hygiene promotion in schools is a primary

intervention because of the potential high risk of disease transmission if facilities are either non-existent, in poor state of repair or incorrectly used. In addition, literature studies show that school-age children can provide effective links with their peers such as child to child and the wider community in communicating important environmental hygiene messages as well as promoting improved sanitation through integration of safe water and sanitation projects.

Research gap

For the purpose of preparing school health programme, information of demographic characteristics of school resources for example age group, the opportunities for interventions and the appropriateness of the available infrastructures are all useful. Hand washing is one of the most effective means of preventing diarrheal diseases, along with the safe stool disposal, safe, clean and adequate water supply. Hand wash with soap can prevent the transmission of variety of pathogens Water and Sanitation Programmes (WSP, 2007). In Lindi Municipality, most of the schools have no functional tube-wells and just over half had no functional toilet facilities. Working toilets were often locked and the key kept in a location that was inaccessible to children. Not only is this, but also due to limited water availability, most toilets in the schools not cleaned regularly. So when children needed a toilet service, they usually return home or go in the bushes alongside the road or in the field or ditches. Severely indeed, very few schools had hand washing facilities. Special attention is needed on this problem in Lindi Municipality and elsewhere with the same situation. Poor sanitation and hygiene has contributed to poor educational performance of the children in the schools particularly the girls. The report by Water Aid UNICEF (2009) had shown that more time can be lost through illness or absence over not being able to deal effectively with girls menses. About 12 % of illnesses in children of 0-15 years of age are due to diarrhea, Ministry of Health and Social Welfare (MoHSW-Tanzania, 2008). Children lose cognitive ability due to worm or Schistosomiasis infestation. The same report pointed out that 61% of children share a single drop-hole toilet in the schools, and some schools have over 200 pupils per latrine and some have no latrine at all. Based on the situational analysis by (Taylor, 2009), under the National Strategy for Growth and Reduction of Poverty two (NSGRP II) review effective hand wash with soap cut diarrheal diseases by 42-47%. Water and environmental sanitation related diseases remained one of the most significant health problems worldwide. Prevention of faecal-oral infection is possible when the methods of stool disposal are improved by the use of properly constructed pit latrines in rural areas, or flush toilets.

Hand washing facilities including soap and water should be provided immediately outside all the toilets and the latrines. Preferably, there should be some facilities for washing the hand with soap and clean running water, such as a plastic container with a tap to wash the hands after using the toilet. Always wash before cooking or eating foods as stated by African Medical Research Foundation (AMREF, 2007, Roschnik and Uddin 2009). At the current rate of progress, the (NSGRP II) review -2009 and Sustainable Development Goals (SDGs, 3, 6, 11, 13 & 15) by 2030 targets for water supply-sanitation-climate change-land degradation-clean environment are out of reach. Therefore, this study addressed the issues on the Environmental sanitary conditions of Primary Schools in Lindi Municipality in Tanzania. The aim is to establish environmental sanitary practices among the school children as one of intervention towards various sanitary related health problems and the sustainable development goals gap in the 21st century by the year 2030. And also to establish if the Ministry of Education and Vocational Training (MoEVT, 2016) SWASH guidelines have been realized in Tanzanian Schools environment.

(MoEVT, 2016) stated that 38% of schools have adequate number of latrines; 20% of schools have water supply facilities within the school premises and less than 10% of all schools in the country have functioning hand washing facilities with available water to enable children maintain their personal hygiene and internalize relevant sanitation practices with inadequate water, sanitation and hygiene conditions in schools. Thus, put forward the strategic areas including, requirements for successful and sustainable School WASH, minimum standards for School WASH, Technical option for water and sanitation, operation and maintenance of School WASH facilities, sanitation and hygiene education, institutional arrangements, financial mobilization and management. This complements national efforts on improvement of school sanitation and hygiene contributing to a positive learning environment, quality education and health for school children.

Materials and methods

Description of Study Area

This study was conducted at Ruaha School which is found at Mnazi-mmoja ward in Lindi Municipality. Its geographical longitudinal coordinates are Latitude 10° 0' south of the equator, and Longitude 39° 19' to 59° 98' East of Greenwich meridian. Western side, southern side and northern side both sides are bordered with Lindi District Council except at the eastern side where there is an Indian ocean.

Target Population

This study involved the population of 550 school children studying standard three to standard seven of both sexes-boys and girls in Ruaha School which is found at Mnazi-mmoja ward. The sample size of 147 school children was purposively involved in this study and the Head of the school. This was for the purpose of obtaining useful information as contribution for

effective discussion of the study findings. Personal observation was also utilized to get more information from the school and the surrounding environments.

Study Design

The study was a Cross –sectional qualitative and quantitative study design which took over within the period of three months in the field sample data collection by the field assistants with the supervision of the Lindi Municipality Health specialist.

Sample size estimation

A sample size was 147; obtained based on the sample size calculation formula:

$$n = \frac{z^2 p (1-p)}{d^2}$$

Where by z = Standard Normal Distribution i. e 1.94 at 95% accuracy confidence level of 0.5.

p = Proportional of faecal matter contamination among school children has been taken to be 50%

n = Minimum sample size

d = Standard error to be tolerated, approximated to 8% for more than 100 sample size.

Substitution of Data

$$n = \frac{1.94^2 \times 0.5 (1-0.5)}{0.08^2} = 147$$

Sampling strategy

A systematic random sampling method was considered and 147 pieces of papers written 'S' for YES and the others of the same amount written 'N' for NO. Then all of these pieces were folded and put into a container, shaken before asking each child to pick one while closing the eyes. All those who picked a paper with the letter 'S' constituted the sample. Hands were constituted the sample in respect of sampling areas for the specimens. Hands have been selected since they are frequently come into contact with faecal matter either anal cleansing or touching the contaminated areas i.e. door handles, shaking hands or chewing the fingers as well as pens, pen caps or pencils.

Data collection procedures and tools

On the case of faecal contamination, swabbing of the hands was done and the sample was transferred to the Microbiological Laboratory at Sokoine Referral Hospital for analysis. Administration of questionnaires to the school children was done and observational method was employed to check the availability and functioning of the environmental sanitary and hygienic facilities.

Questionnaires and Observational tools were employed and for the case of hands sampling a pre-moistened sterile cotton swabs was used which was then put into vials containing 2 ml of sterile 0.1% peptone water ready for Laboratory analysis. To ensure efficient and safety of the samples, they were put immediately into the vaccine carrier which contained ice cubes and sent to Sokoine Regional Referral Hospital laboratory department for analysis.

Pilot Study

A pilot study was conducted in Lindi Municipality, where by the sample size involved respondents from outside the study area. Small number of children of similar classes from Mitwero and Rahaleo primary schools was involved. The aim was to examine the liability and viability of the tools as well as to minimize errors during data collection in the research area of Ruaha Primary School.

Data Analysis procedure

As soon as the data have been collected from the field, transportation processing and analysis was performed in two ways as follows:

All surface sample specimens was processed and analyzed in Microbiological laboratory by using Membrane Filtration Method. A divided sample was incubated at two membranes, one at 35°C - 37°C and another at 44°C - 44.5°C. This was to ensure a direct estimate in number of faecal coli-form organisms. All the specimens were kept into vials containing 2 ml of sterile 0.1 % peptone water. Mac Conkey Aga was used as a culture media so as to facilitate growth of and direct identification of *Escherichia coli* in the form of red colonies as an indication of faecal matter contamination on the surfaces where sample was drawn from.

All responses resulted from the administration of questionnaires and observations were coded, processed and analyzed electronically by the use of computer program STATA version 13.

Data Validation

To ensure completeness and correctness of information from the field, appropriate attention was on the following aspects: Pre-testing of tools during pilot study before being utilized to ascertain their effectiveness. All specimens collected from the field were properly handled under appropriate conditions in order to provide intended Laboratory results.

Ethical considerations and clearance

National Institute for Medical Research (NIMR) a parastatal Organization under the Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) which monitor health research carried out in Tanzania was consulted to get permission on the research which deals with people, in this case the children boys and girls in Ruaha Primary School at Mnazi-mmoja ward in Lindi Municipality. Before doing anything in the research area, the investigator requested an ethical clearance certificate from the Open University of Tanzania, OUT Lindi centre, permission from Lindi Council Municipal Director, as well as Heads of Education and Environmental Health departments. Also permission was requested from Ward Education Officer and from the primary schools in charge. All respondents were consulted after their schools in charge declared by signing on the consent form on behalf of the school children.

Reliability of the collected sample specimens

The reliability of laboratory testing was highest by calibrating the testing tools and for detection of faecal coli-form organisms. The highest agreement was observed and the specimens were taken from all hands i.e. left and right hands. In conclusion, the swab method was used for sample collection and the specimens were used reliably for faecal coli-form organisms (*Escherichia coli*) testing.

Results and discussions

This part presents the study results revealed on environmental sanitary conditions of schools in Lindi Municipality. It discusses the results and issues raised from this study. From these discussions, different perspectives can be drawn as the importance of these results to the respondents, other stakeholders and conclusions can then be end up with the future studies. This discussion focused on three areas, availability of Environmental sanitary facilities in Ruaha school, awareness of proper Environmental hygiene practices among the school students of Ruaha school and the determination of the Environmental sites with high levels of faecal matter contamination at Ruaha school in Lindi Municipality.

Interviewed Respondents

A total of 147 students were interviewed in this study. The findings are presented in the form of tables, pie charts and narrations and Table 1 give age and sex of the respondents.

Table 1: Distribution of respondents by age and sex

Age groups	n = 147					
	Male		Female		Total	
	No.	%	No.	%	No.	%
8 - 11	41	28	46	31	87	59
12 - 15	25	17	27	18	52	35
16 - 19	3	2	5	3	8	5
Total	69	47	78	53	147	100

Table 1 indicates that, majority of respondents 87 (59%) were of age group of 8 – 11 followed by 12 – 15 age group which were 52 (35%) of the respondents. Female were more than a half of the respondents 78 (53%).

Table 2: Distribution of respondents by standard level/class levels of the students

n = 147		
Standard level	Frequency	Percentage
Standard three	36	24
Standard four	43	29
Standard five	31	21
Standard six	18	12
Standard seven	19	13
Total	147	100

Table 2 shows that more than a quarter of the respondents 43 (29%) were standard four followed by standard three 36 (24%) and from standard five to seven the number decreases due to increased IQ in taking care of the environmental sanitation and hygienic conditions.

Availability of Environmental sanitary facilities: The results of the specific objective one found out that it is important that sanitary facilities address the needs of the school students both in terms of availability and accessibility. Sanitary facilities should be sufficient in number to prevent queuing of the students other than in exceptional circumstances. Sanitary facilities should not be an afterthought in the planning of a building, as this can result in facilities that are not enough or in awkward locations, making them difficult to access and use. Whilst guidance is offered on a variety of building types, some may not be categorized easily. In such cases, designers need to discuss specific provision with their clients and the user groups to consider the guidance given under this standard to arrive at a consensus practical solution. Water, sanitation and hygiene (WASH, 2018) facilities in various schools are extremely poor. Many new schools and classrooms are built with no consideration for WASH facilities or if built, these rarely follow any standards. National data shows that on average there is only one pit latrine for every 56 students in schools (UNICEF, 2009) in Tanzania and hand washing in households before eating was 70% (WASH, 2008). There are significant disparities in WASH facilities between rural and urban populations. Only 35 per cent of the rural population has access to improved toilet facilities, compared to 69 per cent of the urban population. Improving WASH outcomes and prioritizing WASH spending is essential to reduce inequality (UNICEF, 2018). The SDGs aim for universal access to WASH and inclusive and effective learning environments for all. These have included WASH services in schools and have specified indicators for the global monitoring of SDG targets 6.1 and 6.2: universal access to WASH – and SDG target 4.a: inclusive and effective learning environment for all. SDG targets and indicators for WASH in schools focus on achieving a basic minimum level of service by 2030. To effectively monitor this, the WHO/UNICEF Joint Monitoring Programme (JMP) for WASH has introduced new service ladders that are clearly elaborated in Figure 2

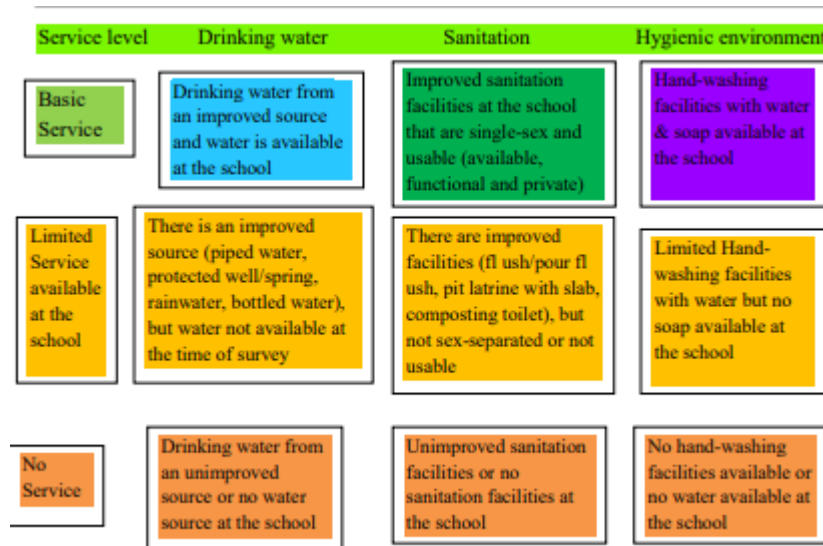


Fig. 1: New Joint Monitoring Programme service ladders for monitoring WASH in schools. (Source: This research paper improved drawings from UNICEF, 2018).

The fee-free education policy, introduced in 2015 in Tanzania, has had positive effects in increasing the number of students enrolled in schools across the country. This increased number of students enrolled in schools means that the infrastructure in existing schools is overloaded and is supporting numbers of students that far exceed the initial design loads. This means that even where WASH facilities had been provided they are now insufficient to meet the needs of all students enrolled.

Awareness of respondents if washing hands after toileting protect them from diseases

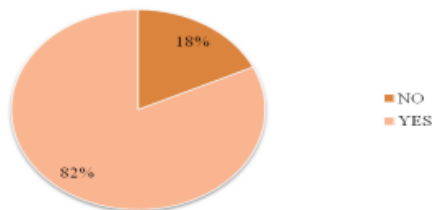


Fig. 2: Distribution of respondents on awareness of washing hands after toileting

From Figure 2, majority of the respondents 121 (82%) were aware that washing hands after toileting could protect them from diseases.

Table 3 indicates that more than a half 94 (64%) of the respondents were not washing hands after toileting.

n=147		
Respondents answer	Total respondents	%
yes	53	36
No	94	64
TOTAL	147	100

Table 4: Distribution of respondents by washing hands using soap and water

n=147		
Respondents answer	Total respondents	%
yes	18	12
No	129	88
TOTAL	147	100

Table 4 reveals that only 18 (12%) of the respondents were washing hands using soap and water after toileting.

Table 5: Distribution of respondents on washing hands by water only

n=147		
Respondents answer	Total respondents	%
yes	32	22
No	115	78
TOTAL	147	100

Table 5 shows that only 32 (22%) of the respondents were washing hands by water only compared with 115 (78%) who were not washing hands after toileting.

Awareness of proper Environmental hygienic practices among school children: Behaviour of respondents on washing hands before eating food

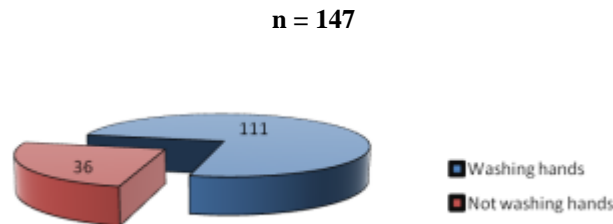


Fig. 3: Distribution of respondents on washing hands before eating

Figure 3 shows that, majority 111 (76%) of the respondents were having a practice of washing hands before eating food and the rest 36 (24%) were not practicing washing hands before eating food. In discussing the second specific objective, it was found that overall, majority of students reported washing hands before meals. However, only 36% of students reported washing hands after toileting. Fecal-oral contamination is a major cause of transmissible diseases such as gastrointestinal infections. Washing hands after defecation is one of the most effective ways to prevent gastrointestinal parasitic infections. While 82% of students reported that washing hands after defecation could protect them from diseases, only 18% were not aware that washing hands can protect them from getting diseases. Although the students know that washing hands after defecation is important, they may be negatively influenced by factors such as laziness, the rush to play with friends, or even the lack of hand washing facilities close to the latrines. Based on these results, it appears that the hygiene practices which require the greatest amount of water result in lower rates of practice. Both washing hands before meals and hand washing after toileting require relatively larger volumes of water.

The low frequencies of hand washing with soap (12%) may be attributed to the lack of soap in school and at home. Soap, water and latrines are essential for proper hygiene practice in schools. A UNICEF (2009) study conducted in Ethiopia found that less than one-third of schools had water points and only 5% had hand washing facilities, none of which had soap. A

study carried out in three rural-based primary schools in Dodoma, central Tanzania to investigate opportunities and challenges head teachers face during the implementation of school Water and Sanitation Hygiene (WASH) programme were absent of standard school toilets and training in sanitation management, fewer toilet holes than required, and lacked running water and funds for WASH activities. However, lack of parental awareness of school WASH activities that may limit their support to their children (Joyce, 2014).

Knowledge of respondents on environmental sites/places that may contain faecal matter

The specific objective three findings as indicated from Figure 4, majority of the respondents 98 (67%) had a moderate knowledge on places that may contain faecal matter where by only 37 (25%) respondents had a high knowledge on that part.

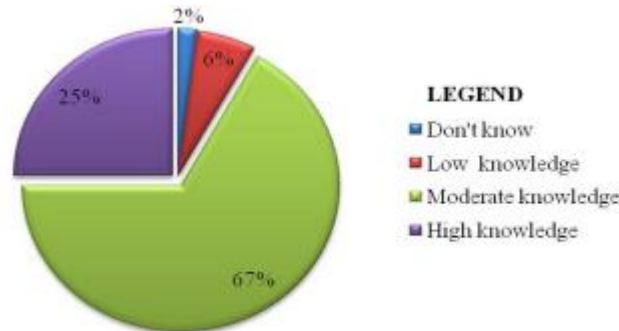


Fig. 4: Distribution of respondents on places that may contain faecal matter

Behaviour of respondents on chewing fingers

Figure 5 shows that, nearly a half 71 (48%) of the respondents were having a behaviour of chewing fingers.

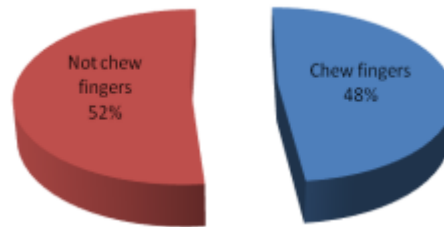


Fig. 5: Distribution of respondents on behaviour of chewing fingers

Figure 6 shows that, 40% (59) of the respondents were having a behaviour of chewing pen caps and 60% (88) dislike to chew pen caps due to low awareness of sanitation education.

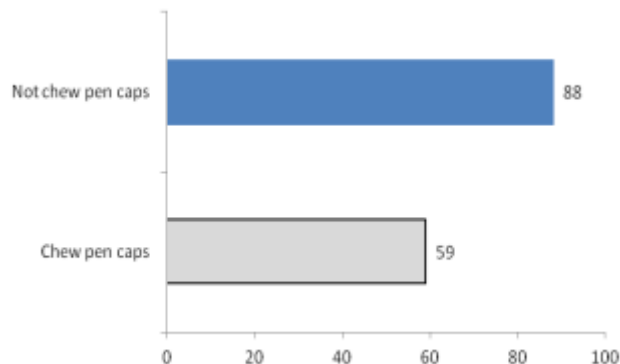


Fig. 6: Distribution of respondents on behaviour of chew pen caps

Table 6 shows that, most 116 (79%) of the respondents had a behavior of shaking hands when greeting the fellow children and few 31 (21%) had not such behavior.

Table 6: Behaviour of shaking hands when greeting the fellow children

n = 147

Behaviour	Total respondents	%
Shake hands	31	21
Not shake hands	116	79
TOTAL	147	100

Table 7: Practices of opening and closing the doors when visiting toilets

n = 147		
Practices	Total respondents	%
Open and close the door	126	86
Not open and close the door	21	14
TOTAL	147	100

Table 7 shows that, majority 126 (86%) of the respondents practiced opening and closing the doors when visiting toilets. Only 21 (14%) did not practice that.

Environmental sites with high levels of faecal matter contamination

Faecal bacteria can survive on hands and surfaces for hours at a time, especially in warmer temperatures away from sunlight. It is easily transferred by touch to door handles, food and even mobile phones. From there, the germs can be picked up by other people. Every year, 3.5million children under the age of five are killed by pneumonia and diarrhoeal diseases – and the simple action of washing hands with soap is one of the most effective ways of preventing diarrhoea illness. In developed countries, hand washing with soap helps to prevent the spread of viral infections, such as norovirus, rotavirus and influenza (Water Supply and Sanitation -WSP, 2011).

In general, pathogenic micro-organisms may be transmitted from source to new victim in a number of ways including direct person-to-person spread and indirect routes including inanimate objects (fomites), food, water or insect vectors. A study conducted in Egypt by Sabra (2013) at Taif University KSA public female restrooms reported contamination sites of the toilet handle 91.3%, door 73.8%, sink 63.3% where E.coli counted 22.5%. The summary of the bacteria types was *Staphylococcus aureus*, *Escherichia coli*, (*Bacillus spp.* and *Klebsiella pneumoniae*), *Enterococcus faecalis*, *Citrobacter spp.* *Pseudomonas aeruginosa* and *Proteus mirabilis* as follow 76/187 (40.6%), 42/187 (22.5%), 40/187 (21.4%), 25/187 (13.4%), 18/187 (9.6%), 16/187 (8.6%) and 13/187 (7%).

To manage the risks of excreta-related disease transmission, it is important to apply a multiple barrier approach similar to the Hazard Assessment and Critical Control Point (HACCP). The use of safe sanitary installations and the appropriate handling, treatment and use of excreta are important barriers or critical control points in the transmission of faecal-oral disease. Effective excreta management programmes can reduce disease transmission via drinking water, shaking hands and via food chains. As discussed earlier, when such management fails, other interventions are necessary to prevent the spread of disease. Numerous studies have helped to identify additional barriers to the spread of faecal-oral disease. Many of these barriers are related to behaviours such as good personal and domestic hygiene practices, water storage and food preparation (UNICEF, 2009). Pickering *et al.* (2011) reported the fraction of respondents that could show them a specific place at their home designated for hand washing after using the toilet (60%) and before preparing food (37%). Enumerators observed the presence of soap at 50% of these hand washing stations; water was readily available at 43% of the locations. Kyriacou *et al.* (2008) while screening for faecal contamination in Primary Schools in Crete, Greece revealed faecal streptococci were found at 52.9% of children's hands and at 16.7% of other surfaces. Children, who had parents with the highest education level (>12 years), had the lowest percentage (48.8%) of faecal contamination on their hands. Furthermore, boys exhibited higher levels of hands contamination compared with girls.

Among the environmental surfaces examined, the school canteen reception was the most contaminated area. They concluded that high faecal contamination was detected in primary schools in the examined region. The educational level of parents correlated well with the contamination of children's hands. (Kaltenthaler *et al.*, 1995).

Therefore, behaviour modifications as well as technical Environmental Sanitation solutions are necessary to reduce the transmission of excreta-related diseases. An evaluation study of the MoEVT (2016) SWASH guidelines implementation conducted by Prince *et al.*, (2017) revealed that only 50% of schools met the Tanzania guideline of 50 boys per drop hole, while 43% met the guideline of 40 girls per drop hole. About 53% of schools had a reliable water supply, 43% had some functional hand washing stations, but only 29% and 19% had water and soap available at the stations, respectively. But found poor planning and coordination, inadequate funding, and low technical capacity as barriers to achieve the intended objectives.

Findings from the Head of School and personal observations

Apart from the pupils, the head of Ruaha primary school was a part in this study to give the opinions on the availability of School Water and Sanitation Hygiene (SWASH) practices and the other interventions required. In finding out from the head of school the availability of functional School Water and Sanitation Hygiene (SWASH) club, the head of Ruaha primary school declared that, the school had no such a club.

The personal observation was also used to obtain the information in this study. This mainly concentrated on the environmental conditions around the school compound and the surroundings under the following: subheadings: **(i) Latrines:** It was observed that, there was only one latrine which is a traditional pit latrine (TPL). The latrine had 4 holes, 2 for boys and 2 for girls. The results had shown that, only 33% (2 out of the required 6) and 40% (2 out of the required 5) for girls and boys respectively existed. And no holes prepared for the disabled children or the less privileged individuals. **(ii) Urinals:** No urinals observed around the school compound. **(iii) Changing room for girls:** No changing room for the girls who were on their menses periods. **(iv) Hygiene and privacy:** During the study it had been revealed that, the floor/slab was clean, walls clean and there was good privacy for the latrine users. **(v) Hand washing points:** It was observed that, there was neither running water nor soap in both inside and outside of the latrines. **(vi) Open defecation:** No faeces visible either on the slab or the walls. Faeces were visible outside surroundings on the compounds around the bushes near the school compound.

Conclusions

The General Environmental cleanliness around the school

Generally, the Environmental cleanliness was in poor conditions. The School environment was scattered with papers and plastic bags and full of grasses. No enough trees for shades and decoration of the school environment for beautifications and no water sources specifically for the school use. Generally, the findings of this research indicated that, there was insufficient availability of environmental sanitary facilities. The study revealed that, there was only one latrine which is traditional latrine with few drop holes compared with the number of pupils and the teachers. No School Water and Sanitation Hygiene (WASH) club.

Also there was poor awareness of proper environmental hygiene practices among the school children. Nearly half of the respondents were having a behavior of chewing fingers and worse enough more than a half of the respondents (78%) were not washing hands after toileting. It was noted that, majority of the respondents had a moderate knowledge on places that may contain faecal matter. Environmental sanitary conditions of primary schools in Lindi Municipality remained poor and challenging even with the National Sanitation Campaign (NSC) conducted by the Municipal sanitation and environmental office in Lindi Municipal council. Very little improvement was achieved as refuse containers were over-flowing with refuse at the period of the study. Many areas of the Ruaha primary school environment were seen with littering of sachet water bags, waste paper and weeds. Sanitary facilities remained inadequate while student population continues to increase and the number of drop holes is very few compared to the number of the children.

Recommendations

From the study findings and the observations made, here is recommended to where, whom and what should be done for environmental sanitation and hygiene improvement among primary schools in Lindi Municipality and Tanzania in general.

First recommendation is to the authorities to consider the minimum standard that, one latrine for every 20 girls and one latrine for every 25 boys in all schools and emphasizing on the installation of hand washing facilities to each primary school in the Country. Schools should be provided with litter bins and be used effectively under monitoring. Primary school teachers should be provided with their own latrines instead of sharing latrine with pupils. The Municipal Councils should set aside an area for solid waste collection point's prior to disposal points. School teachers should be provided with knowledge/capacity building on Environmental management particularly Environmental Sanitation and Hygiene. Every school should have meetings with parents in every three months on Environmental Management and sanitation issues. Environmental practitioners at the Council should organize meetings with community in all 18 wards at Lindi Municipal Council on Environmental Management, sanitation and hygiene. There should be stronger coordination to stakeholders' private-public partnerships with clearly defined roles including cost sharing. The stakeholders should also consider the impact of increasing funding for both software and hardware components to improve the enabling environment, and to develop harmonized monitoring tool for sustainable school water, sanitation and hygienic environment.

The second recommendations are for the ministries responsible for hygienic and sanitary conditions. The MoHSW should ensure that the recommended and approved school design maps be adhered. The ministry should take action (Law enforcement) through using Public health Act 2009 and Environmental Management Act, 2004 to the councils failed to monitor the Environmental sanitation and hygiene in their schools. The Ministry should develop different simple leaflets on proper solid waste management and be used all over the schools in the country. The Ministry of Environment can make close supportive supervision in schools to identify challenges and problems on Environmental issues and support the possible

solutions. The ministry should convince the Government to ensure that the Environmental practitioners are employed in all Local Governments Authorities for technical support. The Ministry should make sure that all primary schools adhered to Environmental laws particularly Environmental Management Act, 2004. The Ministry of Education may oversee the establishment of hygiene and sanitation clubs to pass on this life-saving sanitation and hygiene practices to family members and the community as a whole. Establish the Training Curriculum on Environmental Education and Sanitation (TCEESA) right from pre-primary, primary up to the Higher Learning levels in Tanzania. The Ministry of Water, Energy and Minerals may also make sure that enough and clean water is available in all schools in Tanzania and ensures that the water sources are safeguarded from intruders and encroachments.

The third recommendation is for the school board/committee & Teachers should be comply with any directives that may be issued from time to time from the Ministry of Environmental (MOEVT), National Environmental Management Council (NEMC), Ministry of Health and Social Welfare (MoHSW), Ministry of Water, Energy and Minerals and the Local Government Authorities and advise the schools accordingly. Advise the students/pupils on good hygienic behaviors to safeguard their health and the environment. There should be community education to sensitize community members on the School WASH activities and the importance of their attending school meetings and participation in School WASH activities. The Parents are also responsible for buying shoes for their children so that they do not have to enter and use the toilets with barefooted. Not only that but the Local Government Authorities (LGAs) can organize and provide SWASH training (including hygiene education) and advice to teachers, head of schools, and other school staff and school committees/boards as well as to Plan and coordinate School WASH competitions. They can also fence the schools to avoid outside pollution. The fourth recommendations for the students/pupils to use School WASH facilities correctly and responsibly and practice good hygienic behavior as well as to participate in school campaigns, development of hygiene messages, competitions and projects on School WASH as well as to play an active role in cleaning and maintenance of SWASH facilities.

Further research

Monitoring, evaluation tool and capacity building is vital to improve the environmental sanitation in schools as well as to provide valuable feedback to the stakeholders especially policy makers to have a harmonized WASH policy in place because to the moment there are policy for water sector 1991 National Water Policy, which resulted in the new National Water Policy (NAWAP) of 2002. (URT, 2002) as well as sanitation and hygiene subsector. The key policy targets include universal access to water supply in urban areas by 2025, and increasing water supply service coverage in rural areas from 51% in 2000 to 90%, as envisioned in the National Development Vision 2025.

Acknowledgement

The work of putting this research together is a collaborative effort of many actors including the Open University of Tanzania, Lindi Municipal Director Office and colleagues from different branches of the Open University of Tanzania. Without their cooperation, this study would not have been possible. First of all thanks to the Lindi Municipal Director the then Mr. Kelvin Makonda for granting permission to conduct this study in Lindi Municipal Council and his encouragement, support and useful contributions. Sincere thanks also go to Mr Ezra Apiyo, Municipal Environmental Management Officer for his extensive suggestions and tireless support in making this academic endeavor a reality. Then I am greatly indebted to Seif Magayu, the Lindi Municipality Health Officer Specialist for spending so much time to assist this work and support at every stage of doing this research as well as all the communications. Deeply thanks to Mr. Ismail Mbani the research assistant who tirelessly worked in interviewing the respondents. Finally, many thanks to all the Lindi Municipal Council stakeholders and all those who in one way or another contributed to the success of this research.

References

- Adam Biran, Wolf Peter Schmidt, Lemlem Zeleke, Haron Emukule, Hla Khay, Julian Parker and Dorothy Peprah, (2012). Hygiene and sanitation practices amongst residents of three long-term refugee camps in Thailand, Ethiopia and Kenya. Available at <http://www.onlinelibrary.wiley.com/doi/10.1111/j.1365...x/pdf> (Accessed on 18th March 2021).
- Akbar K. Ahmed (2000). *Frequency of Intestinal parasitic infection in children 5-12 of age in Abbot bad*. Egypt.
- Flora Kessy and Richard Mahali (2017). Water, Sanitation and Hygiene services in Tanzania: Access, Policy Trends and Financing. THDR 2017: Background Paper No. 11 ESRF Discussion Paper 72. Available at: <http://www.esrftz.org/> (Accessed on 19th January, 2021).
- Gerald R. and David M. AMREF, (2007). *School Sanitation and Hygiene Education*. Kenya, Africa.
- Gugu F. (2010). *WATER AID, School- Water and Sanitation Hygiene (SWASH)*, Johannesburg, S.A.
- Jacqueline T., Niklaus H., Dale Y., (2013). A review of sanitation and hygiene in Tanzania. MSABI (Maji Safi kwa Afya Bora, Ifakara). <https://assets.publishing.service.gov.uk/media/57a08a2fed915d3cfd000628/tanzania-sanitationreview.pdf> (Accessed on 7th April, 2021).
- Jewkes RU, O'Connor BH (1990). *Crisis in out Schools: Survey of Sanitation Facilities in Schools in Bloomsbury Health District*, British Medical Journal, 1990.
- International Journal of Environmental Sciences*

- Kaltenthaler E.C, Elsmorth A.M, Schweiger M.S, Mara D.D and Braunholtz D.A, (1995). *Faecal contamination on children's hands and environmental surfaces in primary school in Leeds, United Kingdom*. Available at https://www.researchgate.net/publication/23568953_Screening_for_faecal_contamination_in_primary_schools_in_Crete_Greece (Accessed on 26th March 2016).
- Koopmans, (2004). *Applied and Environmental Microbiology*, Columbia, USA.
- Laborde D.J, Weigle K.A, Weber D.J, Sobsey (1989). *The frequency level and Distribution of faecal contamination in Day-Care Center classrooms (1008-1011)*.
- Lindi Municipality annual health report (2013). Lindi Region, Tanzania.
- Loc .C, Phan T.T and Khai .L, (2000). *Bacteriological indicators of faecal contamination of water* in Tau Phu Thauh, University Medicine Department, Agriculture college, Centho University, Vietnam.
- Mafuru Solomi Juma, Peter Elia Mosha, Stanslaus Mbenea Msuya (2018). The State of Water Supply and Sanitation in Government Primary Schools in Dares Salaam Region a Case of Kinondoni Municipality, Tanzania. Available at: <http://www.sciencepublishinggroup.com/j/fem> (Accessed on 7th April, 2021).
- MoHSW-Tanzania, (2008). *Sharpened One Plan* – about RCHS, Dar es Salaam, Tanzania.
- National Strategy for Growth and Reduction of Poverty II review, (2009). Dar es Salaam, Tanzania.
- MoEVT (2016). National guideline for water, sanitation and hygiene for Tanzania schools. Ministry of Education and Vocational Training, Tanzania.
- National Strategic Plan for School Water, Sanitation and Hygiene (SWASH) 2012 -2017. Ministry of Education and Vocational Training (MoEVT), Tanzania.
- Nemes, J. (2014). The water and sanitation (wash) drive in Tanzania: opportunities and challenges head teachers face in rural-based schools. *International Journal of Education and Research Vol. 2 No. 1 January 2014*. <https://www.ijern.com> (Accessed on 7th April, 2021).
- Nemes, J. (2012). Challenges of Managing Primary Schools with Limited Leadership Training; The Case of Head teachers in three Selected Regions of Tanzania. PhD Thesis (Published). The University of Dodoma: Tanzania.
- Prince Antwi-Agyei, Anyitike Mwakitalima, Amour Selemam, Filemoni Tenu, Theresia Kuiwite, Stephen Kiberiti and Elisa Roma (2017). Water, sanitation and hygiene (WASH) in schools: results from a process evaluation of the National Sanitation Campaign in Tanzania. Available at: *Journal of Water, Sanitation and Hygiene for Development* February, 2017. <https://www.researchgate.net/publication/313735098> (Accessed on 7th April, 2021).
- Roschnik N, and Uddin I, (2009). *Improving water and sanitation in schools and communities*, Nasirnagar, Bangladesh.
- Taylor B. (2009). *Situational Analysis of women, children and water (NSGRP- Review)*, Sanitation and Hygiene Sector, Tanzania.
- Ulukanligil M, and Seyrek A, (2003). *Demographic and Parasitic infection status of school children and sanitary conditions of school children and sanitary conditions of schools* in Sanliurfa, BMC Public Health, Turkey (1471-2458/3/29).
- Water, sanitation and hygiene (UNICEF, 2015). Providing adequate water, sanitation and hygiene (WASH) services is critical to improving the survival, health and development of children. UNICEF for every child – URT want to achieve by 2021 strengthened national water, sanitation and hygiene.
- Water Aid - UNICEF, (2009). *School Wash Mapping*, Tanzania. Accessed from http://www.unicef.org/tanzania/WASH_factsheet (Accessed on 03rd Septe3mber, 2016).
- Water, Sanitation and Hygiene (WASH, 2018) *Budget Brief Tanzania*. Available at <https://www.unicef.org/esa/media/2351/file/UNICEF-Tanzania-Mainland-2018-WASH-Budget-Brief-revised.pdf> (Accessed on 18th January, 2021).
- Water Supply and Sanitation (WSP, 2011) in Tanzania Turning Finance into Services for 2015 and Beyond. An AMCOW Country Status Overview. Available at <https://www.wsp.org/sites/wsp/files/publications/CSO-Tanzania.pdf> (Retrieved 19 January, 2021).
- WHO (2009). *Water, Sanitation and Hygiene Standards for Schools in Low-cost*, Australia. WHO/UNICEF JMP (2018). School Water, Sanitation and Hygiene Assessment. MAIN REPORT Tanzania February, 2020. <https://www.unicef.org/tanzania/media/2356/file/National%20SchoolWASHReport2020.pdf>. (19/01/2021).
- World Bank (2018). Reaching for the SDGs: The Untapped Potential of Tanzania's Water Supply, Sanitation, and Hygiene Sector. WASH Poverty Diagnostic. World Bank, Washington, DC.
- WSP (2007). *The hand washing Handbook*. A guide for developing a Hygiene Promotion program to increase hand washing with soap. <http://www.onlinelibrary.wiley.com/doi/10.1111/j.1365...x/pdf> (Accessed on 26th March 2019).