WASH IN SCHOOLS

WATER SANITATION AND HYGIENE

GUIDELINES FOR LEBANON

SETTING STANDARDS ENSURING CHILDREN'S HEALTH

These guidelines are meant to evolve dynamically and will have to be reviewed every 5 years in order to keep pace with evolving situation and technological progress. Feel free to take part in the process by sending your feedback, comments and remarks to: (to be defined) washinschools@irc.nl (?) msahin@unicef.org (?) washinschoolslebanon@gmail.com (?)
This document is the result of a participatory effort followed by a consultation process involving (list of stakeholders). The views expressed in the guidelines are solely the responsibility of the participants of this joint endeavor.

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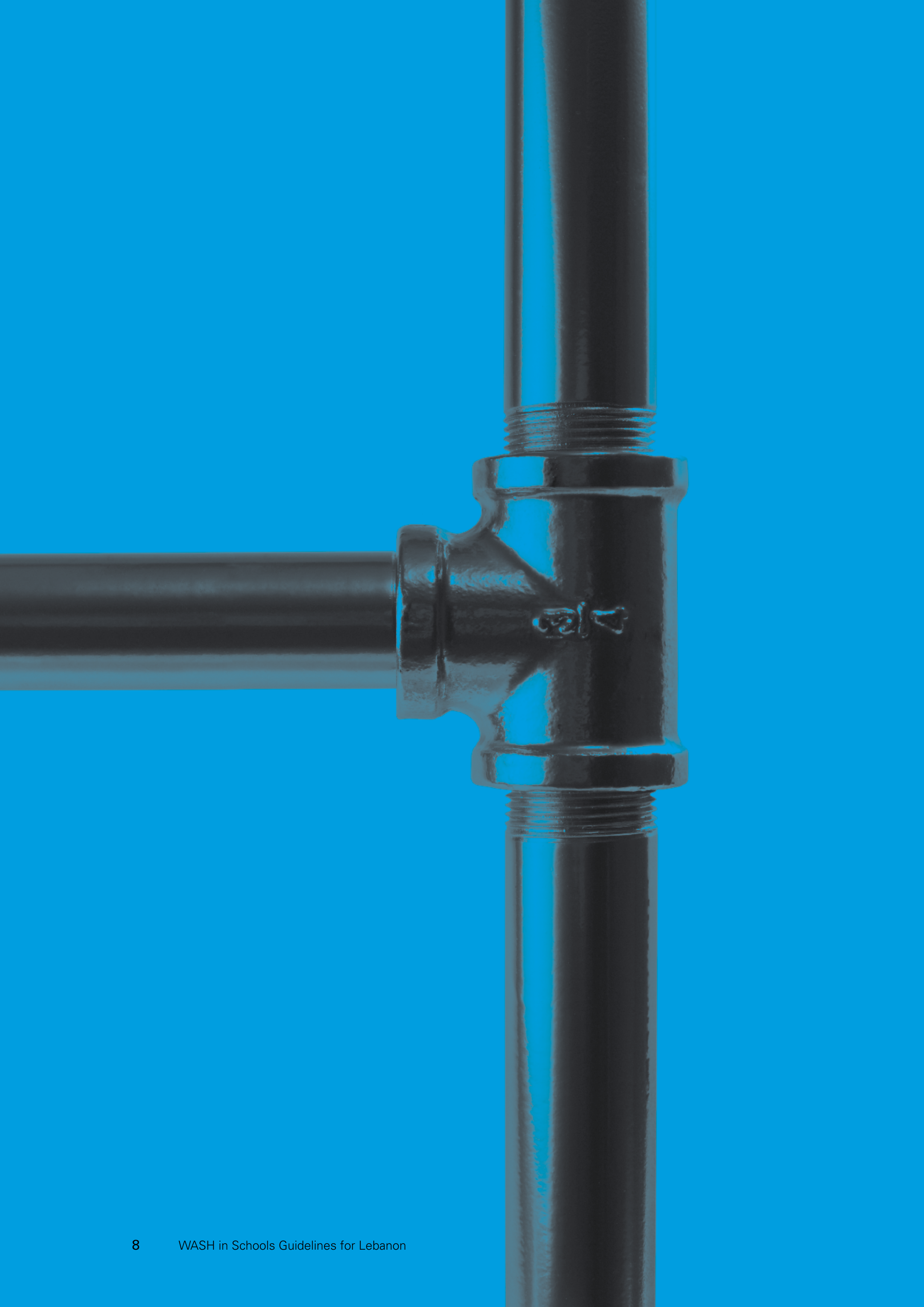
TABLES

ACRONYMS AND ABBREVIATIONS

AUB	American University of Beirut
CDR	Council for Development and Reconstruction (PMO)
CERD	Council for Education Research and Development
DOPS	Département d'Orientation Pédagagogique et Sociale (MEHE)
ECU	Engineering Coordination Unit (MEHE)
GDWQ	Guidelines for Drinking Water Quality (WHO)
HRBA	Human Rights Based Approach
IDP	Internally Displaced People
INEE	Inter-Agency Network for Education in Emergencies
IRC	International Resource Center
LCO	Lebanon Country Office (UNICEF)
MDG	Millennium Development Goals
MEHE	Ministry of Education and Higher Education
MENA	Middle East and North Africa
MENARO	MENA Regional Office (UNICEF)
MoPH	Ministry of Public Health
NGO	Non Governmental Organization
NTU	Nephelometric Turbidity Unit
O&M	Operation and Maintenance
PMO	Prime Minister's Office
SDC	Swiss Development and Cooperation Agency
SHA	Swiss Humanitarian Aid
TDS	Total Dissolved Solids
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
UV	Ultraviolet
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
WinS	WASH in Schools

ACKNOWLEDGEMENTS



INTRODUCTION

1. WASH IN SCHOOLS PROGRAMMING: A UNICEF INITIATIVE

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1. WASH IN SCHOOLS PROGRAMMING: A UNICEF INITIATIVE

The “Call to Action for WASH in Schools” campaign was formally launched in 2010. This major initiative involving UNICEF and key partners calls on decision-makers to increase investments and on practitioners and other concerned stakeholders to improve collaboration on programming effectiveness. The ultimate goal is to expand WASH in Schools (WinS) programmes to improve health, foster learning and enable children to participate as agents of change within their homes and communities. WinS is currently implemented by UNICEF in 94 country programmes around the world.

(Figure: Health and non-health impact of WinS)

The rationale behind the Initiative is that improved WASH could contribute to drastically reduce mortality and morbidity rates linked to diarrheal diseases. Schools are present a high concentration of people and are hence an environment presenting a high risk of person-to-person contamination, which can potentially affect students, staff and their families.

Pupils studying in a school environment free of health hazards are less subject to absenteeism: adequate WASH equipments and practices on the school premises boost both attendance and learning abilities. Children integrate life-skills and can be considered as agents of change, allowing a wider outreach to the communities: they become the advocates of health and life long skills in their families, allowing results to be sustainably maintained over the years[ii].

2. WASH IN SCHOOLS GUIDELINES: INSTRUCTIONS FOR USE

Referring to documents like the Sphere Project handbook[iii] and "Water, Sanitation and Hygiene Standards for Schools in Low-cost settings"[iv], each chapter of the guidelines will address a specific WASH component following an identical structure:

1. **Definition:** in what aspects is this component relevant to children's health.
2. **Standard:** statement that describes the situation we want to achieve and maintain, e.g. "access to water ensured at all time".
3. **Indicators:** benchmark specifying the minimal values to attain in order to fulfill the standard, e.g. "20 liters of potable water per day and per capita (l/d/c)".
4. **Guidance note:** adding information on how to reach the benchmark values, on system limitations and important parameters to consider.
5. **References:** which are the most relevant documents for each WASH component, further readings.
6. **Appendices:** referring to the factsheets presented in part C relevant to the specific WinS component.

This document addresses the specific situation of public schools in Lebanon and intends to serve as a base for the authorities to set WinS national standards. Nevertheless, similarities with other countries in the MENA Region or other Middle Income Countries are likely: there should be no barrier to adapting the guidelines to a similar context.

3. SITUATION ANALYSIS: WASH AND EDUCATION IN LEBANON

The Ministry of Education and Higher Education (MEHE) oversees the management, operation and maintenance of the 1366 public schools of Lebanon, and supervises the construction of new school buildings with the Council of Development and Reconstruction (CDR), which is directly attached to the Prime Minister's Office.
One official document, the Decree 9091 of 2002 elaborated by the MEHE's Engineering Coordination Unit (ECU) and Center for Education and Research Development (CERD), sets standards and dimensions for the construction of new school buildings in the pre-university public education. This official document covers many architectural aspects, but the need for more detailed standards for WASH is Schools was identified.
Following this needs assessment, a collaboration between UNICEF LCO, the SDC and the MEHE started, aiming at producing technical guidelines covering all WinS aspects of pre-university (pre-primary, primary, intermediate and secondary cycles) schools.
Going back to the Lebanese context, the public Education sector is competing with the private sector, which absorbs about 60% of the students and is characterized better achieve-

ment and retention rates. Public school buildings are owned by the Government of Lebanon in 30% of the cases, while the remaining 70% are rented from private owners or provided by NGO's, in which situation they were not always conceived as school premises. The present guidelines mainly address the WASH equipment of infrastructures, which were initially built to serve education purposes: the rehabilitation of apartments and commercial venues into suitable learning spaces is often too cumbersome and specific to be analyzed in a general manner. Nevertheless, the aim is to provide guidance for the construction and rehabilitation of school buildings offering enough flexibility in decision making to adapt to most of the cases.

Looking at the Education Sector, 88.5% of primary school age children (6 years) are attending first grade with one to one gender parity. Enrollment rates for children aged 6 to 11 years in primary and intermediate schools are very high (98.3%) and almost equal for both sexes. As for the enrollment rates in intermediate and high school, 81.1% of children aged 12 to 17 years enroll in intermediate or high school with some variations between the two sexes (85.2% for girls and 77.4% for boys)[v].

The latest 2008 school WASH survey[vi] showed that public schools mainly rely on piped networks (67%) and groundwater (18%) as drinking-water sources, the remaining options being tanks (water trucking), bottled water and surface water. The water supply through municipal networks is regularly interrupted, which implies that schools might have use alternative water sources and that the risk of contamination of piped water is high (low pressure, non continuous circulation). Moreover, groundwater contamination has to be considered, either through unsafe septic tanks (cesspits) or due to infiltration of saltwater in the aquifers.

Water quality in schools is normally monitored, though with long intervals, and general maintenance of the water supply equipments remains an important issue. Different methods are used for treatment of drinking-water on school premises, the main one being filtration and chlorination, reaching about 25% of the institutions. Soap is available in less than 50% of the schools, which represents another important risk of diarrheal disease contamination. Globally, the ratio of toilets per students is of 9 to 100, but data on effective access, functionality and user-friendliness is lacking[vii].

Considering the Lebanese water sector globally, 35% of the households use the public network as source for drinking-water, while almost 50% prefer to use bottled water bought from the stores for this specific purpose. Looking at the accessibility, 75% of the households are connected to the water network, though long interruptions have to be considered to evaluate the actual level of service. About two thirds of the population have access to sanitation systems at their homes; 50% are connected to the sewerage system, while 20% use septic tanks[viii].

For the record, the data mentioned above does not reflect the 100% percent access to improved drinking water sources and sanitation published for Lebanon in the MDG Progress Reports.

4. CROSS-CUTTING ISSUES

4.1 GENDER

Girls are likely to be affected in different ways by the lack of adequate WASH equipments and related practices in general, and in particular on school premises. In poor countries, women and girls are traditionally in charge of water collection. The situation might be different in Lebanon, but let us bear this in mind, especially for secluded and underserved areas where water networks are still lacking.

Girl students generally have increased needs for safety and privacy, to which one has to add access to adequate facilities and consumables and knowledge of menstrual hygiene good practices. These needs are essential and have to be translated in effective measures, aiming at reducing girls' drop out rates and increasing their achievement.

4.2 DISABILITY

Equal opportunities have to be guaranteed to children with physical disabilities. A school is more than a classroom, and access to adapted WASH facilities is mandatory to offer child-friendly facilities for all. Special needs have to be assessed and addressed accordingly.

4.3 GENERAL SAFETY

Schools are a global learning environment where cognitive process happens before, during and after class. Child-friendly school premises are spaces where learning, playing and exchange occur under absolute safety conditions. Physical and mental harm can be avoided by acting on the school physical environment and its adequate monitoring.

4.4 EMERGENCY PREPAREDNESS AND EMERGENCY RESPONSE

Children spend time on school premises, which implies that the structural safety of the buildings has to cope/comply with hazards likely to occur, e.g. floods, fires, landslides and earthquakes. Appropriate behavior can be strengthened through regular evacuation drills and through games during extra-curricular activities.

In the case of conflict in country or at the regional level, IDP's and refugees may use schools as shelters. Maintaining education services and ensuring sufficient access to WASH facilities in such conditions is often a great challenge for the management of the mobilized institutions.

The two main documents defining strategies and standards for education and service delivery in state of emergency are the "INEE Minimum Standards for Education in Emergencies"[ix] and the "Minimum Standards for Emergency Response" by the Sphere Project[x].

4.5 HUMAN RIGHTS BASED APPROACH (HRBA)

Everyone has the right to water and sanitation. This right is recognized in inter¬national legal instruments and provides for sufficient, safe, acceptable, physically accessible and affordable water and accessible sanitation facilities. An adequate amount of safe water is necessary to prevent death from dehydration, to reduce the risk of water-related disease and to provide for consumption, cooking and personal and domestic hygienic requirements.

The right to water and sanitation is inextricably related to other human rights, including the right to health, the right to housing and the right to adequate food. As such, it is part of the guarantees essential for human survival. States and non-state actors have responsibilities in fulfilling the right to water and sanitation. In times of armed conflict, for example, it is prohibited to attack, destroy, remove or render useless drinking water installations or irrigation works[xi].

Similarly, children and staff have a right to water and sanitation on the premises of the school. Insufficient, not adapted or malfunctioning WinS equipments have a direct impact on pupils' ability to learn and staff to provide services.

GUIDELINES

1. WATER QUALITY

2. WATER QUANTITY

3. WATER FACILITIES AND ACCESS TO WATER

4. HYGIENE PROMOTION

5. TOILETS

6. CONTROL OF VECTOR-BORNE DISEASES

7. CLEANING, DRAINAGE & WASTE DISPOSAL

1. WATER QUALITY

1.1 DEFINITION

Sufficient quality of water must be ensured to avoid contamination of the users. Depending on the source and use intended, different indicators have to be met, having an impact on subsequent actions to be taken, and treatment methods must be applied.
Drinking-water quality is sufficient when no risk of developing diarrheal diseases is linked to its consumption. Water for other uses (hand washing, cleaning and other amenities) can present the risk of contamination through other vectors (e.g. Guinea Worm), though these diseases do not occur in Lebanon.
Water must also be considered as acceptable by the consumer, which might otherwise consider an alternative and maybe unsafe source.

1.2 STANDARD

Standard 1 Water quality: Water for drinking, personal hygiene, and cleaning is safe for the purpose intended.

1.3 INDICATORS

Microbiological quality of drinking-water: Escherichia coli or thermotolerant coliform bacteria are not detectable in any 100 ml sample.

Treatment of drinking-water: Drinking-water from unprotected sources is treated to ensure microbiological safety.

Chemical and quality of drinking water: Water meets WHO Guidelines for drinking water quality concerning chemical parameters.

Acceptability of drinking-water: No tastes, odors, colors would discourage consumption of water.

Water for other purposes: Water that is not of drinking-water quality is used only for cleaning, laundry and sanitation.

1.4 GUIDANCE NOTE

1.4.1. MICROBIOLOGICAL QUALITY OF DRINKING-WATER

Fecal coliform bacteria (>99 % of which are E. coli) are an indicator of the level of human and/or animal waste contamination in water and the possibility of the presence of harmful patho¬gens. If any fecal coliforms are present, then the water should be treated. Even if water quality is sufficient at the point of delivery, contamination might happen later on, e.g. during storage, which implies a potential contamination before reaching the point of use. Steps that can be taken to minimize such risk include proper cover and disinfection of storage tanks, regular cleaning of the distribution points and maintenance of the distribution network. Water should be routinely sampled at the point of use to monitor the extent of any post-delivery contamination[xii].

- Maintenance of water distribution points: routinely at the end of each school day, including cleaning of the taps and basins.
- Maintenance of storage tanks: according to procedure (see section C) ideally 4 times a year, minimum once a year before the beginning of the new academic cycle.
- Maintenance of the water network: repairs to occur immediately after leaks or other failures are observed, general maintenance once a year during the summer break.
- Water quality testing: at the point of delivery for drinking water, ideally once a week for larger (>500 students) schools, minimum once a month.

1.4.2. TREATMENT OF DRINKING-WATER

Water should be treated with a residual disinfectant such as chlorine if there is a significant risk of source or post-delivery contamination. This risk will be determined by conditions in the school, such as population density, excreta disposal arrangements, hygiene practices and the prevalence of diarrheal disease.

For water to be disinfected properly with chlorine, turbidity must be below 5 NTU: bacteria are often located on particles, which reduces the effectiveness of the treatment and induces a potential health hazard. If the water source contains excessive suspended solids, turbidity reduction can be achieved by filtration, sedimentation or flocculation[xiii].

An alternative to chlorination that is often implemented in Lebanon is direct filtration, either at the point of use or at the level of the storage tanks. This method has several advantages: no chemicals added to drinking-water, no modification of the taste and no risk of producing potentially harmful disinfection by-products. Nevertheless, filters have to be exchanged on a regular basis, normally after a period of 3 to 12 months and funds and logistic for the supply of “cartouches” have to be planned.

Other methods to achieve adequate quality of drinking-water are treatment by ultraviolet (UV) or ozonation. Different manufacturers provide that type of modern equipments, but the need to plan maintenance has to be stressed and the dependence on constant electricity supply is a major limitation factor. As electricity shortages are common in Lebanon, the whole drinkable water supply can be contaminated during a single power cut.

Treatment methods can also be combined, depending on the source of water and quality targeted.

1.4.3. CHEMICAL AND RADIOLOGICAL QUALITY OF DRINKING-WATER

Where hydrogeological records or knowledge of industrial or military activity suggest that water supplies may carry chemical or radiological health risks, they should be rapidly assessed by carrying out a chemical analysis. A decision that balances short-term public health risks and benefits should then be made. Furthermore, a decision to use possibly contaminated water for longer-term supplies should be made on the basis of a more thorough assessment and analysis of the health implications[xiv].

The essential elements (major ions), as well as certain trace elements (iron, zinc, copper, manganese etc.), are considered important for human health. Groundwater can supply the essential daily intake of some of these minerals, but a varied and balanced diet is the best way to ensure sufficient intake. Toxic elements may lead to acute health hazards if ingested at high concentrations, or may lead to chronic diseases if consumed at low levels over an extended period. Drinking water quality guidelines and regulations (e.g. WHO guidelines and national standards) have been developed on the basis of known or supposed risks to health. Except in the case of agricultural contamination (pesticides, fertilizers or manure), chemical pollution of groundwater is mainly of natural origin, induced by the interactions between the rock and the water (leaching and dissolving). These interactions can create acceptance problems (e.g. in case of excessive conductivity or high iron presence) that can put people off a water source, which is in fact potable from a sanitary point of view. It may also present a health risk (e.g. chronic diseases linked to mineral toxicity). Nevertheless, the biggest problem remains microbiological pollution of water[xv].

The following guidelines values have to be considered[xvi]:

TABLE 1 **INORGANIC CHEMICALS OF HEALTH SIGNIFICANCE IN DRINKING-WATER**

Chemical	Guideline value (mg/liter)
Arsenic	0.01
Barium	0.7
Boron	0.5
Chromium	0.05
Fluoride	1.5
Manganese	0.4
Molybdenum	0.07
Selenium	0.01
Uranium	0.015

Source: WHO, GDWQ 2008, Table 8.18

TABLE 2

CHEMICALS FROM INDUSTRIAL SOURCES AND HUMAN DWELLINGS THAT ARE OF HEALTH SIGNIFICANCE IN DRINKING-WATER

Inorganic chemicals	Guideline value (mg/liter)
Cadmium	0.003
Cyanide	0.07
Mercury	0.006
Organic chemicals	**Guideline value (µg/liter)**
Benzene	10
Carbon tetrachloride	4
Di(2-ethylhexyl)phthalate	8
Dichlorobenzene, 1,2	1000
Dichlorobenzene, 1,4	300
Dichloroethane, 1,2	30
Dichloroethene, 1,2	50
Dichloromethane	20
Dioxane, 1,4	50
Edetic acid (EDTA)	600
Ethylbenzene	300
Hexachlorobutadiene	0.6
Nitrilotriacetic acid (NTA)	200
Pentachlorophenol	9
Styrene	20
Tetrachloroethene	40
Toluene	700
Trichloroethene	20
Xylenes	500

Source: WHO, GDWQ 2008, Table 8.21

TABLE 3

CHEMICALS FROM AGRICULTURAL ACTIVITIES THAT ARE OF HEALTH SIGNIFICANCE IN DRINKING-WATER

Non-pesticides	Guideline value (mg/liter)
Nitrate	50 (short-term exposure)
Nitrite	3 (short-term exposure)
Nitrite	0.02 (long-term exposure)
Pesticides used in agriculture	**Guideline value (µg/liter)**
Atrazine	2
Carbofuran	7
Chlordane	0.2
Cyanazine	0.6

TABLE 3

Pesticides used in agriculture	Guideline value (µg/liter)
Cyanazine	0.6
2,4-dichlorophenoxyacetic	30
2,4-DB	90
1,2-Dibromoethane	0.4
1,2-Dichloropropane (1,2-DCP)	40
1,3-Dichloropropene	20
Endrin	0.6
Lindane	2
MCPA	2
Mecoprop	10
Methoxychlor	20
Metolachlor	10
Simazine	2
2,4,5-T	9
Trifluralin	20

Source: adapted from WHO, GDWQ 2008, Table 8.24

TABLE 4

CHEMICALS USED IN WATER TREATMENT OR USED IN MATERIALS IN CONTACT WITH DRINKING-WATER THAT ARE OF HEALTH SIGNIFICANCE IN DRINKING-WATER

Disinfectants	Guideline value (mg/liter)
Chlorine	5
Monochloramine	3
Sodium dichloroisocyanurate	50 As sodium dichloroisocyanurate 40 As cyanuric acid
Disinfection by-products	**Guideline value (µg/liter)**
Bromate	10
Chlorate	700
Chlorite	2
Chloroform	7
Dibromochloromethane	0.2
N-Nitrosodimethylamine (NDMA)	0.6
Trichloroacetate	30
Trichlorophenol, 2,4,6	90
Contaminant from treatment chemicals	**Guideline value (µg/liter)**
Acrylamide	0.5
Epichlorohydrin	0.4

TABLE 4	Contaminants from pipes and fittings	Guideline value (µg/liter)
	Antimony	20
	Benzo[a]pyrene	0.7
	Copper	2000
	Lead	10
	Nickel	70
	Vinyl chloride	0.3

Source: adapted from WHO, GDWQ 2008, Table 8.2

Water samples can be analyzed by professional private laboratories or under the supervision of the Ministry of Public Health (MoPH).

1.4.4. ACCEPTABILITY ASPECTS OF DRINKING-WATER

Taste is not in itself a direct health problem (e.g. slightly saline water does not pose a health risk), but if the safe water supply does not taste good, users may drink from unsafe sources and put their health at risk. To avoid this, hygiene promotion activities are needed to ensure that only safe supplies are used[xvii].

Taste and odor can originate from natural inorganic and organic chemical contaminants and biological sources or processes (e.g., aquatic microorganisms), from contamination by synthetic chemicals, from corrosion or as a result of water treatment (e.g., chlorination). Taste and odor may also develop during storage and distribution due to microbial activity. Taste and odor in drinking-water may be indicative of some form of pollution or of a malfunction during water treatment or distribution. It may therefore be an indication of the presence of potentially harmful substances. The cause should be investigated and the appropriate health authorities should be consulted, particularly if there is a sudden or substantial change. Color, cloudiness, particulate matter and visible organisms may also be noticed by consumers and may create concerns about the quality and acceptability of a drinking-water supply[xviii].

TABLE 5 **CONTAMINANTS HAVING AN IMPACT ON DRINKING-WATER ACCEPTABILITY**

Category	Examples
Biologically derived contaminants	Actinomycetes, fungi, animal life (invertebrates), cyanobacteria, algae.
Chemically derived contaminants	Aluminium, ammonia, chloride, chlorine, chlorophenols, color (organic matter, rust), copper, dichlorobenzenes, dissolved oxygen, ethylbenzene, hardness (calcium, magnesium), hydrogen sulfide, iron, manganese, monochloramine, monochlorobenzene, petroleum oils, pH, corrosion, sodium, styrene, sulfate, detergents, toluene, dissolved solids, trichlorobenzenes, turbidity, xylenes, zinc

Source: WHO, GDWQ 2008, Table 8.18

1.4.5. WATER FOR OTHER PURPOSES

Water for other purposes, like toilet flushing, hand washing, cleaning or plants watering must not comply with drinking water standards. Hence, an economical solution is to implement two separate water networks on the school premises, with the condition that a clear distinction (e.g. color codes, signs, warnings) is made and that children and staff are sensitized to this feature on the occasion of the start of the school year, with eventual reminders during hygiene education and/or extra-curricular activities.

1.5 REFERENCES

- "Humanitarian Charter and Minimum Standards for Humanitarian Response", The SPHERE Project, 2011.
- "Water, Sanitation & Hygiene for populations at risk", ACF, 2005.
- "Guidelines for Drinking Water Quality", WHO, 2008.
- "Oxfam guidelines for water treatment in Emergencies", Oxfam, year unknown.
- "Safe piped water – managing microbial water quality in piped distribution systems", WHO, 2004
- "Water safety in buildings", WHO, 2011

1.6 WATER QUALITY: APPENDICES

Water quality assessment

- Water sampling
- Suspended solids: how to measure a maximal NTU of 5 with a field turbidimeter.
- Microbiological analysis of water sample: how to check the are 0 fecal coliforms / 100 ml sample with the field lab (SHA user manual).
- Acidity/alkalinity: how to check that the pH is between 6.5 and 8.5
- Salinity/conductivity: how to check that the values are under 1000mS/cm (TDS under 1000mg/l).
- Measure of the temperature

Water treatment

- Schema: which treatment is appropriate (based on assessment)
  Filtration: different types, O&M
- Chlorination: WHO method, or SHA, measurement of residual chlorine
- UV & ozonation

Other

- Tanks: specification, O&M
- Separate networks and signage
- Different water sources: which quality to expect
- Pipes and fittings: which are the appropriate materials

2. WATER QUANTITY

2.1 DEFINITION

Sufficient quantity of water must be ensured to cover all needs of students and school staff during teaching time and extra-curricular activities. The additional volume of water necessary for general maintenance of all equipment on the premises must also be taken in account. Hence, the quantities necessary for the different uses, maybe coming from different sources or conveyed by different systems, must be available on all days were a school is functioning, i.e. with the exception of breaks like week ends and holidays.

2.2 STANDARD

Standard 2 Water quantity: Sufficient water is available at all times for drinking, personal hygiene, cleaning, and amenities.

2.3 INDICATORS

Basic quantities of water required: 5 liters per schoolchildren and staff member per day

Additional quantities of water required:

Flushing toilets:	10-20 liters per person per day
Pour-flush toilets:	1.5-3 liters per person per day
Anal washing:	1-2 liters per person per day
Laboratory:	2 liters per person per day
Garden:	5 liters per square meter per day

2.4 GUIDANCE NOTE

2.4.1. BASIC QUANTITIES OF WATER REQUIRED

The absolute minimum quantity of water to provide to each student and staff is 5 liters a day. This is used for hydration and handwashing, hence needs to be of potable quality.

2.4.2. ADDITIONAL QUANTITIES OF WATER REQUIRED

Additional quantities are necessary for the operation of the sanitaries, including cleansing in the case where no toilet paper is used (function of the cultural context). The type of sanitation equipment in place defines the quantity of water to be provided, but the use intended does not require potable quality: no water treatment is required and alternative sources can be used.

2.4.3. OTHER NEEDS

Additional quantities are necessary for general maintenance and cleaning of the school premises, including maintenance of the sanitary equipment. School compounds often have a small garden, which will require watering during the warm season. In the case the janitor lives on the premises, his needs (including his family members) have to be covered.

2.5 REFERENCES

"Towards better programming: A water handbook", UNICEF, 1999.

2.6 WATER QUANTITY: APPENDICES

- How to calculate the water need for a day, accounting for all consumption types
- How to calculate the number of tanks necessary to ensure sufficient water storage, taking in account interruption of service delivery
- Dependence on supply: which alternative sources to consider in case on interruption of the service
- Different water sources and possible use
- Separation of different water networks
- Pipes and fittings: how to avoid water and pressure losses

3. WATER FACILITIES AND ACCESS TO WATER

3.1 DEFINITION

Water points and facilities covering all needs have to be available and accessible to all schoolchildren and staff members. In this regard, the use intended for each source has to be clear, the distances limited and the way to them accessible to everyone, including children and staff with special needs.

Access level is defined as follows by the WHO[xix]:

TABLE 6 **DEFINITION OF ACCESS LEVELS**

Service level	Water quantity	Access measure	Needs met	Level of health concern
No access	Often below 5 l/c/d	More than 1000m or 30 minutes total collection time	Consumption: cannot be assured Hygiene: not possible (unless inimized at source)	Very high
Basic access	Average quantity unlikely to exceed 20 l/c/d	Between 100 and 1000m or 5 to 30 minutes total collection time	Consumption: should be assured Hygiene: hand-washing and basic food hygiene possible; laundry/ bathing difficult to assure unless carried out at source	High
Intermediate access	Average quantity about 50 l/c/d	Water delivered through one tap onplot (or within 100m or 5 minutes total collection time)	Consumption: assured Hygiene: all basic personal and food hygiene assured; laundry and bathing should also be assured	Low
Optimal access	Average quantity 100 l/c/d and above	Water supplied through multiple taps continuously	Consumption: all needs met Hygiene: all needs should be met	Very low

Considering the fact that schools are not meant to provide students with the whole palette of services related to water, the following is proposed:

- Basic to intermediate access in terms of quantity, with a target set between 20 to 50 liters per capita a day.
- Optimal access in terms of amount and location of taps, which are constantly functioning.
- Basic to intermediate access in terms of consumption and delivery, covering drinking and hygiene needs, but also quantities allocated to cleaning (amenity use).

3.2 STANDARD

Standard 3 Water facilities and access to water
Sufficient water-collection points and water-use facilities are available in the school to allow convenient access to, and use of, water for drinking, personal hygiene and cleaning.

3.3 INDICATORS

Hand washing: Reliable water point, with soap or a suitable alternative, is available at all the critical points within the school, particularly in toilets. The following ratios have to be observed:
- 1 sink for 8 students of preschool level
- 1 sink for 15 students above preschool level
- 1 sink for 15 staff members

Drinking-water: A reliable water point is accessible for staff and schoolchildren, including those with disabilities, at all times. The following ratios have to be observed:
- 1 water point for 12 students of preschool level
- 1 water point for 20 students above preschool level
- 1 water point for 10 staff members

3.4 GUIDANCE NOTE

3.4.1. HAND WASHING

Water points for hand washing are available in the vicinity of the toilets (ratio of one washing basin for one toilet unit) and on each building level. Each water point is provided with soap and sufficient water pressure at all times. Height of the washing basin and of the tap is adapted to the user. Maximum distance to a washing basin is 30 meters.

3.4.2. DRINKING-WATER

Water points for drinking purposes are available in sufficient quantities (see ratios proposed above), on the level of the schoolyard, with an additional water point on each building level. Water for drinking purposes is available at all times. The height of the taps is adapted to the size of the children: sections with different heights may offer adequate access for all ages. Maximum distance to a washing basin is 30 meters.

3.5 REFERENCES

- "Domestic water quantities, service level and health", G. Howard, J. Bartram, WHO, 2003.
- "Water safety in buildings", WHO, 2011

3.6 WATER FACILITIES AND ACCESS TO WATER: APPENDICES

- Distances: where to place water taps
- Interruption of delivery: which alternative sources to consider
- How to calculate the number of tanks (w, w/o interruption of service)
- Different water sources and possible use
- Water taps: different types
- How to calculate the number of taps
- Dimension of washing basins
- Technical options for water points
- Guidance system / signage
- Separation of different water networks
- Maintenance of washing basins and drinking-water points

4. HYGIENE PROMOTION

4.1 DEFINITION

Water points and facilities covering all needs have to be available and accessible to all schoolchildren and staff members. In this regard, the use intended for each source has to be clear, the distances limited and the way to them accessible to everyone, including children and staff with special needs.

The provision of hardware like water taps, toilets, and consumables like soap is in itself not sufficient to have a significant impact on the occurrence of diarrheal diseases. Hygiene promotion, which can be understood as an awareness raising process on the proper attitudes and ways to use these equipments, is mandatory to achieve effective enhancement in schoolchildren's health. Hygiene promotion comprises all interventions aiming at developing life skills by pupils, increasing their awareness and understanding of which behavior are favorable to their well being.
Similarly, staff in charge of maintenance of WASH equipments on the school premises understands the key role they play in keeping the surrounding environment safe and clean, and the positive impact it has on everybody's health status.

(Figure: fecal-oral route transmission of diseases and barriers)

Hygiene promotion must cover all possible pathways leading to potential fecal-oral disease transmission[xx]:

- Appropriate use and maintenance of sanitation facilities
- Safe disposal of feces
- Handwashing at crucial moments (after defecation, before eating or preparing food)
- Clean water use and storage
- Control of flies and other insect vectors

According to studies (e.g. Almedom et al., 1997), safe defecation facilities and proper handwashing with water and soap reduce incidence of diarrheal diseases by 70%.

4.2 STANDARD

Standard 4 Hygiene promotion: Correct use and maintenance of water and sanitation facilities is ensured through sustained hygiene promotion.
Water and sanitation facilities are used as resources for improved hygiene behaviors.

4.3 INDICATORS

Curriculum: Hygiene education is included in school curriculum.

Behavior: Positive hygiene behaviors, including correct use and maintenance of facilities are systematically promoted among staff and schoolchildren.

Environment: Facilities and resources enable staff and schoolchildren to practice behaviors that control disease transmission in an easy and timely way.

Menstrual hygiene: Special girls needs are addressed in the curriculum and school health councilors are able to provide guidance to adolescents.

4.4 GUIDANCE NOTE

4.4.1. HYGIENE EDUCATION IS PROVIDED

In most of the cases, education curricula are already overloaded and no slot is left for specific classes on hygiene. Luckily, the components linked to good hygiene behaviors can easily be incorporated in general classes like biology, environment and civic education.
Curricula revision is a long process involving multiple stakeholders, which implies long cycles of duration of about a decade. A possible way to fill the gap during this process is to develop hygiene related teaching materials to be implemented during extra-curricular activities. Structures like school health clubs are appropriate venues for testing and rolling out sessions on body hygiene, water and vector disease transmission, use of sanitation and handwashing facilities, without forgetting the environmental aspects related to wastewater and garbage disposal. Let us not forget the central role that the school health counselor has to play in this process. He or she is linking education to public health, reaching all school children and staff members. Therefore, he or she can facilitate most of the processes related to hygiene education at school level, directly with the main beneficiaries.

4.4.2. POSITIVE HYGIENE BEHAVIORS ARE PROMOTED

Focusing on positive behaviors rather than stigmatizing improper hygiene is a key to improving children's attitude: a reward is better that a punishment. This can be achieved through billboards presented on strategic places on school premises, but also developed through games.

4.4.3. FACILITIES AND RESOURCES ENABLE CONTROL OF DISEASE TRANSMISSION

The fact that proper WASH infrastructures (hardware) do not allow achieving results as long as they are not complemented with hygiene promotion (software) is well known. It must also be stated that software interventions in the absence of proper hardware will not have the positive impacts one could hope for.

Hence, the infrastructures on the premises must enable schoolchildren to apply the knowledge they acquired during curricular and/or extra-curricular activities. Sanitary equipments, water taps and garbage bins must be functioning, well maintained, accessible and available in sufficient quantities. Consumables like toilet paper and soap must be provided in sufficient quantities and at all times.

4.4.4. MENSTRUAL HYGIENE

Menstrual hygiene is a sensitive but important topic. Depending on the cultural context, girls might be unaware of changes occurring during puberty, hence unable to manage their menstrual hygiene properly. Sensitization activities should be carried in school, knowing that inadequate menstrual management can not only lead to reduction of learning capacities and absenteeism, but also to diseases. Securing schoolgirls right to dignity is a priority.

4.5 REFERENCES

- "Life-skills based hygiene education", IRC, 2004
- "Vipindi vya maisha: girls puberty book, growth and change", M. Sommer, 2009.
- "Towards better programming: A manual on hygiene promotion", UNICEF, 1999.
- "Towards better programming: A manual on School sanitation and hygiene", UNICEF, 1998.
- "Hygiene and sanitation software: an overview of approaches", WSSCC, 2010.

4.6 HYGIENE PROMOTION: APPENDICES

- Hygiene curriculum: a few examples (life skills based approach)
- Extra-curricular activities: school health club
- Menstrual hygiene
- Supply of consumables: toilet paper, soap, detergents, and hygienic pads
- Supply of consumables: alternatives to soap for handwashing
- Role of the school health counselor

5. TOILETS

5.1 DEFINITION

The right to toilets is a less popular topic than the right to water, yet the availability of sanitary facilities for schoolchildren and staff members on school premises is mandatory to ensure a safe and friendly learning environment. No other WASH component has to respond to such a large amount of indicators, which is a hint of its significance.
Sanitation facilities should be as compatible as possible with local practices, preferred positioning of latrines or other cultural or religious norms. Beneficiaries themselves best assess the range of technical solutions adapted to their needs[xxi].

5.2 STANDARD

Standard 5 Toilets: Sufficient, accessible, private, secure, clean, gender-specific and culturally appropriate are provided and accessible for schoolchildren and staff at all times.

5.3 INDICATORS

Number of toilets:
1 toilet per 8 preschool students.
1 toilet per 20 schoolgirls.
1 toilet for 10 female staff.
1 toilet for 30 and 1 urinal for 20 schoolboys (CH: 1 toilet and 2 urinal for 30 schoolboys).
1 toilet for 15 and 1 urinal for 10 male staff.

Accessibility: Toilets are easily accessible to all, including students and staff with disabilities, and are located at a maximal distance of 30 meters from every user.

Privacy and security: Toilets provide privacy and security.
Cabins are equipped with door of a sufficient height to allow privacy.
Child-friendly locking systems are in place (easy system to lock and unlock).

Hygiene: Toilets are easy to use and easy to clean.
Toilets are cleaned after all breaks, i.e. cleaning routine takes place 3 times a day.
Toilets are equipped with convenient hand washing facilities close by.

Gender specificity: Toilet blocks for girls are distinct from toilet blocks for boys. Toilet blocks for teachers and staff are distinct from toilets for schoolchildren.

Adaptation to local culture: Toilets must be equipped with interfaces adapted to local practices, i.e. sitting or squatting toilets depending on the context.
The equipment provided for anal cleansing is culturally appropriate.

Timeliness: Toilets are functional, clean and accessible at all times, not only during breaks.

5.4 GUIDANCE NOTE

5.4.1. NUMBER OF TOILETS

The calculation of the contingent of toilets to be provided depends on the school population, which can vary from one year to the other. Nevertheless, data is available and published every year by the MEHE (CRDP, ESDS).
If the total number of toilet units is easy to define based on the ratio and the capacity of the institution, it does not give further information on the disposition, i.e. how many toilet units per sanitary block, and where to place the blocks in the building structure.
Ideally, separate blocks for girls and for boys must be accessible at each level of the building, plus larger blocks at the level of the schoolyard. It has been observed that toilets initially intended for students at the levels of the classrooms were finally reserved to the sole use of the teachers, resulting in an insufficient ratio. This should be avoided by all means. Gender specific for students, teachers and other staff members should be available at different spots of the building, with the exception of institutions of a small capacities (few classrooms only).

5.4.2. ACCESSIBILITY

Child friendly toilets are accessible to all age categories, which implies that separate toilet blocks have to be planned for pre-scholar levels (kindergarten). For sitting toilets, maximum height to consider is around 30 cm, while for squatting latrine, the maximum diameter of the orifice should be of 15 cm. Height of washing basin should also be of maximum 50cm. Pre-school toilet blocks should be at a minimal distance from the classrooms.
Toilets for primary and secondary level can be equipped with standard equipments, either sitting or squatting, with washing basins and accessories nearby. Maximal distance to each user should be of 30 meters. Minimal surface to consider for each cabin is of 1.4 x 0.75 meters, with a minimal height of 1.80 meters. A space of 10 cm height above the ground should be left open, in order to facilitate cleaning procedure.
On each level the school, two separate and gender specific toilets (or 10% of the toilets) have to be adapted to the needs of children with disabilities. The surface of each cabin has

to be superior to 1.30 x 1.50 meters and the width of the door of at least 90cm, in order to allow maneuvering a wheelchair. A free space of 1.30 x 0.80 meter allow to proceed to a half turn, and the internal equipments disposed accordingly, including the toilet itself and a lateral bar (at least 40cm length with mid-point at 50-70 cm). The height of the toilet seat must not exceed a height of 45 to 50 centimeters, and the height of the washing basin is optimal at 0.85 cm above ground level. Doors should open outwards[(xxii)].
To allow easy access to critical equipments with a wheelchair, ramps of a maximal slope of 1:12 (or even better, 1:20) and continuous handrail of a diameter of 4-6 cm have to be planned. If steps cannot be avoided, they should be of maximal height of 16 cm and of a minimal depth of 26 cm. Flat thresholds have to be installed with a minimal door width of 90 cm to ensure easy access in all school areas[(xxiii)]. Obstacles on the ground should generally be avoided, including drains, and steps can be signaled with bright paint.

5.4.3. PRIVACY AND SECURITY

Toilet cabins must be equipped with separation walls, doors and locking systems allowing privacy. Locking systems must be adapted to children, i.e. robust and easy to manipulate. During the design and the layout of the blocks within the building, attention should be paid to the relative position of windows, staircases and hallways. Toilets have to be secure spaces, located on the school perimeter and inaccessible to external people. Cubicle doors must open outwards.

5.4.4. HYGIENE

In rooms containing sanitary equipments, walls have to be tiled to a minimum height of 1.50 meters to allow easy cleaning and maintenance. Detergents and equipments for cleaning must be available and janitors should clean all sanitary equipments at least 3 times a day.
Children and staff have to be informed on the proper use of the toilets, so that they are clean and functioning at all times. A bin, toilet paper, water hose or water bucket have to be provided in each toilet unit to allow proper cleaning. Washing basins equipped with soap have to be located in the immediate vicinity of the toilet blocks for had washing.

5.4.5. GENDER SPECIFICITY

A strict gender separation between the toilet blocks of the boys and the girls is mandatory. If possible, they should not be located to close from each other. Identically, separate toilets are provided for female and male teachers.

5.4.6. ADAPTATION TO LOCAL CULTURE

As seen during school visits, the idea to install “modern” sitting toilets is not always crowned with success. If one parameter is clearly linked to culture (i.e. what interface users know how to handle), the second one is the access to continuous, reliable and sufficient sources if water for flushing.

If both cultural and access parameters are not fulfilled, the best option will be to install squatting slabs, which also have the advantage to be easier to clean and maintained, and are therefore more hygienic.
Similarly, the beneficiaries should decide which option is preferred for cleansing. Depending on the region or the community considered, toilet paper or water hoses will be provided.

5.4.7. TIMELINESS

All toilets must be clean and functioning at all times.

5.5. REFERENCES

- "Normes de construction scolaires à l'usage des gens intéressés à la construction d'écoles en Haïti", Ministère de l'Education Nationale et de Formation Professionnelle, 2010.
- Accessibilty in Emergency – Technical sheets – WASH infrastructure Pakistan", Handicap International, 2010.
- "Compendium of Sanitation Systems and Technologies", EAWAG, 2008.
- "Towards better programming: A sanitation handbook", UNICEF, 1997.

5.6 TOILET: APPENDICES

- Different types of user interface
- Anal cleansing
- Flushing systems: how to cope with water scarcity
- Toilet cabin equipments and dimensions
- Hand washing facilities
- Supply of consumables
- Special equipments for girls
- Special equipments for people with disabilities
- Maintenance of toilet blocks

6. CONTROL OF VECTOR-BORNE DISEASES

6.1 DEFINITION

Appropriate conveyance, storage, treatment and/or evacuation of wastewater and other solid waste are key elements to control diseases spreading in direct school environment.
A vector is a disease-carrying agent and vector-borne diseases are a major cause of sickness and death around the world. Flies play an important role in the transmis-sion of diarrheal disease. Biting flies, bedbugs and fleas are a painful nuisance and in some cases transmit significant diseases such as typhus, scabies and plague. Rats and mice can transmit diseases, such as leptospirosis and salmonellas, and can be hosts for other vectors, e.g. fleas, which may transmit Lassa fever, plague and other infections.
The nature of vector-borne disease is often complex and addressing vector-related problems may demand specialist attention. However, there is often much that can be done to help prevent the spread of such diseases with simple and effective measures, once the disease, its vector and their interaction with the population have been identified[xxiv].
Looking closely at the school environment, focus will be made on avoiding transmission of diarrheal diseases through flies.

6.2 STANDARD

Standard 6 Vector-borne diseases: Schoolchildren, staff and visitors are protected from disease vectors.

6.3 INDICATORS

Density: Density of vectors in the school is minimized.
Wastewater and solid waste are either conveyed out of the premises or confined.

Protection: Schoolchildren and staff are protected from potentially disease-transmitting vectors.

Treatment: Children and staff diagnosed with vector-borne diseases are treated adequately. In case of epidemic, all staff, schoolchildren and their relatives are treated adequately.

6.4 GUIDANCE NOTE

6.4.1. DENSITY

Vector control can be achieved by avoiding keeping waste for a long period of time: regular removal ensures minimal storage, reducing density of vectors by eliminating their habitat. In the case of wastewater, the best solution is to have access to a connection to the sewage system and water in sufficient quantities to install toilets with flushing system. Fecal matter is instantly conveyed out of the perimeter of the school, and – as long as wastewater is not discharged in a pit nearby – there is no risk of direct contamination. If one or both of the initial conditions are not fulfilled, a more suitable technical solution has to be found to avoid rapid degradation of the sanitary status of the sanitary equipments.
If discharge in the network is impossible and/or insufficient quantities of water are available for flushing, the raw effluent should be collected in a septic tank built according to the state of the art. Improper construction can lead to leakages and, depending on the geological situation, contamination of the groundwater. Septic tanks have to be emptied on a regular basis by vacuum trucks, ideally during holidays.
In the case of garbage disposal, bins have to be emptied after every school day, including bins located in the toilets.

6.4.2. PROTECTION

School population is protected from vectors by primary and secondary barriers. Simple measures can contribute to schoolchildren and staff protection: garbage bins are covered, nets are installed on the windows of the classrooms, repellants are sprayed etc.
Again, the linkage to be made with hygiene education has to be stressed. School population has to be aware of the risks related to vectors and participate actively in maintaining the implemented barriers. Proper behavior benefits the whole community.

(Figure: faecal-oral transmission route of disease and barriers)

6.4.3. TREATMENT

The availability of medication for diarrheal diseases treatment under the administration of the school health counselor can have a great impact on the burden of diseases carried by the school population, with a positive outreach to the population.

Prevention of diseases, including some of the water related diseases, can be achieved through immunization campaigns in a joint effort with the MoPH.

6.5 REFERENCES

- "Global burden of disease and risk factors", World Bank, 2006.
- "Humanitarian Charter and Minimum Standards for Humanitarian Response", The SPHERE Project, 2011.

6.6 VECTOR CONTROL: APPENDICES

- Wastewater storage
- Wastewater conveyance
- Wastewater treatment
- Solid waste disposal, recycling
- Treatment of diarrhea
- Treatment of worms and helminthes
- Immunization
- Impact of handwashing

7. CLEANING, DRAINAGE & WASTE DISPOSAL

7.1 DEFINITION

The last WASH component comprises all elements necessary to fulfill the previous ones. School area and equipments must be kept clean, dry and safe, ensuring an effective impact on children's health.
Cleaning and maintenance of WASH infrastructure is not the most pleasant task, but is absolutely necessary: toilets and water points will not be used extensively if not clean. To keep all WASH infrastructures in condition for proper use, support from staff is essential. Without significant involvement from the janitors, teachers and school health counselor, it will become very difficult to maintain and clean WASH infrastructures. Ideally, a general maintenance scheme should be established.
Cleaning and maintenance are difficult without required materials and spare parts. Particularly for water supply systems, the management of the school needs to ensure the availability of sufficient and technically adequate spare material, such as water taps. They need to be robust and of good quality to ensure that equipments do not regularly cease working[xxvi].
Surface water in or near school premises may come from household and water point wastewater, leaking toilets and sewers, rainwater or rising floodwater. The main health risks associated with surface water are contamination of water supplies and the living environment, damage to toilets and dwellings, vector breeding, and the area and further increase the risk of contamination. A proper drainage plan, addressing stormwater drainage through school site planning and wastewater disposal and conveyance should be implemented to reduce potential health risks to the school population.
Solid waste management is the process of handling and disposal of solid waste which, if unattended appropriately, can pose public health risks to the school population and can have a negative impact on the environment. Such risks can arise from the breeding of flies and rodents that thrive on solid waste and the pollution of surface - and groundwater sources due to leachate from waste. Uncollected and accumulating solid waste may also create an ugly and depressing environment, which might help discourage efforts to improve other aspects of environmental health. Solid waste often blocks drainage channels and leads to an increased risk of flooding, resulting in environmental health problems associated with stagnant and polluted surface water .
Poor or no disposal of garbage and waste increases serious risks such as the pollution of surface water, groundwater and the environment in general. This is a perfect breeding ground for flies and will attract rats and other rodents that are vectors for various diseases[xxvii].

7.2. STANDARD

Standard 7 Cleaning, drainage and waste disposal: The school environment is kept clean and safe.

7.3. INDICATORS

Classrooms: Classrooms and other teaching areas are regularly cleaned to minimize dust and moulds.

School safety: Classroom furniture, outside and inside areas are kept free of sharp objects and edges and other physical hazards.

Solid waste: Solid waste is collected from the classrooms, offices and recreational areas daily and disposed safely.

Wastewater: Wastewater is disposed quickly and safely.

Drainage: Rainwater and residual water from maintenance is conveyed from all surfaces of the school compound (roofs, inside and outside areas) quickly and safely.

7.4. GUIDANCE NOTE

7.4.1. CLASSROOMS

Classrooms are cleaned daily to remove dust and litter.

7.4.2. SCHOOL SAFETY

Furniture is chosen to enhance safety of the schoolchildren: no sharp edges, adapted sizes, and ergomy. Old funitures are disposed safely, in locations inaccessible to pupils. Locked doors bar access to technical rooms and rooftops. Construction finishing is adequate to avoid harm by irons sticking out of concrete blocks, apparent electric cables, sharp edges.

7.4.3. SOLID WASTE

The school population has the means to dispose their solid waste conveniently and effectively, so that the direct environment is not littered.
Solid waste from the laboratories must be collected separately and treated according the advice of the teacher in charge.

A ratio of one 100 liters bin for 50 people should allow to cover the daily needs for waste storage.

7.4.4. WASTEWATER

People have an environment in which health risks and other risks posed by water erosion and standing water, including rainwater, floodwater, and wastewater are minimized. Effluents from the chemistry class have to be collected separately, and treated according the recommendation of the teacher in charge before final disposal.

7.4.5. DRAINAGE

People have an environment in which health risks and other risks posed by water erosion and standing water, including rainwater, floodwater, domestic wastewater and wastewater from medical facilities, are minimized.

7.5. REFERENCES

- "Primary school physical environment and health", WHO, 1998.

7.6. CLEANING, WASTEWATER AND DRAINAGE: APPENDICES

- Wastewater storage
- Wastewater conveyance
- Rainwater drainage
- Rainwater harvesting
- Waterproofing
- Furnitures
- Emergency exits
- Access to dangerous zones
- Survey tool

NOTES

i “WASH 2010 Annual Report”, UNICEF, 2010.

ii “Water, Sanitation and Hygiene Standards for Schools in Low-cost Settings”, JMP, 2009.

iii “Humanitarian Charter and Minimum Standards in Humanitarian Response”, The SPHERE Project, 2011.

iv “Water, Sanitation and Hygiene Standards for Schools in Low-cost Settings”, JMP, 2009.

v “Following up on the situation of women and children – Lebanon MICS3 2009 final report”, UNICEF, 2010.

vi “Assessing physical environment health profiles of public schools in Lebanon”, AUB & WHO, 2009

vii “Assessing physical environment health profiles of public schools in Lebanon”, AUB & WHO, 2009.

viii “Following up on the situation of women and children – Lebanon MICS3 2009 final report”, UNICEF, 2010.

ix “Minimum Standards for Education in Emergencies, Chronic Crisis and Early Reconstruction”, INEE, 2004.

x “Humanitarian Charter and Minimum Standards for Humanitarian Response”, The SPHERE Project, 2011.

xi “Minimum Standards for Education in Emergencies, Chronic Crisis and Early Reconstruction”, INEE, 2004.

xii “Humanitarian Charter and Minimum Standards for Humanitarian Response”, The SPHERE Project, 2011.

xiii “Humanitarian Charter and Minimum Standards for Humanitarian Response”, The SPHERE Project, 2011.

xiv “Humanitarian Charter and Minimum Standards for Humanitarian Response”, The SPHERE Project, 2011.

xv “Water, Sanitation & Hygiene for populations at risk”, ACF, 2005.

xvi “Guidelines for Drinking Water Quality”, WHO, 2008.

xvii “Humanitarian Charter and Minimum Standards for Humanitarian Response”, The SPHERE Project, 2011.

xviii “Guidelines for Drinking Water Quality”, WHO, 2008.

xix “Domestic water quantity, service level and health”, G. Howard, J. Bartram, WHO, 2003.

xx “Emergency sanitation manual”

xxi “Camp management toolkit”, UNHCR, 2008.

xxii “Accessibilty in Emergency – Technical sheets – WASH infrastructure Pakistan”, Handicap International, 2010.

xxiii “Normes de construction scolaires à l’usage des gens intéressés à la construction d’écoles en Haïti”, Ministère de l’Education Nationale et de Formation Professionnelle, 2010.

xxiv “Humanitarian Charter and Minimum Standards for Humanitarian Response”, The SPHERE Project, 2011.

xxv “Camp management toolkit”, UNHCR, 2008.

xxvi “Humanitarian Charter and Minimum Standards for Humanitarian Response”, The SPHERE Project, 2011.

xxvii Camp management toolkit”, UNHCR, 2008.

FACTSHEETS

A 01 MEASUREMENT OF TURBIDITY

1. Field lab preparation

Dispose all necessary equipment and the water samples you intend to test on a stable surface you initially cleaned with alcohol:
- Incubator, filter and pump
- Labeled petri dishes
- Sterilization material

2. Sterile zone

Define a sterile surface on which you may lay the equipment after disinfection (filter, funnel, forceps) between two manipulations.
You may use absorbent paper, or even better, an inox plate which may be easily cleaned with alcohol and tissues.

3. Preparation of the plates

a) In the case of aluminium petri dishes and MLSB preparation:
- Disinfect each petri dish with alcohol and tissues before labeling them.
- Dispense one growth pad in each dish and saturate it with MSLB solution (2ml max) before removing the excess of solution.

b) In the case of EC compact dry medium:
- Label each plastic petri dish
- Add 1 ml of deionized water to each dish with a sterile plastic pipette to rehydrate the medium
- In case the wagtest potatest (or any circular device) is used, the edges of the cases have to be removed in order to fit in the incubator.

4. Disinfection of the filter

- The filter has to be properly cleaned between each test preparation to avoid cross contamination of the samples.
- The sensitive surfaces are the funnel/cylinder (especially the inside) and the filtering surface.
- Alcohol and tissues are preferable to inflamed alcohol, as it produces combustion residues (dark traces).
- Rinsing of the filter with deionized water to eliminate alcohol of the surface.

5. Preparation of the filtration

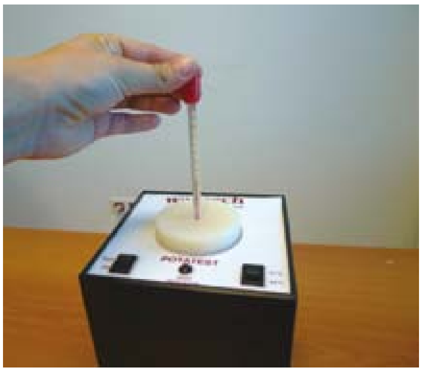
- The membrane is placed on the filter with the forceps after the latter was disinfected with alcohol.
- The funnel is placed on the funnel, so that all bacteria will remain on the membrane
- The pump is connected to the collector.

6. Filtration

- Pour 100 ml of the water sample in the funnel.
- Activate the manual pump until all liquid has been filtered.
- If the membrane breaks, discard it and restart from point 4.

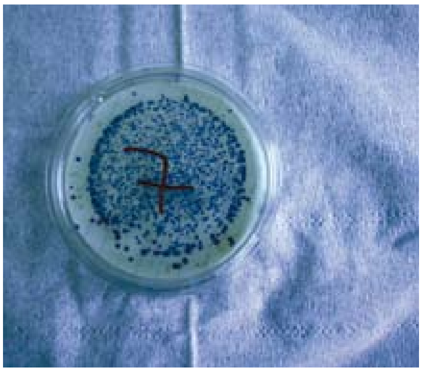
7. Preparation of incubation

- After the funnel is removed, place the membrane on the incubation plate labeled for the sample with the forceps.
- Always disinfect the forceps between two manipulations and place it on the dedicated sterile area.
a) In the case of aluminium petri dishes and MLSB preparation: wait 1-4 hours before starting the incubation (resuscitation time).
b) In the case of EC compact dry medium, incubation can start without waiting time.



8. Incubation

- Make sure that the incubator has reached the adequate temperature with the provided thermometer before starting incubation:
a) 37°C for total coliforms,
b) or 44°C for faecal coliforms.
- Temperature can be chosed by using the switch on the upper side of the incubator.
- Ideal incubation time: 14-24 hours.



9. Results interpretation

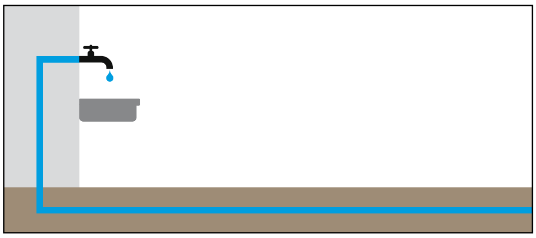
- Colonies can be counted after conclusion of the incubation, the results are given in CFU (Colony Forming Units) / 100 ml.
- Over 100 CFU / 100 ml, samples are qualified of TNTC (Too Numerous To Count).
- At 37°C, we express the presence of total coliforms, at 44°C of faecal (thermotolerant) coliforms.
- On MLSB, colonies appear yellow.
- On EC compact dry medium, E. coli are blue and coliforms pink to violet (37°C).

10. General remarks

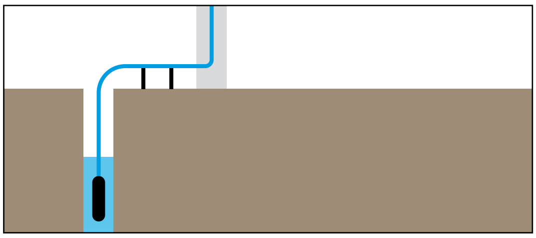
The described method assess water quality is clearly quantitative, nevertheless, bear in mind that the criteria for water to be potable is to have 0 CFU / 100 ml. Hence, excessive accuracy (e.g. the difference between 2 samples having 56 and 78 CFU / 100 ml) is neither relevant nor significant.
Let us bear in mind that cross contamination (from one sample to the other) is a danger during this analyze, which could lead to wrongly disqualify an effectively potable drinking water source. Always keep your samples, hands, working surfaces and equipments clean!

A 09 SEPARATION OF WATER NETWORKS AND SIGNAGE

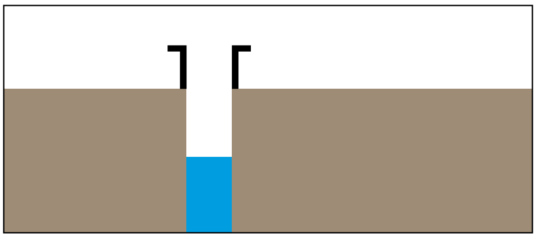
A 10 DIFFERENT WATER SOURCES AND POSSIBLE USE



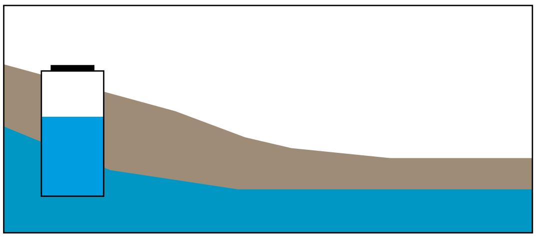
Water from the public network is adapted to all uses, including drinking purposes. Nevertheless, its quality should be regularly monitored.
Risks of interruption of service.



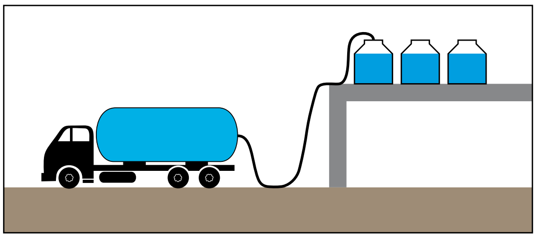
Private boreholes are suitable for all uses including drinking purposes to the conditions that the groundwater. Hence, water quality should be regularly monitored. In the coastal zone, probability of high salinity. Ineffective in case of power cut (pump).



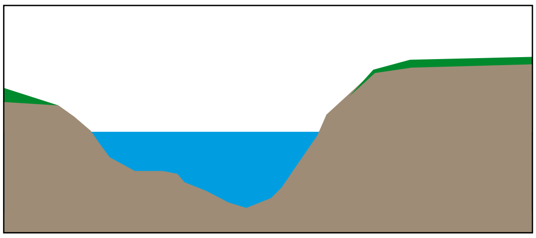
Wells are robust equipments allowing a direct access to groundwater. Can be used as a shallow borehole with a pump. Quality must be continuously monitored: due to its reduced depth, contamination might occur and use of source of drinking water might be dangerous.



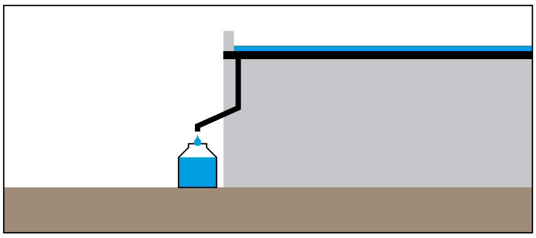
Springs are a safe source of water for all purposes if the catchment area is free of contamination sources. If planned correctly, water could flow freely to the local storage facilities on the school premises



Water trucking is a good but often expensive option in case of interruption or absence of service delivery. Due to possible variation of the source, water quality should be monitored at each delivery.



Surface water can be the only accessible source of water, but with high seasonal variation. Lakes, rivers and ponds nevertheless present a high risk of contamination, with a high suspended solid rate compromising disinfection.



Rainwater harvesting is a cheap but seasonally dependant source of drinking water. If correctly implemented (cleaning of surfaces, choice of materials) it is a safe source of drinking water.