A photograph of three young girls in a school setting, focused on washing their hands at a public water tap. The girl on the left is wearing a red patterned shirt, the middle girl a light green patterned shirt, and the girl on the right a red polka-dot shirt. They are all looking down at their hands as they wash. The background is slightly blurred, showing other people and a wooden wall.

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Preface

The inclusion of water, sanitation and hygiene (WASH) in schools as part of the Sustainable Development Goals (SDGs), necessitates the development of national, regional and global estimates of WASH in schools coverage to track progress over time. While many countries have national coverage estimates for water and sanitation in schools, indicators often vary between countries, limiting cross-country comparability and regional or global aggregation.¹ Additionally, current estimates often don't consider hygiene or service attributes specified by the normative criteria for the human rights to water and sanitation.²

This document presents recommended core questions to support harmonised monitoring of WASH in schools as part of the SDGs. The questions map to harmonised indicator definitions of “basic” service and to service ladders that can be used to monitor progress. They are intended for use in national or sub-national facility surveys and census questionnaires. If national and sub-national surveys use the questions and response categories in this guide, it will help to improve survey comparability over time and between countries, as well as harmonise data with the SDG definitions for WASH in schools.

The questions in this guide were agreed upon by the Global Task Team for Monitoring WASH in Schools in the SDGs, convened by the Joint Monitoring Programme for Water and Sanitation (JMP).³ They are based on the current global norms⁴, existing national standards, questions in national censuses and multi-national surveys, global WASH in schools monitoring recommendations⁵, and normative human rights criteria: *availability, acceptability, accessibility and quality*.²

National estimates will likely derive from national monitoring systems using self-report questionnaires (e.g. Education Management Information Systems, EMIS) as well as facility surveys that collect data via interviews and observation by trained enumerators.

The core questions are thus intended to be (1) applicable for use in different types of data collection mechanisms, (2) relevant in all countries and settings, and (3) provide the *minimum* criteria for meeting the SDGs for WASH in schools. For countries where the minimum criteria are not aspirational and monitoring systems have the capacity for additional questions, the core questions can be supplemented with questions from the expanded set provided in Annex A.

This document:

- presents core indicator definitions for “basic” WASH in schools services and associated JMP service ladders,
- describes why it is important to adopt a harmonised set of core questions for monitoring WASH in schools,
- introduces core questions to support harmonised data collection to monitor WASH in schools in the SDGs,
- presents data analysis and tabulation guidance to calculate coverage of “basic” WASH in schools, and
- provides an example of incorporating the core questions in national questionnaires (e.g. EMIS).

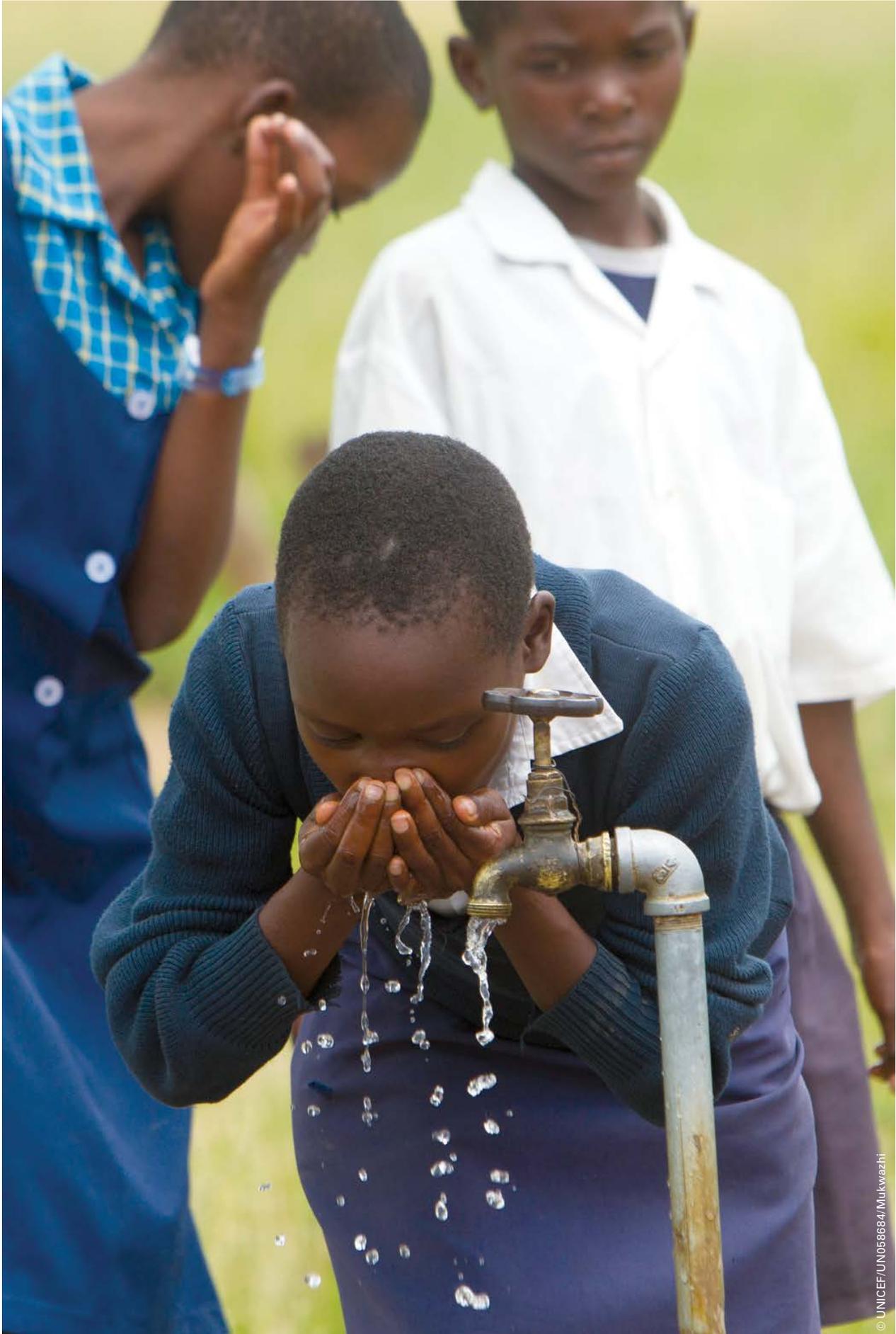
1 UNICEF (2015) *Advancing WASH in schools monitoring (working paper)*.

2 UN (2014) *Realising the human rights to water and sanitation: A handbook*, Booklets 1 and 5; Affordability is not explicitly monitored via the proposed indicators due to the diverse contexts and complex nature of measuring affordability in the school setting.

3 The task team was an open membership group, consisting of over 40 WASH in schools experts, who conducted biweekly meetings over a three month period. Agreement was finalised at an Expert Group Meeting hosted by the JMP on 20-21 June, as documented in the meeting report: <https://washdata.org/report/june-2016-wins-expert-group-meeting-report>.

4 WHO (2009) *Water, sanitation and hygiene standards for schools in low-cost settings*.

5 UNICEF (2011) *WASH in schools monitoring package*.



1 BACKGROUND

1.1 WASH in schools in the SDGs

Drinking water, sanitation and hygiene (WASH) beyond the household, and particularly in the school-setting, is crucial to the health and education of children. Children spend a significant portion of their day at school where WASH services can improve educational opportunities and decrease the potential for disease transmission between students.⁶ In recognition of the importance of WASH in this setting, WASH in schools is implicitly and explicitly captured in the post-2015 Sustainable Development Goals (SDGs).

The terms “universal” and “for all” in Targets 6.1 and 6.2 implicitly highlight the need for expanding WASH monitoring from the household level to non-household settings, such as schools, as we progress from the MDG to the SDG era (Table 1). Target 6.2 also calls for special attention to the needs of girls and those in vulnerable situations. Target 4.a includes WASH in schools, explicitly, with an associated indicator of the “proportion of schools with access to:...(e) basic drinking water; (f) single-sex basic sanitation; and (g) basic handwashing facilities” (Table 1). *The purpose of this document is to provide harmonised indicators and core questions to collect data on “basic” drinking water, sanitation and handwashing in schools for comparable national coverage estimates and SDG monitoring.*

Table 1. SDG targets and indicators related to WASH in schools

Goals	Targets	Indicators
6: Ensure availability and sustainable management of water and sanitation for all	6.1: By 2030, achieve universal and equitable access to safe and affordable drinking water for all	See 4.a.1 for WASH in schools indicators
	6.2: By 2030 achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations	See 4.a.1 for WASH in schools indicators
4: Ensure inclusive & equitable quality education & promote lifelong learning opportunities for all	4.a: Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all	4.a.1 Proportion of schools with access to: (a) electricity; (b) the Internet for pedagogical purposes; (c) computers for pedagogical purposes; (d) adapted infrastructure and materials for students with disabilities; (e) basic drinking water; (f) single-sex basic sanitation facilities; and (g) basic handwashing facilities (as per the WASH indicator definitions) ⁷

1.2 Why use harmonised questions in school surveys?

Surveys and national Education Management Information System (EMIS) questionnaires are used to assess WASH in schools services in many countries. However, the specific indicators used to determine coverage are often either unclear or vary greatly between data sources, limiting the potential for cross-country comparison and accurate regional and global aggregation. For example, water coverage estimates in Kiribati (3 per cent) are based on a minimum quantity of water per student from an improved source, while in Namibia (81 per cent), coverage includes all schools where any water source exists.¹ The JMP faced similar challenges for household monitoring at the beginning of the MDG era which were resolved by providing harmonised core questions for use in household surveys.⁸

The JMP uses data from multiple data sources to provide the most accurate national, regional and global estimates. Current major data sources for WASH in schools include national EMIS censuses, the World Bank-supported Service Delivery Indicator (SDI) survey, the Latin American Laboratory for Assessment of the Quality

6 Jasper, C., Le, T. & Bartram J. (2012) Water and Sanitation in Schools: A Systematic Review of the Health and Educational Outcomes. *Int. J. Environ. Res. Public Health*. 9:2772-2787; UNICEF (2012) *Raising even more clean hands*.

7 This refers to the definitions presented in this document.

8 WHO and UNICEF (2006) *Core questions on drinking water and sanitation for household surveys*.

of Education (LLECE) regional comparative and explanatory study (e.g. SERCE), and the UNESCO-UIS education survey which requests WASH in schools data from national governments (typically EMIS data).

However, since these surveys and questionnaires use different questions and response options, the data from each source are often not comparable with each other or not harmonised with the SDG indicators for WASH in schools. As a result, establishing accurate national trends over time and cross-country comparable estimates has been a challenge. Realisation of this need prompted the process of developing the guidance provided in this document with recommended core questions and response categories for uniform monitoring of WASH in schools.

1.3 Scope of SDG monitoring

The WASH in schools indicators and questions for global SDG monitoring focus on “outputs” (i.e. if services are in place to enable and encourage WASH behaviours; **Figure 1**). “Inputs” (e.g. maintenance budget) and “outcomes” (e.g. student handwashing practices) are important for program monitoring and evaluation, but are typically beyond the scope of national and global monitoring. For guidance on monitoring inputs and outcomes, see modules 2 and 3 in the WASH in Schools Monitoring Package.⁵

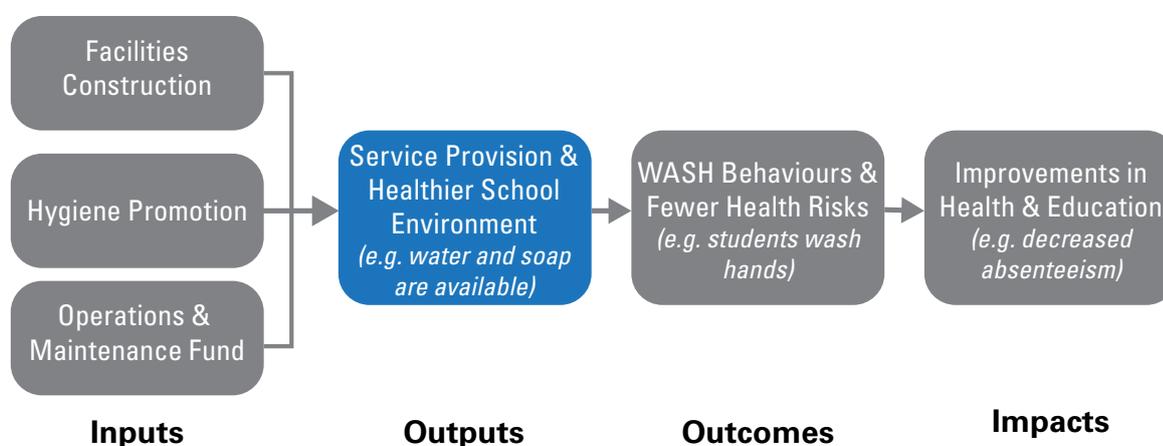


Figure 1. Example of a simple results chain for WASH in schools; global monitoring will focus on “outputs”

2

GLOBAL WASH IN SCHOOLS INDICATORS

2.1 Definitions of SDG indicators for WASH in schools

The core indicators define “basic” drinking water, sanitation and handwashing facilities. Global monitoring will include data on pre-primary, primary and secondary schools, where possible. Early Childhood Development (ECD) centres⁹ will not be included in global monitoring at this stage, due to data collection challenges associated with the unregistered status of many centres. However, this should not preclude monitoring WASH in ECD centres as part of national efforts and these will be included in future global monitoring.

1. Proportion of schools with a basic drinking water service

Definition: Proportion of schools (including pre-primary, primary and secondary) with drinking water from an improved water source available at the school

Element	Definition
improved	The main drinking water source is of an “improved” type. An “improved” drinking water source is one that, by the nature of its construction, adequately protects the source from outside contamination, particularly faecal matter (JMP definition ¹⁰). “Improved” water sources in a school setting include: piped, protected well/spring (including boreholes/tubewells, protected dug wells and protected springs), rainwater catchment, and packaged or delivered water. “Unimproved” sources include: unprotected well/spring, and surface water (e.g. lake, river, stream, pond, canals, irrigation ditches) or any other source where water is not protected from the outside environment.
available	There is water from the main drinking water source available at the school on the day of the survey or questionnaire.

2. Proportion of schools with a basic sanitation service

Definition: Proportion of schools (including pre-primary, primary and secondary) with improved sanitation facilities at the school, which are single-sex and usable

Element	Definition
improved	The sanitation facilities are of an “improved” type. An “improved” sanitation facility is one that hygienically separates human excreta from human contact (JMP definition ¹⁰). “Improved” facilities in a school setting include: flush/pour-flush toilets, pit latrines with slab, and composting toilets. “Unimproved” facilities include: pit latrines without slab, hanging latrines, and bucket latrines, or any other facility where human excreta is not separated from human contact.
single-sex	There are separate toilet facilities dedicated to female use and male use at the school. Note: may not be applicable in pre-primary schools.
usable	Toilets/latrines are available to students (doors are unlocked or a key is available at all times), functional (the toilet is not broken, the toilet hole is not blocked, and water is available for flush/pour-flush toilets), and private (there are closable doors that lock from the inside and no large gaps in the structure) on the day of the survey or questionnaire. Note: lockable doors may not be applicable in pre-primary schools.

3. Proportion of schools with a basic hygiene service

Definition: Proportion of schools (including pre-primary, primary and secondary) with handwashing facilities, which have soap and water available

Element	Definition
handwashing facilities	A handwashing facility is any device or infrastructure that enables students to wash their hands effectively using running water, such as a sink with tap, water tank with tap, bucket with tap, tippy tap, or other similar device. Note: a shared bucket used for dipping hands is not considered an effective handwashing facility.
soap and water	Both water and soap are available at the handwashing facilities for girls and boys on the day of the questionnaire or survey. Soapy water (a prepared solution of detergent suspended in water) can be considered as an alternative for soap, but not for water, as non-soapy water is needed for rinsing. Note: ash or mud may be available for hand cleansing but is not an acceptable alternative to soap for global monitoring.

⁹ Pre-primary schools typically refer to the one year prior to entering formal year 1, while ECD centres include preschools and child care centres, which are typically unattached, community-based programs that provide class-based services for children aged three to five.

¹⁰ See washdata.org for more information on the JMP definitions for “improved” facilities, as well as current categorizations.

2.2 Service ladders for progressive realisation and greater aspiration

Similar to JMP monitoring of household WASH, multi-level service ladders for monitoring WASH in schools (*Figure 2*) enable countries at different stages of development to track and compare progress in reducing inequities. There are separate ladders for drinking water, sanitation and hygiene.¹¹ Within each category, the *core* service ladders include three levels: no service, limited service, and basic service, where the “basic” service threshold corresponds to the SDG indicator for Target 4.a.

For countries where “basic” service is not an aspirational aim and further monitoring resources are available, an additional “advanced” service level is suggested. The criteria for the “advanced” level are preliminarily defined in *Figure 2*; countries are encouraged to further adapt, define and quantify the specifics as appropriate in terms of national needs, priorities and resources available. Countries are also encouraged to review and adapt their national WASH in schools standards and targets in light of these service ladders and the suggested core and expanded questions.¹²

DRINKING WATER	SANITATION	HYGIENE
Advanced service: Additional criteria may include quality, quantity, continuity, and accessibility to all users	Advanced service: Additional criteria may include student per toilet ratios, menstrual hygiene facilities, cleanliness, accessibility to all users, and excreta management systems	Advanced service: Additional criteria may include hygiene education, group handwashing, menstrual hygiene materials, and accessibility to all users
Basic service: Drinking water from an improved source and water is available at the school at the time of the survey	Basic service: Improved sanitation facilities at the school that are single-sex and usable (available, functional and private) at the time of the survey	Basic service: Handwashing facilities with water and soap available at the school at the time of the survey
Limited service: Drinking water from an improved source but water is unavailable at the school at the time of the survey	Limited service: Improved sanitation facilities at the school that are either not single-sex or not usable at the time of the survey	Limited service: Handwashing facilities with water but no soap available at the school at the time of the survey
No service: Drinking water from an unimproved source or no water source at the school	No service: Unimproved sanitation facilities or no sanitation facilities at the school	No service: No handwashing facilities available or no water available at the school
Note: Improved sources include piped water, boreholes or tubewells, protected dug wells, protected springs and packaged or delivered water. Unimproved sources include unprotected wells, unprotected springs and surface water.	Note: Improved facilities include flush/pour flush toilets, ventilated improved pit latrines, composting toilets and pit latrines with a slab or platform. Unimproved facilities include pit latrines without a slab or platform, hanging latrines and bucket latrines.	Note: Handwashing facilities may be fixed or mobile, and include a sink with tap water, buckets with taps, tippy-taps and jugs or basins designated for handwashing. Soap includes bar soap, liquid soap, powder detergent and soapy water but does not include ash, soil, sand or other handwashing agents.

Figure 2. New JMP service ladders for monitoring WASH in schools in the SDGs

Data required to monitor the *core* indicators for “basic” service are currently scarce in many regions of the world. The first priority for global monitoring is therefore to collect information on the first three levels of the ladder, up to the “basic” service level, as guided by the recommended *core* question set. However, additional information needed to assess “advanced” service are solicited in the recommended *expanded* question set to support enhanced national and sub-national monitoring efforts, and potentially future global monitoring.

11 The service ladder associated with handwashing facilities was labelled as “hygiene” to allow for greater breadth within the “advanced” service level, including menstrual hygiene education and products.

12 For more details of the rationale behind the ladders, see the Expert Group Meeting report for monitoring WASH in schools in the SDGs: <https://washdata.org/report/june-2016-wins-expert-group-meeting-report>.

3

CORE WASH QUESTIONS FOR SCHOOL SURVEYS

The following core questions are the *minimum* needed to report on the SDG indicators presented in Section 2. In some cases, an alternative question is provided to offer flexibility based on survey type and capacities. The core questions are presented in three sections: questions related to (1) drinking water, (2) sanitation, and (3) hygiene. To report on the SDGs for WASH in schools, all the questions in each section need to be included in the survey or questionnaire. If there is not capacity to include all seven core questions, it is recommended to include all questions related to either drinking water, sanitation or hygiene (or two of the three), rather than include one question related to each, which would preclude the ability to report on any of the SDG indicators for WASH in schools. Detailed notes have been provided for each question. These are intended for survey or questionnaire designers and more concise notes may be desired for the surveys themselves (see Section 5.1 for examples of potential EMIS questionnaires).

3.1 Core drinking water questions

Question W1 aims to determine the type of the school’s main source of drinking water. This serves as a proxy for whether the school’s drinking water is safe, providing an estimate at a much lower monitoring cost than direct water testing would require. The recommended categories are based on JMP definitions of “improved” and “unimproved” water sources. Based on the SDG focus beyond infrastructure to consideration of service provision, Question W2 asks about the availability of water on the day of the survey or questionnaire. The day of data collection serves as a proxy for water availability on a typical day (when averaged over all schools) and limits response bias by asking about a specific moment in time. These two questions are sufficient to calculate “basic” water service in schools. An alternative to these questions, Question W1/2, is provided for surveys or questionnaires that can support matrix style questions where schools are likely to use multiple water sources or where there is interest in water availability beyond drinking water.

W1. What is the main source of drinking water provided by the school? (check one - most frequently used)

Piped water supply	
Protected well/spring	
Rainwater	
Unprotected well/spring	
Packaged bottled water	
Tanker-truck or cart	
Surface water (lake, river, stream)	
No water source	

Note: If there is more than one source, the one used most frequently for drinking water should be selected. If children need to bring water from home because water is not provided by the school, “no water source” should be selected.

Response options should be modified to reflect the local context and terminology such that respondents are able to clearly understand each one, and they are able to be categorized as improved, unimproved or no water source. Photos may be useful, where feasible.¹³ An “improved” drinking water source is one that, by the nature of its construction adequately protects the source from outside contamination, particularly faecal matter (JMP definition⁹). “Improved” water sources in school settings include: piped, protected well/spring (including boreholes/tubewells, protected dug wells and protected springs), rainwater catchment, and packaged or delivered water. “Unimproved” sources include: unprotected well/spring, and surface water (e.g. lake, river, stream, pond).

If interested in monitoring whether or not children bring drinking water from home as an interim step to water provision at schools, an additional option, “children bring water from home” could be added. This will be considered as “no water source” for the purpose of global monitoring.

¹³ See the following example to base localized photos or drawings on: Shaw, R. (2005) Preparation of pictorial illustrations on access to water supply and sanitation facilities for use in national household surveys. WHO/UNICEF Joint Monitoring Programme.

W2. Is drinking water from the main source currently available at the school?

Yes	
No	

Note: To be considered available, water should be available at the school at the time of the survey or questionnaire, either from the main source directly or stored water originally from the main source.

W1 & W2 (alternative). What is the main source of water for the school?

Source	Currently Available	Main source of drinking water (check one)
<input type="checkbox"/> Piped	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> Protected well/spring	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> Unprotected well/spring	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> Rainwater	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> Packaged bottled water	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> Tanker-truck or cart	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> Lake/River/Stream	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> No water source	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No

Note: This question can replace questions W1 and W2 for surveys with greater analysis capacity and where multiple or back-up water sources are common.

See notes for Questions W1 and W2.

3.2 Core sanitation questions

Certain sanitation technologies are more likely than others to hygienically separate human excreta from student contact. These are categorized by the JMP as “improved” sanitation facilities, while others are labelled as “unimproved,” following the same definitions and categories used for household-level monitoring. Question S1 asks about the most common type of student toilet or latrine at the school to provide a general sense of how well school sanitation facilities support hygienic separation of human waste from user contact. The recommended response categories are based on JMP categories of “improved” and “unimproved” sanitation.

Since the presence of a toilet or latrine does not necessarily indicate that children are able or likely to use it, Question S2 aims to understand if there are *usable* student toilets or latrines at the school, where usable is defined as available, functional and private. The number of toilets is requested in question S2 based on the common interest of national governments to track students per toilet ratios. The quantity will not be used for global SDG monitoring in the near future, but could possibly be tracked at a later date and national governments are encouraged to monitor quantities based on national standards.

Question S3 solicits information about single-sex toilets. An alternative to questions S2 and S3 is provided for countries or surveys with capacity for matrix style questions and interest in toilet quantities by sex and/or usability.

S1. What type of student toilets/latrines are at the school? (check one - most common)

Flush / Pour-flush toilets	
Pit latrines with slab	
Composting toilets	
Pit latrines without slab	
Hanging latrines	
Bucket latrines	
No toilets or latrines	

Note: If more than one type is used, the most common type of student toilet/latrine should be selected.

Response options should be modified to reflect the local context and terminology such that responses are able to be categorized by improved, unimproved or none. Photos may be useful, where feasible.¹² An “improved” sanitation facility is one that hygienically separates human excreta from human contact (JMP definition⁹). “Improved” facilities in school settings include: flush/pour-flush toilets, pit latrines with slab, and composting toilets. “Unimproved” facilities include: pit latrines without slab, hanging latrines, and bucket latrines, or any other facility where human excreta is not separated from human contact.

S2. How many student toilets / latrines are currently usable (available, functional, private)? (insert number of holes / seats / stances)

Insert number	
---------------	--

Note: Only count toilets/latrines that are usable at the time of the survey or questionnaire, where “usable” refers to toilets/latrines which are (1) available to students (doors are unlocked or a key is available at all times), (2) functional (the toilet is not broken, the toilet hole is not blocked, and water is available for flush/pour-flush toilets), and (3) private (there are closable doors that lock from the inside and no large gaps in the structure) at the time of the questionnaire or survey. If *any* of these three criteria are not met, the toilet/latrine should not be counted as usable. However, lockable toilets may not be applicable in pre-primary schools.

S3. Are the toilets/latrines separate for girls and boys?

Yes	
No	

Note: Single-sex toilets means that separate girls’ and boys’ toilets are available at the school, or it is a single-sex school and has toilets.¹⁴ To be considered separate, facilities should provide privacy from students of the opposite sex, but this definition should be further defined based on local context, as needed. For schools that have separate shifts for girls and boys (i.e. girls attend the school at a separate time from boys), depending on local culture, the response could be “yes” since at the time of use, the toilets are only for girls. This question may not be applicable in pre-primary schools.

S2 & S3 (alternative). How many toilets/latrines are at the school? (insert number)

	Girls’ only toilets	Boys’ only toilets	Common use toilets
Total number			
Number that are usable (available, functional, private)			

Note: This question can replace questions S2 and S3 above for surveys with greater analysis capacity and interest in toilet quantities and generating pupils per toilet ratios. The “common use toilets” column is necessary to determine if the girls and boys toilets are separate, which is not possible with the girls’ only and boys’ only columns alone.

The number of urinals, teacher toilets or other categories could be added depending on national interest and capacities. In schools where boys and girls are in separate shifts and use the same facilities but at different times, the total number of toilets could be entered for the number reserved for girls and the number reserved for boys (i.e. the same number for both) since at the time of use they are all reserved for each sex separately. Quantities are not needed for global monitoring, but may be desired by national governments.

See notes for Questions S2 and S3.

¹⁴ Based on the UNESCO-UIS definition

3.3 Core hygiene questions

To date WASH in schools monitoring has focused on water and sanitation coverage, despite evidence that handwashing with soap may provide an even greater health impact.¹⁵ This focus has been changing recently, with the inclusion of handwashing facilities within the indicator definition for WASH in schools in the SDGs, and a small number of countries already including questions about handwashing facilities in their EMIS questionnaires. The core hygiene questions support increased monitoring of this important aspect of WASH in schools, including not only the presence of infrastructure (Question H1), but also the provision of soap and water (Question H2).

H1. Are there handwashing facilities at the school?

Yes	
No	

Note: A handwashing facility is any device or infrastructure that enables students to wash their hands effectively using running water, such as a sink with tap, water tank with tap, bucket with tap, tippy tap, or other similar device. Note: a shared bucket used for dipping hands is not considered an effective handwashing facility.

H2. Are both soap and water currently available at the handwashing facilities?

Yes, water and soap	
Water only	
Soap only	
Neither water or soap	

Note: To be considered available, water and soap must be available at one or more of the handwashing facilities at the time of the survey or questionnaire. If girls and boys have separate facilities, soap and water should be at both. Soapy water (a prepared solution of detergent suspended in water) can be considered as an alternative for soap, but not for water, as non-soapy water is needed for rinsing. Surveys may choose to add other response categories for ash or alcohol hand rub, but these should be kept as separate categories from soap to support SDG monitoring.

15 Cairncross, S. et al. (2010) Water, sanitation and hygiene for the prevention of diarrhea. *Int. J. Epidemiol.* 39(1):i193-i205.

4

DATA ANALYSIS & REPORTING

Table 2 provides guidance on data tabulation for national monitoring of WASH in schools as part of the SDGs. Additional disaggregation by geographic region (e.g. province) is also recommended for national monitoring to support identification of sub-national disparities. The calculations provided in **Table 3** should be used to populate **Table 2** based on responses to the core questions. Some countries may wish to also track the proportion of schools with no water or sanitation service, if this is considered a challenge in the local context.

Table 2. Tabulation guide for SDG reporting of WASH in schools

Proportion of pre-primary, primary and secondary schools with basic water, sanitation and hygiene							
SURVEY NAME, YEAR (note if data were observed or reported)							
Proportion of schools		National	Urban	Rural	Pre-primary	Primary	Secondary
Water	With an improved drinking water source						
	With drinking water available from an improved source*						
Sanitation	With improved toilets						
	With improved toilets which are usable						
	With improved toilets which are single-sex				may not be applicable ¹⁶		
	With improved toilets which are usable and single-sex*						
Hygiene	With handwashing facilities which have water available						
	With handwashing facilities which have water and soap available*						

*SDG indicator for “basic” service

Table 3. Calculating WASH in schools service levels based on responses to the core questions

Indicator	Calculation*
Proportion of schools with an improved drinking water source	the number of schools where W1 = an improved source, divided by the total number of schools surveyed
Proportion of schools with drinking water available from improved source (basic)	the number of schools where W1 = an improved source AND W2 = Yes, divided by the total number of schools surveyed
Proportion of schools with improved toilets	the number of schools where S1 = an improved facility, divided by the total number of schools surveyed
Proportion of schools with improved toilets which are usable	the number of schools where S1 = an improved facility AND S2 ≥ 1, divided by the total number of schools surveyed
Proportion of schools with improved toilets which are single-sex ¹⁶	the number of schools where S1 = an improved facility AND S3 = Yes, divided by total number of schools surveyed
Proportion of schools with improved toilets which are usable and single-sex (basic)	the number of schools where S1 = an improved facility AND S2 ≥ 2 AND S3 = Yes, divided by total number of schools surveyed
Proportion of schools with handwashing facilities which have water available	the number of schools where H1 = Yes AND H2 = Yes, soap and water OR water only, divided by the total number of schools surveyed
Proportion of schools with handwashing facilities that have soap & water (basic)	the number of schools where H1 = Yes AND H2 = Yes, soap and water, divided by the total number of schools surveyed

*Where possible, national coverage data should be disaggregated by residence (urban / rural), school type (pre-primary / primary / secondary), and regions (e.g. provinces).

¹⁶ If single-sex toilets are not applicable in pre-primary schools, all pre-primary schools with usable improved toilets can be included in estimates for “basic” sanitation service.



5 DATA SOURCES

National monitoring systems (e.g. EMIS) are likely to be one of the largest sources of data for SDG monitoring of WASH in schools (**Table 4**). The UNESCO UIS survey solicits EMIS data from national governments as the source of their data collection. EMIS typically collect data through self-report questionnaires.¹⁷ Additional data sources include facility surveys, which collect data via interview and observation by trained enumerators. These include the LLECE quality of education survey (Latin America), the World Bank SDI survey (currently in Africa, but with potential to expand), and the WHO European region school exposure survey.

Table 4. Nationally representative major data sources for WASH in schools

Survey/Source	Geographical Reach	School type	Frequency	Data collection	Data availability
National monitoring systems (e.g. EMIS)	Most countries; but many have data that are not readily accessible/reported	Typically all public schools (some include private)	Typically annual or twice yearly	School administration questionnaires (<i>reported</i>)	Varies; often not easily accessible or frequently updated
UNESCO UIS ¹⁸	Over 90 countries globally in 2018; 42 countries in Africa prior to 2018	Primary and secondary (public and private)	Annual	Secondary data solicited from national government (EMIS, <i>reported</i>)	Public reports
World Bank SDI ¹⁹	9 countries in Africa; 5 more planned. Potential to expand to other regions, pending interest and capacities	Mostly primary (public and private)	By request (1-2 times per country to date)	Primary independent collection (<i>observed</i>)	Public reports and datasets
LLECE Quality of Education Survey ²⁰	17 countries in Latin America	Primary and secondary (if 3rd or 6th grade)	2008, 2013	Primary data collection (<i>observed</i>)	Public reports and datasets
WHO European Region School Exposure ²¹	38 of the 53 countries in the European region	Pre-primary, primary and secondary	2014	Primary data collection (<i>observed</i>)	Public report

Comparison of the questions included in major data sources against the SDG criteria, suggests that data sources already include some of the SDG criteria for “basic” WASH in schools services. In many cases only minor changes would be needed to align existing surveys and censuses with the SDG indicators. Regional scoping studies from Latin America and the Caribbean²² and East Asia and the Pacific²³ provide additional information and examples.

17 Validation opportunities should continue to be explored, including community surveys, and school accreditation and inspection reports. A study in Indonesia suggests that national EMIS data are accurate. Similar studies may be useful in other countries. (see: UNICEF Indonesia (2015) *WASH in Schools in Eastern Indonesia – assessing quality and Sustainability in 3 Provinces via a student and facility survey*). For all data sources, the JMP global dataset will record if data were observed or reported.

18 <http://data.uis.unesco.org/>

19 <http://www.worldbank.org/sdi>

20 <http://www.unesco.org/new/en/santiago/education/education-assessment-llece/>

21 WHO (2015) *School environment: policies and current status*. Copenhagen: WHO Regional Office for Europe.

22 WHO and UNICEF (2017). *Scoping Study: Are data available to monitor the SDGs for WASH in schools and health care facilities in the Latin America and Caribbean region?* Geneva and New York. <<https://washdata.org/report/sdg-wash-institutions-lacro>>

23 WHO and UNICEF (2017). *Scoping Study: Preparing for SDG reporting of WASH in schools in East Asia and the Pacific*. Geneva and New York. <<https://washdata.org/report/jmp-2017-preparing-sdg-reporting-wins-eap>>

5.1 Integrating core questions into national EMIS

In many countries there are opportunities to monitor the WASH in schools targets of the SDGs through existing mechanisms (e.g. EMIS), thus strengthening national systems in the process of global monitoring. **Figures 3** and **4** provide example EMIS questionnaires incorporating the recommended core questions. These questions could be added directly to EMIS questionnaires (with localised terminology for facility types), or existing questions could be modified to reflect the recommended core questions. Where these questions do not address all national priorities for WASH in schools and there are additional monitoring capacities, relevant questions from the expanded set could be added, such as questions regarding menstrual hygiene management (MHM) or accessibility for those with limited mobility (see Annex A).

1. What is the main source of drinking water for the school? (check one)

Piped water Tubewell/borehole Covered well/spring Rainwater catchment
 Open well/spring Cart/tanker-truck Lake/river/stream Bottled water
 No water

2. Is drinking water from the main source currently available at the school?

Yes No

3. What type of student toilets/latrines are at the school? (check one – most common)

Flush/Pour -flush toilets Pit latrines with slab Composting toilets
 Pit latrines without slab Hanging latrine (hole over water) Bucket latrine
 No toilets or latrines

4. How many student toilets/latrines are currently usable (available, functional, private)?

Insert number

5. Are the toilets/latrines separate for girls and boys?

Yes No

6. Are there handwashing facilities at the school?

Yes No

7. Are both soap and water currently available at the handwashing facilities?

Yes, soap and water Water only Soap only Neither

Figure 3. Example of core WASH in schools questions for national EMIS

1. What is the main source of water for the school? (check all that apply)

Source	Currently Available	Main Source of Drinking Water (check one)
<input type="checkbox"/> Piped	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> Covered well/spring	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> Open well/spring	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> Rainwater	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> Bottled water	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> Tanker-truck or cart	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> Lake/River/Stream	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> No water source	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No

2. What type of student toilets/latrines are at the school? (check one – most common)

Flush/Pour -flush toilets Pit latrines with slab Composting toilets
 Pit latrines without slab Hanging latrine (hole over water) Bucket latrine
 No toilets or latrines

3. How many toilets/latrines are at the school? (insert numbers)

	Girls' only toilets	Boys' only toilets	Common use toilets
Total number			
Number that are usable (available, functional, private)			

4. Are there handwashing facilities at the school?

Yes No

5. Are both soap and water currently available at the handwashing facilities?

Yes, soap and water Water only Soap only Neither

Figure 4. Example of core WASH in schools questions for national EMIS, using the alternative matrix style questions

Annex A

EXPANDED WASH QUESTIONS FOR SCHOOL SURVEYS

The following questions provide a menu of options for countries or survey programs to expand upon the core question set where “basic” service is not sufficiently ambitious, there are national or sub-national priorities beyond the criteria for “basic”, and/or there is greater capacity for monitoring. The questions are presented in three sections: questions related to (1) drinking water, (2) sanitation, and (3) hygiene. Each question maps to a potential criteria for the “advanced” service level in the JMP service ladders for WASH in schools. Questions are based on the current global norms²⁴ and emerging priorities (e.g. menstrual hygiene management, MHM²⁵) that are not captured in the core questions. They are categorized based on the normative human rights criteria: *availability*, *accessibility*, *acceptability*, and *quality*.²⁶

While it may be fairly straightforward to add questions to a questionnaire or survey, capacities to analyse and report data should be considered. Increasing the amount of data collected increases survey costs, and is only worthwhile if the additional information is analysed, reported and linked to decision-making and national or sub-national programs.

A.1 Expanded drinking water questions

Questions XW1 and XW2 aim to capture drinking water *availability*, taking into consideration the difference between shortages during the day and periods during the year where water is often unavailable. *Accessibility* of drinking water is included in XW3-5, which address accessibility to those with limited mobility, small children, and the number of drinking water collection points at the school. Drinking water *quality* is solicited in questions XW6 and XW7, which request information about water treatment practices at the school and compliance with national standards based on water quality testing. The global norm for school drinking water *acceptability* states that “there are no tastes, odours, or colours that would discourage consumption of the water.” Compliance with this norm is not captured in the expanded questions due to the subjectivity of response and likelihood of inconclusive results.

Availability

XW1. In the previous two weeks, was drinking water from the main source available at the school throughout each school day?

Yes	
No	

Note: Only respond “yes” if water was available at all times during the school day for the previous two weeks. Respond “no” if water was not available, at any time during any of the school days in the previous two weeks.

XW2. Is drinking water from the main source typically available throughout the school year?

Yes (<i>always</i>)	
Mostly (<i>unavailable ≤ 30 days total</i>)	
No (<i>unavailable > 30 days total</i>)	

Note: Respond “no” if the total time without water during the school year is more than 30 days.

24 WHO (2009) *Water, sanitation and hygiene standards for schools in low-cost settings*. Geneva: World Health Organization.

25 Various components are considered essential to MHM: (1) clean materials to absorb or collect menstrual blood, (2) space to change materials in privacy as often as needed, (3) soap and water for washing as required, (4) safe and convenient facilities to dispose of used materials, and (5) basic information about the menstrual cycle and how to manage it with dignity and without discomfort or fear.

26 UN (2014) *Realising the human rights to water and sanitation: A handbook*, Booklets 1 and 5; Affordability is not explicitly monitored via the proposed indicators due to the diverse contexts and complex nature of measuring affordability in the school setting.

Accessibility

XW3. Is drinking water accessible to those with limited mobility or vision?

Yes	
No	

Note: To be considered accessible, water can be accessed (directly from the source or from a storage container) via a clear path without stairs or steps* that is free of obstructions and has age-appropriate handrails, the tap can be reached from a seated position, and the water source/dispenser can be opened/closed with minimal effort with one closed fist or feet.

*Maximum ramp slope should follow national standards. In the absence of national standards, the following global guidelines are recommended: a maximum ramp slope of 1:20 without handrails or 1:10 with handrails for the first 10 meters (if a longer ramp is needed, there should be an intermediate level landing every 10m).

XW4. Is drinking water accessible to the smallest children at the school?

Yes	
No	

Note: To be considered accessible, the water tap can be reached and easily opened/closed by the smallest children. May not be applicable in secondary schools.

XW5. How many drinking water points (e.g. taps) are at the school?

Insert number	
---------------	--

Note: Count the total number of drinking water points at the school for students. This includes any point where children can get water to drink when needed. These could include, but are not limited to, piped taps, water fountains, jugs, water coolers, and buckets with taps, as well as protected wells or rainwater tanks if children get water directly from those sources.

Quality

XW6a. Does the school do anything to the water from the main source to make it safe to drink?

Yes	
No	

Note: The water treatment equipment / supplies should be observed, if possible.

XW6b. If yes, what treatment method is used?

Filtration	
Boiling	
Chlorination	
SODIS	
Ultraviolet disinfection	
Other _____	

Note: SODIS refers to "solar disinfection" where plastic bottles of water are set in the sun for a number of hours.

XW7. Is the school's main water source compliant with national standards for drinking water?		
Contaminant	Tested in past 12 months	Compliant
<i>E. coli</i>	[] yes [] no [] don't know	[] yes [] no [] don't know
Arsenic	[] yes [] no [] don't know	[] yes [] no [] don't know
Lead	[] yes [] no [] don't know	[] yes [] no [] don't know
Other_____	[] yes [] no [] don't know	[] yes [] no [] don't know
Contaminant unknown	[] yes [] no [] don't know	[] yes [] no [] don't know

Note: The structure can be modified for surveys that don't accept matrix style questions. If the water was tested, but the contaminants tested are unknown, the "contaminant unknown" row can be used. For surveys that test water as part of data collection, the "tested in past 12 months" column can be changed to "sample taken." WHO guidelines recommend a standard of zero *E. coli* (or thermotolerant coliform bacteria) in any 100-mL sample, a maximum arsenic level of 0.01 mg/L, and a maximum lead guideline of 0.01 mg/L.⁴ The contaminants in the table can be changed based on the context. If chlorine residual is tested, this may also be recorded; the drinking water guideline is at least 0.2 mg/L

A.2 Expanded sanitation questions

Acceptability of school sanitation facilities can greatly influence their use. If toilets or latrines are not acceptable to students, they may prefer to use the bush, hold back their toilet needs which can have negative health impacts, or stay home (particularly in the case of girls during their menses). While usability of facilities, including availability, functionality and privacy, is included in the core question set (S2), the expanded questions include aspects of acceptability that may be more challenging to monitor, such as cleanliness and facilities for menstrual hygiene management (questions XS1-5).

Questions XS6-8 collect information on the *accessibility* of school toilets and latrines, including whether they are accessible to those with limited mobility and small children, and their location at the school. The *availability* of facilities is collected as part of the core question on usable toilets (S2), but question XS9 specifically asks when students are permitted to use the toilets. The *quality* of facilities, including lighting, the provision of anal cleansing materials, and faecal waste disposal once pits or septic tanks are full, are captured in questions XS10-12. Additionally, expanded analysis can be conducted on responses from the alternate core question S2/3 to calculate ratios of students per toilet by sex and to gauge maintenance practices.

Acceptability

XS1. Are water and soap available in a private space for girls to manage menstrual hygiene?

Yes, water and soap	
Water, but not soap	
No water	

Note: Check yes if water and soap are available for discrete personal hygiene (hand and body washing), cleaning clothes/uniform, and washing reusable menstrual hygiene products (as applicable). This question is not applicable in pre-primary schools.

XS2. Are there covered bins for disposal of menstrual hygiene materials in girls' toilets?

Yes	
No	

Note: This question is not applicable in pre-primary schools.

XS3. Are there disposal mechanisms for menstrual hygiene waste at the school?

Yes	
No	

Note: Disposal mechanisms can include incineration or another safe method on-site, or safe storage and collection via a municipal waste system, as appropriate. Not applicable in pre-primary schools.

XS4. How many times per week are the student toilets cleaned?

At least once per day	
2-4 days/week	
Once per week	
Less than once per week	

Note: Although this question focuses on operation and maintenance processes, and not outputs, it is intended to provide a proxy for toilet cleanliness and may be more appropriate for self-response administration surveys than XS5.

XS5. In general, how clean are the student toilets?

Clean	
Somewhat clean	
Not clean	

Note: Visit as many of the student toilets as possible, and then select the appropriate description based on your general impression and the following definitions. Clean: all toilets do not have a strong smell or significant numbers of flies or mosquitos, and there is no visible faeces on the floor, walls, seat (or pan) or around the facility. Somewhat clean: there is some smell and/or some sign of faecal matter in some of the toilets. Not clean: there is a strong smell and/or presence of faecal matter in most toilets. This question is only appropriate for surveys that include observation by trained enumerators.

Accessibility**XS6. Is there at least one usable toilet/latrine that is accessible to the smallest children at the school?**

Yes	
No	

Note: To be considered accessible, a toilet/latrine should be available that can be used by the smallest children, which has a smaller toilet hole, a lower seat, and a lower door handle. May not be applicable in secondary schools.

XS7. Is there at least one usable toilet/latrine that is accessible to those with limited mobility or vision?

Yes	
No	

Note: To be considered accessible, the facility can be accessed via a clear path without stairs or steps* that is free of obstructions and has age-appropriate handrails, there is enough space inside for a wheelchair user to enter, turn, close the door and park by the toilet (1.5 m²), the door is wide enough for a wheelchair (at least 80 cm) and opens outward with minimal or no difference in floor height between outside and inside, and the door handle and seat are within reach of children using wheelchairs or crutches/sticks, including a fixed raised pan or movable raised toilet seat to accommodate children who may have difficulty squatting.

*Maximum ramp slope should follow national standards. In the absence of national standards, the following guidelines are recommended: a maximum ramp slope of 1:20 without handrails or 1:10 with handrails for the first 10 meters (if a longer ramp is needed, there should be an intermediate level landing every 10m).

XS8. Where are the student toilets located?

Within school building	
Outside building, but on-premises	
Off-premises	

Note: If there are multiple locations, respond based on the most frequently used by students. This question may be especially applicable in cold climates, boarding schools, and in regions with prolonged periods of darkness during school hours.

Availability**XS9. When are students permitted to use the school toilets/latrines?**

At all times during the school day	
During specific times during the school day	
There are no toilets available for use at the school	

Note: Where feasible, such as in small program evaluations or sub-regional surveys, this question may provide more accurate information if asked of students.

Quality

XS10. Are culturally appropriate anal cleansing materials currently available to all students?

Yes	
No	

Note: Response should be based on the time of the questionnaire or survey and should be observed if possible. Anal cleansing materials will likely vary between countries and over time, and should be defined based on local context. In schools that have a multi-cultural student body, respond “yes” only if materials are provided to suit the needs of all students.

XS11. Is there currently functional lighting in the student toilets?

All toilets	
Some toilets	
None	

Note: Response should be based on the day of the survey or questionnaire and should be observed if possible. This question may be especially appropriate for boarding schools and in countries or regions with prolonged periods of darkness during the school day, but is relevant in most settings. Where day-time toilet lighting is of interest, electric lighting or construction that allows natural light to enter is acceptable.

XS12. Are latrines or septic tanks emptied (or latrines safely covered) when they fill up?

Yes	
No	

Note: This question does not apply to all sanitation facilities (e.g. sewer connection) but primarily to the management of faecal sludge from on-site systems.

Respond “no” if there are any latrines at the school that are currently too full to be used and the pit has not been emptied (or a new pit has not been dug and the full pit safely covered).

Additional questions regarding safely managed sanitation could be added based on household questions for SDG monitoring, but the scope of questions may only be realistic up to the school boundary (e.g. if pits are emptied, the school can likely only provide information up to the point where the sludge left the school premises, not about how the sludge is managed after leaving the school).

Expanded analysis of results from core questions

Additional indicators can also be calculated from the core questions, which may be included in national monitoring:

1. Students per toilet ratios can be calculated from alternative core Question S2/3, by dividing the number of female students by the number of girls’ toilets, and the number of male students by the number of boys’ toilets.
2. Operation and maintenance can be evaluated by calculating the ratio of usable to total toilets in S2/3.

A.3 Expanded hygiene questions

Questions XH1 and XH2 focus on *accessibility* of handwashing facilities for those with limited mobility and for small children. The *availability* of soap and water at different locations and the number of taps are solicited in questions XH3 and XH4. The *quality* of hygiene services, including group handwashing, products and education related to menstrual hygiene management, and solid waste management, are captured in questions XH5-7, which may be more applicable in some contexts than others. In addition to these, questions are provided that relate to bathing and washing areas, which are mostly specific to the current global norms for boarding schools, but may be applicable in day schools for some contexts.

Accessibility

XH1. Are there handwashing facilities accessible to those with limited mobility or vision?

Yes	
No	

Note: To be considered accessible, handwashing facilities can be accessed via a clear path without stairs or steps* that is free of obstructions and has age-appropriate handrails, the tap and soap are reachable from a seated position and the tap can be operated by feet and/or one closed fist with minimal effort.

*Maximum ramp slope should follow national standards. In the absence of national standards, the following global guidelines are recommended: a maximum ramp slope of 1:20 without handrails or 1:10 with handrails for the first 10 meters (if a longer ramp is needed, there should be an intermediate level landing every 10m).

XH2. Are there handwashing facilities accessible to the smallest children at the school?

Yes	
No	

Note: To be considered accessible, the smallest children should be able to reach the tap and soap, and be able to operate the tap on their own with minimal effort. May not be applicable in secondary schools.

Availability

XH3. Where are handwashing facilities with water and soap located at the school? (mark all that apply)

Toilets	
Food preparation area	
Food consumption area	
Classrooms	
School yard	
Other _____	

Note: Only mark those areas where both water and soap are available at the time of the survey or questionnaire.

XH4. How many handwashing facilities with water and soap are located at the school? (insert number of taps)

Total number of taps	
Number with water & soap	

Note: Insert the total number of handwashing points (e.g. taps) that exist at the school and the number that have both water and soap at the time of the survey or questionnaire.

Quality

XH5. How many times per week are group handwashing activities conducted for all students?

At least once per school day	
2-4 days/week	
Once per week	
Less than once per week	

Note: Applicable in countries that have adopted the Three Star Approach²⁷ (or similar).

XH6. Which of the following provisions for menstrual hygiene management (MHM) are available at the school?

Bathing areas	
MHM materials (e.g. pads)	
MHM education	

Note: Bathing areas are separate from latrines and toilets. The design may vary based on local context, but at minimum should have *water and soap* inside and be *private* (have closable doors that lock from the inside, and no holes, cracks, windows or low walls that would permit others to see in). MHM Material types may vary based on local context. Availability may be via free distribution or for purchase. MHM education should be institutionalized (i.e. regularly taught in class or through a regular school program) to be considered as a response for this question.

XH7. How is solid waste (garbage) from the school disposed of?

Collected by municipal waste system	
Burned on premises	
Buried and covered on premises	
Openly dumped on premises	

Note: The first three are considered appropriate forms of solid waste disposal. Openly dumped on-premises is not considered an appropriate form of disposal.

Boarding Schools (or other applicable contexts)

XHB1. How many bathing areas are available?

Insert number	
---------------	--

Note: To be considered available, water and soap should be currently available within bathing areas, and the bathing area should be private (i.e. have closable doors and no holes, cracks, windows or low walls that would permit others to see in).

XHB2. Are there separate facilities or times for girls and boys to bathe?

Yes	
No	

Note: To be considered separate, the bathing areas should provide privacy from the opposite sex (i.e. have closable doors and no holes, cracks, windows or low walls that would permit others to see in).

XHB3. Are there separate facilities or times for students and residential staff to bathe?

Yes	
No	

Note: To be considered separate, the bathing areas should provide privacy between students and staff (i.e. have closable doors and no holes, cracks, windows or low walls that would permit others to see in).

²⁷ UNICEF/GIZ (2013) Field Guide: The Three Star Approach for WASH in Schools.

XHB4. Is there at least one bathing area that is accessible for females with limited mobility and a separate one for males with limited mobility?

Yes	
No	

Note: Answer yes only if there are separate disability accessible bathing areas or times for males and females

XHB5. Is there hot water available in the student bathing areas?

Always	
Sometimes	
Never	

Note: This question is particularly applicable in cold climates.

