An-Najah National University

Faculty of Graduate Studies

Water Consumption Practices in Schools of Nablus Directorate of Education

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Dedication

To my parents and my wife for their encouragement and support.

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First of all, praise be to Allah for helping me in making this thesis possible.

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الإقرار

أنا الموقع أدناه مقدم الرسالة التي تحمل عنوان:

Water Consumption Practices in Schools of Nablus Directorate

أقر بأن ما اشتملت عليه هذه الرسالة إنما هي نتاج جهدي الخاص باستثناء ما تمت الإشارة إليه حيثما ورد، وان هذه الرسالة ككل أو أي جزء منها لم يقدم من قبل لنيل أي درجة علمية أو أي بحث علمي لدي أية مؤسسة تعليمية أو بحثية أخرى.

Declaration

The work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

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Signature: **التوقيع :**

Date: 20/05/2015 **التاريخ :**

Table of Contents

List of Tables

List of Figures

List of Appendix Tables

List of Appendix Figures

Abbreviations

Symbols	Definition
PCBS	Palestinian Central Bureau of Statistics
m^3	Cubic Meter
l	Liter
l/s-d	Liter Per student Per Day
l/o-d	Liter Per Occupant Per Day
m^3/year	Cubic Meter Per Year
RPF	Rural Primary Females
RPM	Rural Primary Females
RSF	Rural Secondary Females
RSM	Rural Secondary Males
UPM	Urban Primary Males
USM	Urban Secondary Males
USF	Urban Secondary Females
UK	United Kingdom
No.	Number
t	Student-t distribution value (from statistical tables)
TC	Total Coliform
FC	Fecal Coliform

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Abstract

Water is an essential, precious and limited resource. While the world's population increases, water cost is rising rapidly; therefore it should be conserved and not wasted. Schools are considered strategic locations for promoting water saving initiatives and developing water analysis because of the high number of students. These schools must try to improve their water systems to conserve water and look for ways to improve water quality.

This thesis aims at finding indicators of water consumption in eight types of schools through water metering and historical data about users in these schools and to compare them with international standards. It also aims at linking water consumption with other related factors inside school grounds. In addition, the researcher aims to study the potential of water conservation opportunities and savings at schools (if all schools water fixtures is to be replaced with low flow ones),the study also discusses drinking water quality in public schools and presents information about the sources of contaminants (Total and Fecal coliforms). Lastly it aims at evaluating schools under study as a green buildings with respect to the Palestinian 2013 Green Buildings Guidelines.

Relevant data are collected from the Directorate of Education of Nablus, Ministry of Health and Nablus Municipality and organized into categories by type of case study first, then by type of school. Testing for total and fecal coliforms is performed by collecting water samples from two types of schools depending on water sources. Based on the analysis of collected data, a set of proposed actions and recommendations is developed and concluded.

Results showed that water consumption indicators range from 3.38 to 4.67 liters/student/day in primary school ,while it is 4.86 liters/student/day in secondary female's schools and 6.3 liters/student/day in secondary male's schools. The study also shows that secondary male students consume more water daily than primary school students (males and females) and more than secondary female's students despite the fact that they use similar facilities at schools. The researcher finds that schools in Palestine consume less than half the quantity for schools in Europe and America, and less than the best practice consumption in the UK schools. Results of water quality show that drinking water at schools across the Governorate is contaminated by total and fecal coliforms especially at schools with cisterns. Contamination is found in 42% of the governorate schools that uses cisterns only or any other water resource. On the other hand contamination is about 20% of schools that uses public water network.

The researcher also finds that low water consumption at schools is contributed to the type of installed water fixture devices which are low-

flow types, and low water uses in kitchens , canteens, miscellaneous faucets and toilets.

The research showed that it is not cost-effective to carry out retrofit projects in public schools in this situation though there would be no savings achieved. Water consumption in public schools is less than the best practice when schools are fully retrofitted with low flow fixtures. Low water usage at schools might also not be consistent with principles of health and sanitation, so such concerns should be addressed and resolved by authorities.

Finally, this study reveals that most schools under study satisfies just 22% green buildings guidelines requirements with respect to water efficiency item, while the newest schools satisfies about 48 % of these requirements.

The researcher recommends that schools that uses cisterns are required to test their water and report any problems to the authorities and to achieve the requirements and conditions of the Green Buildings Guidelines for all new schools.

Chapter One

Introduction

1.1 General Background

Palestine faces severe water crisis. Supplies from the Palestinian water resources are mostly threatened and controlled by the Israeli occupation. In addition; Palestine is classified as a semi-arid region, so water consumption should be carefully monitored.

"Primary school education is an important foundation of a nation, and deeply influences the development of society" [1]. "*The supply and utilization of water in schools greatly affects the health and sanitation of the children's learning environment. A significant quantity of water used in schools is lost due to inappropriate use or wastage. However, a low water usage might also not be consistent with principles of health and sanitation. The quantity of water used by each school child varies significantly in any society. This information is critical for the society to notice the potential of improving water conservation in public schools*" [2].

The responsibility for ensuring a sustainable water for future lies on the community as a whole; everyone has a role to play to make sure that water is planned for properly.

Education of the public at large, municipal officials and water suppliers is crucial to generating an understanding of the issues, and creating acceptance to the implementation of water conservation efforts. It is important to provide the public with the basic understanding of sound water resources management and planning and to explain the associated economic and environmental benefits. Public education can be an essential

prerequisite to the successful adoption and implementation of conservation practices.

Water conservation has become global trend and it is important to the society. An appropriate school planning for water utilization would greatly contribute to a country's budget for education and promote the conservation of water resources [2].

Water consumption per user in non-residential buildings is still a very complicated issue for engineers and designers in the process of analyzing water demand and water management. It is easier to design for residential units than for public buildings, as designer may never know exactly how many users will access the building daily, one can just estimate the number of consumers [3].

Based on the above, it is of great importance to develop proper estimates for water consumption in schools, in addition to developing proper cost effective practices to reduce water consumption.

1.2 Research Questions

The main research questions can be summarized as:

- What is the average quantity of water consumed daily per male, female, primary and secondary students, in rural and urban areas? Is it high?
- How much schools spend on water for each square meter of floor, land spaces of different types of schools mentioned above?

- Are these schools green buildings (with respect to water and sanitation items)? To what level? What measures can be practiced to optimize water use and increase efficiency?
- Is water quality used in the schools of West Bank acceptable and within the Palestinian standards?

1.3 Objectives

The main objectives of this research were:

1- To determine the specific water consumption in public schools of Nablus Directorate, in addition to general investigations on water quality in the chosen schools.

2- To compare Nablus schools performance indicators on water consumption with regional and international standards.

3- To develop a set of recommendations on the most appropriate measures to minimize consumption rates of water and to reduce wastages at schools.

4- To assess the efficiency of water use in schools within a comprehensive description of the efficiently use of available water resources and within the appropriate environmental standards and local conditions.

1.4 Beneficiaries of Research

The results of this research can be helpful for:

1- Engineers for designing infrastructure in public schools projects.

2- Water managers in the process of evaluating water systems.

3- Students: sustainable development is important to prepare engineers for the future.
4- Schools: schools perform better when they take responsibility for their own improvement, and through education for sustainable development.
5- Government: Saving resources such as water can also save government significant sums of money.
6- Future generations: through protecting the environment for future generations to meet their own needs.

1.5 Study Area

Nablus Directorate of Education (presently covers 164 public schools that have 52,666 students, distributed throughout 1st grade to 12th grade) is one of the largest educational directorates with respect to number of students and schools in the West Bank. Its schools extends from Jordan valley in the east to about 16 kilometer to the west of Nablus City. These schools (Figure 1.1) are distributed in Nablus city, near its refugee camps and in about 30 surrounding villages [4].

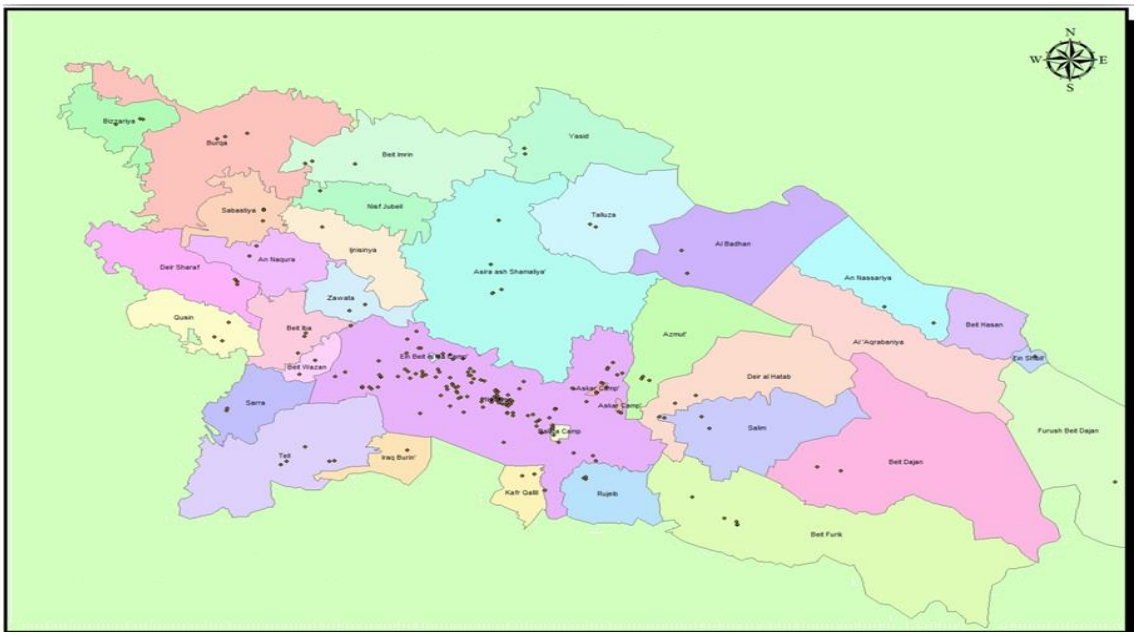

Figure 1.1: Distribution of Schools in the study area

The schools are distributed and classified as per the following criteria**:**

1- Gender (Male and Female).

2- Level of school (Primary and Secondary).

3- Community type (Urban and Rural).

This classification (Table 1.1) is applied to assess the needed samplesizes to statistically satisfy the objectives of this research.

Table 1.1: Nablus Directorate schools classifications.

164 Public schools							
77 Male Schools				87 Female Schools			
44 Primary Schools		33 Secondary Schools		52 Primary Schools		35 Secondary Schools	
28 Urban Schools	16 Rural Schools	10 Urban Schools	23 Rural Schools	36 Urban Schools	16 Rural Schools	15 Urban Schools	20 Rural Schools

1.6 Significance of the Study

Water consumption analyses in public schools have a great importance for the following reasons:

1- Water is a limited resource and the cost of providing it is rising rapidly. A school that is equipped with water conservation devices may use less than half the amount of water used in other schools [5].If water use in schools can be reduced to two cubic meters per student per year, this could save a school of 600 students around 1700 USD annually based on the average existing conditions in schools, which will contribute to whole budget of the country [5].
2- The results of this analysis can be helpful for engineers and water managers to have a reference in the process of dimensioning a water system and of designing infrastructures in public school projects.
3- The awareness of how much the existing buildings are consuming water is an important starting point to set the future goals of how much their performance must be improved with time [6], and how better the new constructions or the remodeled ones should be.
4- The sustainable management of urban water has become imperative, particularly for countries which have limited water resources on the civil consumption level [3].

Based on the above, schools are strategic locations for developing water analysis and conservation projects for three reasons:

1. Schools have a high consumption concentration.
2. Schools are the places where the concentration of people is higher.
3. Schools are effective to promote water saving initiatives as they involve education and awareness and at the same time are easier

than open-air spaces and other type of buildings to be analyzed for user [3].

1.7 Thesis Outline

The general structure of the thesis goes as follows: Chapter 2 furnishes related literature review for water consumptions in schools, water savings measures and practices. Chapter 3 describes sources, quality, verification and possible sources of errors of collected data while Chapter 4 demonstrates analysis performed to calculate per student water consumption, cost savings analysis, evaluation of water quality in schools and evaluation of schools as green buildings. In Chapter 5, the main conclusions and recommendations based on the analysis.

Chapter Two

Literature Review

2.1 Introduction

Many communities are thriving the challenge for supporting their growth and its associated demand for safe drinking water and disposal or their wastewater without depleting aquifers and reducing stream flows. As land development continues, it is becoming increasingly difficult to balance these needs and some areas are experiencing water shortages, reduced stream flow and degraded water quality.

Water conservation is an important tool for reducing water demand, and limiting water use should be an everyday practice for people and businesses. Water efficiency measures can lead to significant reductions in water and sewer costs. Many guides are available which describe ways that residences and businesses can conserve water. In many instances, water is wasted by old habits, like leaving the water running when brushing teeth, and using old appliances like toilets which were built before conservation standards took effect. Water conservation may require changing old habits and re-thinking of the way of doing things.

2.2 Student Water Use per Day Indicator

2.2.1 Indicator Description

This indicator measures the per student water usage, the total amount of water used in various forms inside the school divided by (total number of students multiplied by occupancy period in days).

Therefore, per student water use includes the water used at school facilities, and leakage in the delivery system inside the school building. So, per student usage is a good overall measure of how water is conserved.

Additionally, daily per student water consumption is used to compare water consumption from selected schools, (due to a relatively high comparison error).

It is also made up of meter losses (as meters age they turn more slowly), leaks from the system, well wash water and other system maintenance, water theft, and water use at locations that are too slow to make the meter turn (i.e. small leaks, swamp cooler bleed-off).

2.2.2 Calculation of Per Student Water Consumption

At first glance, calculating per student water use seems as simple as dividing the amount of water withdrawn or used by the number of students using it. However, it is sometimes necessary to use more sophisticated calculation methods [7].

For example, the per student rate can be very different depending on the time in the year, weather and climate condition, Time of day also can be important. Facilities types in schools that use unusually high quantities of water [7].

In addition, there are differences in how the amount of water used is calculated. In some cases, it is appropriate to use the total water withdrawn from water meters. Other times, it is necessary to use what is called “finished” water. This is the water withdrawn from municipality plus any water imported from another utility or rain water harvesting, minus water exported to another utility and minus losses that occur during transport and treatment of the water. Water managers consider these and other factors when making per student calculations for specific purposes [7].

2.3 Water Conservation

Water demand in schools arise typically from appliances, urinals, toilets, taps, water used to maintain the school grounds and water leakage, so water fixture appliances that the most water and energy efficient machines must be purchased and installed at schools [8].

2.3.1 Urinals

Older schools that do not have any control devices on their urinal cisterns could benefit considerably by installing cistern flush controllers. A urinal without controls will simply keep filling and flushing water 24 hours, seven days a week and are very wasteful. Urinal controls are based on presence detection and only flush the urinals after use (they will also have a setback programmed to ensure minimum flushing for hygiene purposes during school holidays) [8].

2.3.2 Toilets

- **Variable flushing devices**

  These are retrofitted devices which allow pupils having flushed the toilet to press a button when the toilet bowl is clear; the depressed button will then interrupt the flush and stop unnecessary water wastage. They are relatively easy to fit, requiring no plumbing or maintenance. They are not suitable for concealed or built-in toilet cisterns [8].

- **Water displacement devices in WC's**

  Water displacement devices reduce the amount of water that can fill the cistern and thus act as a water displacement device [8].

They are appropriate for older cisterns, toilet cisterns with a 7 - 9 liter flush (usually installed through 1993-1999) have the potential to save up to 1 liter per flush. Toilet cisterns with a 9 liter flush or greater (usually installed prior to 1993) have the potential to save up to 3 liters per flush. (These type of cisterns are found in Europe and America and it is not noticed in schools under study). They should not be used on modern low volume cisterns and may not be appropriate in some cases where drains may be in poor condition [8].

- **Installing reduced flush toilets**

  Replacing a 9 liter flush toilet with a dual flush toilet with 3 and 6 liter flushes can save up to half the water used for WC flushing [8].

- **Ball valves and overflows**

  Ball valves and overflows on WC cisterns should be checked regularly. Some cisterns have an externally piped overflow and some have internal overflows.

  With an internal overflow the spillover is into the bowl. Ball valves on the schools large cold water storage tanks should be checked annually at the same time that the tanks are being inspected and cleaned [8].

2.3.3 Taps

Leaking taps can usually be repaired by replacing worn washers.

- **Self-closing taps**

  Taps left running waste enormous amounts of water. Consider replacing conventional screw taps with percussion taps that close automatically after a preset period of between 1 and 30 seconds, thus reducing the

possibility of taps left running. Some models also have a flow rate restrictor which can be used to deliver a lower flow rate than conventional taps. Self-closing taps need to be inspected and maintained regularly. It may be possible to just change the tap head without having to disturb the tap body or wash hand basin plumbing [8].

- **Spray taps**

  Spray taps can save up to 50% water consumption. Spray taps need to be Inspected and maintained regularly to make sure there is no soap, grease or lime scale blocking the spray outlet [8].

2.3.4 Showers

Showers left running waste enormous amounts of water. Consider replacing conventional shower controls with percussion controls that close automatically after a preset period of time. Self-closing controls need to be inspected and maintained regularly [8].

2.4 Water Quality

2.4.1 Water Pollution Definition

Any physical, chemical, or biological change in water quality that has a harmful effect on living organisms or makes water unsuitable for desired uses. Pollutants may be biodegradable, non-biodegradable, or slowly degradable. Sewage, industrial chemicals, heavy metals from industrial processes, and household cleaners are examples of materials commonly discharged into streams and rivers. Additional water pollutants include chemicals, pesticides, fertilizers, motor oil, litter, and other components, of

polluted runoff. Water can also be polluted by pollutants that come from the air – a process called atmospheric deposition [9].

2.4.2 Importance of Water Safety in Schools

Drinking water supplies in schools must be the safest. In most places, drinking water tap is rigorously regulated and tested and must comply with government standards. Therefore, for most people's the quality of tap water is not at all an issue, and is often of good quality, and surely cheaper and more environmentally-friendly than bottled water [10].

But, if it is revealed that water in school area is safe to drink, it is more complicated to know for sure how safe the water is at a particular school. This is because water quality varies depending on the source of the water and the pipes and fixtures through which the water flows [10].

Factors associated with water quality in schools include the following:

- School's water source: If school water comes from a local utility, chances are water meets all municipal and state guidelines [10].

  If school has its own water source, such as a well or groundwater, it must regularly test its water and report these findings. If a school has unsafe water, it is likely due to contaminate well or groundwater (or contamination from pipes or other infrastructure, described below). A school's geography might place it at higher risk for ground or well water contamination. Schools with unsafe water must either fix these problems, perhaps through filtration or other means, or notify students, teachers, and others that the water is unsafe for

consumption. Such schools may be required to purchase clean water from outside sources [10].

- Water quality of the school area

  Some regions are known to have poorer quality water for a variety of reasons, including agricultural regions, industrial areas (or places where industry used to be), and areas with naturally occurring water contaminants. While all schools in these areas may not have poor quality water and schools outside of these areas may have poor quality water, this is a useful starting place in learning about school's water quality. Local health or water departments would likely know about the water quality in these areas [10].

- The state of the pipes and fixtures in school

  Even if school water source is clean, the pipes and fixtures that carry the water to the drinking tap and into student’s cup might contribute contaminants, such as copper, lead, or arsenic, to the drinking water supply. Schools must comply with relevant rules for testing and monitoring for these contaminants. If they are found in the water, schools can remedy the problems through a number of options, including low-cost solutions such as flushing pipes or filtration [10].

2.4.3 Tap Water Quality

Most tap water in Palestine is assured by the water suppliers (Municipalities) to be clean and safe for drinking, however, in some cases, tap water may not be safe to drink because of unsafe plumbing systems or contaminated water sources. It is important to have drinking water tested so

that water quality problems are addressed when and where they exist. If water quality problems cannot be fixed, then schools should use alternate methods of providing drinking water to students, including installing point-of-use filtration systems that are certified to remove contaminants, or purchasing drinking water for students and staff. It is a good idea to regularly communicate drinking water testing results and actions to students, parents, and the community. Schools may consider starting a campaign to actively promote water quality or work with local organizations on a community-wide tap water promotion campaign [10].

2.4.4 Local Tap Water Taste

Even though most tap water is safe to drink, the taste of the water varies depending on the source. Filtering water and chilling the water are two strategies that may improve the taste [10].

2.4.5 Drinking Water Pollution

Drinking water can contain bacteria, viruses, metals or chemicals.

Students and teachers in schools need water throughout the day. But in some schools, the drinking water isn't as clean as it should be [10].

Sometimes water passing through old plumbing systems picks up harmful metals, like lead. Or water might come from a reservoir or lake that's polluted. Pesticides and fertilizers that run off lawns, paint that's dumped down drains and chemicals from factories can all pollute drinking water sources [12].

Before it comes through the faucet, drinking water is often treated to remove harmful substances. But many water systems don't do a good enough job at this, so the water they deliver to their customers may not be as clean as it should be. Many schools face a special problem with their drinking water because it doesn't come from the community's main water system, but from a separate one. There are fewer rules for keeping this kind of water safe and it's not tested as often, so the people who drink it don't always know as much about it as they should [10].

2.4.6 Risks of Drinking Polluted Water

If it contains bacteria or viruses, you might begin vomiting or have an attack of diarrhea. If you frequently drink water that contains traces of pesticides, industrial products or lead, you can suffer effects ranging from stomachaches to headaches or even cancer [10].

Chapter Three

Methodology

3.1 Introduction

The research methodology was adopted to meet the set of the research objectives as summarized in Figure 3.1.

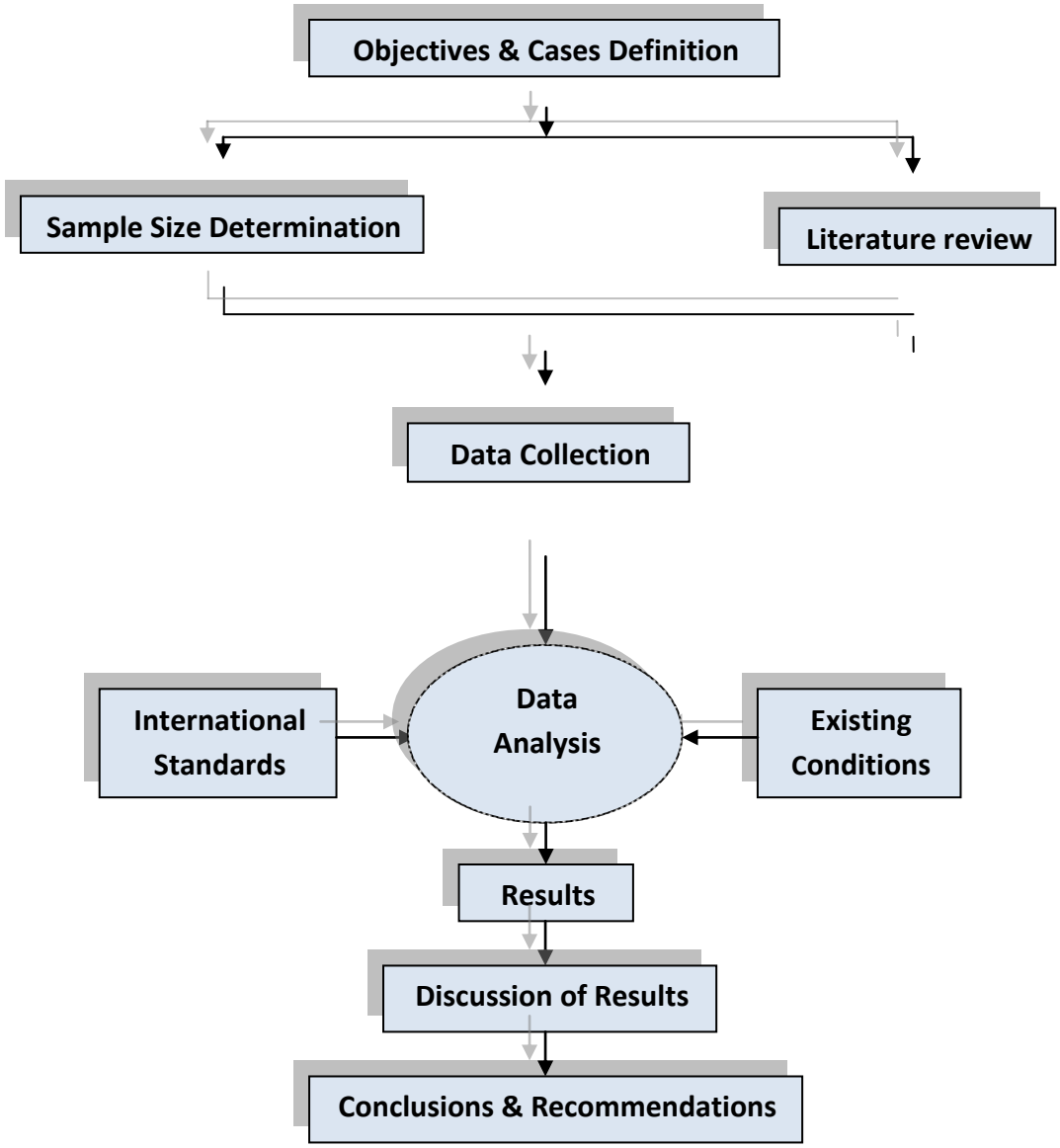

Figure 3.1: Research Methodology

3.2 Selection of Schools' Sample

"The determination of a sample size is a common task for many researchers. Inappropriate, inadequate, or excessive sample sizes continue to influence the quality and accuracy of research. Sample size is one of the

four inter-related features of a study design that can influence the detection of significant differences, relationships or interactions" [11].

Table 3.1 below, is used to determine the sample size that would result in a 95 % confidence and a margin of error less than or equal 3%. This table presents sample size values that is appropriate for many common sampling problems. The table includes sample sizes for both continuous and categorical data assuming alpha (α) levels of 0.10, 0.05, or 0.01, which belongs confidence levels of 90, 95, and 99%, respectively. The margins of error used in the table were 0.03 for continuous data and 0.05 for categorical data. *"Researchers may use this table if the margin of error shown is appropriate for their study. However, the appropriate sample size must be calculated if these error rates are not appropriate"* [11].

Table 3.1: Minimum returned sample size for a given population [11]

Population size	**Sample size**					
	Continuous data (margin of error = 0.03)			**Categorical data (margin of error = 0.05)**		
	alpha=0.10 t=1.65	**alpha=0.10 t=1.96**	**alpha=0.05 t=1.96**	**p=0.50 t=1.65**	**p=0.50 t=1.96**	**p=0.50 t=2.58**
100	46	55	68	74	80	87
200	59	75	102	116	132	154
300	65	85	123	143	169	207
400	69	92	137	162	196	250
500	72	96	147	176	218	286
600	73	100	155	187	235	316
700	75	102	161	196	249	341
800	76	104	166	203	260	363
900	76	105	170	209	270	332
1000	77	106	173	213	278	399
1500	79	110	183	230	306	461
2000	83	112	189	239	323	499
4000	83	119	198	254	351	570
6000	83	119	209	259	362	598
8000	83	119	209	262	367	613
10000	83	119	209	264	370	623

From table 3.1, A sample from a population size of 164 schools with α=0.05 (statistical significance of 95%) will be taken. a sample of 73 public schools will be selected which represents the target of an investigation; it is distributed as shown table (4) below:

Table 3.2 below, is used to calculate the sample size for each type of schools in this research based on three α levels and a set error rate depending on Table 3.1, the calculations is shown in Table 3.2 below.

Table 3.2 Sample size determination.

School Type	Number of Schools Under Study	Calculated Sample size*	Sample size (approximation of column No 2)
Rural secondary Female School(RSF schools)	20	8.54	9
Urban secondary Female School(USF schools)	15	6.40	7
Rural Primary Female School(RPF schools)	16	6.83	7
Urban Primary Female School(UPF schools)	36	15.37	16
Rural Secondary Male School(RSM schools)	23	9.82	10
Urban Secondary Male School(USM schools)	10	4.27	5
Rural Primary Male School(RPM schools)	16	6.83	7
Urban Primary Male School(UPM schools)	28	11.95	12
Total	**164**		**73**

***Calculated sample size of a certain type of schools =(Number of schools under study of a certain type/164)*total sample size**

Where total sample size is considered from Table 3.1 as 70 schools.

So, a sample of a minimum 73 schools that will be considered in the study were distributed as shown in Figure (3.2)below:

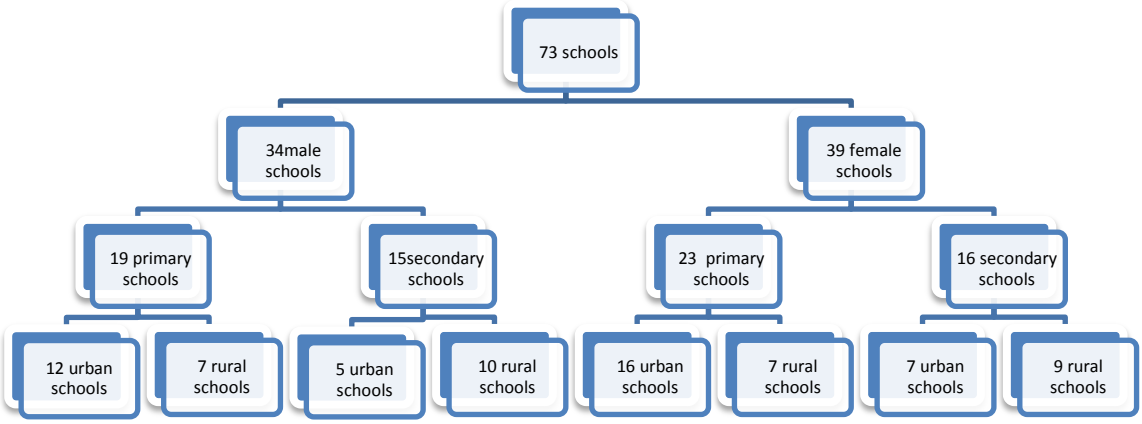

Figure 3.2: Selected schools' sample-sizes.

In this research a 113 sample schools are studied in order to achieve more than 95% confidence which is acceptable for scientific research.

3.2 Data Collection

Monthly billing information were collected for each individual meter at each school that gives more detailed information about end water use and conservation measures. It is possible to compare uses on a monthly basis from year to year to examine trends and to estimate indoor and outdoor uses. Many studies have used billing data to examine residential use and to test effects of conservation measures , e.g., Brown and Caldwell(1984) and Howe and Linaweaver (1967).

Data were collected from 113 out of 164 school through a structured interview with the principals of the targeted schools, such data included but not limited to:

- area of buildings and lands;
- number of teachers and students;
- proportion of males and females;
- number and types of toilets;
- number of drinking fountains;

In addition to other factors and other important information concerning water utilization conditions, such as related facilities, water sources and other items for all types of schools under study.

Monthly water consumption and water fees were collected from Nablus Directorate of Education(Financial Department) and water suppliers(which includes: local villages councils and Nablus Municipality(Department of Water and Sanitation)).(water consumption data for sample schools is shown in Tables 1 and 2 in appendix A).

Water quality data were collected from Directorate of Health in Nablus city, Department of Schools Health in Nablus Directorate, Water and Sanitation Department in Nablus Municipality. Water quality data were analyzed for both schools with public system and own source water supplies). Water quality data for sample schools is shown in Figure 2, appendix B.

Statistical analysis and calculation was used to analyze the available data.

3.3 Quality of Data

The types of data collected were checked for consistency for all schools during the year and organized, tracked, and analyzed by school and data type to be sure that there were no inconsistent data.

With respect to the data about area of buildings and lands, number of teachers and students, proportion of males and females, number and type of toilets, drinking fountains is accurate because it is collected through a structured interview which is mentioned earlier, they were checked and reviewed by specialists in the Directorate of Education of Nablus.

3.4 Pre-Processing and Quality Assurance of Water Use Records and Fixture Counts

The pre-processing of data consists of taking consumption and other data for 12 months and averaging it across 176 days of student occupancy period during this 12 months. Due to the differing times of meter reading for each water supplier, the data needed for processing before they could be used in the study.

Schools are consuming water over eight months a year or 176 days in the year. Many suppliers read their water meters bimonthly, but not at the same time during the month, and some take just nine meters readings throughout the year. To account for the suppliers that don't take reading bimonthly, the meters from June/July to August/September, and about 20 days in January (the days of schools recess) was considered to be approximately equal to zero, and the value of reading was distributed on the total months of the year in which the schools are consuming water to get the total use over the non-metered months. This is reasonable because the summer and winter holiday's monthly use is fairly constant and approximately equals zero. Lastly, all of the water use records were converted to a unit of liters (since the water use data from the various water suppliers were measured in

differing units (cubic meter)), put into a database, and general outliers were removed from the dataset (the outliers are any observations that seem to stick far out from the major mass of the data, from statistical point of view it is the observations will fall outside of the control limits

The upper control limit (Mean + 2 Standard deviation) and the lower control limit (Mean - 2 Standard deviation) on the control charts help to identify unusually low or unusually high observations. It allows us to distinguish between typical variation and variation that is especially large and could be due to special or assignable causes. Any time an observation falls outside of the control limits, an effort should be made to search for the reason.

A step-by-step process is developed for organizing, analyzing, and checking these data by using Excel files for each individual type of school as well as an overall reporting datasheet and a quality control checklist.

Given the nature of the data and possible sources of error, it was assumed that any water meter showing negative peaks or suspected numbers indicated a misreading or a leak. These schools were not included in our analyses as it would have skewed the results [4]. For better problem resolution at these particular locations, further study may be warranted

3.5 Data Verification.

A two tailed t-test was used to check the results obtained from the collected data by comparing and checking mean water consumption per occupant for different school types which are supplied with water from different suppliers. However, it couldn’t be verified through comparing the monthly

consumed volume of water because there is a high degree of variability in monthly water bills for each school.

In another attempt to verify the data, Water's data analysis was compared for all types of schools. Through this process minor issues were discovered and corrected.

3.6 Possible Sources of Error and Improvements to Study

Some possible sources of error are related to the meter resolution. A uniform duration of billing data may improve accuracy and consistency of the data.

The school schedule and holidays also may contribute to inaccurate data to improve the study, outside of school holidays and weekends.

While monthly billing data is an important source of information for many utilities, Dziegieleweski (1993) points out several problems frequently encountered with such type of data:

- Unequal billing periods.
- Alack of correspondence between billing periods and calendar months.
- Estimated meter readings or incorrect meter readings due to meter mis-registration.
- Unusual usage level.
- Meter replacements and manual adjustments to meters.

  These problems must be encountered in any study which attempts to use monthly billing data to asses conservation measures effectiveness.

3.7 Intervention Motivations

The main steps followed in this research can be summarized in the following:

1- Data collection of water consumption, bill sums, fixture and student count of public schools. The specific documentation provided by competent services of the Municipality, Villages council and Directorate of Education was organized into categories by type of case study first, and then by type of school (UPF, UPM, USF, USM, RPF, RPM, RSF and RSM schools); All data were organized for the academic year 2013/2014.

2- Data were then processed through properly organized spreadsheets for monthly time evaluations for schools' buildings. Data were selected in order to filter the reliable ones and isolate those with anomalies in consumption, gaps, and discrepancies. The water monitoring was implemented to collect more accurate data, which were used later to formulate a trend for water consumptions in these type of buildings.

3- Documents found in Directorate of Education about building occupants, water fixture types, specifications and counts of schools investigated, were organized following the same categorization of water consumption data, in order to make it easier to link the different parts of the research.

4- Water tests data were obtained from Ministry of health and Nablus Municipality, it was organized and analyzed according to water sources type in school.

5- Water metering, feedback on use patterns, and water quality were then connected to students and schools in order to establish water balance indicating water use per school (average estimation using data by month), water consumed per occupant per day, cost savings (water and cost), payback for exploring opportunities and evaluate schools with respect to water quality and as a green buildings.

Based on the analysis of collected data, a set of proposed actions and recommendations were developed.

Chapter Four

Analysis, Interpretations, and Results

4.1 Per Student Water Use

This section presents some general information which provides a reference to assess levels of water consumption in different types of the schools mentioned earlier.

The concept of per student water use is used to compare water use over time or among groups of students that use water supplies inside their schools. It means the average amount of water each student in a particular school uses on a daily basis, expressed as “liters per student per day.”

4.1.1 Purposes of Per Student Water Use

Water managers’ use per student measurements for a number of purposes such as:

- Assessing water demand and identifying use patterns,
- Setting goals and establishing use thresholds of water consumption,
- Evaluating conservation program effectiveness. [12].

4.1.2 Importance of Per Student Water Use Indicator

Water conservation is an essential element of the country strategy to ensure a sustainable water supply. Per student water use shows water usage over time, taking into account the students increase or decrease inside schools, which helps to determine progress toward water conservation goals.

Smaller lot sizes, rainwater harvesting, and efficient watering practices reduce outdoor water use. Low flow toilets, water saver showers, low water use washing machines and dishwashers, and hot water recirculation

systems along with consumer practices to conserve water, reduce indoor water use [13].

By tracking the use of water over time, the managers know how well its conservation program is working and also when additional and/or more challenging measures are needed [13].

Monthly water meter billing data provide useful information about student's water use patterns, particularly when combined with basic information about number of student, area of landscape and buildings, sanitary fixtures, etc. [13].

4.1.3 Water Use in Schools

Monthly data were selected from January to December 2013 (12 months) for urban schools and some of rural schools and about 16 or 18 months for other rural schools.

The evaluation over several months can minimize the influence of exceptional events such as special works and consumptions as well as any temporary losses.

The graph below profiles the overall water usage at Sarra School, (as sample schools) during the most recent 18 months of records.

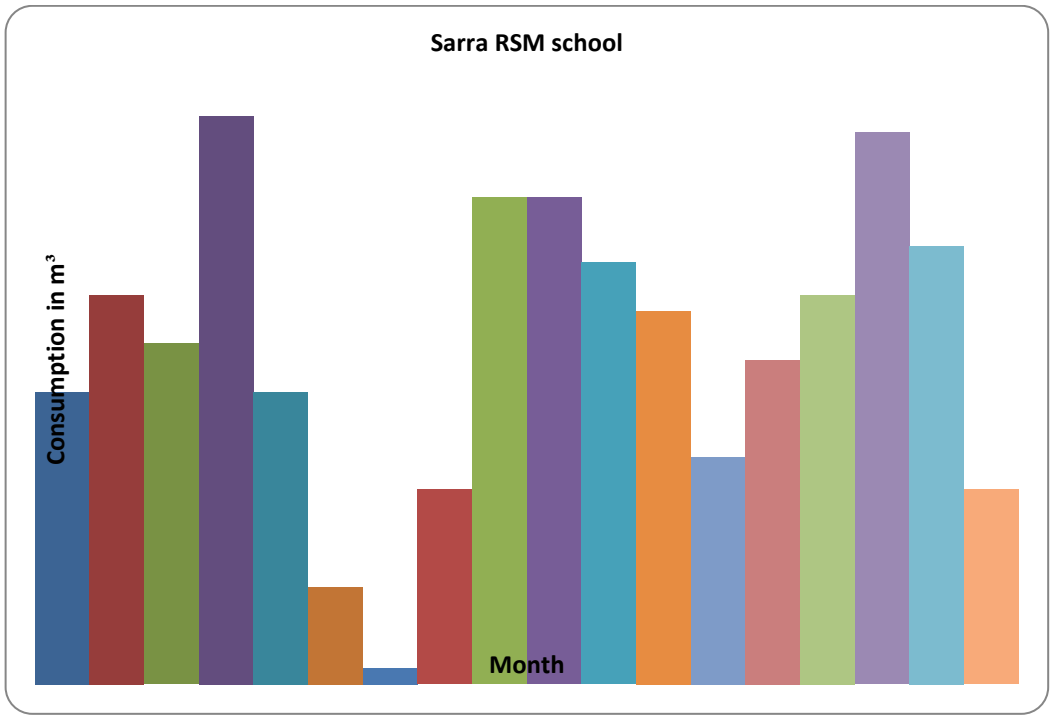

Figure 4.1: Water metering results of 18 month study period analyzed for a sample school

The figure shows that water consumption for Sarra School is collected for 18 months(3 studying semesters).it shows fairly consistent water usage over the full school semesters, February through May 2013(2nd semester) (116 cubic meter), and September 2013 through December 2013 (123 cubic meter), February through May 2014(2nd semester) (117 cubic meter). A symmetry in consumption for the first five months of 2013 and 2014 is noticed, also quantity of water consumed in 1st semester approximately equals that for the second semester of the same year. The largest quantity of water consumed(the peak value) was in April for both years 2013 & 2014, which was about 35 cubic meters.

The usage decline for the summer months (summer holiday) and January (20 holidays between 1st and 2nd semester) is obvious.

4.1.4 Uniform per Student Water Use Measures

The goal of the uniform methodology is to provide a common means of comparing and reporting per student water use among different school types mentioned earlier throughout the study area.

The water used per student per day is calculated using the Uniform Student per day water consumption method, which is defined as:

(School Finished Water Used by Water Consumption Units)

(Number Of School Occupants × Consumption periods in days)

Where

- Consumption periods are the sum of student occupancy days in the study period.
- School Finished Water Used by Water Consumption Units is the sum of finished water used by all school units served by a utility, (this is the school water meter reading).
- Number of school occupants is the sum of students and staff of the school.

This measure considers all water users in the school area, including students and staff, staff are usually about five to six percent or less of the total number of students, so the difference between their consumption and student's consumption can be neglected. These measures improve the ability to understand schools water use data, and compare water use among different schools; Table 4.1 below shows an example of consumption l/s.d is for urban primary female schools.

Number of students was taken as the average of two or three semesters depending on data recording period, for this reason fractions are seen in this item.

Table 4.1: Example of average water consumption per student for urban primary female schools

UPF Schools				
School Name	**number of Student**	**Quantity of Consumed Water (m^3)**	**Period of Consumption (days)**	**Consumption l/s.d**
Al-Khaldiyah School	269.5	236	198	4.42
Ibrahim Snobar School	413.75	386	198	4.71
Asma Bint Al-Seddeq School	205.75	1208	198	29.65
Al-Khansa School	177.75	113	198	3.21
Al-Karmel School	357	508	198	7.19
Al-Nethameya (B) School	194.5	153	198	3.97
Al-khdegyeh School	534	110	198	1.04
Al-Nethameyah (A) School	115.5	278	198	12.16
Ibn Sina School	223.5	29	198	0.66
Al-Imam Al-Shafi'i School	137	207	198	7.63
Al-Imam Ali School	247	145	198	2.96
Al-Zainabieh School	116	146	198	6.36
Bisan School	165.5	209	198	6.38
Jameela Bouherd School	104	142	198	6.90
Rafedia School	465.5	250	198	2.71
Saeed BinAmerSchool	385.25	338	198	4.43
Sameer Abdulhadi School	550.5	300	198	2.75
Zafer Al-Masri School	424.75	633	198	7.53
Adel Zu'aytir School	278.5	126	198	2.28
Abdullatif Hawash School	276.5	459	198	8.38
Othman Ibn Affan School	728.5	288	198	2.00
Omar Al-Mukhtar School	304.5	158	198	2.62
Fadwa Tukan School	430.75	333	198	3.90
Mahmoud Abu-Ghazaleh School	287.5	266	198	4.67
Yasser Arafat School	477	300	198	3.18

The average daily water consumption per student for Asma Bint Al-Seddeq School is the highest, it is considered outlier reading ,so, it is removed from calculations.

Upon this ,the maximum and minimum values of daily per student water consumption indicator for this type of schools becomes 12.16 & 1.04 respectively.

4.1.5 Water Use Analysis

The collected data for various schools has been subdivided into 8 types as per criteria which is illustrated in sample size determination section(Table 3.2) During the validation phase of the data, gathered through monthly technical readings of municipal metering devices, a variety of problems were found. The reason behind were the different gaps in readings and numerous instances of inconsistencies both between the different months and between the values in cubic meters and associated costs.

Because of that it was decided to develop the processing and analysis of data just on schools that had a certain continuity in consumption, in order to avoid exceptional consumption cases.

The same continuity in water consumption in all types of school was noticed, because all schools have the same use of water in buildings (they have the same facilities). Activities performed in different school areas are bathrooms, kitchens, and sometimes irrigation.

Schools were analyzed on an individual type basis; the data were separated and ranked by calculated l/s.d, below lower control limit and over upper control limit, l/s.d was assumed to be a faulty meter or incorrect entry so those data points were eliminated(see figure 1 in appendix B).

All schools were grouped and the overall results of water consumption indicator for all schools type are shown in figure 4.2 below.

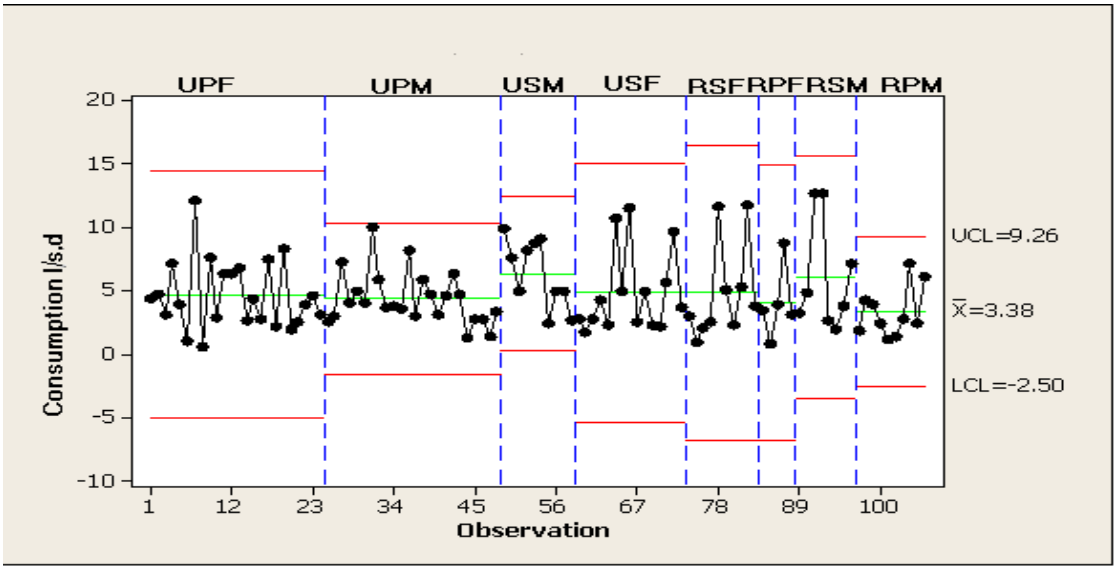

Figure 4.2: Schools water consumption l/s.d.

Figure 4.2 indicate that water consumption varies significantly among individual schools for same or different types which requires additional researches to explain the reason.

The basic demand and the characteristics of water consumption were analyzed, the utilization frequency for water associated with individual schools type was calculated. as presented in Figure 4.3 below.

(in this figure per student water consumption on for each type of schools on X-axis while the frequency of schools of certain water consumption per student on Y-axis).

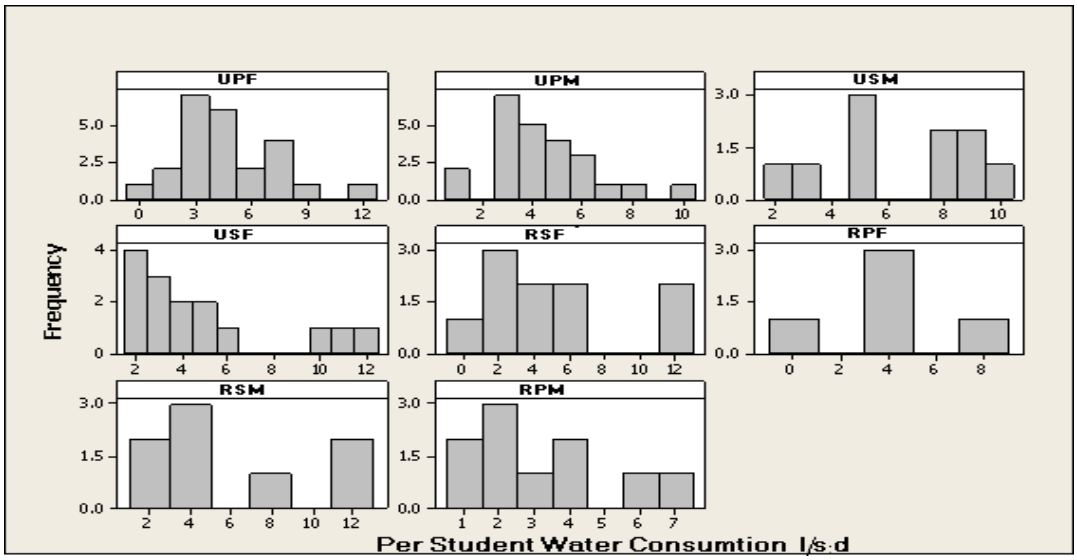

Figure 4.3: Histogram of water consumption l/s.d for different types of schools

It is obvious that there is a high degree of variability in consumption between different schools from the same or different types, where the data ranges between the maximum of 12.72 l/s.d and minimum values of 0.98 l/s.d ,the range is 11.74 l/s.d which is large.

By summarizing schools consumptions, it can be clearly perceive the range of data using a box-plot graph, where we can see the extreme values and the average range of a 25%-75% percentile (Table 4.2).

Table4.2: Schools water consumption statistical analysis

School	UPF	UPM	USM	USF	RSF	RPF	RSM	RPM
Mean	5.67	4.93	6.38	4.84	5.1	4.07	6.16	3.38
Standard Deviation	5.65	3.36	2.72	3.26	4.02	2.91	4.34	2.00
Minimum	0.66	1.27	2.44	1.75	0.98	0.87	2.00	1.25
1st Quartile	2.73	3.06	4.38	2.35	2.21	2.00	2.86	1.81
Median	4.42	4.05	6.30	3.76	3.89	3.56	4.34	2.62
3rd Quartile	7.04	5.90	8.88	5.75	8.5	6.39	11.33	4.76
Maximum	12.16	17.75	9.97	11.55	11.8	8.82	12.72	7.22

The box-plot for these values is shown in Figure 4.5 below.

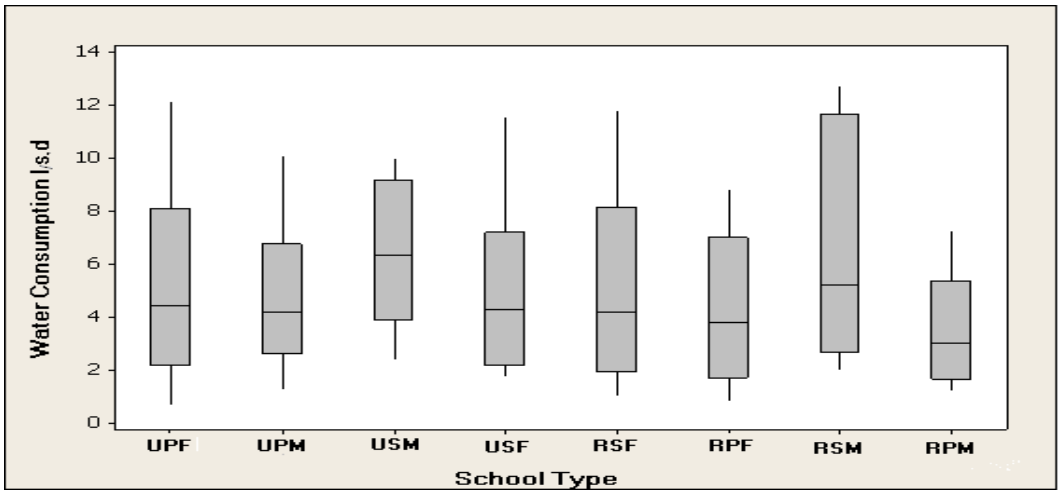

Figure 4.4: Box Plot for school water consumptions. Area extremes show the minimum, 25p, median, 75p (percentile); and maximum values respectively

The statistical analysis made for output data shows that the distribution is from a minimum of 0.66 to a maximum of 12.72, so the range is 12.06. This result shows that the standard deviation of the water consumption is large and significant.

The mean daily water consumption per student is calculated for the eight type of schools under study ,results is shown in figure 4.4 below.

School Type	UPF	UPM	USM	USF	RSF	RPF	RSM	RPM
Average Consumption l/s.d	4.67	4.39	6.38	4.84	4.88	4.07	6.16	3.38

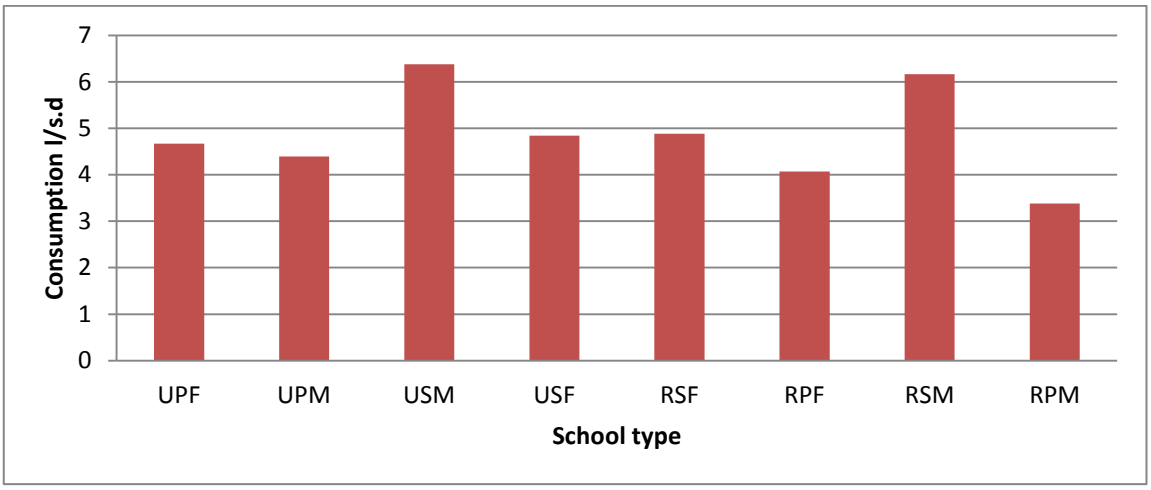

Figure 4.5: Average water consumption per occupant for all types of schools

The results show that the rational basic demand for water varied from 3.38 to 6.38 liters per student per day as shown in Figure 4.4. Moreover older students use more water on a daily basis than primary school students, despite that they have the same services at their schools, such as toilets and miscellaneous faucets, etc.

Most secondary males schools might have problems of consuming larger quantity of water (with respect to other types of schools), this may be because involving leaking pipes, or faulty water facilities,

Urban schools have a higher consumption rate than rural schools except for secondary female schools which is approximately the same for both urban and rural areas.

Statistical analysis observation reveals that almost 22 %(33 from 164) of these schools might have problems of consuming too much water with respect to other schools (secondary males school).

That is to say, some unreasonable water utilization is occurring in these schools or some serious water problems have to be fixed such as leaking pipes or broken water facilities.

Besides the basic demands for water consumption of school, there are no different conditions between each school that affect the water consumption and cause the divergence of estimation.

4.1.6 Accuracy Considerations

For insuring accuracy of the data, it was expected that schools with large and unusual consumption values would fall outside the upper control limit, so it is considered as outliers then it was removed from calculations.

The second method for insuring accuracy is through comparison of mean water consumption through two tailed t-test for all types of schools, and then the difference found to be insignificant.

For this, assuming data are normal, a two tailed test performed on mean and standard deviation of water consumption of all types of schools in the study resulted in 99% confidence that the difference in the means of the of every two sets of measurements is insignificant.

The close correlation between these measurements makes it highly unlikely that there are significant errors between measurements of different groups of the study. In order for these to be large errors, and for the variation between the measurements to be small. The fact that the true average difference is very close to zero indicates that there is no systematic errors between readings (results), otherwise, it would be expected that there would be a large positive or negative error between different types of data. The fact that the average weighted errors were closed to zero and the t-test resulted in 99% confidence implies that the errors are insignificant.

The results of two tailed test performed on mean and standard deviation of water consumption of all types of schools (using Minitab 17 Statistical software) is shown in Figure 4.6 and 4.7 below

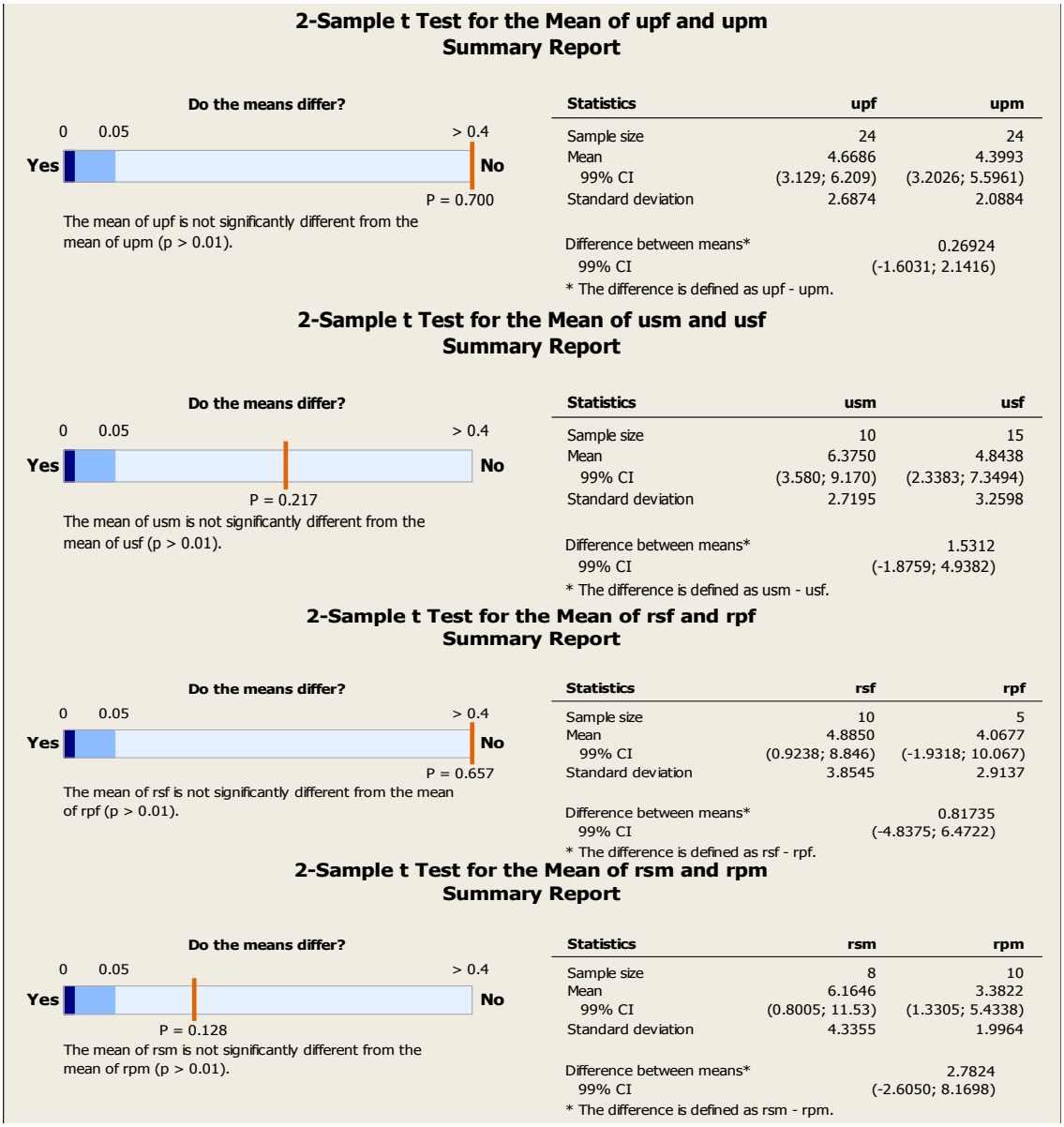

Figure 4.6: two samples t-test for means of water consumption for all school types.

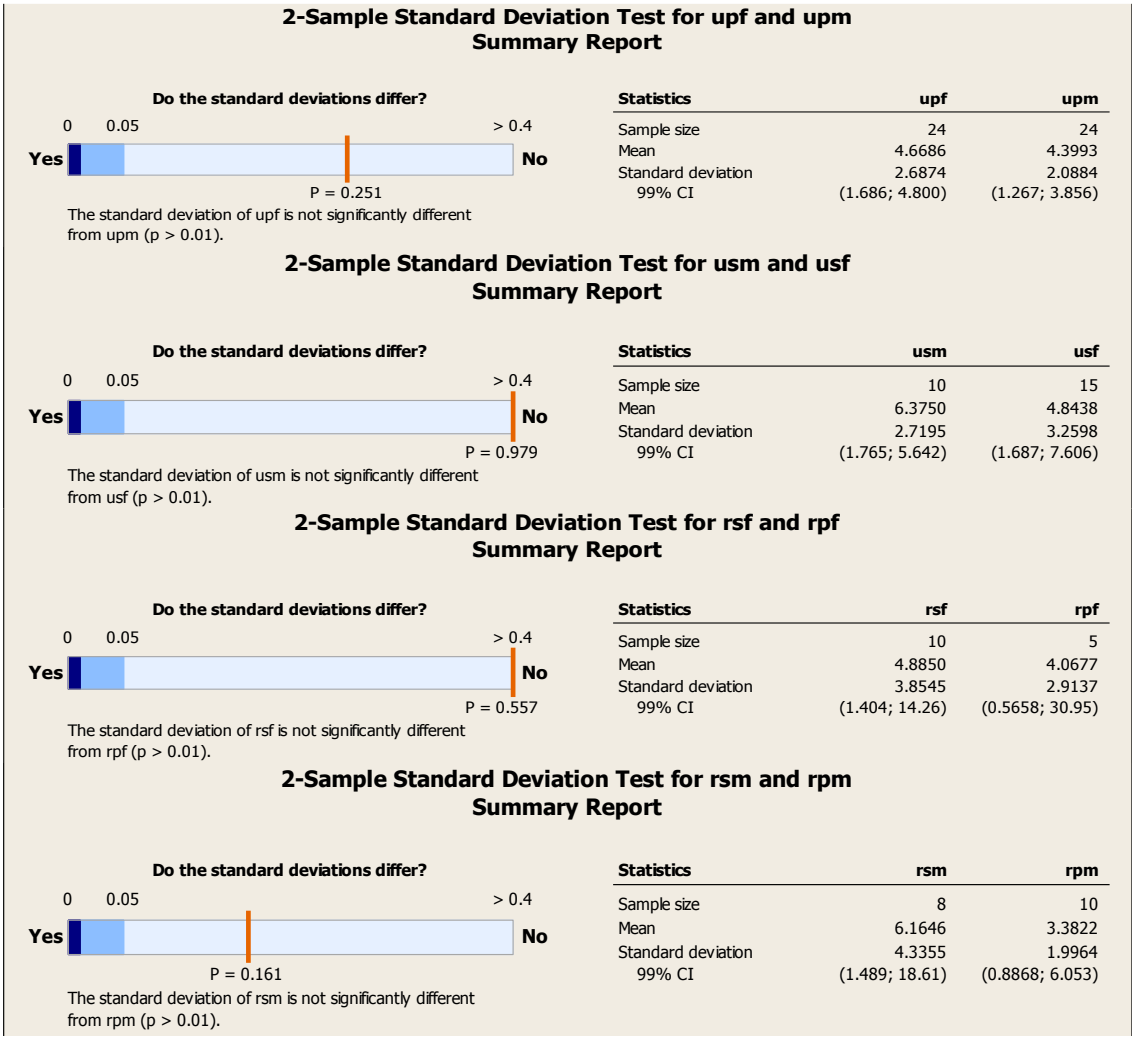

Figure 4.7: two tailed t-test for the standard deviation of water consumption for the 8 types of schools

4.1.7 Factors affecting consumption:

Data about water uses in schools were divided into five water use categories: 1) toilets, 2) miscellaneous faucets, 3) irrigation, 4) leaks 5) cleaning.

The relationship between water usage in l/s.d to number of students, the amount of floor space, area of lands, number of toilets, faucets and number of drinking fountains in the schools is checked using linear regression analysis.

It was found that there was no clear and constant relation between these factors and water use, this might be because of irregular and excessive distribution of water fixtures in schools with respect to the number of students and staff, so all students are doing full loads of using water fixtures they need in schools.

4.1.8 Comparison with International Standards

Usage above 3.5 m³/student/year (9.59 l/s.d) in schools is considered excessive [14].

Water usage will vary depending on local school usage patterns; typically a reasonably generous water usage in a school would be 19 liters per student per day (3,500 liters or 3.5 m^3 per student per year) [15].

A realistic guide for new schools would be 12 – 14 liters per student per day (2,000 – 2,600 liters or 2.2 m^3 – 2.6 m^3 per student per year). Schools with sports facilities will vary depending on shower usage etc [15].

Table 4.3 below shows some estimates about water consumption in (UK) for different types of schools:

Table 4.3: Typical and best practice benchmarks for water consumption usage in schools [16]

	Typical	Best practice	Unit	Sample
Primary school with pool	4.3	3.1	m³/student/yr	14,330
Primary school without pool	3.8	2.7	m³/student/yr	14,330
Secondary school with pool	5.1	3.6	m³/student/yr	14,330
Secondary school without pool	3.9	2.7	m³/student/yr	14,330

Upon the previous tables, it is noticed that the best practice in secondary schools without pools in UK is 2.7 m^3/student/yr which is still slightly higher than RSM and USM schools of Nablus which is 2.25 and 2.33 m^3/student/yr respectively.

When comparing the best practice in primary schools without pools in UK with primary schools in Nablus, the difference approximately equals is 0.9 m^3/student/yr(2.46 l/d) Which is not too much high.

4.1.9 Discussion of Results

Findings on public school buildings show that the values of water consumption indicators varied from 3.38 to 4.67 liters/student/day consumption in primary school buildings, it was about 4.86 liters/student/day in the case of secondary female's schools and it was 6.3 in secondary male's schools.

Results also reveal that the basic demand for water by RPM school students is less than UPF and RPF students, mainly because the mean of age schools students in rural areas is less than that for urban areas.

As they are older and therefore need to be more looked after in everyday activities. As consequence they also have more school staff, and their student daily usage differs from the occupant daily usage analysis breakdown for building consumptions. On the other hand primary school students are more similar to office building users: they are at school during the opening hours, and they use water in rest times and for civil uses mostly. They have holidays from June to September, and we can notice how consumptions low down in this period.

Using these results, and based on this investigation about water usage, a performance indicator for consumptions in all kinds of schools was set. It can be a reference above which the situation can be considering alarming and to be monitored, as there is a suspect of leakage or anomalies.

In fact average daily water consumption for a student enrolled in primary school is less than to about 2% of water used by a student in secondary school. This is because secondary students consume more water for all other civil activities where their services need to support education at this level.

Despite the fact that a determination of water consumption should account for individual situation of a school (kitchen, toilets, garden...), It was noticed that water consumption in the categories schools has some common elements because services found in all schools are the same.

4.2 Water Savings Analysis

4.2.1 Water Use Categories

For the purpose of the analysis, data about water uses in schools were divided into five water use categories: 1) toilets, 2) urinals, 3) miscellaneous faucets, 4) irrigation, and 5) leaks.

The analysis involves aggregating the data about end use of water in schools to calculate the quantity of water that is consumed per student for each type of the five categories mentioned above , which will help to estimate the quantity of water that can be conserved per student for the study group and for the whole country.

4.2.2 Data Collection

In water planning, especially for conservation studies, it is important to know what percentage of water is devoted to each purpose. By knowing this, a percent reduction in one type of use can then be projected as to its impact to total use, for example, it doesn't do any good to know that new toilets use half as much water as old ones unless you also know what percentage of indoor water use which is devoted to toilet flushing [6].

Furthermore, the estimates of minimum daily individual fixture frequency use per Person, low flow fixture maximum flow rate are based on locally and international relevant data, rather than studies conducted in distant locations which is similar to the local system [6].

4.2.3 Common Errors in the Use of Conservation Savings Estimates

The following list of common errors is important to remember at the outset of an analysis of conservation savings:

- Not accounting for ongoing savings due to natural replacement;
- Not identifying whether savings are "net" of other possible causes aside from the conservation program under consideration; and
- Not accounting for the decay in conservation savings, should such decay exist [6].

4.2.4 Usage Model

The usage model was correlated with the number of total fixtures and the consumption data recorded for each school and calibrated with actual data. A key finding is that most school use values calibrated well with utility

data. There were some outliers, including schools already upgraded to 100% low-flow fixtures and schools with no low flow fixtures, but overall these schools were few [13].

4.2.5 Savings Calculations

The approach of quantifying savings involved creating a usage model that include a calibrated custom frequency of use value by school type along with per student water consumption, and endues fixture flow rates. Water consumption by end-use fixtures in each school was estimated using actual consumption of water compared to existing low-flow fixture rates for schools if it is completely retrofitted to determine typical water savings per student in each type of schools mentioned above.

The two key savings formulas applied to determine water usage is given below:

Theoretical Water Usage (l/s.d) =sum of((Low-flow fixture flow-rate) X (individual fixture use frequency))

Fixture volumetric flow rates were based on observed ratings.

For toilets and urinals, fixture volumetric flow rates were based on fixture labeling (which is also determined in green building guidelines - State of Palestine). Dates stamped on toilets/urinals determined individual fixture rates.

The ratings of toilets/urinals without stamped dates were determined using the year the building was constructed or significantly renovated (including end-use fixtures) as per site visits done by the researcher.

The following table summarizes volumetric flow rates for low-flow fixtures based on green buildings Guidelines in State of Palestine:

Table 4.4 Maximum water flow rate of low-flow fixtures [18]

Conservation Device	Low flow fixture water use (Liter/flush or liter/min)
Toilets	6 Liter/flush
Urinals	2 Liter/flush
Drinking Fountain	2.7 liter/min
Washing Faucet	2 liter/min
Kitchen Faucet	7 liter/min

Using these factors, the total modeled water consumption was compared to actual indoor water utility data (exclusive of irrigation and estimated process water use). When necessary, reasonable adjustments to the usage model (use frequency) were made such that modeled consumption more closely reflected the actual data. The frequency of use calculations are derived from a series of different statistical analyses performed on a spreadsheet model. The school types first were categorized by their process water opportunities and then separated by the school gender: male schools (use urinals) and female schools (no urinal use). The final step was to calculate the daily per student usage if all water consumption tools in school is low-flow.

The frequency of use (the minimum case (100% incomplete)) is considered in the study is adapted from previous researches[6] are summarized in the following table.

Table 4.5 Use frequency of different types of water fixtures in different types of schools [6]

School Type	Average Toilet Flushes per person Per Day	Average Urinals Flushes per person Per Day	Average Faucets Run Minutes per person Per Day
Elementary(29.03%)	0.9	0.5	0.6
Middle/High(36%)	1.1	0.6	0.7
100% Incomplete(20.05%)	0.7	0.4	0.4
100% retrofitted(36%)	1.1	0.6	0.7

If minimum usage percentage in sample school is considered just for five types of usages(toilets ,urinals, drinking fountain & miscellaneous faucet) and neglecting that for irrigation , education and leakage ,the following analysis is performed for the two types of schools (male's schools and females schools).

4.2.6 Potential Water Conservation Opportunities and Savings

On the basis of the site assessments conducted at each of the 164 schools, five end-use water conservation opportunities were identified: toilets, urinals, Drinking fountains, washing basins and kitchen faucet. While irrigation faucet at schools was counted, they are not included as a conservation opportunity because it is not used regularly and it is not used in many schools because there is no green area to be irrigated. Laboratory basins (troughs) also were not included because they are rarely to be used.

All of the end-use fixtures in the 164 schools were counted and categorized by type to determine retrofit opportunities that would reduce water consumption. The types of retrofits identified are detailed below:

Drinking fountain taps

Existing, non low-flow drinking fountain tap replaced with 2.7 liters per minutes ones (low-flow taps).

Bathroom washbasins

Existing, non low-flow bathroom wash hand basins replaced with 2 liters per minutes ones(low-flow washbasin).

3-Kitchen sink

Existing, non low-flow kitchen sinks replaced with 7 liters per minutes ones (low-flow kitchen sink).

4-Toilets

Existing, non low-flow toilets replaced with 6 liters per flush models (low-flow toilets).

5- Urinals

Existing, non low-flow urinals replaced with 2 liters per flush model (low-flow urinals).

To calculate savings, end-use water fixture consumption in each building was estimated using occupancy information and existing fixture flow rates to determine an average frequency of use for each fixture. Directorate of education provided the number of students and staff per school as well as the number of school days annually (176).

Using these factors, the total projected water usage was compared to actual indoor water utility data (exclusive of irrigation ,water of cleaning school grounds and educational laboratory faucets).

Tables 4.6 and 4.7 summarizes Theoretical water consumption (l/s.d) if the school is retrofitted with low flow water consumptions tools (male Schools)

Table 4.6 Theoretical water consumption (l/s.d) if the school is retrofitted with low flow water consumptions tools (male Schools)

Conservation Device	Low flow fixture water use (Liter/flush or liter/min)	Average Rate of use (people use water in flushes per day or minute /day)	Total Water Used by Low flow fixtures (Liters/ Student/day)
Toilets	6 Liter/flush	0.7 flushes per student per day	4.2
Urinals	2 Liter/flush	0.4 flushes per student per day	0.8
Drinking Fountain	2.7 liter/min	0.2 minute per student per day	0.54
Washing Faucet	2 liter/min	0.25 minute per student per day	0.5
Kitchen Faucet	7 liter/min	0.05 minute per student per day	0.35
		Total(l/s.d)	**6.39**

The average water consumption for RSM and USM are 6.16 and 6.38 l/s.d which is less than the theoretical water consumption (l/s.d) if the school is retrofitted with low flow water consumptions tools (male Schools) which is 6.39 l/s.d

The calculations for female's schools are introduced in the following table.

Table 4.7 Theoretical water consumption (l/s.d) if the school is retrofitted with low flow water consumptions tools (female Schools)

Conservation Device	Low flow fixture water use (Liter/flush or liter/min)	Average Rate of use (student use water in flushes per day or minute /day)	Total Water Used by Low flow fixtures (Liters/ Student/day)
Toilets	6 Liter/flush	0.7 flushes per student per day	4.2
Urinals	-	0.4 flushes per student per day	0
Drinking Fountain	2.7 liter/min	0.2 minute per student per day	0.54
Washing Faucet	2 liter/min	0.25 minute per student per day	0.5
Kitchen Faucet	7 liter/min	0.05 minute per student per day	0.35
		Total(l/s.d)	**5.59**

According to the calculation above two important conclusions can be drawn from this analysis:

- There is a minimum consumption of 6.39 liters per pupil per day for males schools and 5.59 liters per student per day, below which it would not be cost-effective to carry out retrofit because there would be no savings achieved, and the maximum average water consumption in males schools is 6.38 l/s.d and for females schools was 4.88 l/s.d which is less than the best practice if schools is fully retrofitted with low flow fixtures.
- The results from analysis demonstrate that there is value in benchmarking of schools to help priorities water suppliers and managers activities.

- Findings indicate that no opportunities for additional process water savings, because water used in schools for different types of uses are minimum than the best practice if schools is fully retrofitted with low flow fixtures which require further studies to explain the reasons.
- It is noticed that water fixtures in schools are used infrequently for many reasons that require a further research, so there is no opportunity for any additional savings related to these fixtures.

This being the case, it is worthwhile exploring how the Department for Education and Schools benchmarking tool introduced in this section might be used to guide water company activities.

The minimal opportunities for additional process water savings, which are lower than expected and are attributed to a number of factors, including:

1. Recent equipment upgrades, where most of water fixtures devices in schools are low-flow types.
2. Low water use in kitchens, canteens.
3. Low water use for laundry and toilets.
4. Water-cooler(refrigeration) was found to be shutdown and not working which reduces the quantity of water that the student drinks specially in summer.
5. Process water use in canteens is limited because many schools use ready meals or sandwiches that require no rinsing or washing.
6. Low water use in irrigation, because area of gardens in most schools are small, or plants type in school gardens require little quantities of water.

4.3 Water Quality Assessment in Schools

4.3.1 Introduction

This section discusses drinking water quality in public schools and presents information regarding sources of contaminants (especially total and fecal coliforms), and some guidance materials to asses in testing contaminant in drinking water, in addition to some background information on the laws and regulations concerning these contaminants in drinking water.

Ensuring drinking water quality at schools is important because that's where students spend their day, and most likely will drink water while they are in schools. *"Consuming enough fluids on a daily basis is important for children's health. Water is a great choice because:*

- *It doesn't contain the calories, caffeine, or sugar that may be found in other beverages, and*
- *It helps nearly every part of the human body function efficiently*"[19].

4.3.2 Reasons for Selecting the Coliforms Test

"The total bacteria test is a primary indicator of "potability", suitability for consumption, of drinking water. It measures the concentration of total coliform bacteria associated with the possible presence of disease causing organisms"[19].

"Coliform bacteria are a natural part of the microbiology of the intestinal tract of warm blooded mammals, including people. Coliform bacteria can also be found in soil, other animals, insects, etc. The total coliform group is

relatively easy to culture in the lab, usually in high numbers in polluted water and testing for coliform bacteria is faster and cheaper than testing for specific organisms and pathogens. Therefore, coliform test has been selected as the primary indicator bacteria for the presence of disease causing organisms" [19].

4.3.3 Coliforms Potential Health Hazards

Coliform bacteria are not pathogenic (disease causing) organisms, and are only mildly infectious. For this reason these bacteria are relatively safe to work with in the laboratory. If large numbers of coliforms are found in water, there is a high probability that other pathogenic bacteria or organisms, such as Giardia and Cryptosporidium, may be present.

The Palestinian standards requires public drinking water supplies to demonstrate the absence of total coliforms per 100 ml of drinking water. At this time, there are no regulations governing individual water wells. It is up to the private well owner to have his or her water tested [19].

4.3.4 Data Analysis

Testing for total and fecal coliforms was performed by collecting water samples from two types of schools, divided in respect to their water source as follows:

1- Schools that uses its ground water tank as water source(alone or in addition to any other water resource) (50 schools).
2- Schools which uses public water system alone (5 schools).

Results of test analysis for these types of schools for total and fecal coliforms are summarized in figures 4.8 and 4.9.

Figure 4.8 below shows the percentages of schools where water was contaminated and not contaminated with both total and fecal coliforms from tested schools that use its ground water tank as a water source. Results as follows:

- 42% of sampled schools water is contaminated with total coliforms 76% of it are contaminated with fecal coliform .
- 58% of sampled schools water isn't contaminated with total or fecal coliforms.

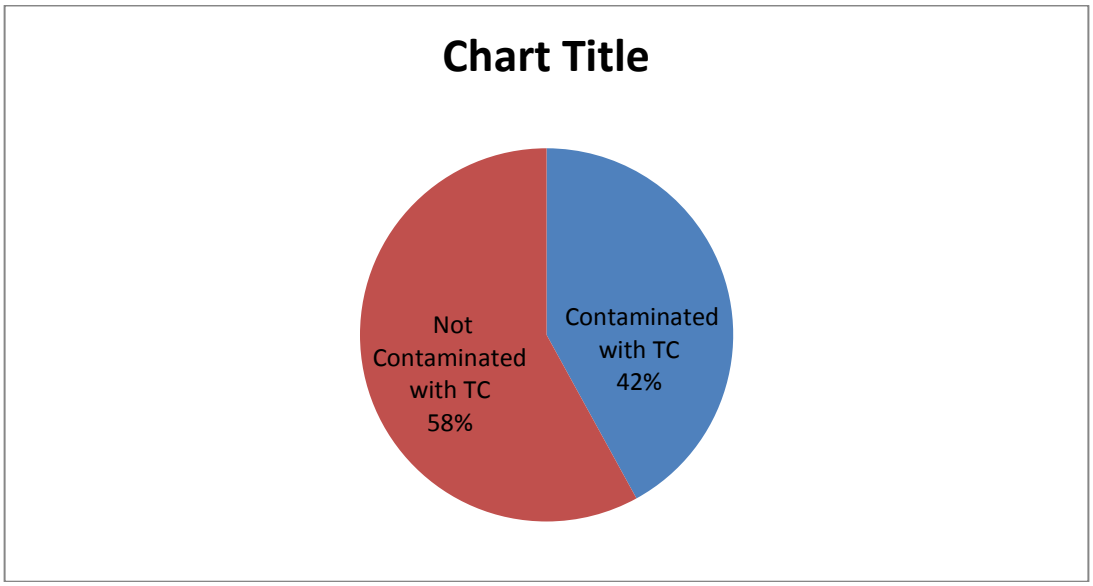

Figure 4.8: (Schools which uses cisterns as a water source) total and fecal coliform water test statistics

Figure 4.9 below shows the percentages of schools that its water is contaminated and not contaminated with both total and fecal coliforms

from tested schools that use public water network as a source. Results show that:

- 20% of sampled schools water is contaminated with total coliforms,10% of it is contaminated by fecal coliform.
- 80% of sampled schools water isn't contaminated with total or fecal coliforms.

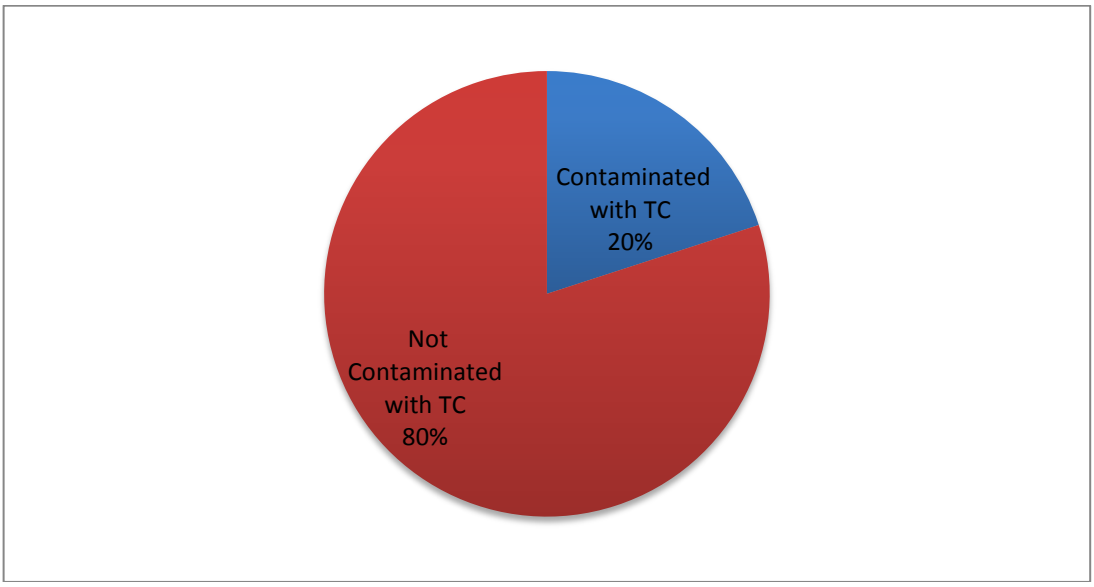

Figure 4.9: (Schools which uses just public network water supply source) total and fecal coliform water test statistics

4.3.5 Sources of Contaminants in Schools

The field investigation reveals that the reasons of contaminants are:

1. In south east of Nablus village's schools (11 villages), pumping of water from the chlorinated public water system to the polluted cisterns in schools then to the schools roof tanks.
2. In Jordan valley region, the public water system that feeds schools is not chlorinated.

3. Some areas like Qabalan Village, cisterns of schools are so dirty and are not cleaned for about 2 years, (it must be cleaned yearly).
4. Some areas like Bait Fureek village, the intermitted public water supply system (which provides schools with water once every 8 days) enforce schools to use collected water from schools roof which is polluted by feces of birds.
5. Some roof tanks cover in schools are opened or drilled which allows to be contaminated with feces of birds.
6. Leaving water tanks on schools roof and cisterns without cleaning for a long period of time.
7. Bacteria that may grow within the plumbing system and on water fountains and faucets, or enter the facility's distribution system (the building's pipes and plumbing) through cross connections [20].

4.3.6 Discussion and Results

Results shows that drinking water at many schools across the Governorate is contaminated by total and fecal coliforms.

The contamination is most apparent at schools with wells, the contamination reaches a 42% of the governorate schools that uses ground water tanks, while it is about 20% of schools that uses public water network.

Field investigations reveals that ground water and roof tanks at some schools are so tainted with feces of birds on roofs tanks, which also arrive to wells of schools from roofs of the schools.

Results of tests reveals also that these toxins could also be found in water at homes, offices and businesses (see water tests results performed by Ministry of health ,in Appendix E). But the contaminants are especially dangerous to children, who drink more water per kilograms than adults and are more vulnerable to the effects of many hazardous substances. The most frequently cited contaminant was total coliform bacteria.

This tells that there is a widespread problem that needs to be fixed because there are ongoing water quality problems in small and large utilities, as well.

Testing to detect dangerous toxins such as lead and arsenic, which can wreak havoc on major organs and may retard children's learning abilities, must be conducted in schools.

The problem goes beyond schools that use ground water tanks. Schools that draw water from public utilities showed contamination; too, but with lower percentages especially buildings where feces of birds and other dirt’s come to drinking tanks from openings or from opened covers.

4.3.7 Suggested Solutions for Water Quality Problems at Schools

- Schools cisterns and roof tanks must be cleaned periodically.
- Schools cisterns should be chlorinated by specialists before it is used.
- Because tests reveal that some school's tap water is unsafe, there are a number of solutions to recover this problem. schools can install filtration systems, or, for certain contaminants, flushing pipes can solve the problem. If such simple short-term steps are insufficient,

purchasing bottled water may be a last resort. This option is potentially costly and has environmental concerns associated with plastic bottle waste.

- Water from fountains must run for some seconds before taking a drink: Water that comes out of a drinking fountain might contain some contaminants.
- To schools that purchase water, Water suppliers are required to write reports on the quality of their drinking water each year. These documents. If school has its own water supply instead of using city's or town's supply, specialists must be asked for test results.

4.4 Evaluation of Schools as Green Buildings

This section helps to assess the efficiency of water use in schools within the description of the overall efficiently use of available water resources, and within the appropriate standards for the environment and local conditions, and depending on any recommendations Issued by official establishments.

4.4.1 Green Schools Specifications and Conditions

Water use efficiency in schools reviews the important aspects that must be assessed, measures and requirements that should be considered in the treatment and use of water resources and takes into account the advantages of the sewage treatment for the schools, These measures and aspects are:

1. Determination of water consumption depending on the type of the building and the tools used in it.
2. Exploitation of any other available water resources of the building.

3. Choice of best situation for sewage treatment and water recycling.
4. Quality of the methods used to control distribution and consumption of potable and treated water [18].

Total points of water use efficiency are 50 (as per Green Buildings Guidelines – State of Palestine-2013), that are used to assess water use efficiency in schools, and distributed to the following aspects:

1. Efficiency of water use.
2. Rationalizing the consumption of cold water (water-consuming tools).
3. Rationalizing hot water consumption.
4. Rain water harvesting and re-use & condensation of water exploitation
5. Waste and gray water recycling and re-use
6. Water system management, monitoring, metering and control [18].

4.4.2 Description of Sample Schools

After field investigations to all sampled schools, and checking green school requirements for each field mentioned in previous section, the following are the findings:

- Water use efficiency: the mandatory requirements under this aspect are reuse rain water (rain water harvesting), few schools construct a ground water tank to collect rainwater for re-use for irrigation works, and this may be because of financial restrictions.
- Drinking fountains in schools is installed with automatic closing immediately upon completion of use, and this in turn reduces water

wastage. It is also noted that in all new schools, water from outside drinking fountains is drained to the nearest green area instead of draining to general drainage network in order to exploit water to irrigate the area nearby.

- Solar heaters are available in two schools which is constructed after 2012 year, which only provide the school kitchen with hot water.
- Water harvesting: it is noted from the study that a ground water tank for rainwater harvesting is not mandatory, it depends on the available budget of the project of building the school, so it is recommended to make it a priority.
- It is noted that re-use of rainwater applied only in two schools study area. So it must be stressed the importance of having a well to collect rainwater, and re-exploit this water when needed, whether for irrigation or for cleaning operations and other things.
- Heaters: According to the study electrical heaters are available in all schools.

  Potential opportunities relative to end-use fixture data that were gathered during the assessments are described below,

  - Toilets
  - Urinals
  - Drinking fountains Wash basins (troughs)
- Toilets: The site assessments confirmed that public schools toilets have flow rates of6 liters per flush and that is the low flow toilet which is described as per green building guidelines in state of

Palestine. So no opportunity exists to retrofit these models with any other types of toilets.

- Urinals: The site assessments confirmed that many of the urinals in public schools are 2 liters per flush models .So no opportunity exists to retrofit these models with any other types of urinals.
- Drinking fountains: The site assessments confirmed that 50% of the drinking fountains in public schools are low-flow models, the others can be retrofitted with 2.7 liters per minute models.

4.4.3 Evaluation of School-Samples

After analyzing and studying of selected schools, and depending upon the standards and the specifications that mentioned earlier, a detailed analysis and results is shown briefly in Tables 4.8 and 4.9 below.

Calculation of the percentage of reduction of the total water consumption of schools is done as follows:

R= Water flow rate **x** duration of consumption **x** the number of usage times for each user **x** Number of Users. Then;

Percentage reduction = [(R-D) / R] x 100)] where:

R: Total Reference Water Use (calculated as per equation above)

D: Total Design Water Use (from metering data).

Table 4.8: An example of percent reduction calculation for sample school

(Reference Water Use-"R-value)					
Water consuming tool	**Flow or volume**	**Period of consumption**	**Number of times Used/person**	**Number of Consumers**	**The volume of water used/Day (Liter)**
kitchen faucet	7 liters/min	30 minutes	1	2	420.0
Drinking Water Taps	2.7 liters/min	0.25 minutes	1	486.5	328.4
Laundries	2 liters/min	4 minutes	1	486.5	194.6
Toilets	6 liters/flush	1 flush	0.7	486.5	2043.3
Urinals	2 litters/flush	1 flush	0.4	486.5	389.2
(Total Reference Water Use -"R")=					**3375.5**
		(Total Design Water Use – "D"=			**618.0**
			Percentage reduction =		**81.7%**
				collected points	**3 points**

According to Table 4.8, percent of reduction for almost all of schools is more than 40% , so all schools got 3 points for the first item of efficiency of water use. Analysis for other items of efficiency of water use in schools is shown and explained in Table 4.9 below.

Table 4.9 Scores of old and new schools within water use efficiency item.

	Stan-dard	Schools built after 2010	%from Standard	Schools built before 2010	%from Standard
1-Efficiency of water use	Required	3	100%	3	100%
2-Distribution of points within item of(water consumption reduction)					
Achievement of the ratio of overall reduction in the consumption of potable water for drinking (not less than 30% of the consumption) through the selection of high-efficiency water use(Potable Water)equipment .	8	6	75%	4	50%
Exploitation of additional resources for water, for example: rain harvesting and gray water treatment etc. (increase in stealthy general water consumption by at least 20%)	6	3	50%	1	16.6%
The presence of high-efficiency irrigation system.	2	0	0%	0	0%
Total points	16	9	56.25%	5	31.25%
3-Distribution of points within item of(rationalization of production and consumption of hot water)					
The use of alternative energy sources such as solar energy in meeting the needs of consumption and distribution of hot water in the building by not less than 75% of overall consumption	9	6	67%	0	0%
Selection of equipment, tools and materials used in the production, supply and distribution of hot water inside the building with the efficiency of not less than 90%, and the optimal use of energy consumption (Optimization of Energy Resource).	4	0	0%	0	0%
Consumption control and adjustment of temperature of hot water supplied to all points of use and control of the circulation of water in the hot water distribution.	1	0	0%	0	0%
Protection systems and treatment against corrosion and calcification , safety and security to maintain the sustainability of the hot water system.	1	0	0%	0	0%

Energy recovery or retrieve it from the heat and air-conditioning, refrigeration and heating	1	0	0%	0	0%
Total points	16	6	37.5%	0	0%
4-Distribution of points within item of (efficient water harvesting)					
Provides a complete system for the exploitation of rain water for the purposes of drinking water after the match of all required conditions.	2	0	0%	0	0%
Provides a complete system for the exploitation of rainwater for non-potable water after the match of all required conditions.	2	2	100%	0	0%
Total points	4	2	50%	0	0%
5-Distribution of points within the item of(exploit gray water)					
Provide a system to collect gray water	3	1	33%	1	50%
Provide an effective system for filtering and disinfecting gray water	3	0	0%	0	0%
Provide a network to store water for irrigation or toilets	2	2	100%	1	50%
Total points	8	3	37.5%	2	25%
6-Distribution of points within the item of (water consumption management during the measurement, monitoring and control					
The existence of systems for managing the measurement , controlling and monitoring water consumption inside and outside the building	2	0	0%	0	0%
And control systems in the presence of quality drinking water and non-potable water and take care of the All components of any health and environmental risks	2	0	0%	0	0%
The existence of systems and mechanisms of security and safety for the use of the water system in the building and identify dangers sources and containment of hazardous events	1	0	0%	0	0%
there are plans of awareness , guidance and education in the rationalization of water consumption for owners , users , operators , technicians and visitors of buildings	1	1	100%	1	100%
Total points	**6**	**1**	16.6%	**1**	**16.6%**

Table 4.9 is summarized as shown in Table 4.10 below:

Table 4.10: Summary of scores of old and new schools within water use efficiency item

No.	Distribution points within the axis of Efficiency of water use.	Distributi-on points	Schools built after 2010	%from Standard	Schools built before 2010	%from Standard
1	Efficiency of water use.	Required	3	100%	3	100%
2	Rationalizing the consumption of cold water (water-consuming tools).	16	9	56.25%	5	31.25%
3	Rationalizing hot water consumption.	16	6	37.5%	0	0%
4	Rain water harvesting and re-use &condensation of water exploitation.	4	2	50%	0	0%
5	Waste and gray water recycling and re-use	8	3	37.5%	2	25%
6	Water system management, monitoring, metering and control.	6	1	16.6%	1	16.6%
	Total points	**50**	**24**	**48%**	**11**	**22%**

It is noticed that, most of schools under study satisfies just 22% of the requirements of Green buildings council guidelines – State of Palestine), while the newest schools(that built after 2010) satisfies less than 48% of these requirements, all schools are far away from implementation of green school requirement as per green buildings council guidelines in State of Palestine.

Upon previous theme, all items No 2, 3, 4, 5 and 6 from the previous table must be improved to enhance the water use efficiency, also it is recommended to provide a well to collect rainwater to reuse f irrigation and cleaning for all schools.

Chapter Five

Conclusions and Recommendations

The followings are the main conclusions and recommendations:

5.1 Conclusions

1- Findings on public school buildings are that the values of water consumption indicators varied from 3.38 to 4.67 litres/student/day in primary school buildings, it was about 4.86 litres/student/day for secondary female's schools and it was 6.3 in secondary male's schools.

2- Water consumption of schools in Europe , America and the best practice in UK schools (as an example) is greater than schools under study, this is may be for the following reasons:

- Recent equipment upgrades, where most of water fixtures devices in schools are low-flow types.
- Low water use in kitchens and canteens.
- Low water use for faucets and toilets.
- Water-cooler (refrigeration) was found to be shutdown and not working which reduces the quantity of water that the student drinks specially in summer (there is no cold water in summer for many schools).
- Process water use in canteens is limited because many schools use ready meals or sandwiches that require no rinsing or washing.
- Low water use in irrigation, because area of gardens in most schools are small, or plants type in school gardens require little or zero quantities of water.

- Some students bring their drinking water with them by having a special bottle, bought from the market for such purposes.

3- It is not cost-effective to carry out retrofit of water fixtures in public schools in this situation, because there would be no savings achieved, because water consumption in public schools is less than the best practice if schools are fully retrofitted with low flow fixtures, this is for the same reasons mentioned in point number two in this section, in addition to that water fixtures in schools are used infrequently for many reasons that require a further research, so there is no opportunity for any additional savings related to these fixtures.

4- Number of water fixtures (toilets, urinals, drinking fountains and miscellaneous faucets) in schools is irregular and might be in excess or shortages with respect to the number of students and staff which require further research about this point.

5- Results shows that drinking water at some schools across the Governorate is contaminated by total and fecal coliforms, the contamination is most apparent at schools with cisterns, which represent about 50% percent of the studied schools, the contamination occurred in about 42% of schools that uses its own water source, and in about 20% of schools that uses public water system, the contamination source at some schools are so tainted with faeces of birds on roofs tanks, which also arrive to cisterns of schools from roofs of the schools, or loss of cleaning for schools cisterns and roof water tanks.

6- Schools that is built before the year of 2010 satisfies just 22% of the requirements of Green Buildings Council Guidelines – State of

Palestine-2013),while that built after the year of 2010 satisfies less than 48% of these requirements, all schools are far away from implementation of green school requirement as per green buildings council guidelines in State of Palestine-2013.

5.2Recommendations

1- The low water usage at schools might not be consistent with principles of health and sanitation, so, health and sanitation concerns at schools should be addressed, monitored and followed.

2- Because the contamination of schools-water is most apparent at schools with cisterns, and the contamination source is the feces of birds on roofs tanks, which also arrive to ground water tanks of schools from roofs of the schools, Water tanks at roofs and schools cisterns must be closed correctly and cleaned periodically .

3- Water suppliers are required to report on the quality of their drinking water each year. If school has its own water supply instead of using city's or town's supply, school principals must ask specialist to apply water quality tests periodically.

4- Achieving the requirements and conditions of the green schools with respect to water and sanitation item in all new schools by limiting or eliminating the use of potable water for landscape irrigation, use high-efficiency irrigation technology , use captured rain or recycled site water to reduce potable water consumption for irrigation, reduce generation of wastewater and potable water demand and maximization of water efficiency within buildings .

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Appendix A

Tables

Table 1 Water consumption readings for urban schools(m^3) (Source: Nablus Municipality).

1-2014	2-2013	1-2013	3-2013	4-2013	5-2013	6-2013	9-2013	8-2013	10-2013	11-2013	12-2013	7-2013	School Name
140	4	3	15	5	6	28	25	28	0	1	5	20	مدرسه اناث مخيم بلاطه الوكاله
1057	53	162	119	89	77	102	83	88	87	83	30	70	مدرسة اناث مخيم عسكر
278	21	3	25	38	21	18	30	22	22	46	15	7	مدرسه اناث مخيم عسكر الوكاله
419	24	17	33	19	24	20	27	24	18	16	8	17	مدرسه اناث نابلس الابتدائيه الوكاله
230	30	25	22	24	28	2	19	24	19	27	10	0	مدرسه اناث نابلس الاعداديه الوكاله
401	9	9	17	35	35	20	75	35	40	44	0	60	مدرسة بنات عسكر
410	28	30	47	28	39	19	61	23	45	42	15	17	مديرية التربية و التعليم/نابلس مدرسه ذكور بلاطه ال*
458	27	37	19	38	53	48	81	24	51	38	14	23	مدرسه ذكور مخيم بلاطه الوكاله
181	5	7	22	20	14	9	37	10	15	23	19	0	مدرسه ذكور نابلس الاعداديه الوكاله
813	62	48	78	77	83	30	83	44	104	49	20	18	مديرية التربية و التعليم/نابلس مدرسه عسكر المختلطه
355	29	15	33	45	27	24	59	6	27	20	22	18	مديرية التربية و التعليم/نابلس مدرسه الحاج علي ا*
178	22	16	26	17	16	31	9	16	9	7	3	2	مديريه التربيه والتعليم /نابلس مدرسه لطفيه الصيفي
1149	60	35	140	84	142	74	81	80	133	120	40	22	مدرسه اناث مخيم بلاطه الاساسيه الثانيه
798	47	48	54	63	50	16	170	7	135	111	35	0	مدير وكاله الغوث /مدرسه الاناث
582	34	16	40	36	35	14	49	4	37	40	15	8	مدير وكاله الغوث /مدرسه الذكور

مدير وكاله الغوث المركزالصحي	37	37	42	42	39	42	43	39	32	55	36	26	475
مدير مكتب التربيه والتعليم	26	28	35	33	39	32	48	19	23	36	17	8	383
مديرية التربية و التعليم/نابلس المدرسه الزينبيه ل*	2	3	37	0	10	8	23	13	11	13	10	12	146
مديرية التربية و التعليم/نابلس المدرسه الصلاحيه *	16	78	57	71	331	140	94	37	51	79	143	116	1265
مديرية التربية و التعليم/نابلس المدرسه الصلاحيه ل*	3	10	14	21	5	9	4	2	31	44	5	8	164
مديرية التربية و التعليم/نابلس المدرسه الفاطميه ا*	8	15	41	17	50	28	27	20	19	33	10	11	308
مديرية التربية و التعليم/نابلس المدرسه الفاطميه ل*	1	2	0	3	6	3	1	3	4	8	2	1	43
مديرية التربية و التعليم/نابلس مدرسه الاسماء الاب*	13	77	14	80	106	100	50	83	83	80	229	176	1208
مديرية التربية و التعليم/نابلس مدرسه الامام الحسن*	3	12	16	16	25	32	2	20	36	24	16	31	264
مديرية التربية و التعليم/نابلس مدرسه الامام علي ب*	33	6	5	6	21	10	1	4	23	20	4	7	145
مديرية التربية و التعليم/نابلس مدرسه الخالديه ال*	35	20	18	21	12	24	13	15	19	19	28	12	250
مديرية التربية و التعليم/نابلس مدرسه الرازي الابت*	1	1	1	1	1	1	0	1	0	1	1	0	9
مديرية التربية و التعليم/نابلس مدرسه الشهيد سعد ص*	6	34	44	65	5	84	19	64	56	74	40	59	573
مديرية التربية و التعليم/نابلس مدرسه الشهيد ياسرع*	8	10	22	36	7	45	15	36	46	31	4	27	300
مديرية التربية و التعليم/نابلس مدرسه الصناعه	240	380	365	365	160	390	230	270	255	159	160	166	3690
شركه رزق المصري للهندسه والمقاولات	24	19	25	21	9	23	20	50	65	46	30	14	376
مديرية التربية و التعليم/نابلس مدرسه الغزاليه	4	32	16	36	8	10	30	28	28	30	22	90	356
مديرية التربية و التعليم/نابلس مدرسه المخفيه الجد*	5	32	37	65	31	30	7	24	22	33	7	32	331
مديرية التربية و التعليم/نابلس مدرسه المساكن الثا*	6	23	9	84	1	29	2	6	10	8	97	45	324
مديرية التربية و التعليم/نابلس مدرسه برهان كمال	44	21	21	51	31	56	31	12	59	30	8	17	405
مديرية التربية و التعليم/نابلس مدرسه بلال بن رباح*	12	31	31	51	21	42	12	61	19	26	6	27	362
مديرية التربية و التعليم/نابلس مدرسه بنات الكرمل *	35	79	29	30	23	62	30	30	20	62	2	40	508
مديرية التربية و التعليم/نابلس مدرسه بنات اليرموك*	0	0	13	0	0	0	0	0	0	0	0	0	13
مديرية التربية و التعليم/نابلس مدرسه بنات بيسان ا*	3	36	19	11	16	12	7	17	25	12	20	16	209

مديرية التربية و التعليم/نابلس مدرسه بنات عمر الم*	0	18	26	11	15	37	12	6	9	11	3	2	158
مديرية التربية و التعليم/نابلس مدرسه بنات نابلس ا*	2	22	11	17	8	11	6	22	16	12	2	10	144
مديرية التربية و التعليم/نابلس مدرسه جميله ابوحير*	5	6	10	16	17	28	5	20	9	11	2	6	142
مديرية التربية و التعليم/نابلس مدرسه حسيب الصباغ	3	11	20	20	16	11	13	26	25	31	8	17	220
مديرية التربية و التعليم/نابلس مدرسه ذكور الرازي *	12	8	8	22	14	8	8	8	9	8	4	8	135
مديرية التربية و التعليم/نابلس مدرسه ذكور العامريه	0	3	4	1	5	0	3	6	2	4	4	4	43
مديرية التربية و التعليم/نابلس مدرسه ذكور العامري*	1	4	7	4	17	5	4	5	1	1	1	1	59
مدرسه رشيد منيب المصري	7	6	31	14	11	28	23	23	30	39	10	6	237
مديرية التربية و التعليم/نابلس مدرسه روحي ملحس	16	17	10	43	5	40	24	23	3	11	10	28	238
مديرية التربية و التعليم/نابلس مدرسه رياض برهان ك*	6	13	24	35	20	85	17	47	27	56	4	16	367
مديرية التربية و التعليم/نابلس مدرسه سعيد بن عامر	20	29	31	47	40	46	5	19	18	24	37	17	338
مديرية التربية و التعليم/نابلس مدرسه سمير عبدالها*	17	17	10	65	16	35	23	38	23	21	14	7	300
مديرية التربية و التعليم/نابلس مدرسه صارم الدين ا*	5	30	65	84	38	84	45	37	76	117	76	142	816
مديرية التربية و التعليم/نابلس مدرسه طارق بن زياد*	12	14	53	29	12	24	6	24	14	16	17	9	243
مديرية التربية و التعليم/نابلس مدرسه ظافر المصري	3	20	3	6	15	18	17	17	62	35	20	4	240
مديرية التربية و التعليم/نابلس مدرسه ظافر المصري	40	9	12	18	28	33	49	41	91	56	5	31	430
مديرية التربية و التعليم/نابلس مدرسه عبدالرحيم ال*	1	14	18	15	11	8	1	4	6	15	11	6	122
مديرية التربية و التعليم/نابلس مدرسه عبدالمغيث ال*	39	10	6	25	41	39	11	20	23	29	27	36	317
مديرية التربية و التعليم/نابلس مدرسه عراق التايه *	8	10	18	34	3	31	11	19	13	11	8	2	171
مديرية التربية و التعليم/نابلس مدرسه عمر بن الخطاب	9	17	31	19	27	8	8	19	18	23	7	15	214
مديرية التربية و التعليم/نابلس مدرسه عمرو ابن الع*	5	18	8	28	32	32	27	23	46	25	62	26	359
مديرية التربية و التعليم/نابلس مدرسه فهمي الصيفي	0	36	40	25	16	25	10	23	22	20	15	5	274
مديريه التربيه والتعليم /نابلس المدرسه النظاميه ا*	3	12	11	19	6	21	7	21	12	13	13	8	153
مديريه التربيه والتعليم /نابلس مدرسه ابو بكر الصد*	26	77	87	82	13	110	64	92	114	114	277	50	1166

مديريه التربيه والتعليم /نابلس المدرسه النظاميه ا*	1	9	8	11	6	13	9	11	8	12	6	13	110
مديريه التربيه والتعليم /نابلس مدرسه ابن سينا الا*	0	1	2	3	4	1	6	3	4	3	1	4	32
مديريه التربيه والتعليم /نابلس مدرسه ابن قتيبه ال*	110	214	162	69	53	115	85	80	100	62	48	57	1315
مديريه التربيه والتعليم /نابلس مدرسه ابوبكر الصديق	2	6	21	40	6	36	9	14	23	30	5	10	212
مديريه التربيه والتعليم /نابلس مدرسه الجنيد للذكور	0	24	24	27	10	15	7	17	27	21	31	14	227
مديريه التربيه والتعليم /نابلس مدرسه الحاج معزوز *	3	20	3	12	23	3	21	34	23	11	6	12	192
مديريه التربيه والتعليم /نابلس مدرسه الخديجيه الا*	2	25	26	33	4	8	4	24	53	22	17	28	278
مديريه التربيه والتعليم /نابلس مدرسه الخديجيه الا*	1	3	5	7	2	12	1	7	16	5	1	5	69
مديريه التربيه والتعليم /نابلس مدرسه الخنساء الاب*	2	6	12	15	2	15	10	15	12	9	6	4	113
مديريه التربيه والتعليم /نابلس مدرسه الشهيد ناصر *	6	86	38	192	9	83	4	18	21	21	4	17	511
مديريه التربيه والتعليم /نابلس مدرسه الشيخ محمد ت*	17	30	28	63	23	79	17	29	75	96	67	41	583
مديريه التربيه والتعليم /نابلس مدرسه العائشيه الث*	0	0	0	0	0	0	0	0	0	0	0	0	0
مديريه التربيه والتعليم /نابلس مدرسه العائشيه الث*	38	122	87	62	32	60	114	91	66	101	115	113	1086
مديريه التربيه والتعليم /نابلس مدرسه الكندي الاسا*	13	115	179	220	122	70	18	21	27	47	13	17	872
مديريه التربيه والتعليم /نابلس مدرسه المعري الابت*	4	5	11	10	3	10	7	8	11	7	2	6	90
مديريه التربيه والتعليم /نابلس مدرسه المعري الملحق	0	3	1	1	0	14	0	19	5	13	8	10	74
مديريه التربيه والتعليم /نابلس مدرسه الملك طلال ا*	99	36	34	61	37	61	30	66	80	80	83	2	725
مديريه التربيه والتعليم /نابلس مدرسه بسام الشكعه *	21	39	33	63	45	55	13	44	57	40	21	24	480
مديريه التربيه والتعليم /نابلس مدرسه جمال المصري	54	123	27	66	5	27	42	185	154	50	18	18	1022
مديريه التربيه والتعليم /نابلس مدرسه خديجه ام الم*	6	8	12	12	1	19	2	14	13	13	11	4	122
مديريه التربيه والتعليم /نابلس مدرسه رشده المصري	55	53	33	51	59	51	35	38	44	40	14	34	539
مديريه التربيه والتعليم /نابلس مدرسه رفيديا الاسا*	5	38	18	24	15	25	15	13	18	32	16	18	250

مديريه التربيه والتعليم /نابلس مدرسه زواتا الابتد*	12	24	30	21	41	37	15	20	51	33	24	20	341
مدرسه زواتا الثانويه	10	7	10	11	11	29	10	38	20	6	23	22	234
مديريه التربيه والتعليم /نابلس مدرسه سمير سعدالدين	81	14	19	52	40	77	82	90	52	44	30	31	635
مديريه التربيه والتعليم -مدرسه عادل زعيتر للبنات	2	7	13	16	2	19	1	22	15	9	8	3	126
مديريه التربيه والتعليم /نابلس مدرسه عبدالرحيم مح*	1	16	11	26	6	40	9	13	32	30	8	21	230
مديريه التربيه والتعليم /نابلس مدرسه عثمان بن عفان	6	16	33	28	5	30	6	29	17	28	29	32	288
مديريه التربيه والتعليم /نابلس مدرسه فاطمه حبيشه *	9	10	20	24	25	20	11	24	25	27	7	22	235
مديريه التربيه والتعليم /نابلس مدرسه فدوى طوقان	20	63	18	38	21	34	8	21	29	30	20	9	333
مديريه التربيه والتعليم /نابلس مدرسه قدري طوقان ا*	14	18	17	30	32	39	17	36	62	35	33	30	373
مديريه التربيه والتعليم /نابلس مدرسه قدري طوقان ا*	33	5	32	40	54	45	45	25	25	15	2	19	344
مديريه التربيه والتعليم /نابلس مدرسه كمال جنبلاط *	49	18	21	37	48	63	36	39	43	39	4	25	434
مديريه التربيه والتعليم /نابلس مدرسه محمدعزت دروزه	1	17	30	14	21	10	31	12	27	8	6	10	194
مديريه التربيه والتعليم /نابلس ملحق مدرسه الزينبي*	0	0	6	14	0	0	0	0	0	0	0	0	20
مديريه التربيه والتعليم	0	0	0	0	0	0	0	0	0	0	0	0	0
مديريه الشوون الاجتماعيه	16	49	25	17	48	12	26	15	19	18	19	22	347
مديره الشوون الاجتماعيه	0	0	0	0	0	0	0	0	0	0	0	0	0
مديريه الشوون الاجتماعيهبنابلس	9	15	0	2	1	1	45	33	47	9	9	7	198
وزاره / الثقافه	3	2	2	2	1	3	4	2	3	3	1	3	30
وزاره الاتصالات وتكنولوجياالمعلو	31	0	0	2	0	0	2	0	0	4	0	0	39
وزاره الاشغال العامه	40	1	84	187	102	30	50	137	112	6	6	4	759
وزاره الاقتصاد الوطني/التموين	5	9	10	10	6	10	9	11	12	9	0	11	111
محافظه نابلس	99	<Null>	74	75	65	94	84	79	81	99	198	77	1025
مدير التربيه والتعليم	1	0	0	0	0	0	1	2	0	2	0	0	7

مديرية التربية و التعليم/نابلس مدرسه اليرموك	0	0	0	0	0	0	0	0	0	0	0	0	0
مدرسة اليرموك للبنات	7	129	130	94	19	66	7	19	14	14	19	35	795
مديريه التربيه والتعليم /نابلس مدرسه ابن الهيثم ا*	17	50	9	50	19	47	43	36	36	31	2	14	373
مديرية التربية و التعليم/نابلس مدرسه القدس الاساس*	4	17	27	29	37	20	22	22	22	26	20	20	288
مديرية التربية و التعليم/نابلس مدرسه جمال عبدالنا*	16	17	13	40	23	37	19	15	27	9	5	24	277
مديرية التربية و التعليم/نابلس مدرسه سعد بن ابي و*	3	23	25	25	5	39	18	22	26	21	6	15	238
مديرية التربية و التعليم/نابلس مدرسه عبداللطيف هو*	63	7	7	20	61	45	10	20	32	36	78	69	459
مكتب التربيه والتعليم	7	11	14	19	16	19	14	19	15	17	6	13	185
مديريه التربيه والتعليم /نابلس مدرسه الامام الشاف*	32	11	23	8	30	19	8	13	7	14	16	7	207
مديريه التربيه والتعليم /نابلس مدرسه حسن عرفات ال*	2	7	7	10	4	21	3	11	7	21	13	16	125
مديريه التربيه والتعليم /نابلس مدرسه عبدالحميد ال*	180	7	50	56	163	63	87	112	47	42	14	31	870
مديريه التربيه والتعليم /نابلس مدرسه عمر المختار *	0	44	1	0	0	0	0	0	0	0	0	0	45
مديريه التربيه والتعليم /نابلس مدرسه نعيم عبدالها*	6	10	17	19	1	27	14	24	25	22	13	11	205
الزاويه الحنبليه لذكر الله	3	20	25	40	3	44	12	20	25	32	12	10	266
مديريه التربيه والتعليم /نابلس الروضه النموذجيه	10	8	9	18	17	20	8	30	29	23	20	15	217
مدرسه الحرش	20	38	10	77	2	46	12	31	39	43	27	30	386
مديرية التربية و التعليم/نابلس مدرسه ابن حزم الاس*	9	5	8	20	2	18	11	18	20	9	8	12	143
مديرية التربية و التعليم/نابلس مدرسه بنات ابن حزم	0	4	6	6	1	5	3	5	4	4	3	3	51
وزاره التعليم العالي	5	5	4	4	3	4	4	3	4	3	2	2	46

Table 2 Water consumption readings for rural schools.

Bait Imreen S. B. Sch.		Bait Iba S. G. Sch.		Al-Ittihad P. M. Sch.	
Consumption m³	Date of reading	Consumption m³	Date of reading	Consumption m³	Date of reading
25	31/01/2013	14	31/01/2013	11	31/01/2013
20	28/02/2013	14	28/02/2013	11	28/02/2013
30	31/03/2013	44	31/03/2013	24	31/03/2013
75	30/04/2013	38	30/04/2013	25	30/04/2013
20	31/05/2013	14	31/05/2013	20	31/05/2013
35	30/06/2013	22	30/06/2013	9	30/06/2013
20	31/07/2013	21	31/07/2013	10	31/07/2013
135	31/08/2013	27	31/08/2013	11	31/08/2013
70	30/09/2013	44	30/09/2013	26	30/09/2013
40	31/10/2013	25	31/10/2013	25	31/10/2013
20	30/11/2013	0	30/11/2013	17	30/11/2013
20	31/12/2013	26	31/12/2013	17	31/12/2013
20	31/01/2014	**289**	**Sum**	**206**	**Sum**
20	28/02/2014				
25	31/03/2014				
140	30/04/2014				
20	31/05/2014				
735	**Sum**				

Bazzary P. B.Sch.		Bazzary S.G.Sch.		Bazzary S.B.Sch.	
Consumption m³	Date of reading	Consumption m³	Date of reading	Consumption m³	Date of reading
12	31/01/2013	4.4	31/01/2013	20.4	31/01/2013
12	28/02/2013	4.4	28/02/2013	10.4	28/02/2013
17	31/03/2013	11.4	31/03/2013	11.4	31/03/2013
17	30/04/2013	16.4	30/04/2013	20.4	30/04/2013
37	31/05/2013	20.4	31/05/2013	39.2	31/05/2013
17	30/06/2013	4.4	30/06/2013	23.2	30/06/2013
24	31/07/2013	2.4	31/07/2013	33	31/07/2013
30	31/08/2013	33	31/08/2013	75	31/08/2013
54	30/09/2013	24	30/09/2013	132	30/09/2013
42	31/10/2013	84	31/10/2013	10.8	31/10/2013
30	30/11/2013	117	30/11/2013	8.4	30/11/2013
12	31/12/2013	24	31/12/2013	2.4	31/12/2013
20	31/01/2014	2.4	31/01/2014	3.6	31/01/2014
34	28/02/2014	46	28/02/2014	10.8	28/02/2014
202	31/03/2014	40	31/03/2014	10.8	31/03/2014
90	30/04/2014	21.6	30/04/2014	10.8	30/04/2014
90	31/05/2014	40	31/05/2014	58	31/05/2014
41	30/06/2014	9.6	30/06/2014	36	30/06/2014
781	**Sum**	**505.4**	**Sum**	**516.6**	**Sum**

Dair Sharaf P.B. Sch.		Al-Naqoora P.G.Sch.		Al-Naqoora S. B. Sch.	
Consumption m³	Date of reading	Consumption m³	Date of reading	Consumption m³	Date of reading
3	31/01/2013	37	31/01/2013	28	31/01/2013
3	28/02/2013	56	28/02/2013	25	28/02/2013
8	31/03/2013	16	31/03/2013	46	31/03/2013
7	30/04/2013	37	30/04/2013	51	30/04/2013
7	31/05/2013	34	31/05/2013	40	31/05/2013
3	30/06/2013	16	30/06/2013	19	30/06/2013
2	31/07/2013	16	31/07/2013	16	31/07/2013
11	31/08/2013	37	31/08/2013	56	31/08/2013
8	28/09/2013	37	30/09/2013	56	30/09/2013
6	31/10/2013	56	31/10/2013	81	31/10/2013
9	30/11/2013	25	30/11/2013	51	30/11/2013
7	31/12/2013	166	31/12/2013	28	31/12/2013
74	**Sum**	16	06/01/2014	28	06/01/2014
		16	28/01/2014	16	28/01/2014
		16	02/03/2014	46	02/03/2014
		19	31/03/2014	40	31/03/2014
		28	30/04/2014	86	30/04/2014
		151	31/05/2014	56	31/05/2014
		46	29/06/2014	28	29/06/2014
		825	**Sum**	**797**	**Sum**

Kufur Qalil S.G.S.		Dair Sharaf S. G.Sch.		Dair Sharaf .S.B.Sch	
Consumption m³	Date of reading	Consumption m³	Date of reading	Consumption m³	Date of reading
28	31/01/2013	80	31/01/2013	50	31/01/2013
50.6	28/02/2013	75	28/02/2013	54	28/02/2013
12.34	31/03/2013	130	31/03/2013	75	31/03/2013
46	30/04/2013	124	30/04/2013	76	30/04/2013
55.2	31/05/2013	71	31/05/2013	30	31/05/2013
22.92	30/06/2013	10	30/06/2013	28	30/06/2013
10	31/07/2013	5	31/07/2013	35	31/07/2013
10	31/08/2013	8	31/08/2013	62	31/08/2013
25	28/09/2013	60	28/09/2013	65	30/09/2013
30	31/10/2013	39	31/10/2013	22	31/10/2013
19	30/11/2013	56	30/11/2013	17	30/11/2013
12	31/12/2013	7	31/12/2013	29	31/12/2013
19	31/01/2014	**665**	**Sum**	**543**	**Sum**
31	28/02/2014				
21	31/03/2014				
11	30/04/2014				
16	31/05/2014				
0	30/06/2014				
419.06	**Sum**				

Kufu Qalil P.B.Sch.		Sarra S.G.Sch.		Sarra S.B.Sch.	
Consumption m³	Date of reading	Consumption m³	Date of reading	Consumption m³	Date of reading
6	31/01/2013	41	01/01/2013	18	01/01/2013
16.2	28/02/2013	49	01/02/2013	24	01/02/2013
17.7	31/03/2013	101	01/03/2013	21	01/03/2013
29.88	30/04/2013	85	01/04/2013	35	01/04/2013
22.92	31/05/2013	65	01/05/2013	18	01/05/2013
7	30/06/2013	53	01/06/2013	6	01/06/2013
60	31/07/2013	49	01/07/2013	1	01/07/2013
6	31/08/2013	135	01/08/2013	12	01/08/2013
38	30/09/2013	81	01/09/2013	30	01/09/2013
47	31/10/2013	57	01/10/2013	30	01/10/2013
22	30/11/2013	53	01/11/2013	26	01/11/2013
11	31/12/2013	45	01/12/2013	23	01/12/2013
10	31/01/2014	53	01/01/2014	14	01/01/2014
18	28/02/2014	69	01/02/2014	20	01/02/2014
10	31/03/2014	105	01/03/2014	24	01/03/2014
27	30/04/2014	53	01/04/2014	34	01/04/2014
159	31/05/2014	57	01/05/2014	27	01/05/2014
0	30/06/2014	45	01/06/2014	12	01/06/2014
507.7	**Sum**	**1196**	**Sum**	**375**	**Sum**

Bait Fureek P. B. Sch. (B)		Bait Fureek P. B. Sch.(A)		Al-Bortoghaleya P. G. Sch.	
Consumption m³	Date of reading	Consumption m³	Date of reading	Consumption m³	Date of reading
0	08/04/2013	0	08/04/2013	53	01/06/2013
0	27/04/2013	9	27/04/2013	45	01/07/2013
0	04/06/2013	15	04/06/2013	47	01/08/2013
0	09/07/2013	9	09/07/2013	27	01/09/2013
2	14/08/2013	5	14/08/2013	13	01/10/2013
0	02/09/2013	12	02/09/2013	20	01/11/2013
1	28/09/2013	10	28/09/2013	15	01/12/2013
6	02/11/2013	14	02/11/2013	11	01/01/2014
3	28/11/2013	9	28/11/2013	11	01/02/2014
10	31/12/2013	6	31/12/2013	21	01/03/2014
2	27/01/2014	3	27/01/2014	21	01/04/2014
2	25/02/2014	7	25/02/2014	13	01/05/2014
7	26/03/2014	10	26/03/2014	3	01/06/2014
12	26/04/2014	9	26/04/2014	**300**	**Sum**
6	28/05/2014	16	28/05/2014		
4	23/06/2014	5	23/06/2014		
55	**Sum**	**139**	**Sum**		

Bait Fureek S.G. Sch.		ait Fureek P.B. Sch. (highe		Bait Fureek P. G. Sch.	
Consumption m³	Date of reading	Consumption m³	Date of reading	Consumption m³	Date of reading
67	08/04/2013	13	08/04/2013	13	08/04/2013
9	24/04/2013	15	24/04/2013	15	24/04/2013
11	23/05/2013	23	23/05/2013	14	23/05/2013
20	09/07/2013	2	09/07/2013	10	09/07/2013
10	20/07/2013	7	20/07/2013	6	20/07/2013
6	29/08/2013	5	29/08/2013	10	29/08/2013
0	25/09/2013	13	25/09/2013	17	25/09/2013
7	30/10/2013	20	30/10/2013	16	30/10/2013
3	23/12/2013	20	23/12/2013	9	23/12/2013
5	28/12/2013	15	28/12/2013	11	28/12/2013
2	23/01/2014	10	23/01/2014	16	23/01/2014
2	23/02/2014	17	23/02/2014	12	23/02/2014
0	23/03/2014	20	23/03/2014	24	23/03/2014
6	23/04/2014	15	23/04/2014	11	23/04/2014
10	25/05/2014	16	25/05/2014	16	25/05/2014
4	22/06/2014	5	22/06/2014	10	22/06/2014
162	Sum	216	Sum	210	Sum
Bait dajan S.G.Sch.		**Bait dajan P.B.Sch.**		**Bait dajan S.B.Sch.**	
Consumption m³	Date of reading	Consumption m³	Date of reading	Consumption m³	Date of reading
23	01/01/2014	3	01/01/2014	14	01/01/2014
2	01/02/2014	3	01/02/2014	5	01/02/2014
8	01/03/2014	2	01/03/2014	10	01/03/2014
8	01/04/2014	13	01/04/2014	15	01/04/2014
38	01/05/2014	15	01/05/2014	16	01/05/2014
6	01/06/2014	13	01/06/2014	20	01/06/2014
23	01/01/2013	19	01/01/2013	10	01/01/2013
4	01/02/2013	4	01/02/2013	4	01/02/2013
19	01/03/2013	9	01/03/2013	11	01/03/2013
12	01/04/2013	8	01/04/2013	26	01/04/2013
9	01/05/2013	13	01/05/2013	32	01/05/2013
42	01/06/2013	13	01/06/2013	30	01/06/2013
3	01/07/2013	6	01/07/2013	7	01/07/2013
13	01/08/2013	0	01/08/2013	0	01/08/2013
34	01/09/2013	14	01/09/2013	14	01/09/2013
19	01/10/2013	14	01/10/2013	26	01/10/2013
4	01/11/2013	8	01/11/2013	21	01/11/2013
18	01/12/2013	8	01/12/2013	18	01/12/2013
285	Sum	165	Sum	279	Sum
Sebastya P.B. Sch.		**Sebastya S.G.Sch.**		**Sebastya S.B.Sch.**	
Consumption m³	Date of reading	Consumption m³	Date of reading	Consumption m³	Date of reading
4	01/01/2013	2	01/01/2013	22	01/01/2013
8	01/02/2013	16	01/02/2013	24	01/02/2013
14	01/03/2013	17	01/03/2013	23	01/03/2013
14	01/04/2013	39	01/04/2013	28	01/04/2013
17	01/05/2013	24	01/05/2013	23	01/05/2013
11	01/06/2013	4	01/06/2013	8	01/06/2013
0	01/07/2013	3	01/07/2013	9	01/07/2013
0	01/08/2013	19	01/08/2013	4	01/08/2013
25	01/09/2013	54	01/09/2013	21	01/09/2013
15	01/10/2013	13	01/10/2013	16	01/10/2013
18	01/11/2013	14	01/11/2013	17	01/11/2013
1	01/12/2013	4	01/12/2013	10	01/12/2013
127	Sum	209	Sum	205	Sum

Asira P.B.Sch.		Asira P.G.Sch.(A)		Masqat P.B.Sch.	
Consumption m³	Date of reading	Consumption m³	Date of reading	Consumption m³	Date of reading
60	12/01/2013	6	12/01/2013	10	12/01/2013
26	02/02/2013	9	02/02/2013	0	02/02/2013
10	11/03/2013	0	11/03/2013	0	11/03/2013
16	02/04/2013	4	02/04/2013	0	02/04/2013
30	07/05/2013	26	07/05/2013	30	07/05/2013
0	05/06/2013	10	05/06/2013	3	05/06/2013
67	10/07/2013	10	10/07/2013	0	10/07/2013
0	13/08/2013	0	13/08/2013	0	13/08/2013
81	12/09/2013	1	12/09/2013	17	12/09/2013
40	12/10/2013	24	12/10/2013	40	12/10/2013
36	10/11/2013	0	10/11/2013	20	10/11/2013
20	17/12/2013	20	17/12/2013	20	17/12/2013
21	14/01/2014	0	14/01/2014	20	14/01/2014
407	Sum	110	Sum	160	Sum

Asira S.G.Sch.(canteen)		Asira P.B.Sch.(canteen)		Asira S.G.Sch.	
Consumption m³	Date of reading	Consumption m³	Date of reading	Consumption m³	Date of reading
2	12/01/2013	0	12/01/2013	8	12/01/2013
0	02/02/2013	0	02/02/2013	5	02/02/2013
1	11/03/2013	0	11/03/2013	5	11/03/2013
0	02/04/2013	0	02/04/2013	20	02/04/2013
1	07/05/2013	1	07/05/2013	30	07/05/2013
10	05/06/2013	0	05/06/2013	25	05/06/2013
0	10/07/2013	0	10/07/2013	15	10/07/2013
0	13/08/2013	0	13/08/2013	0	13/08/2013
21	12/09/2013	0	12/09/2013	27	12/09/2013
5	12/10/2013	0	12/10/2013	30	12/10/2013
2	10/11/2013	0	10/11/2013	37	10/11/2013
1	17/12/2013	0	17/12/2013	20	17/12/2013
7	14/01/2014	0	14/01/2014	38	14/01/2014
50	Sum		Sum	260	Sum

Table 3 Average water consumption per occupant for (UPF) school

UPF Schools				
School Name	**No. of Student**	**Qty of Water Consumed (m^3)**	**Period of Consumption (days)**	**Consumption l/s.d**
Al-KhaldiyahSchool	269.5	236	198	4.42
IbrahimSnobarSchool	413.75	386	198	4.71
AsmaBintAl-SeddeqSchool	205.75	1208	198	29.65
Al-KhansaSchool	177.75	113	198	3.21
Al-KarmelSchool	357	508	198	7.19
Al-Nethameya(B) School	194.5	153	198	3.97
Al-khdegyehSchool	534	110	198	1.04
Al-Nethameyah(A) School	115.5	278	198	12.16
Ibn Sina School	223.5	29	198	0.66
Al-ImamAl-Shafi'ISchool	137	207	198	7.63
Al-ImamAliSchool	247	145	198	2.96
Al-ZainabiehSchool	116	146	198	6.36
BisanSchool	165.5	209	198	6.38
JameelaBouherdSchool	104	142	198	6.90
RafediaSchool	465.5	250	198	2.71
SaeedBinAmerSchool	385.25	338	198	4.43
SameerAbdulhadiSchool	550.5	300	198	2.75
ZaferAl-MasriSchool	424.75	633	198	7.53
Adel Zu'aytir School	278.5	126	198	2.28
AbdullatifHawashSchool	276.5	459	198	8.38
Othman Ibn Affan School	728.5	288	198	2.00
OmarAl-MukhtarSchool	304.5	158	198	2.62
FadwaTukanSchool	430.75	333	198	3.90
MahmoudAbu-GhazalehSchool	287.5	266	198	4.67
YasserArafatSchool	477	300	198	3.18

Table 4 Average water consumption per occupant for (UPM) school

UPM Schools				
School Name	No. of Student	Qty of Water Consumed (m^3)	Period of Consumption (days)	Consumption l/s.d
Ibn Al-Haytham School	740.5	373	198	2.54
Ibn Hazm (B)School	323	194	198	3.03
Ibn Qoutaiba School	911.25	1315	198	7.29
AbuBakerAl-SiddeeqLow-BasicSchool for Boys	263.5	212	198	4.06
AbuBakrAl-SiddeeqHigh-BasicSchool for Boys	331.75	1166	198	17.75
Al-HassanBinAliSchool	269	264	198	4.96
Al-RaziSchool	168.5	135	198	4.05
Al-ZainabiehSchool	83	166	198	10.10
Martyr Sa'ed SayelSchool	490.5	573	198	5.90
Al-GhazaliyaSchool	484.75	356	198	3.71
Al-MakhfeyahSchool	434.5	331	198	3.85
Al-Ma'rri School	229.5	164	198	3.61
Burhan Kamal School	247	405	198	8.28
Bassam Shak'a School	787.5	480	198	3.08
HassanArafatSchool	107	125	198	5.90
HasibAl-SabbaghSchool	232.5	220	198	4.78
RouhiMalhasSchool	386.25	238	198	3.11
Riyad Borhan Kamal School	399.5	367	198	4.64
Tariq Ibn Ziyad School	193	243	198	6.36
AbdulmoghaitAl-ansariSchool	339	317	198	4.72
Abdul-RahimJardanehSchool	486.5	122	198	1.27
FahmiAl-SaifiSchool	500	274	198	2.77
MunibRashidAl-MasriSchool	418.75	237	198	2.86
Al-AmeriyaSchool	157	43	198	1.38
Na'eem AbdelHadiSchool	310.25	205	198	3.34

Table 5 Average water consumption per occupant for (USM) school

USM Schools				
School Name	No. of Student	Qty of Water Consumed (m^3)	Period of Consumption (days)	Consumption l/s.d
Al-SlaheyahSchool	640.75	1265	198	9.97
Al-KindiSchool	577	872	198	7.63
Al-MasakenSchool	329.25	324	198	4.97
King Talal School	445.5	725	198	8.22
Prince sarem Al-DeenAl-Najmi School	468.25	816	198	8.80
AbdulHamidSayehSchool	481.5	870	198	9.13
Omar Ibn Al-Khattab School	443.75	214	198	2.44
Amr Ibn Al-Aas School	366	359	198	4.95
QadriTouqanSchool	729	717	198	4.97
LutfeyahAl-SaifiSchool	336.25	178	198	2.67

Table 6 Average water consumption per Occupant for (USF) school

USF Schools				
School Name	No. of Student	Qty of Water Consumed (m^3)	Period of Consumption (days)	Consumption l/s.d
HajAliAl-TibiSchool	648.25	355	198	2.77
HajMazuzAl-MasriSchool	554.5	192	198	1.75
HajjaRashdaAl-MasriSchool	969	539	198	2.81
SheikhMohammedTuphahah School	686.25	583	198	4.29
Al-Salaheyyah School	352	164	198	2.35
Al-Aesheyah School	510.75	1086	198	10.74
Al-Fatimia School	351.75	351	198	5.04
Al-YarmoukSchool (Balata)	347.75	795	198	11.55
Gamal AbdelNasser School	542.5	277	198	2.58
Samir Sa'ad Eddin School	644.25	635	198	4.98
AbdulRahimMahmoud School	496.5	230	198	2.34
IraqAl-Tayeh Secondary School	392	171	198	2.20
Qordoba Secondary School (Askar)	352.5	401	198	5.75
Jamal Al-Masri School	529	1022	198	9.76
Kamal Jumblat School	582.5	434	198	3.76

Table 7 Average Water Consumption per occupant for (RSM) school

RSM Schools						
School Name	Lowest class	Top class	No. of Student	Qty of Water Consumed (m^3)	Period of Consumption (days)	Consumption l/s.d
Sebastia School	7 th Grade	12 th Grade	351.3	205	176	3.32
BeitDagan School	1 st Grade	12 th Grade	218.5	279	264	4.84
Zawata School	5 th Grade	12 th Grade	185.8	468	198	12.72
DeirSharafSchool	5 th Grade	12 th Grade	242.5	543	176	12.72
BaitImreen School	8 th Grade	12 th Grade	205.2	147	264	2.71
Al-Naqoura School	1 st Grade	12 th Grade	302.7	160	264	2.00
Sarra School	1 st Grade	12 th Grade	370.3	375	264	3.84
Bizzariya School	5 th Grade	12 th Grade	258.0	488	264	7.16

Table 8 Average water consumption per occupant for (RSF) school

RSF Schools				
School Name	No. of Student	Qty of Water Consumed (m^3)	Period of Consumption (days)	Consumption l/s.d
AssiraAl-Shamaleyah School	519.5	310	198	3.01
BeitFurik School	627.3	162	264	0.98
BeitDagan School	509.2	285	264	2.12
Sebastia School	455.8	209	176	2.61
DeirSharaf School	323.0	665	176	11.70
KafrQalil School	308.7	419	264	5.14
BaitImreen School	457.3	278	264	2.30
Bizzariya School	405.5	568	264	5.31
Hamza bin Abdul-Muttalib School	388.5	2572	176	37.62
Sarra School	384.0	1196	264	11.80
BeitIba School	422.5	289	176	3.89

Table 9 Average water consumption per occupant for (RSF) school

RPF Schools				
School Name	No. of Student	Qty of Water Consumed (m^3)	Period of Consumption (days)	Consumption l/s.d
PortugueseSchool / Beit Furik	426.0	300	198	3.56
BeitFurikSchool	914.5	210	264	0.87
AsiraAl-ShamaleyahSchool	158.0	110	176	3.96
ZawataSchool	390.5	682	198	8.82
NaqouraSchool	199.3	165	264	3.14
AzmutSchool	0.0		176	#DIV/0!
			176	#DIV/0!

Table 10 Average water consumption per occupant for (RPM) school

RPM Schools				
School Name	No. of Student	Qty of Water Consumed (m^3)	Period of Consumption (days)	Consumption l/s.d
MuscatBasicSchool for Boys / Assira	419.3	160	198	1.93
AsiraAl-ShamaleyahBasicSchool for Boys	477.5	407	198	4.30
SebastiaBasicSchool for Boys	184.0	127	176	3.92
BeitDaganBasicSchool for Boys	260.0	165	264	2.40
BeitFurikBasicSchool for Boys	575.0	189	264	1.25
Beit Furik high-Basic School for Boys	560.5	216	264	1.46
DeirSharafBasicSchool for Boys	149.3	74	176	2.82
KafrQalilBasicSchool for Boys	290.2	507	242	7.22
BaitImreenBasicSchool for Boys	238.2	152	264	2.42
BizzariyaBasicSchool for Boys	121.0	195	264	6.10

Table 11Water fixtures count for rural and urban schools

	Toilets of Staff			Toilets of Students			Laundries			Drinking Water Taps				
Number of urinals (for male students)	Mixed	Females	Males	Mixed	Females	Males	Mixed	Females	Males	Mixed	Females	Males	School Name	Number
0	0	1	0	0	6	0	0	2	0	0	8	0	Ibn Sina Basic School for Girls	1
0	0	2	0	0	5	0	0	2	0	0	5	0	Aadel Zu'aytir Basic School for Girls	2
0	0	2	0	0	11	0	0	3	0	0	15	0	Zafer Masri Basic School for Girls	3
0	0	1	0	0	4	0	0	4	0	0	14	0	Omar Mukhtar Basic School for Girls	4
0	0	1	0	0	3	0	0	2	0	0	9	0	Bisan Basic School for Girls	5
0	0	1	0	0	6	0	0	2	0	0	9	0	Asma Bint Al-Seddeq Basic School for Girls	6
0	0	2	0	0	8	0	0	4	0	0	8	0	Abdullatif Hawash Basic School for Girls	7
0	0	2	0	0	23	0	0	15	0	0	14	0	Othman Ibn Affan Basic School for Girls	8
0	0	1	0	0	5	0	0	3	0	0	9	0	Imam Ali Basic School for Girls	9
0	0	2	0	0	9	0	0	4	0	0	10	0	Alkhdegeyah Basic School for Girls	10
0	0	1	0	0	10	0	0	4	0	0	8	0	Al-Carmel Basic School for Girls	11
0	0	1	0	0	5	0	0	2	0	0	5	0	Al-Nethameyah Basic School for Girls (A)	12

0	0	2	0	0	9	0	0	3	0	0	10	0	Rafedia Basic School for Girls	13
0	0	2	0	0	7	0	0	3	0	0	8	0	Sa'id bin Amer Basic School for Girls	14
0	0	1	0	0	4	0	0	3	0	0	8	0	Al-Nethameyah Basic School for Girls (B)	15
0	0	2	0	0	8	0	0	4	0	0	9	0	Fadwa Touqan Basic School for Girls	16
0	0	1	0	0	4	0	0	2	0	0	5	0	Imam Shafi'i Basic School for Girls	17
0	0	2	0	0	17	0	0	17	0	0	16	0	Yasser Arafat Basic School for Girls	18
0	0	1	0	0	3	3	0	1	2	5	0	0	Khadija,(the mother of believers) Basic-Mixed School	19
0	0	3	0	0	9	0	0	5	0	0	9	0	Samir Abd al-Hadi Basic School for Girls	20
0	0	2	0	0	12	0	0	8	0	0	7	0	Ibrahim Snobar Basic School for Girls	21
0	0	2	0	0	10	0	0	4	0	0	9	0	Mahmoud Abu-Ghazaleh Elementary Girls	22
0	0	6	0	0	9	0	0	5	0	0	12	0	Nablus Turkish Elementary Girls	23
0	0	2	0	0	3	0	0	1	0	0	12	0	Nablus Basic School for Girls	24
0	0	1	0	0	4	0	0	1	0	0	5	0	Jameela Bouherd Basic School for Girls	25
0	0	1	0	0	3	0	0	1	0	0	8	0	Zainabieh Basic School for Girls	26
0	0	2	0	0	6	0	0	2	0	0	7	0	Khalidiya Basic School for Girls	27
0	0	1	0	0	7	0	0	6	0	0	6	0	Khansa Basic School for Girls	28
0	0	0	2	0	0	8	0	0	2	0	0	9	Fahmi Al-SaifiBasicSchool for Boys	29

12	0	0	2	0	0	11	0	0	5	0	0	10	Martyr SaadSayelBasicSchool for Boys	30
0	0	1	0	0	3	3	0	3	3	6	0	0	Omar Naim Abdel Hadi basic-mixed for Boys	31
0	0	0	2	0	0	5	0	0	6	0	0	14	Al-Ma'arri BasicSchool for Boys	32
17	0	0	1	0	0	16	0	0	8	0	0	12	Ibn Qoutaiba Basic School for Boys	33
7	0	1	2	0	0	8	0	0	5	0	0	10	Bassam Shaka'a BasicSchool for Boys	34
5	0	0	2	0	0	5	0	0	3	0	0	8	Aameria BasicSchool for Boys	35
0	0	1	1	0	0	4	0	0	1	0	0	6	Tariq ibn Ziyad Basic School for Boys	36
0	0	0	1	0	0	4	0	0	0	0	0	8	Hassan ArafatBasicSchool for Boys	37
0	0	0	2	0	0	9	0	0	4			9	Abu BakrBasic-HighSchool for Boys	38
2	0	0	1	0	0	4	0	0	1	0	0	6	Al-Razi BasicSchool for Boys	39
0	1	0	1	0	0	2	0	0	1	0	0	4	Al-Zainabieh BasicSchool for Boys	40
1	0	2	2	0	0	3	0	0	3	0	0	10	Abd-Almoghait Al-AnsariBasicSchool for Boys	41
3	0	0	2	0	0	9	0	0	5	0	0	8	Hasib SabbaghBasicSchool for Boys	42
6	0	0	2	0	0	9	0	0	6	0		6	Ibn al-Haytham Basic School for Boys	43
0	0	0	8	0	0	12	0	0	6	0	0	8	Abdul RahimJardanehBasic School for Boys	44

0	0	1	1	0	2	2	0	2	1	8	0	0	Bilal BinRabahBasic-MixedSchool	45
0	0	1	0	0	4	3	0	2	2	8	0	0	Sa'ad BinAbiWaqasBasic-MixedSchool	46
0	0	1	2	0	0	8	0	0	4	0	0	4	Ghazaliya BasicSchool for Boys	47
3	0	0	2	0	0	6	0	0	4	0	0	9	Burhan Kamal BasicSchool for Boys	48
0	0	1	0	0	2	2	2	1	1	5	0	0	Fatima HbaishehBasic-MixedSchool	49
3	0	0	2	0	0	6	0	0	6	0	0	15	Al-Hassan BinAliBasicSchool for Boys	50
0	0	0	2	0	0	10	0	0	6	0	0	9	Rouhi MalhasBasicSchool for Boys	51
7	0	0	2	0	0	8	0	0	5	0	0	8	Abu BakerAl-SiddeeqLow-BasicSchool for Boys	52
0	0	1	1	0	0	10	0	0	8	0	0	8	Reyad Kamal BasicSchool for Boys	53
5	0	0	2	0	0	12	0	0	4	0	0	16	Al-Makhfeyah BasicSchool for Boys	54
0	2	0	0	0	4	3	5	0	0	9	0	0	Martyr NasserLeddawiBasic-MixedSchool	55
0	0	0	1	0	0	6	0	0	4	0	0	6	Ibn Hazm Basic School for Boys(A)	56
0	0	0	2	0	0	7	0	0	5	0	0	8	Haj MohammadAliQurmanBasicSchool for Boys	57

0	0	0	3	0	0	6	0	0	6	0	0	7	Yoseph BarqawiBasicSchool for Boys	58
0	0	0	2	0	0	8	0	0	4	0	0	8	Munib RashidMasriBasicSchool for Boys	59
3	0	0	2	0	0	6	0	0	2	0	0	12	Ibn Hazm Basic School for Boys (B)	60
0	0	0	5	0	0	4	0	0	4	0	0	7	Naim AbdelHadiBasicSchool for Boys	61
0	0	2	0	0	10	0	0	12	0	0	10	0	Al-Salaheya Secondary School for Girls	62
0	0	1	0	0	9	0	0	1	0	0	10	0	Fatimia Secondary School for Girls	63
0	0	4	0	0	6	0	0	6	0	0	15	0	Gamal AbdelNasserSecondary School for Girls	64
0	0	2	0	0	9	0	0	3	0	0	12	0	Samir Sa'ad EddinSecondary School for Girls	65
0	0	4	0	0	11	0	0	4	0	0	15	0	Hajja RashdaAl-MasriSecondary School for Girls	66
0	0	3	0	0	10	0	0	7	0	0	15		Kamal JumblattSecondary School for Girls	67
0	0	4	0	0	12	0	0	3	0	0	12	0	Haj MazuzAl-MasriSecondary School for Girls	68
0	0	2	0	0	20	0	0	16	0	0	9	0	Haj AliTibiSecondary School for Girls	69
0	0	6	0	0	8	0	0	7	0	0	6	0	Jamal Al Masri Secondary School for Girls	70
0	0	3	0	0	16	0	0	4	0	0	12	0	Iraq Al-TayehSecondary School for Girls	71
0	0	2	0	0	16	0	0	11	0	0	14	0	Yarmouk Secondary School for Girls	72

0	0	2	0	0	16	0	0	8	0	0	12	0	Qordoba Secondary School for Girls	73
0	0	3	0	0	10	0	0	5	0	0	8	0	Alaeshiah Secondary School for Girls	74
0	0	2	0	0	18	0	0	12	0	0	8	0	Sheikh MohammedTuphahahSecondary School for Girls	75
0	0	3	0	0	8	0	0	4	0	0	8	0	Abdul RahimMahmoudSecondary School for Girls	76
5	0	0	2	0	0	7	0	0	5	0	0	8	King Talal BinAbdullahSecondary School for Boys	77
5	0	0	3	0	0	16	0	0	6	0	0	20	Qadri TouqanSecondary School for Boys	78
5	0	0	2	0	0	6	0	0	6	0	0	5	Amr ibn al-Aas Secondary School for Boys	79
2	0	0	2	0	0	8	0	0	10	0	0	8	Abdul HamidAl-SayehSecondary School for Boys	80
5	0	0	5	0	0	8	0	0	7	0	0	16	Al-Salaheyah Secondary School for Boys	81
8	0	0	8	0	0	8	0	0	6	0	0	9	Prince sarem Al-DeenAl-NajmiSecondary School for Boys	82
0	0	0	2	0	0	14	0	0	8	0	0	16	Al-Masaken Secondary School for Boys	83
8	0	0	3	0	0	7	0	0	5	0	0	8	Lutfeyah Al-SaifiSecondary School for Boys	84
0	0	0	1	0	0	6	0	0	3	0	0	10	Omar bin KhattabSecondary School for Boys	85
4	0	0	4	0	0	10	0	0	6	0	0	10	Al-Kindi Secondary School for Boys	86

0	0	2	0	0	4	3	0	2	1	8	0	0	Zawata Basic-MixedSchool	87
0	0	1	0	0	7	0	0	7	0	0	8	0	Naqoura BasicSchool for Girls	88
0	0	2	0	0	24	0	0	8	0	0	12	0	Beit FurikBasicSchool for Girls	89
0	0	3	0	0	9	0	0	3	0	0	8	0	Till BasicSchool for Girls	90
0	0	3	0	0	6	0	0	6	0	0	6	0	Assira BasicSchool for Girls A	91
0	0	2	0	0	2	0	0	1	0	0	2	0	Assira BasicSchool for Girls (B)	92
0	0	2	0	0	7	0	0	4	0	0	6	0	Azmut BasicSchool for Girls	93
0	0	2	0	0	12	0	0	16	0	0	8	0	Portuguese BasicSchool for Girls - Beit Furik	94
3	0	1	1	0	4	2	0	2	2	0	9	9	BaitWazanBasic-mixedSchool	78
6	0	0	1	0	0	6	0	0	5	0	0	5	SebastiaBasicSchool for Boys	83
0	0	0	2	0	0	6	0	0	3	0	0	10	KafrQalilBasicSchool for Boys	96
0	0	1	1	0	0	12	0	0	4	0	0	7	AssiraBasicSchool for Boys	97
0	0	1	0	0	2	2	0	1	1	6	0	0	NesfIjbailBasic-MixedSchool	98
0	0	1	1	0	0	6	0	1	3	0	0	5	BurqaBasicSchool for Boys	99
0	0	0	2	0	0	7	0	0	8	0	0	8	RouhiAl-HindiBasicSchool for Boys / Till	109
5	0	2	2	0	0	6	0	0	2	0	0	10	BeitFurikBasicSchool for Boys	110
3	0	1	1	0	0	3	0	0	3	0	0	4	DeirSharafBasicSchool for Boys	133
0	0	0	2	0	0	7	0	0	2	0	0	6	BeitFurikHigh-BasicSchool for Boys	134

0	0	3	0	0	2	2	7	0		7			Deir al-Hatab Basic-mixed School	135
0	0	0	2	0	0	4	0	0	10	0	0	7	MuscatHigher-BasicSchool for Boys	136
0	0	0	4	0	0	4	0	0	2	0	0	4	BaitImreenBasicSchool for Boys	137
7	0	0	2	0	0	7	0	0	7	0	0	8	Mohammed bin Rashid Al Maktoum Basic School for Boys / Tel	140
3	0	0	2	0	0	12	0	0	6	0	0	16	Salem / Deir al-Hatab Basic School for Boys	151
0	0	0	1	0	0	4	0	0	4	0	0	5	BizzariyaBasicSchool for Boys	152
0	0	2	2	0	0	12	0	0	2	0	0	8	Al-IttihadBasicSchool for Boys	163
0	0	1	0	0	12	0	0	7	0	0	8	0	SebastiaSecondary School for Girls	76
0	0	2	0	0	9	0	0	2	0	0	6	0	BeitIbaSecondary School for Girls	77
0	0	1	0	0	9	0	0	4	0	0	11	0	DairSharafSecondary School for Girls	81
0	0	2	0	0	7	0	0	5	0	0	6	0	BaitImreenSecondary School for Girls	88
0	0	5	0	0	13	0	0	8	0	0	14	0	BeitDaganSecondary School for Girls	90
0	0	2	0	0	6	0	0	2	0	0	12	0	YassidSecondary School for Girls	93
0	0	2	0	0	10	0	0	4	0	0	8	0	Deiral-HatabSecondary School for Girls	94
0	0	1	0	0	4	0	0	8	0	0	8	0	AzmutSecondary School for Girls	100
0	0	1	0	0	14	0	0	9	0	0	15	0	SalemSecondary School for Girls	101
0	0	2	0	0	11	0	0	6	0	0	9	0	Mohammed bin Rashid Al Maktoum Secondary School for Girls / Rujeib	102

0	0	2	0	0	11	0	0	5	0	0	8	0	BurqaSecondary School for Girls	106
0	0	4	0	0	10	0	0	3	0	0	10	0	Till Secondary School for Girls	112
0	0	2	0	0	12	0	0	6	0	0	8	0	BeitFurikSecondary School for Girls	113
0	0	2	0	0	1	0	0	3	0	0	7	0	AssiraSecondary School for Girls	114
0	0	1	0	0	7	0	0	3	0	0	3	0	SarraSecondary School for Girls	118
0	0	1	0	0	3	0	0	2	0	0	7	0	Taluzah Secondary School for Girls	95
0	0	3	0	0	4	0	0	2	0	0	5	0	Kafr QalilSecondary School for Girls	96
0	0	2	0	0	4	0	0	2	0	0	6	0	Qusin Secondary School for Girls	97
0	0	5	0	0	6	0	0	3	0	0	8	0	Bizzariya Secondary School for Girls	98
15	0	2	5	0	2	12	0	1	7	19	0	0	Beit Dagan mixed-secondary School	99
4	0	0	2	0	1	9	0	1	2	0	0	15	Taluzah secondary-Mixed School	100
0	0	1	2	0	1	6	0	1	2	5	2	8	Naqoura Mixed-secondarySchool	101
3	0	0	2	0	0	8	0	0	3	0	0	6	Yassid Secondary School for Boys	102
7	0	0	2	0	0	8	0	0	4	0	0	9	Rujeib Secondary School for Boys	103
0	0	1	1	0	5	5	0	3	3	0	4	4	Frush Beit Dagan Mixed-secondary	104
0	0	0	2	0	1	12	0	0	6	6	0	0	Bait ImreenMixed-secondarySchool	105
7	0	0	2	0	3	10	0	3	6	0	5	8	Sebastia Mixed-secondary	106
0	0	0	2	0	0	10	0	0	2	0	0	8	Burqa Secondary School for Boys	107
0	0	1	1	0	1	13	0	1	6	0	0	12	Wadi Al - BadanSecondary-MixedSchool	108
6	0	0	2	0	0	9	0	0	5	0	0	10	Till Secondary School for Boys	109

0	0	0	1	0	5	4	0	3	3	0	2	12	Deir SharafSecondary-MixedSchool	110
0	0	0	1	0	0	8	0	0	3	0	0	12	Salem / Deiral-HatabSecondary School for Boys	111
0	0	1	1	0	3	3	0	2	2	0	6	6	Alaqrabanyah secondary-Mixed School	112
7	0	0	3	0	0	11	0	0	4	0		10	Beit FurikSecondary School for Boys	113
0	0	2	2	0	0	6	0	0	1	0	0	12	Sarra Secondary School for Boys	114
4	0	0	3	0	0	11	0	0	3	0	0	10	Assira Secondary School for Boys	115
0	0	2	4	0	1	4	0	1	3	0	1	8	Zawata Secondary-MixedSchool	116
3	0	0	6	0	0	6	0	0	4	0	0	12	Azmut Secondary School for Boys	117
3	0	0	3	0	0	12	0	0	8	0	0	14	Qusin Secondary school for Boys	118
0	0	0	5	0	2	12	0	2	6	0	2	8	Muscat secondary-Mixed School - Beit Iba	119
0	0	0	2	0	0	13	0	0	7	0	0	8	Bizzariya Secondary School for Boys	120

Table 12Students count and school building data for rural and urban area

The total area of the school grounds (m^2)	Area of School Building	Area of school playgrounds	Total No. of Students	Number of students / females	Number of students / male	No. of Classes	Top class	Lowest class	School Name	Number
5000.00	640.00	450.00	198	198	0	8	8 th Grade	7 th Grade	Ibn Sina Basic School for Girls	1
2200.00	450.00	1750.00	225	225	0	9	7 th Grade	5 th Grade	Aadel Zu'aytir Basic School for Girls	2
2669.00	2225.00	1444.00	335	335	0	12	11 th Grade	5 th Grade	Zafer Masri Basic School for Girls	3
1577.00	908.00	300.00	279	279	0	10	9 th Grade	6 th Grade	Omar Mukhtar Basic School for Girls	4
2000.00	374.00	500.00	199	199	0	8	6 th Grade	1 st Grade	Bisan Basic School for Girls	5
700.00	450.00	320.00	160	160	0	7	7 th Grade	1 st Grade	Asma Bint Al-Seddeq Basic School for Girls	6
1365.00	1420.00	700.00	264	264	0	8	4 th Grade	1 st Grade	Abdullatif Hawash Basic School for Girls	7
5000.00	2200.00	2000.00	697	697	0	20	10 th Grade	1 st Grade	Othman Ibn Affan Basic School for Girls	8
1767.00	382.00	1385.00	249	249	0	9	6 th Grade	1 st Grade	Imam Ali Basic School for Girls	9
2000.00	860.00	1140.00	514	514	0	14	6 th Grade	1 st Grade	Alkhdegeyah Basic School for Girls	10
1229.00	641.00	588.00	317	317	0	12	10 th Grade	9 th Grade	Al-Carmel Basic School for Girls	11
1100.00	330.00	500.00	86	86	0	4	2 nd Grade	1 st Grade	Al-Nethameyah Basic School for Girls (A)	12
3826.00	1222.00	2604.00	460	460	0	12	10 th Grade	7 th Grade	Rafedia Basic School for Girls	13
1577.00	1508.00	1200.00	383	383	0	12	6 th Grade	1 st Grade	Sa'id bin Amer Basic School for Girls	14

1000.00	382.00	429.00	177	177	0	6	5 th Grade	3 rd Grade	Al-Nethameyah Basic School for Girls (B)	15
2000.00	1880.00	1530.00	407	407	0	12	6 th Grade	1 st Grade	Fadwa Touqan Basic School for Girls	16
320.00	165.00	67.00	116	116	0	6	6 th Grade	1 st Grade	Imam Shafi'i Basic School for Girls	17
5000.00	2300.00	1000.00	427	427	0	15	10 th Grade	1 st Grade	Yasser Arafat Basic School for Girls	18
544.00	323.00	133.00	165	89	76	8	6 th Grade	1 st Grade	Khadija,(the mother of believers) Basic-Mixed School	19
2548.00	2130.00	1100.00	549	549	0	18	9 th Grade	1 st Grade	Samir Abd al-Hadi Basic School for Girls	20
3338.00	2407.00	550.00	429	429	0	14	9 th Grade	1 st Grade	Ibrahim Snobar Basic School for Girls	21
950.00	1470.00	710.00	303	303	0	11	6 th Grade	1 st Grade	Mahmoud Abu-Ghazaleh Elementary Girls	22
3000.00	2500.00	2000.00	235	235	0	11	10 th Grade	1 st Grade	Nablus Turkish Elementary Girls	23
482.00	325.00	156.00	108	108	0	6	6 th Grade	1 st Grade	Nablus Basic School for Girls	24
1000.00	300.00	120.00	88	88	0	6	6 th Grade	1 st Grade	Jameela Bouherd Basic School for Girls	25
500.00	340.00	160.00	96	96	0	6	6 th Grade	1 st Grade	Zainabieh Basic School for Girls	26
1404.00	677.00	690.00	245	245	0	9	8 th Grade	7 th Grade	Khalidiya Basic School for Girls	27
1528.00	368.00	533.00	172	172	0	8	4 th Grade	1 st Grade	Khansa Basic School for Girls	28
1140.00	1230.00	416.00	467	0	467	15	9 th Grade	1 st Grade	Fahmi Al-Saifi Basic School for Boys	29
3400.00	1830.00	1140.00	485	0	485	14	8 th Grade	1 st Grade	Martyr Saad Sayel Basic School for Boys	30
1338.00	288.00	500.00	142	78	64	7	7 th Grade	1 st Grade	Omar Naim Abdel Hadi basic-mixed for Boys	31
900.00	338.00	180.00	205	0	205	9	6 th Grade	3 rd Grade	Al-Ma'arri Basic School for Boys	32
4208.00	802.00	1161.00	839	0	839	22	9 th Grade	1 st Grade	Ibn Qoutaiba Basic School for Boys	33

1974.00	1750.00	700.00	730	0	730	20	8 th Grade	1 st Grade	Bassam Shaka'a Basic School for Boys	34
3500.00	500.00	500.00	151	0	151	7	10 th Grade	8 th Grade	Aameria Basic School for Boys	35
667.00	373.00	217.00	196	0	196	7	7 th Grade	1 st Grade	Tariq ibn Ziyad Basic School for Boys	36
1258.00	197.00	1061.00	106	0	106	4	4 th Grade	1 st Grade	Hassan Arafat Basic School for Boys	37
4968.00	1540.00	540.00	307	0	307	10	10 th Grade	6 th Grade	Abu Bakr Basic-High School for Boys	38
77600.00	270.00	506.00	158	0	158	7	4 th Grade	1 st Grade	Al-Razi Basic School for Boys	39
700.00	200.00	200.00	86	0	86	4	2 nd Grade	1 st Grade	Al-Zainabieh Basic School for Boys	40
1788.00	1634.00	1244.00	286	0	286	8	4 th Grade	1 st Grade	Abd-Almoghait Al-Ansari Basic School for Boys	41
1364.00	1388.00	976.00	215	0	215	8	4 th Grade	1 st Grade	Hasib Sabbagh Basic School for Boys	42
2370.00	1350.00	1020.00	657	0	657	21	9 th Grade	1 st Grade	Ibn al-Haytham Basic School for Boys	43
2090.00	1453.00	582.00	505	0	505	13	10 th Grade	8 th Grade	Abdul Rahim Jardaneh Basic School for Boys	44
1509.00	903.00	785.00	247	123	124	9	7 th Grade	1 st Grade	Bilal Bin Rabah Basic-Mixed School	45
550.00	500.00	300.00	261	150	111	10	6 th Grade	1 st Grade	Sa'ad Bin Abi Waqas Basic-Mixed School	46
2018.00	1812.00	653.00	438	0	438	13	10 th Grade	5 th Grade	Ghazaliya Basic School for Boys	47
2221.00	988.00	1433.00	224	0	224	10	10 th Grade	1 st Grade	Burhan Kamal Basic School for Boys	48
440.00	167.00	273.00	141	61	80	5	5 th Grade	1 st Grade	Fatima Hbaisheh Basic-Mixed School	49
673.00	955.00	235.00	228	0	228	7	6 th Grade	1 st Grade	Al-Hassan Bin Ali Basic School for Boys	50
3000.00	1800.00	1200.00	364	0	364	11	10 th Grade	1 st Grade	Rouhi Malhas Basic School for Boys	51

1732.00	1260.00	640.00	257	0	257	10	5 th Grade	1 st Grade	Abu Baker Al-Siddeeq Low-Basic School for Boys	52
4400.00	1911.00	1615.00	410	0	410	12	7 th Grade	1 st Grade	Reyad Kamal Basic School for Boys	53
2489.00	1867.00	960.00	456	0	456	12	9 th Grade	5 th Grade	Al-Makhfeyah Basic School for Boys	54
2156.00	950.00	364.00	146	83	63	7	7 th Grade	1 st Grade	Martyr Nasser Leddawi Basic-Mixed School	55
300.00	200.00	100.00	70	0	70	4	2 nd Grade	1 st Grade	Ibn Hazm Basic School for Boys(A)	56
2150.00	2150.00	750.00	511	0	511	16	9 th Grade	1 st Grade	Haj Mohammad Ali Qurman Basic School for Boys	57
2191.00	598.00	1000.00	82	0	82	4	8 th Grade	5 th Grade	Yoseph Barqawi Basic School for Boys	58
1830.00	1125.00	598.00	385	0	385	10	7 th Grade	5 th Grade	Munib Rashid Masri Basic School for Boys	59
1664.00	780.00	1040.00	280	0	280	10	7 th Grade	3 rd Grade	Ibn Hazm Basic School for Boys (B)	60
2620.00	1000.00	1400.00	312	0	312	10	8 th Grade	1 st Grade	Naim Abdel Hadi Basic School for Boys	61
3700.00	1260.00	1300.00	368	368	0	12	12 th Grade (commercial)	9 th Grade	Al-Salaheya Secondary School for Girls	62
3060.00	1000.00	70.00	280	280	0	12	12 th Grade (commercial)	10 th Grade	Fatimia Secondary School for Girls	63
6445.00	2403.00	600.00	442	442	0	14	12 th Grade (Literary)	11 th Grade (Scientific)	Gamal Abdel Nasser Secondary School for Girls	64
4091.00	2546.00	2800.00	540	540	0	16	12 th Grade (Literary)	11 th Grade (Literary)	Samir Sa'ad Eddin Secondary School for Girls	65
4000.00	3200.00	1000.00	877	877	0	24	12 th Grade (Literary)	1 st Grade	Hajja Rashda Al-Masri Secondary School for Girls	66
4270.00	3025.00	1245.00	520	520	0	16	12 th Grade (Literary)	11 th Grade (Scientific)	Kamal Jumblatt Secondary School for Girls	67

8000.00	2200.00	4800.00	495	495	0	14	12 th Grade (Literary)	7 th Grade	Haj Mazuz Al-Masri Secondary School for Girls	68
3500.00	2355.00	2000.00	635	635	0	21	11 th Grade (Literary)	1 st Grade	Haj Ali Tibi Secondary School for Girls	69
2740.00	1747.00	955.00	496	496	0	13	12 th Grade (Literary)	7 th Grade	Jamal Al Masri Secondary School for Girls	70
2070.00	1977.00	793.00	365	365	0	12	12 th Grade (Literary)	1 st Grade	Iraq Al-Tayeh Secondary School for Girls	71
4177.00	2624.00	1553.00	352	352	0	11	12 th Grade (Literary)	10 th Grade	Yarmouk Secondary School for Girls	72
2836.00	2564.00	816.00	367	367	0	11	12 th Grade (Literary)	10 th Grade	Qordoba Secondary School for Girls	73
4050.00	1878.00	1770.00	444	444	0	13	12 th Grade (Scientific)	10 th Grade	Alaeshiah Secondary School for Girls	74
3342.00	2230.00	900.00	605	605	0	22	12 th Grade (Literary)	1 st Grade	Sheikh Mohammed Tuphahah Secondary School for Girls	75
2500.00	1100.00	1300.00	456	456	0	14	12 th Grade (Literary)	7 th Grade	Abdul Rahim Mahmoud Secondary School for Girls	76
1800.00	1635.00	842.00	359	0	359	12	12 th Grade (Literary)	11 th Grade (Scientific)	King Talal Bin Abdullah Secondary School for Boys	77
4536.00	2750.00	3687.00	703	0	703	19	12 th Grade (Literary)	9 th Grade	Qadri Touqan Secondary School for Boys	78
3900.00	1000.00	2900.00	237	0	237	8	11 th Grade (Literary)	10 th Grade	Amr ibn al-Aas Secondary School for Boys	79
2500.00	1310.00	1490.00	372	0	372	11	11 th Grade (Literary)	10 th Grade	Abdul Hamid Al-Sayeh Secondary School for Boys	80
7430.00	2200.00	1668.00	542	0	542	18	12 th Grade (Literary)	11 th Grade (Scientific)	Al-Salaheyah Secondary School for Boys	81
4800.00	2550.00	2000.00	421	0	421	16	12 th Grade	9 th Grade	Prince sarem Al-Deen Al-Najmi	82

							(commercial)		Secondary School for Boys	
3300.00	2170.00	920.00	238	0	238	10	12 th Grade (Literary)	10 th Grade	Al-Masaken Secondary School for Boys	83
1726.00	1460.00	392.00	288	0	288	9	12 th Grade (Literary)	8 th Grade	Lutfeyah Al-Saifi Secondary School for Boys	84
3360.00	1876.00	2484.00	344	0	344	12	12 th Grade (commercial)	10 th Grade	Omar bin Khattab Secondary School for Boys	85
3000.00	2016.00	1984.00	529	0	529	16	12 th Grade (Literary)	7 th Grade	Al-Kindi Secondary School for Boys	86
1006.00	603.00	403.00	371	261	110	14	10 th Grade	1 st Grade	Zawata Basic-Mixed School	87
1385.00	434.00	914.00	181	181	0	10	10 th Grade	1 st Grade	Naqoura Basic School for Girls	88
2000.00	1000.00	1000.00	738	738	0	20	5 th Grade	1 st Grade	Beit Furik Basic School for Girls	89
2000.00	1400.00	576.00	324	324	0	12	6 th Grade	1 st Grade	Till Basic School for Girls	90
5000.00	1416.00	1000.00	500	500	0	15	7 th Grade	3 rd Grade	Assira Basic School for Girls A	91
1680.00	500.00	1180.00	189	189	0	8	2 nd Grade	1 st Grade	Assira Basic School for Girls (B)	92
2000.00	450.00	750.00	130	130	0	4	4 th Grade	1 st Grade	Azmut Basic School for Girls	93
3172.00	2217.00	1516.00	406	406	0	11	8 th Grade	6 th Grade	Portuguese Basic School for Girls - Beit Furik	94
2049.00	1216.00	1441.00	282	87	195	10	10 th Grade	1 st Grade	Bait Wazan Basic-mixed School	95
660.00	680.00	300.00	169	0	169	6	6 th Grade	1 st Grade	Sebastia Basic School for Boys	96
1352.00	885.00	997.00	273	0	273	10	10 th Grade	1 st Grade	Kafr Qalil Basic School for Boys	97
4800.00	1460.00	1100.00	457	0	457	15	5 th Grade	1 st Grade	Assira Basic School for Boys	98
639.00	261.00	293.00	71	37	34	8	8 th Grade	1 st Grade	Nesf Ijbail Basic-Mixed School	99
2000.00	906.00	770.00	270	0	270	11	6 th Grade	1 st Grade	Burqa Basic School for Boys	100
4000.00	1200.00	800.00	186	0	186	7	7 th Grade	1 st Grade	Rouhi Al-Hindi Basic School for Boys / Till	101

1500.00	700.00	740.00	550	0	550	16	4 th Grade	1 st Grade	Beit Furik Basic School for Boys	102
4316.00	354.00	787.00	127	0	127	5	4 th Grade	1 st Grade	Deir Sharaf Basic School for Boys	103
1400.00	727.00	673.00	533	0	533	16	8 th Grade	5 th Grade	Beit Furik High-Basic School for Boys	104
575.00	672.00	200.00	185	117	68	7	4 th Grade	1 st Grade	Deir al-Hatab Basic-mixed School	105
4023.00	2052.00	740.00	401	0	401	12	9 th Grade	6 th Grade	Muscat Higher-Basic School for Boys	106
920.00	852.00	480.00	222	0	222	8	7 th Grade	1 st Grade	Bait Imreen Basic School for Boys	107
3500.00	1320.00	1500.00	215	0	215	8	7 th Grade	1 st Grade	Mohammed bin Rashid Al Maktoum Basic School for Boys / Tel	108
6366.00	1845.00	1715.00	605	0	605	17	9 th Grade	3 rd Grade	Salem / Deir al-Hatab Basic School for Boys	109
525.00	410.00	250.00	118	0	118	4	4 th Grade	1 st Grade	Bizzariya Basic School for Boys	110
8426.00	965.00	2500.00	210	0	210	7	6 th Grade	1 st Grade	Al-Ittihad Basic School for Boys	111
2980.00	1510.00	912.00	429	429	0	15	12 th Grade (Literary)	1 st Grade	Sebastia Secondary School for Girls	112
2676.00	672.00	718.00	392	392	0	13	12 th Grade (Literary)	1 st Grade	Beit Iba Secondary School for Girls	113
3750.00	1680.00	620.00	299	299	0	12	12 th Grade (Literary)	1 st Grade	Dair Sharaf Secondary School for Girls	114
4040.00	1200.00	900.00	422	422	0	16	12 th Grade (Literary)	1 st Grade	Bait Imreen Secondary School for Girls	115
1380.00	1540.00	760.00	481	481	0	17	12 th Grade (Literary)	1 st Grade	Beit Dagan Secondary School for Girls	116
900.00	1250.00	400.00	251	251	0	12	12 th Grade (Literary)	1 st Grade	Yassid Secondary School for Girls	117
5000.00	1510.00	400.00	233	233	0	8	12 th Grade (Literary)	5 th Grade	Deir al-Hatab Secondary School for Girls	118

2000.00	545.00	500.00	246	246	0	9	12 th Grade (Literary)	5 th Grade	Azmut Secondary School for Girls	119
1800.00	940.00	591.00	638	638	0	21	12 th Grade (Literary)	3 rd Grade	Salem Secondary School for Girls	120
2630.00	1272.00	900.00	280	280	0	10	12 th Grade (Literary)	7 th Grade	Mohammed bin Rashid Al Maktoum Secondary School for Girls / Rujeib	121
1500.00	1585.00	1000.00	529	529	0	20	12 th Grade (Literary)	1 st Grade	Burqa Secondary School for Girls	122
3020.00	1278.00	1008.00	340	340	0	12	12 th Grade (Literary)	7 th Grade	Till Secondary School for Girls	123
3325.00	2100.00	2305.00	474	474	0	15	12 th Grade (Literary)	9 th Grade	Beit Furik Secondary School for Girls	124
2150.00	1204.00	672.00	433	433	0	13	12 th Grade (Literary)	8 th Grade	Assira Secondary School for Girls	125
3000.00	876.00	732.00	363	363	0	12	12 th Grade (Literary)	1 st Grade	Sarra Secondary School for Girls	126
2970.00	978.00	713.00	343	343	0	12	12 th Grade (Literary)	1 st Grade	Taluzah Secondary School for Girls	127
650.00	505.00	404.00	291	291	0	12	12 th Grade (Literary)	1 st Grade	Kafr Qalil Secondary School for Girls	128
435.00	504.00	167.00	201	201	0	9	12 th Grade (Literary)	4 th Grade	Qusin Secondary School for Girls	129
2555.00	1055.00	1500.00	382	382	0	15	12 th Grade (Literary)	1 st Grade	Bizzariya Secondary School for Girls	130
7500.00	2150.00	1700.00	434	7	427	17	12 th Grade (Literary)	1 st Grade	Beit Dagan mixed-secondary School	131
5129.00	1260.00	2000.00	353	15	338	15	12 th Grade (Literary)	1 st Grade	Taluzah secondary-Mixed School	132
3125.00	1737.00	2388.00	259	22	237	12	12 th Grade	1 st Grade	Naqoura Mixed-secondary School	133

							(Literary)			
2500.00	1.50	800.00	263	0	263	12	12 th Grade (Literary)	1 st Grade	Yassid Secondary School for Boys	134
4849.00	930.00	1229.00	448	0	448	16	12 th Grade (Literary)	3 rd Grade	Rujeib Secondary School for Boys	135
12286.00	1200.00	930.00	152	72	80	11	12 th Grade (Literary)	1 st Grade	Frush Beit Dagan Mixed-secondary	136
5459.00	1300.00	1250.00	167	13	154	7	12 th Grade (Literary)	8 th Grade	Bait Imreen Mixed-secondary School	137
6000.00	1700.00	1500.00	316	37	279	12	12 th Grade (commercial)	7 th Grade	Sebastia Mixed-secondary	138
7800.00	1280.00	7160.00	270	0	270	12	12 th Grade (Literary)	7 th Grade	Burqa Secondary School for Boys	139
5000.00	1786.00	1330.00	291	35	256	11	12 th Grade (Literary)	3 rd Grade	Wadi Al -Badan Secondary-Mixed School	140
9000.00	1000.00	1800.00	224	0	224	8	12 th Grade (Literary)	8 th Grade	Till Secondary School for Boys	141
4000.00	763.00	2040.00	232	18	214	11	12 th Grade (Literary)	5 th Grade	Deir Sharaf Secondary-Mixed School	142
2500.00	450.00	950.00	224	0	224	9	12 th Grade (Literary)	9 th Grade	Salem / Deir al-Hatab Secondary School for Boys	143
3150.00	804.00	2748.00	154	68	86	7	12 th Grade (Literary)	10 th Grade	Alaqrabanyah secondary-Mixed School	144
4000.00	1992.00	750.00	364	0	364	13	12 th Grade (commercial)	9 th Grade	Beit Furik Secondary School for Boys	145
2021.00	1685.00	1126.00	354	0	354	12	12 th Grade (Literary)	1 st Grade	Sarra Secondary School for Boys	146
10000.00	1520.00	3800.00	260	0	260	10	12 th Grade (commercial)	10 th Grade	Assira Secondary School for Boys	147

1700.00	1630.00	1122.00	166	18	148	8	12 th Grade (Literary)	5 th Grade	Zawata Secondary-Mixed School	148
2110.00	1666.00	1444.00	394	0	394	14	12 th Grade (Literary)	1 st Grade	Azmut Secondary School for Boys	149
4000.00	1200.00	3400.00	199	0	199	8	12 th Grade (Literary)	4 th Grade	Qusin Secondary school for Boys	150
9862.00	2046.00	950.00	215	25	190	8	12 th Grade (Literary)	7 th Grade	Muscat secondary-Mixed School - Beit Iba	151
4680.00	1500.00	1027.00	233	0	233	9	12 th Grade (Literary)	5 th Grade	Bizzariya Secondary School for Boys	152

Table13Microbiological characteristics as per drinking water quality standards in Palestine

Item No.	Property	The unit of measurement	Maximum	Quality impact	Remarks
1.	The total number (Colony Count)	Number / 1 ml at (22 & 37) ° C	In the normal range	Healthy	When necessary
2.	Totalcolon bacteria	Number / 100 ml	0.00	Healthy	95% of the samples must be free The remaining 5% of the samples allow 5 colony
3.	Fecal coliform bacteria	Number / 100 ml	0.00	Healthy	
4.	Fecal streptococcus bacteria	Number / 100 ml	0.00	Healthy	
5.	* Alkolostrediom reducing sulfur	Number / 100 ml	0.00	Healthy	Index factor
6.	** Bacteria Sidmons	Number / 100 ml	0.00	Healthy	When necessary

***Scan in bottled water**

****Scan in hospital (in the operating room)**

Palestinian standard of drinking water No.(41)for 1997.

Appendix B

FIGURES

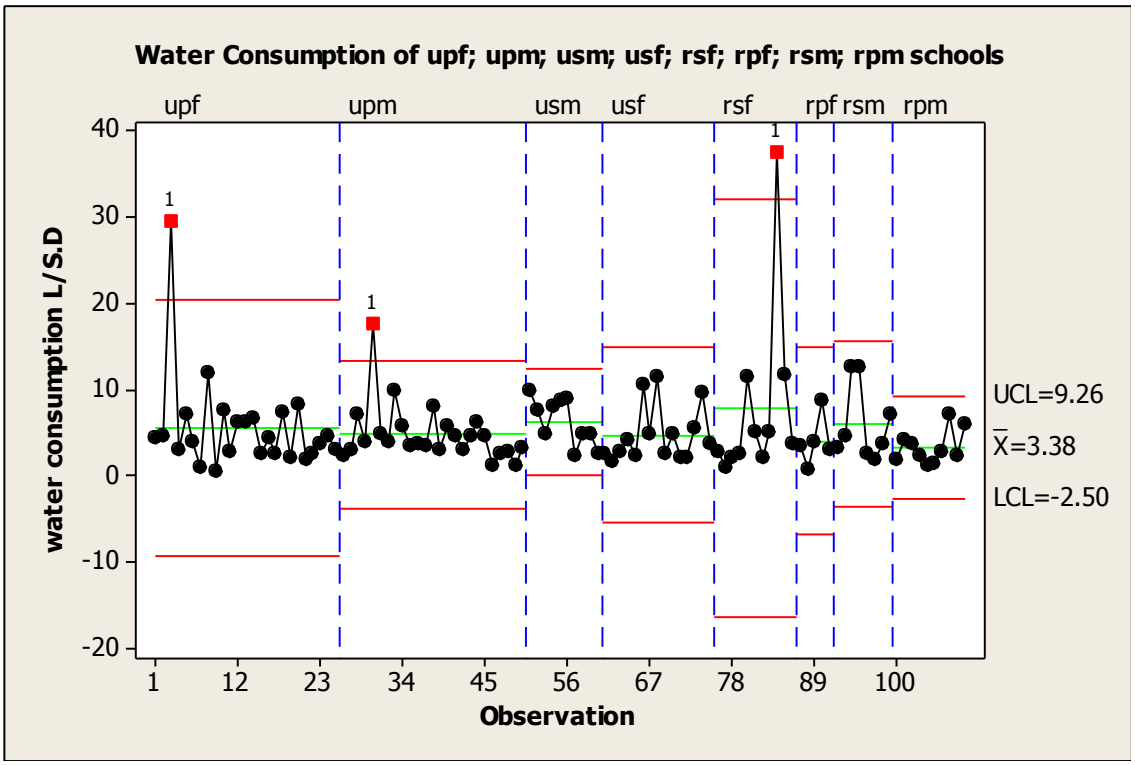
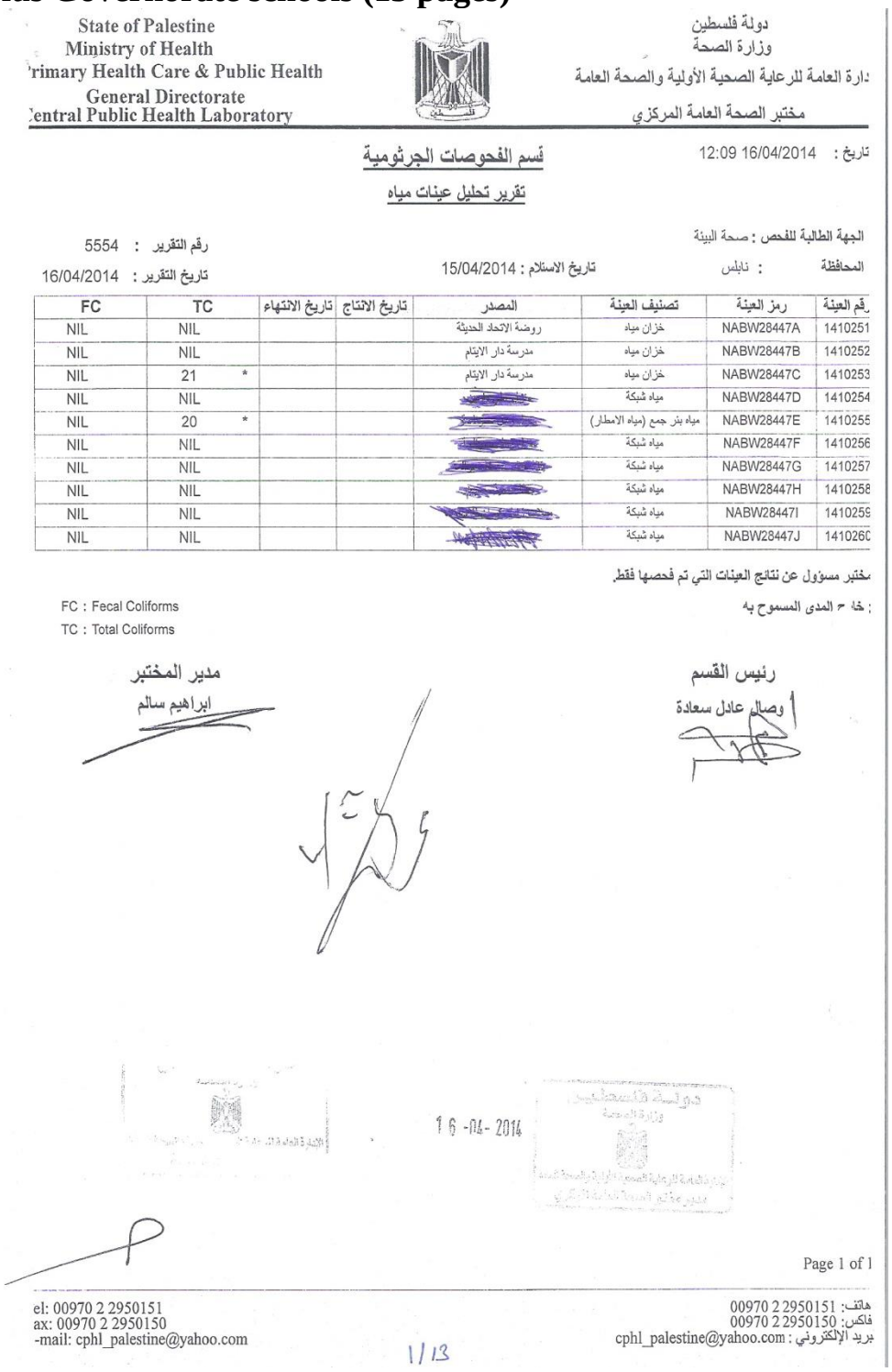


Figure 1: Outliers Determination for average water consumption

Figure 2 Total and Fecal coliform test results for schools in Nablus Governorate schools (13 pages)



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Ministry of Health
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دولة فلسطين
وزارة الصحة
دارة العامة للرعاية الصحية الأولية والصحة العامة
مختبر الصحة العامة المركزي

تاريخ : 12:09 16/04/2014

قسم الفحوصات الجرثومية

تقرير تحليل عينات مياه

الجهة الطالبة للفحص : صحة البيئة

المحافظة : نابلس

تاريخ الاستلام : 15/04/2014

رقم التقرير : 5554

تاريخ التقرير : 16/04/2014

رقم العينة	رمز العينة	تصنيف العينة	المصدر	تاريخ الانتاج	تاريخ الانتهاء	TC	FC
1410251	NABW28447A	خزان مياه	روضة الاتحاد الحديثة			NIL	NIL
1410252	NABW28447B	خزان مياه	مدرسة دار الايتام			NIL	NIL
1410253	NABW28447C	خزان مياه	مدرسة دار الايتام			21 *	NIL
1410254	NABW28447D	مياه شبكة	[redacted]			NIL	NIL
1410255	NABW28447E	مياه بئر جمع (مياه الامطار)	[redacted]			20 *	NIL
1410256	NABW28447F	مياه شبكة	[redacted]			NIL	NIL
1410257	NABW28447G	مياه شبكة	[redacted]			NIL	NIL
1410258	NABW28447H	مياه شبكة	[redacted]			NIL	NIL
1410259	NABW28447I	مياه شبكة	[redacted]			NIL	NIL
1410260	NABW28447J	مياه شبكة	[redacted]			NIL	NIL

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خارج المدى المسموح به :

FC : Fecal Coliforms
TC : Total Coliforms

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16 -04- 2014

Page 1 of 1

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1/13

Figure 2

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rimary Health Care & Public Health
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دولة فلسطين
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الإدارة العامة للرعاية الصحية الأولية والصحة العامة
مختبر الصحة العامة المركزي

التاريخ : 12:35 30/04/2014

قسم الفحوصات الجرثومية

تقرير تحليل عينات مياه

الجهة الطالبة للفحص : صحة البيئة
رقم التقرير : 6368

المحافظة : نابلس
تاريخ الاستلام : 29/04/2014
تاريخ التقرير : 30/04/2014

رقم العينة	رمز العينة	تصنيف العينة	المصدر	تاريخ الانتاج	تاريخ الانتهاء	TC	FC
1411803	NABW28451A	مياه شبكة	[redacted]			NIL	NIL
1411804	NABW28451B	خزان مياه	[redacted]			3	NIL
1411805	NABW28451C	خزان مياه	اكاديمية القران			NIL	NIL
1411806	NABW28451D	خزان مياه	اكاديمية القران			NIL	NIL
1411807	NABW28451E	مياه شبكة	[redacted]			NIL	NIL
1411808	NABW28451F	مياه شبكة	[redacted]			NIL	NIL
1411809	NABW28451G	مصدر (نبع او بئر جوفي)	[redacted]			NIL	NIL
141181	NABW28451H	مياه شبكة	[redacted]			NIL	NIL
1411811	NABW28451I	مياه شبكة	[redacted]			6 *	NIL
1411812	NABW28451J	مصدر (نبع او بئر جوفي)	[redacted]			3	NIL
1411813	NABW28452A	مصدر (نبع او بئر جوفي)	[redacted]			NIL	NIL

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*: خارج المدى المسموح به

FC : Fecal Coliforms
TC : Total Coliforms

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30 -04- 2014

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2/13

State of Palestine
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General Directorate
Central Public Health Laboratory

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مختبر الصحة العامة المركزي

التاريخ : 13:03 27/08/2014

قسم الفحوصات الجرثومية

تقرير تحليل عينات مياه

الجهة الطالبة للفحص : صحة البيئة

المحافظة : نابلس

تاريخ الاستلام : 26/08/2014

رقم التقرير : 12439

تاريخ التقرير : 27/08/2014

رقم العينة	رمز العينة	تصنيف العينة	المصدر	تاريخ الانتاج	تاريخ الانتهاء	TC	FC
1422353	NABW28509B	مياه شبكة	[redacted]			NIL	NIL
1422354	NABW28509C	مياه شبكة	[redacted]			NIL	NIL
1422355	NABW28509D	مياه شبكة	[redacted]			NIL	NIL
1422356	NABW28509E	مياه شبكة	[redacted]			NIL	NIL
1422357	NABW28509F	مياه شبكة	[redacted]			NIL	NIL
1422358	NABW28509G	مياه شبكة	[redacted]			NIL	NIL
1422359	NABW28509H	خزان مياه	[redacted]			TNTC *	TNTC *
1422360	NABW28509I	خزان مياه	[redacted]			NIL	NIL
1422361	NABW28509J	خزان مياه	[redacted]			NIL	NIL
1422362	NABW28510A	مياه شبكة	[redacted]			4 *	4 *
1422363	NABW28510B	خزان مياه	مدرسة عادل زعيتر الاساسية			NIL	NIL

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FC : Fecal Coliforms

TC : Total Coliforms

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27-08-2014

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قسم الفحوصات الجرثومية

تقرير تحليل عينات مياه

التاريخ : 13:22 03/09/2014

الجهة الطالبة للفحص : صحة البيئة

المحافظة : نابلس

تاريخ الاستلام : 02/09/2014

رقم التقرير : 12860

تاريخ التقرير : 03/09/2014

رقم العينة	رمز العينة	تصنيف العينة	المصدر	تاريخ الانتاج	تاريخ الانتهاء	TC	FC
1423288	NABW28512A	مياه شبكة	[redacted]			NIL	NIL
1423293	NABW28511E	خزان مياه	مدرسة بنات بيت فوريك			NIL	NIL
1423294	NABW28511F	خزان مياه	مدرسة بيت فوريك الثانوية			TNTC *	7 *
1423295	NABW28511G	خزان مياه	مدرسة بنات بيت فوريك			NIL	NIL
1423296	NABW28511H	خزان مياه	المدرسة البرتغالية			NIL	NIL
1423297	NABW28511I	خزان مياه	مدرسة بيت فوريك			NIL	NIL
1423298	NABW28511J	خزان مياه	مدرسة بيت فوريك الثانوية			70 *	22 *

المختبر مسؤول عن نتائج العينات التي تم فحصها فقط

*: خارج المدى المسموح به

FC : Fecal Coliforms

TC : Total Coliforms

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3.9.14

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مختبر الصحة العامة المركزي

التاريخ : 12:43 24/09/2014

قسم الفحوصات الجرثومية

تقرير تحليل عينات مياه

الجهة الطالبة للفحص : صحة البيئة

المحافظة : نابلس

تاريخ الاستلام : 23/09/2014

رقم التقرير : 14071

تاريخ التقرير : 24/09/2014

رقم العينة	رمز العينة	تصنيف العينة	المصدر	تاريخ الانتاج	تاريخ الانتهاء	TC	FC
1425187	NABW28514A	خزان مياه	مدرسة بنات قصرة الثانوية			195 *	110 *
1425188	NABW28514B	خزان مياه	ذكور قصرة الاساسية			NIL	NIL
1425189	NABW28514C	خزان مياه	مدرسة قصرة الاساسية المختلطة			NIL	NIL
1425190	NABW28514D	خزان مياه	[redacted]			10 *	10 *
1425191	NABW28514E	خزان مياه	مدرسة ياسر عرفات			NIL	NIL
1425192	NABW28514G	مياه شبكة	[redacted]			17 *	NIL
1425193	NABW28516A	مياه شبكة	[redacted]			20 *	NIL
1425194	NABW28516B	مياه شبكة	[redacted]			NIL	NIL
1425195	NABW28516C	مياه شبكة	[redacted]			30 *	NIL

المختبر مسؤول عن نتائج العينات التي تم فحصها فقط.

*: خارج المدى المسموح به

FC : Fecal Coliforms

TC : Total Coliforms

مدير المختبر
ابراهيم سالم

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دولة فلسطين
وزارة الصحة
الادارة العامة للرعاية الصحية الأولية والصحة العامة
مختبر الصحة العامة المركزي

لتاريخ : 13:15 17/09/2014

قسم الفحوصات الجرثومية

تقرير تحليل عينات مياه

الجهة الطالبة للفحص : صحة البيئة

رقم التقرير : 13617

المحافظة : نابلس

تاريخ الاستلام : 16/09/2014

تاريخ التقرير : 17/09/2014

رقم العينة	رمز العينة	تصنيف العينة	المصدر	تاريخ الانتاج	تاريخ الانتهاء	TC	FC
1424586	NABW28490A	خزان مياه	مدرسة بيت فوريك	(illegible)		320 *	280 *
1424588	NABW28490C	مصدر (نبع او بئر جوفي)	[redacted]			NIL	NIL
1424589	NABW28490D	خزان مياه	مدرسة بيت دجن الثانوية			NIL	NIL
1424590	NABW28490E	خزان مياه	مدرسة بيت دجن الاساسية			NIL	NIL
1424591	NABW28490F	خزان مياه	[redacted]			NIL	NIL
1424592	NABW28490G	خزان مياه	[redacted]			NIL	NIL
1424593	NABW28490H	خزان مياه	مدرسة بنات بيت فوريك			NIL	NIL
1424594	NABW28490I	مياه شبكة	[redacted]			NIL	NIL
1424595	NABW28490J	مياه شبكة	[redacted]			NIL	NIL
1424596	NABW28493A	مياه شبكة	[redacted]			NIL	NIL
1424597	NABW28493B	مياه شبكة	[redacted]			NIL	NIL
1424598	NABW28493C	مصدر (نبع او بئر جوفي)	[redacted]			NIL	NIL

المختبر مسؤول عن نتائج العينات التي تم فحصها فقط.

*: خارج المدى المسموح به

FC : Fecal Coliforms
TC : Total Coliforms

مدير المختبر
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دولة فلسطين
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الإدارة العامة للرعاية الصحية الأولية والصحة العامة
مختبر الصحة العامة المركزي

التاريخ : 12:11 01/10/2014

قسم الفحوصات الجرثومية

تقرير تحليل عينات مياه

الجهة الطالبة للفحص : صحة البيئة

المحافظة : نابلس

تاريخ الاستلام : 30/09/2014

رقم التقرير : 14402

تاريخ التقرير : 01/10/2014

رقم العينة	رمز العينة	تصنيف العينة	المصدر	تاريخ الانتاج	تاريخ الانتهاء	TC	FC
1426002	NABW28519C	خزان مياه	المدرسة البرتغالية			NIL	NIL
1426003	NABW28519D	خزان مياه	[redacted]			NIL	NIL
1426004	NABW28519E	خزان مياه	[redacted]			NIL	NIL
1426005	NABW28519F	خزان مياه	[redacted]			20 *	10 *
1426006	NABW28519G	مياه شبكة	[redacted]			NIL	NIL
1426007	NABW28519H	مياه شبكة	[redacted]			NIL	NIL
1426008	NABW28519I	مياه شبكة	[redacted]			NIL	NIL
1426009	NABW28519J	مياه شبكة	[redacted]			NIL	NIL
1426(	NABW28520A	مياه شبكة	[redacted]			NIL	NIL
1426011	NABW28520B	مياه شبكة	[redacted]			NIL	NIL
1426012	NABW28520C	مياه شبكة	[redacted]			NIL	NIL
1426013	NABW28520D	مياه شبكة	[redacted]			NIL	NIL
1426014	NABW28520E	مياه شبكة	[redacted]			NIL	NIL

المختبر مسؤول عن نتائج العينات التي تم فحصها فقط.

*: خارج المدى المسموح به

FC : Fecal Coliforms

TC : Total Coliforms

رئيس القسم
وصال عادل سعادة

مدير المختبر
ابراهيم سالم

01-10-2014

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التاريخ : 12:11 01/10/2014

قسم الفحوصات الجرثومية

تقرير تحليل عينات مياه

الجهة الطالبة للفحص : صحة البيئة

المحافظة : نابلس

تاريخ الاستلام : 30/09/2014

رقم التقرير : 14401

تاريخ التقرير : 01/10/2014

رقم العينة	رمز العينة	تصنيف العينة	المصدر	تاريخ الانتاج	تاريخ الانتهاء	TC	FC
1425991	NABW28518B	مياه شبكة	[redacted]			NIL	NIL
1425992	NABW28518C	مياه شبكة				9 *	1 *
1425993	NABW28518D	مياه شبكة				4 *	NIL
1425994	NABW28518E	مياه شبكة				NIL	NIL
1425995	NABW28518F	مياه شبكة				130 *	125 *
1425996	NABW28518G	خزان مياه	مدرسة بنات بيت فوريك			70 *	NIL
1425997	NABW28518H	خزان مياه	مدرسة بيت فوريك			NIL	NIL
1425998	NABW28518I	خزان مياه	مدرسة بنات بيت فوريك			TNTC	170
14259	NABW28518J	مصدر (نبع او بئر جوفي)				NIL	NIL
1426000	NABW28519A	خزان مياه	مدرسة بيت فوريك			NIL	NIL
1426001	NABW28519B	خزان مياه	مدرسة بيت فوريك			NIL	NIL

المختبر مسؤول عن نتائج العينات التي تم فحصها فقط.

*: خارج المدى المسموح به

FC : Fecal Coliforms

TC : Total Coliforms

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ابراهيم سالم

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مختبر الصحة العامة المركزي

التاريخ : 11:54 15/10/2014

قسم الفحوصات الجرثومية

تقرير تحليل عينات مياه

الجهة الطالبة للفحص : صحة البيئة

رقم التقرير : 14666

المحافظة : نابلس

تاريخ الاستلام : 14/10/2014

تاريخ التقرير : 15/10/2014

رقم العينة	رمز العينة	تصنيف العينة	المصدر	تاريخ الانتاج	تاريخ الانتهاء	TC	FC
1426443	NABW28521A	خزان مياه	مدرسة الراشد الثانوية للبنين			NIL	NIL
1426444	NABW28521B	خزان مياه	مدرسة جوريش الثانوية للبنين			4 *	NIL
1426445	NABW28521C	مياه شبكة	مدرسة جوريش الثانوية للبنين			1	1 *
1426446	NABW28521D	خزان مياه	مدرسة جوريش للبنات			NIL	NIL
1426447	NABW28521E	خزان مياه	مدرسة تلفيت الثانوية المختلطة			10 *	NIL
1426448	NABW28521F	خزان مياه	مدرسة تلفيت الثانوية للبنات			30 *	6 *
1426449	NABW28521G	خزان مياه	مدرسة الزهراء			20 *	NIL
1426450	NABW28521H	خزان مياه	مدرسة بنات قبلان الاساسية			NIL	NIL
1426451	NABW28521I	خزان مياه	مدرسة بنات قبلان الثانوية			NIL	NIL
142	NABW28521J	خزان مياه	مدرسة ذكور قبلان الثانوية			NIL	NIL
1426454	NABW28522B	مصدر (نبع او بئر جوفي)	[redacted]			NIL	NIL
1426455	NABW28522C	مصدر (نبع او بئر جوفي)	[redacted]			NIL	NIL
1426456	NABW28522D	مصدر (نبع او بئر جوفي)	[redacted]			14	NIL
1426457	NABW28522E	مصدر (نبع او بئر جوفي)	[redacted]			NIL	NIL
1426458	NABW28522F	مصدر (نبع او بئر جوفي)	[redacted]			1	NIL

المختبر مسؤول عن نتائج العينات التي تم فحصها فقط.

*: خارج المدى المسموح به

FC : Fecal Coliforms

TC : Total Coliforms

مدير المختبر
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15 -10- 2014

Page 1 of 1

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مختبر الصحة العامة المركزي

التاريخ : 12:52 22/10/2014

قسم الفحوصات الجرثومية

تقرير تحليل عينات مياه

الجهة الطالبة للفحص : صحة البيئة

رقم التقرير : 14968

المحافظة : نابلس

تاريخ الاستلام : 21/10/2014

تاريخ التقرير : 22/10/2014

رقم العينة	رمز العينة	تصنيف العينة	المصدر	تاريخ الانتاج	تاريخ الانتهاء	TC		FC	
1426898	NABW28524E	خزان مياه	مدرسة اكرم حلوم للبنات			TNTC	*	TNTC	*
1426899	NABW28524F	مصدر (نبع او بئر جوفي)	مدرسة جالود الثانوية المختلطة			NIL		NIL	
1426900	NABW28524G	خزان مياه	مدرسة قريوت للبنات			TNTC	*	130	*
1426901	NABW28523A	خزان مياه	مدرسة اوصرين الثانوية للبنات			140	*	140	*
1426902	NABW28523B	خزان مياه	مدرسة اوصرين الثانوية للبنات			230	*	210	*
1426903	NABW28523C	خزان مياه	مدرسة اوصرين الثانوية للبنين			NIL		NIL	
1426904	NABW28523D	خزان مياه	مدرسة بنات عقربا الثانوية			2		NIL	
1426905	NABW28523E	خزان مياه	بنات عقربا الاساسية			7	*	1	*
1426906	NABW28523F	خزان مياه	ذكور عقربا الثانوية			NIL		NIL	
1426907	NABW28523G	خزان مياه	مدرسة عقربا			NIL		NIL	
1426908	NABW28523H	خزان مياه	مدرسة خولة بنت الازور			NIL		NIL	
1426909	NABW28523I	خزان مياه	مدرسة خالد بن الوليد			NIL		NIL	
1426910	NABW28524H	خزان مياه	مدرسة قريوت			TNTC	*	220	*

المختبر مسؤول عن نتائج العينات التي تم فحصها فقط.

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مدير المختبر
ابراهيم سالم

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10/13

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مختبر الصحة العامة المركزي

التاريخ : 12:52 22/10/2014

قسم الفحوصات الجرثومية

تقرير تحليل عينات مياه

الجهة الطالبة للفحص : صحة البيئة

رقم التقرير : 14967

المحافظة : نابلس

تاريخ الاستلام : 21/10/2014

تاريخ التقرير : 22/10/2014

رقم العينة	رمز العينة	تصنيف العينة	المصدر	تاريخ الانتاج	تاريخ الانتهاء	TC	FC
1426886	NABW28525A	مصدر (نبع او بئر جوفي)	[redacted]			NIL	NIL
1426887	NABW28525B	خزان مياه	مدرسة بنات بيت فوريك			NIL	NIL
1426888	NABW28525C	خزان مياه	مدرسة بيت فوريك			110 *	1 *
1426889	NABW28525D	خزان مياه	مدرسة بيت فوريك			NIL	NIL
1426890	NABW28525E	خزان مياه	[redacted]			NIL	NIL
1426891	NABW28525F	خزان مياه	[redacted]			11 *	NIL
1426892	NABW28525G	خزان مياه	[redacted]			NIL	NIL
1426893	NABW28525H	مياه شبكة	[redacted]			40 *	5 *
142689	NABW28524A	خزان مياه	مدرسة مجدل بني فاضل			NIL	NIL
14268	NABW28524B	خزان مياه	مدرسة مجدل بني فاضل			4 *	NIL
1426896	NABW28524C	خزان مياه	مدرسة دوما المختلطة			20 *	NIL
1426897	NABW28524D	خزان مياه	مدرسة ذكور دوما			6 *	NIL

المختبر مسؤول عن نتائج العينات التي تم فحصها فقط.

*: خارج المدى المسموح به

FC : Fecal Coliforms

TC : Total Coliforms

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22 -10- 2014

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مختبر الصحة العامة المركزي

التاريخ : 12:18 19/11/2014

قسم الفحوصات الجرثومية

تقرير تحليل عينات مياه

الجهة الطالبة للفحص : صحة البيئة

المحافظة : نابلس

تاريخ الاستلام : 18/11/2014

رقم التقرير : 16481

تاريخ التقرير : 19/11/2014

رقم العينة	رمز العينة	تصنيف العينة	المصدر	تاريخ الانتاج	تاريخ الانتهاء	TC	FC
1429633	NABW28531D	خزان مياه	مدرسة العقربانية المختلطة			3	NIL
1429634	NABW28531E	مياه شبكة	مدرسة العقربانية المختلطة			10 *	2 *
1429635	NABW28531F	خزان مياه	مدرسة بنات النصارية			3	1 *
1429636	NABW28531G	مياه شبكة	[redacted]			TNTC *	170 *
1429638	NABW28531I	مياه شبكة	[redacted]			NIL	NIL
1429639	NABW28530A	مياه شبكة	[redacted]			NIL	NIL
1429	NABW28530B	خزان مياه	[redacted]			NIL	NIL
142964	NABW28530C	خزان مياه	مدرسة ذكور عصيرة الشمالية			TNTC *	30 *
1429642	NABW28530D	خزان مياه	مدرسة بنات ياصيد الثانوية			198 *	180 *
1429643	NABW28530E	خزان مياه	مدرسة ذكور ياصيد الثانوية			TNTC *	290 *
1429644	NABW28530F	خزان مياه	مدرسة فروش بيت دجن			NIL	NIL
1429645	NABW28530G	خزان مياه	مدرسة فروش بيت دجن			TNTC *	TNTC *
1429646	NABW28530H	مياه شبكة	[redacted]			NIL	NIL
1429647	NABW28530I	خزان مياه	مدرسة عين شبلي			180 *	25 *
1429648	NABW28530J	خزان مياه	مدرسة عين شبلي			140 *	40 *

مختبر مسؤول عن نتائج العينات التي تم فحصها فقط.

: خارج المدى المسموح به

FC : Fecal Coliforms

TC : Total Coliforms

رئيس القسم
وصال عادل سعادة

مدير المختبر
ابراهيم سالم

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19-11-2014

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مختبر الصحة العامة المركزي

التاريخ : 12:17 19/11/2014

قسم الفحوصات الجرثومية

تقرير تحليل عينات مياه

الجهة الطالبة للفحص : صحة البيئة

رقم التقرير : 16480

المحافظة : نابلس

تاريخ الاستلام : 18/11/2014

تاريخ التقرير : 19/11/2014

رقم العينة	رمز العينة	تصنيف العينة	المصدر	تاريخ الانتاج	تاريخ الانتهاء	TC	FC
1429620	NABW28528A	خزان مياه	مدرسة الاستقلال الاساسية			NIL	NIL
1429621	NABW28528B	خزان مياه	مدرسة جماعين الاساسية للبنين			NIL	NIL
1429622	NABW28528C	خزان مياه	مدرسة جماعين الثانوية للبنين			NIL	NIL
1429623	NABW28528D	خزان مياه	مدرسة جماعين الثانوية للبنات			NIL	NIL
1429624	NABW28528E	خزان مياه	مدرسة جماعين المختلطة			6 *	2 *
1429625	NABW28528F	خزان مياه	[redacted]			NIL	NIL
1429	NABW28528G	مياه شبكة	[redacted]			NIL	NIL
14296	NABW28528H	خزان مياه	[redacted]			NIL	NIL
1429628	NABW28528I	خزان مياه	مدرسة جماعين الاساسية للبنات			NIL	NIL
1429629	NABW28528J	مياه شبكة	[redacted]			NIL	NIL
1429630	NABW28531A	مياه شبكة	[redacted]			TNTC *	290 *
1429631	NABW28531B	مياه شبكة	[redacted]			NIL	NIL
1429632	NABW28531C	مياه شبكة	[redacted]			72 *	15 *

المختبر مسؤول عن نتائج العينات التي تم فحصها فقط.

*: خارج المدى المسموح به

FC : Fecal Coliforms

TC : Total Coliforms

مدير المختبر
ابراهيم سالم

رئيس القسم
وصال عادل سعادة

دولة فلسطين
وزارة الصحة
الإدارة العامة للرعاية الصحية الأولية والصحة العامة
دائرة صحة البيئة

19-11-2014

دولة فلسطين
وزارة الصحة
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13/13

جامعة النجاح الوطنية

كلية الدراسات العليا

أنماط استهلاك المياه في مدارس مديرية التربية والتعليم بنابلس

إعداد

عبدالباسط محمد حميد شريده

إشراف

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قدمت هذه الرسالة استكمالا لمتطلبات الحصول على درجة الماجستير في هندسة المياه والبيئة بكلية الدراسات العليا ،جامعة النجاح الوطنية ،نابلس ،فلسطين

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الملخص

تعتبر المياه من الموارد الأساسية الثمينة والمحدودة. وبينما تتزايد أعداد السكان في العالم، فإن تكلفة التزود بالمياه آخذة في الارتفاع بشكل متسارع؛ ولذلك ينبغي علينا المحافظة على الموارد المائية وإدارتها بشكل جيد. وتعتبر المدارس من أهم المواقع الإستراتيجية لتعزيز مشاريع توفير المياه وإدارة استخدامها بسبب العدد الكبير من الطلاب فيها. كما يجب أن تجري في هذه المدارس محاولات لتحسين أنظمة المياه فيها للحفاظ على الموارد المائية والبحث عن طرق لتحسين نوعية المياه.

وتهدف هذه الأطروحة إلى إيجاد مؤشرات استهلاك المياه في ثمانية أنواع من المدارس عن طريق قياس كميات استهلاك الماء من خلال البيانات التاريخية حول المستخدمين وكميات استهلاك المياه في هذه المدارس، ومقارنتها مع المعايير الدولية. كما تهدف إلى ربط معدل استهلاك المياه مع العوامل الأخرى ذات الصلة داخل أرض المدرسة، وبالإضافة إلى ذلك، يهدف الباحث لدراسة إمكانيات فرص المحافظة على المياه وتحقيق توفير في استهلاكها داخل ارض المدرسة(فيما إذا تم استبدال أدوات استهلاك المياه في المدارس بأخرى منخفضة الاستهلاك). وأخيرا، يناقش البحث جودة مياه الشرب في المدارس العامة، ويقدم معلومات عن مصادر الملوثات فيها (مجموع القولونيات الكلية والبرازية) كما يناقش البحث أيضا تقييم مدارس المحافظة كأبنية خضراء حسب معايير الدليل الإرشادي للأبنية الخضراء في فلسطين.

تم جمع البيانات ذات الصلة من مديرية التربية والتعليم في نابلس، وزارة الصحة وبلدية نابلس وتم تنظيمها في فئات حسب نوع الحالة التي ستتم دراستها، ثم حسب نوع المدرسة. يتم تنفيذ اختبار (مجموع القولونيات الكلية والبرازية)عن طريق جمع عينات المياه من نوعين من المدارس اعتمادا على مصادر المياه المستخدمة في هذه المدارس. وبناء على تحليل البيانات التي تم جمعها، وضعت مجموعة من الإجراءات والتوصيات المقترحة.

وأظهرت النتائج أن مؤشرات استهلاك المياه تتراوح3.83-4.67 لتر/ طالب/ يوم في المدارس الأساسية، في حين أنه 4.86 لتر / طالب / يوم في المدارس الثانوية للبنات و6.3 لتر/ طالب/ يوم في مدارس الذكور الثانوية. وتظهر الدراسة أيضا أن الطلاب الذكور في المرحلة الثانوية يستهلكون كميات اكبر من المياه يوميا من طلاب المدارس الابتدائية (ذكورا وإناثا) وأكثر من الطالبات في المرحلة الثانوية على الرغم من أنهم جميعا يستخدمون نفس المرافق في مدارسهم. ويخلص الباحث إلى أن المدارس في فلسطين تستهلك أقل من نصف الكمية التي تستهلكها المدارس في أوروبا وأمريكا، وأقل من الاستهلاك الأفضل للمدارس في المملكة المتحدة. وأخيرا،فإن النتائج بخصوص نوعية المياه تبين أن مياه الشرب في كثير من المدارس ملوثة بالقولونيات الكلية والبرازية خصوصا في المدارس التي تستخدم خزانات الجمع كمصدر للمياه،حيث كان التلوث في 42٪ من المدارس التي تستخدم خزانات الجمع كمصدر للمياه. وكان التلوث في حوالي 20٪ من المدارس التي تستخدم شبكة المياه العامة كمصدر للتزود بالمياه.

ويخلص الباحث أيضا إلى أن انخفاض استهلاك المياه في المدارس هو بسبب أن الأدوات المستهلكة للماء الراكبة في هذه المدارس معظمها من الأدوات الموفرة في الاستهلاك، وكذلك بسبب قلة استخدام الماء في المطابخ والمقاصف ومختلف أنواع الصنابير والمراحيض.

وأخيرا، تكشف هذه الدراسة بأنه لا فعالية من حيث التكلفة لتنفيذ مشاريع التحديثية للأدوات الموفرة للمياه في المدارس العامة حيث انه لن يكون هناك توفيرات في استخدام المياه.لان استهلاك المياه في المدارس العامة أقل من الاستهلاك الأفضل في حال تم تحديث وتغيير الأدوات المستهلكة للمياه في المدارس إلى الأنواع منخفضة الاستهلاك.وان الاستخدام المنخفض للمياه في المدارس قد لا يكون متوافقا مع مبادئ الإصحاح الصحة العامة،لذلك ينبغي معالجة مثل هذه المخاوف وحلها من قبل السلطات المختصة .وأشارت النتائج كذلك إلى أن المدارس تحقق ما بين 22بالمائة للمدارس القديمة و 48بالمائة للمدارس الجديدة من متطلبات الدليل الإرشادي للبناء الأخضر في فلسطين.

يوصي الباحث بأن المدارس التي تستخدم خزانات الجمع كمصدر للمياه ينبغي عليها القيام باختبارات دورية لنوعية المياه والإبلاغ عن أي مشاكل فيها للسلطات المختصة،ويوصي كذلك بالعمل على تحقيق شروط ومتطلبات البناء الأخضر لجميع المدارس الجديدة.