

water auditing

what is your water being used for and how
much are you using?

- 5 minutes = 75 litres -



- 1 flush = at least 12 litres -



- 1 hour = 1000 litres -



- 1 minute = 5 litres -



jointly by



in collaboration with



Global Environment
Centre

contents

introduction	1
foreward	2
who are we?	3
note for teachers	4
water auditing	5
types of water auditing	5
school water auditing	7
- water quality testing	
- water quantity	
- water mapping	
take action!	16
appendix	21
- water consumption audit report	
- river report card	
glossary	32
important contacts and websites	35

Acknowledgements

The majority of graphics and illustrations are used with permission from Sydney Water, Melbourne Water and UN-Habitat. Some were sourced from various websites and we give them acknowledgement.

This booklet was prepared by
Global Environment Centre and Federation of Malaysian Consumers Associations (FOMCA)
for the
National Water Conservation Campaign (July 2006 -June 2008)

introduction

In this book, we have compiled information and activities on water auditing with respect to both the quality and quantity. We have chosen water auditing as one of the most important issues to focus on to promote water conservation as part of our National Water Conservation Campaign jointly organized by the Federation of Malaysian Consumers Associations (FOMCA) and the Ministry of Energy, Water and Communications (MEWC).

The main purpose of the book is to encourage you to learn more about your own water address, to test ideas and to make discoveries about water auditing. The ultimate objective is to make you aware of the ecological, social and economical processes that affect you, your lives, your resources, your friends, your family, the environment and most importantly your future.

The audits and the activities that we have proposed in this book can be carried out without any specific expensive scientific apparatus and without any chemicals. The most you might need is the "Water Testing Kit" which will be provided to your school.

This water audit is an introduction to the most common issues of water which is a life sustaining resource and by understanding the audit, you can play your role in the conservation of water resources and the environment.



foreward

Water is a basic requirement for human life yet water resources are facing increasing demands and competition among users. Federation of Malaysian Consumers Associations (FOMCA) recognizes the fact that improvements in water management cannot be accomplished by technical or regulatory measures alone, but it has to be coupled up with advocacy, awareness and education of consumer's especially young consumers. With this objective in mind, FOMCA is currently organizing a National Water Conservation Campaign in collaboration with the Ministry of Energy, Water and Communications.

This campaign aims at reducing 10% of domestic water consumption and is targeted in achieving several objectives as below:

- To disseminate information on the current state of water resources and the needs to conserve water.
- Creating consumer awareness to reduce water loss in Malaysia
- To equip members of community to become self-sufficient.
- To advocate water conservation, pollution reduction and water resources preservation to relevant water players of the country.

Our increased water consumption is not only putting a strain on our water resources but also on our individual financial resources. To become a water wise person, you have to first understand your consumption pattern. Educating you, on water auditing is, therefore, very important condition for sustainable development of society.

The book is prepared in such way that no specific or expensive equipments will be needed to conduct the audit in your school or home. This shows that in order to explore the environment around us, the most important driving force is the quest for knowledge, curiosity and creativity.

With that I sincerely hope that, this book and training sessions provided will be a starting point for you and your school to start your water audit programme as part of your effort to conserve precious water resources.

START SAVING! STOP WASTING!



MARIMUTHU NADASON A.M.N, A.M.P, P.J.K
PRESIDENT
FEDERATION OF MALAYSIAN CONSUMERS
ASSOCIATIONS (FOMCA)

who are we?



Ministry of Energy, Water and Communications

The Ministry of Energy, Water and Communications (MEWC) was established on March 27, 2004. The Ministry's role is to administer and manage the nation's energy, communications (infrastructure), postal services and water functions. The Ministry's main thrust is therefore to facilitate and regulate the growth of industries in these sectors to ensure the availability of high quality, efficient and safe services at a reasonable price to consumers throughout the country. The regulatory function of the Ministry is undertaken through its regulatory bodies, namely, the SPAN, Energy Commission and the Communications and Multimedia Commission.



Federation of Malaysian Consumers Association

Federation of Malaysian Consumers Association (FOMCA) is a non-governmental organization, which is voluntary, non-profit, non-political, and civil minded and has been established for the past 32 years with 14 affiliates in all the 14 states of Malaysia. It is an umbrella body of registered consumers associations in Malaysia. FOMCA links the activities of consumers' associations in Malaysia as well as on the international level towards strengthening consumer protection. FOMCA is full member of Consumer's International (CI). CI is an international organization which supports links and represents consumer groups and agencies all over the world. It has a membership of over 250 organizations in 115 countries. It strives to promote a fairer society through defending the rights of all consumers.

FOMCA, in collaboration with the Ministry of Energy, Water and Communications is conducting a National Water Conservation Campaign and this book is part of the campaign activity.



Global Environment Centre

Global Environment Centre was established in 1998 to work on environmental issues of global importance. The Centre is registered in Malaysia as a non-profit organization (Reg. no. 473058-T). It supports information exchange and capacity building as well as undertaking strategic projects particularly in developing countries. It works in partnership with other like-minded agencies worldwide. GEC's River Care Programme focuses on promoting and supporting the integrated management of river basins and water resources with particular emphasis on ensuring that biodiversity and wetland conservation and community considerations are incorporated into river basin management.

note for teachers

Malaysia is a country with an abundance of rainfall, yet lately our water resources are currently under great scrutiny due to the fact that it is often mismanaged. Mismanagement of water cannot be defined only by inadequate policies, lack of enforcement or need for advancement in technology but it is also about the lack of recognition, caring, equality, sharing and respect for water at an individual level.

High water consumption rates by individuals also reflect the mismanagement of water and therefore, we seek the teachers as agents to create change in mindset to teach the younger generation on water conservation. This book will further assist the teachers in conducting water audits and it is divided into 4 main issues:

Water Quality

Knowing the water quality which refers to the level of "cleanliness" of water and ways to check the quality of water and water resources.

Water Mapping

To check the quality of our water resources, the first is to understand exactly where our water is coming from and where it goes. Water mapping will teach the students on the source of our water.

The book is like a river and the teacher's inputs are like small rivers running into the big river. The book is not meant to be a solid, static material; on the contrary, its structure is very elaborate and works as a general framework.

Role of the teacher is to:

- Integrate your own local experience and examples
- Ask your own questions
- Make your own activities relevant to the different issues.

We leave you responsible for this role because you know what the water situation is like in your own respective area.

Water Quantity

Knowing the amount of water used in schools as well as at home. This part of the book is to create awareness on how much water we actually waste in our daily activities.

Water Conservation

After understanding that unknowingly, we are wasting a lot of water, this part contains tips on water conservation is to provide tools for action to the students.

water auditing

definition

Water auditing is a way of looking at how all the water at a given site is being used - the quantity and the quality of the water coming in and out and how it can be used more efficiently. It will also identify other alternative sources and uses for water.



why is it important?

It is important to do a water audit for all the places that utilize water because water is a very precious and finite resource. We cannot create new water, so all the water on Earth is constantly being recycled. If we continue to use water the way we do today, there may be no clean water in the future for our consumption and activities. Imagine if there was no clean water to drink, bathe or wash our faces?

A water audit will tell us where we can save water and also how we can re-use different types of water, rather than using clean, treated water for all our activities. This will then lead to sustainable usage of water.

types of water auditing

There are 3 different aspects to water auditing - Water Quality, Water Quantity and Water Mapping.

water quality

Water quality refers to the 'cleanliness' of the water, and can be measured in several different ways. Firstly, you can look around the water source and use your eyes to see if there is any source of pollution such as dirty drain water and scattered rubbish. Second, you can use chemical test kits to test the chemical properties of the water, and third, you can check what kind of living organisms live inside the waterbody, which can be used as an indicator of water quality.

In Malaysia, water quality is steadily deteriorating. As development increases and the population grows without proper environmental education, especially on the importance of water, the quality of our natural waterbodies are rapidly decreasing.



school water auditing

what?

School water auditing is aimed at monitoring the quality and amount of water being used by the school, and learning how and where all the water is being used. From here, you can help to identify areas where the school can save water and money.

why?

The quality of the water we use and drink is important because it can affect our health. We do not want to be drinking contaminated water or using dirty water in our cooking, so we must be able to identify for ourselves what is good or bad.

Schools waste an estimated average of 50% of the water they pay for, and by doing a water audit, you can help your school minimise this wastage by identifying areas where they can use water more efficiently. In the process, you will be helping to educate your friends in school about saving water and help save your school some money which can be used to finance other school activities! Most importantly, you will be helping to ensure a sustainable future for water in our country.



how can you help?

Water auditing is a big responsibility, so you should form a group of people who are willing to put the extra effort into doing this as an after-school activity. In your group, you can split up the tasks of the water audit. There are many things to be done, and you should have at least 5 people working on each task. Use the water consumption audit report in the appendix as another guide to your activities.



water quality testing

Before you find out how much water you are using, you must know about your water basin and the quality of the water in your basin. As mentioned before, there are many ways to study the health of a waterbody where we may be receiving our water from, as well as the rainwater and treated water we receive.

1 water health check

There are 3 ways we can check the condition of our water:

visual observations

The physical characteristics of an area can give clues to the quality of water found there. Some of the physical characteristics of water quality are: water clarity, water colour, and smell/odour. For drains and rivers, other factors like general land use, riparian vegetation (algae, wetlands), aquatic life (fish, prawns), and measurements of in-stream parameters such as width, depth, flow & substrate, drains, erosion and garbage can also tell a lot about the quality of water.



chemical monitoring

Chemical monitoring and testing is one of the most accurate and reliable testing methods. Chemical testing is used to analyze drinking water. It is extremely useful for determining sources of pollution, as well as determining specific pollutants. For example, high concentrations of nitrogen and phosphorus may indicate fertilizer runoff from a nearby farm. The most common tests are pH, temperature, BOD, COD, *E. Coli*, turbidity, and dissolved oxygen.

in-situ chemical testing



biological monitoring of rivers and streams

Biological monitoring of river and stream life provides remarkable insight into the functional quality of the environment studied. It can reveal important changes in the composition of biological communities caused by human activities. It asks the question: "Is this aquatic community showing evidence of harm?" The approach relies on the great diversity of benthic macroinvertebrate life in rivers and streams to determine how suitable a waterbody is for the support of aquatic life.

nets are great tools for biomonitoring



SPECIAL article: Rivers in Malaysia

There are 189 river basin systems with about 1800 rivers in Malaysia. The total length of the rivers is estimated to be 38,000 km. Most of the rivers in Peninsular Malaysia originate from the central mountain ranges. East Malaysia contains the country's two longest rivers: the Rajang in Sarawak and the Kinabatangan in Sabah. They are each 560 km (350 mi) long and navigable for part of their courses. Peninsular Malaysia's longest rivers include the Pahang (470 km/290 mi long), the Kelantan (about 400 km/250 mi long), and the Perak (about 240 km/150 mi long).

The major role of rivers today is to provide clean water for the 25 million people currently living in Malaysia. Among the river basins, 30 of them are reservoirs and they supply 97% of the water supply throughout Malaysia. Despite the importance of rivers as our main source of drinking water, many of our urban rivers today are heavily polluted with all sorts of chemicals and rubbish due to unsustainable development and improper management of rivers.



We have the ability to change this. Rivers belong to all of us and it is our duty to keep them clean. If we don't have clean rivers, we can't have clean drinking water.

Know that all drains lead to rivers without any treatment because drains are only meant for RAINWATER. They are NOT alternative 'rubbish bins' and should be kept clean at all times.

If you see any illegal dumping or activities happening at a river, contact your local authorities (JPS) and report it to them.

We can make a difference!



water quantity

The water usage of your school needs to be known. Then only can you start working on ways to reduce the amount of water your school uses.

1

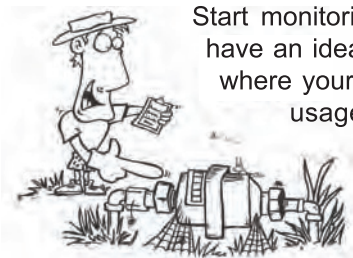
knowing your history

You need to know how much water the school has been using up to now, and the best way is to ask your school for their payment records for the water bill. From here you can extract information on how much water was being used, and how much money the school was paying. Graph the results, and try to analyse the information. Find out which days/months/years there was the most water usage and try to explain why this could have been.



2

a new beginning



Start monitoring your school's current water usage so that you have an idea of how much water your school is using. Find out where your school's water meter is and start monitoring water usage on a daily basis. Record the readings every morning and afternoon at the same time for a few months. Keep a record on paper and graph the results so that you can see any trends or patterns in the water usage. From this information, you can estimate how much water is being used by

each person in the school, and compare this with the recommended amount of water usage by world standards.

SPECIAL activity: Understanding your water bill

Step 1: Identify your current meter reading (A) in your monthly bill. This current meter reading will be the same reading at your water meter at the time when the reading is taken. (Eg : 87 according to the bill)

Step 2: Identify your previous meter reading (B), which should be the same figure as the current reading on your previous bill (Eg : 78 according to the bill)

Step 3: Now, calculate your consumption rate (D) with the formula below:

$$\text{consumption rate reading} = \text{current meter reading} - \text{previous meter reading}$$

$$(D: 9\text{m}^3) = (A: 87\text{m}^3) - (B: 78\text{m}^3)$$

Step 4: If you want to know your average daily consumption, use the formula below:

$$\frac{\text{consumption rate} \times 1000}{\text{days in a month} \times \text{no. of people in the house}} = \text{average daily consumption}$$

$$\frac{\text{example } 9\text{m}^3 \times 1000}{30 \text{ days} \times 2 \text{ people}} = 150 \text{ litres per person per day}$$

With growing water shortages you need to understand water meters. How do they work, how could they affect your bills and how can you save money by consistently monitoring your water usage through the meter? Auditing your water bills monthly will ensure accurate billing by the operators, and therefore it encourages deeper understanding of your water consumption pattern.

REMEMBER SAVING WATER IS NOT ONLY SAVING OUR RESOURCES BUT ALSO SAVING MONEY!
START SAVING, STOP WASTING!



Example of a water bill from Selangor. May differ in other states.

A. Current water meter reading

B. Previous water meter reading

I. Meter registration number

F. Code for charges

C. Type of reading

NOTE: If the figure does not tally with your meter reading, it may be due to the reason that it is an estimation bill. This can be clarified by looking at the Code for the Type of Reading (C): N indicates normal reading according to meter and E indicates that the reading was assumed.

The image shows a sample water bill from Selangor. It contains the following information:

- A. Current water meter reading:** 87
- B. Previous water meter reading:** 78
- I. Meter registration number:** 00-00-0000000000
- F. Code for charges:** 10
- C. Type of reading:** N
- D. Rate of consumption:** 9
- E. Per unit charge:** RM 0.57
- G. Current payment:** RM 5.13
- H. Payment due date:** 18-10-2008

Step 5: To calculate the current payment amount, firstly you must know the per unit water charges rate in your state (E). Then times this rate with the amount of water you have consumed (D).

For example below given are the water charges for Selangor:

0-20 cubic meters	RM 0.57
21-30 cubic meters	RM 1.03
More than 30 cubic meters	RM 2.00
Minimum Amount	RM 6.00

If you have used total of 9m^3 of water then the exact payment amount is $9 \times \text{RM}0.57 = \text{RM}5.13$ for the month, which is lower than the minimum amount so, u will be charged the minimum amount of RM 6.

Step 6: Now, since you know how to calculate your water charges, conduct a water audit for the next 6 months.

If there is indication of a high increase then re-look at the activities during the month. It might be due to a party held in your house or festive season. If there is no distinguished activity, then examine your plumbing system as there might be a leak contributing to the higher water consumption rate.

3 Inventory of water appliances

You have to know where all the water outlets in the school are and calculate approximately how much water is being used from each appliance in the school (e.g. the toilet bowl, taps, kitchens). To do this you can use 1L bottles and run the tap for one minute and see how many bottles it fills up. From this information, you can calculate the approximate percentage of total water being used by each appliance.

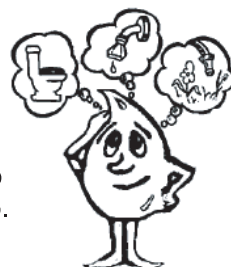
Example table (please construct your own according to your school's facilities)

Location: girls toilets 3rd Floor	litres per minute	minutes of use per day	litres used daily
Number of sinks/taps 1 2			
Number of toilet bowls 1 2			
Number of showers 1 2			



4 Survey of water usage

You also need to know what other activities your water is being used for and whether it can be used more efficiently. To do this, you have to start looking around and asking questions. For example, you should ask your school cleaners how much water they use to wash the toilets or the floors and how often they do so. Can any savings be made there?



5

Source of water

Knowing where your water is coming from will allow you to make better decisions about how it should be used. You have to identify where your water is coming from, and how much you receive from each source. This could be rainwater or surface runoff. Apart from using your tap water for everything, are there any other sources of water you can use? For example, you could use rainwater to wash your floors and flush your toilet bowls instead of using treated tap water. Think about what other daily activities you could substitute rainwater for tap water and write them down.



6

Check for leaks

It is important to find out if there are any leaks in the pipes or appliances in the school. To check if there is a leak, you have to turn off all the taps in the school at the end of the day, and ensure that there are no activities overnight. Check the reading on the water meter before you leave and come early the next day before anyone has used any water in the building and check the reading on the meter again. If there is no leak, there should be no difference in the reading. However, if the readings don't match, then you have to find out where the leak is coming from. Check all the toilets and taps in the school and see if you can find any leaky appliances.



Some toilet leaks are silent, some produce a running water sound and others may be visible as a small trickle running from the rim to the water in the bowl. To detect silent leaks, remove the toilet cistern lid. Flush the toilet to empty the cistern and add a few drops of food colouring to the cistern as it refills. If the tank is leaking, colour will appear in the bowl within 15 to 30 minutes.

Make a checklist of all the appliances that are leaking and their locations. You can also calculate how much water is being lost each day for each leaky appliance.

take action!

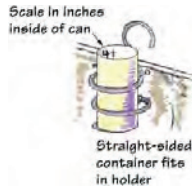
With all the information you have compiled and recorded, you can now start taking action! Take a look at all the areas you have identified where water is being wasted and can be saved or used more efficiently, and start taking action! If you found any leaks, ask your school to get them fixed ASAP! Start your own 'Save Water' campaign in your school, and use the water meter readings as an indicator of your progress.

rainwater harvesting

The water that falls from the sky when it rains is a valuable resource. This water can be used for many purposes such as watering plants, washing floors, and flushing toilets. You can set up a rainwater collection system in your school, but first you must check how much water you receive and its quality.

To check the quantity of the rainwater, you need a large measuring cylinder (from the science lab), some wire, and a hammer and nails.

1. Find a good location where there is no overhanging trees, wires or roofing for your rain gauge.
2. Hammer the holding rack made out of hanger wire or equivalent, to hold the cylinder in place to make sure it doesn't blow away.



When a rain event has just begun to take place, take note of the time. After it has finished raining, go and measure the amount of rainwater found in the cylinder.

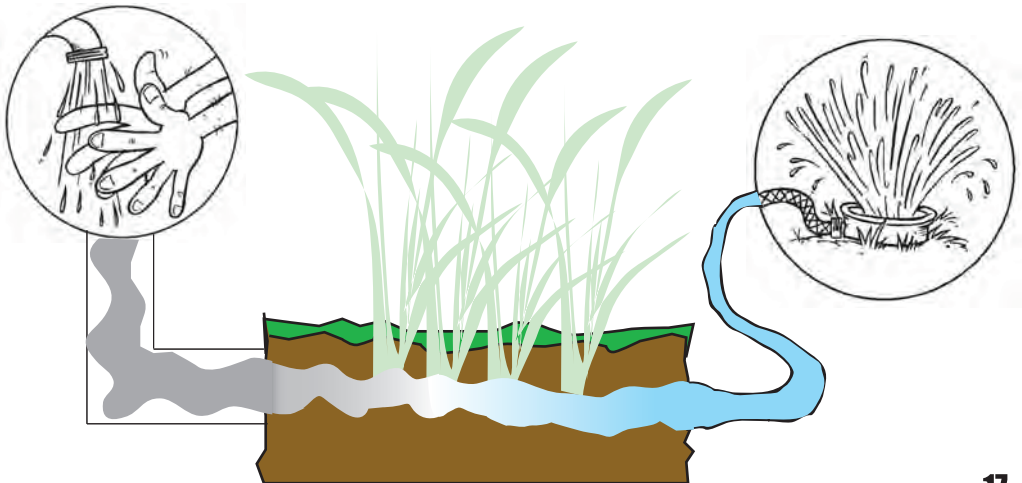
From here, you can estimate the amount of water you receive per minute of rainfall. Keep a good record of rainfall events and how much rainwater you receive for one month. If it is a substantial amount, then you can think about installing a rainwater tank at your school.

Remember to check the quality of your rainfall by collecting a clean sample in a glass or plastic container, and take it back to the science lab to test its chemical properties.



example of a rainwater harvesting system and environmentally friendly home
re-use & recycle!

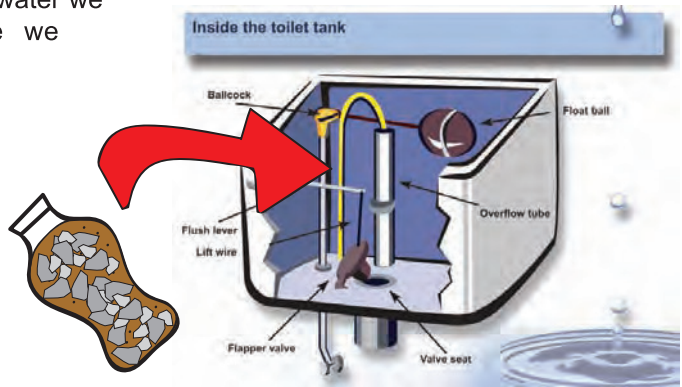
Grey water from bathroom and kitchen sinks can be treated at your school itself! By constructing a wetland cell, you can treat grey water into clean water again, and use that water to water the garden plants, wash the floors or flush the toilet bowls.



out with the old, in with the new!

A more costly, but effective way of saving water is to simply upgrade your appliances to newer ones that are more water efficient. Toilet bowls these days come with dual flush systems, which has a half- and full-flush option. Old toilets were made to use up to 15-30 litres of water per flush, but in fact, we only really need around 8 litres per flush to do the job! Imagine how much water we are wasting everytime we flush away?

A simple and cost-effective way of reducing the amount of water per flush, is to



place a bottle filled with something heavy like sand or gravel and place it in the water tank behind the toilet bowl.

You can also report all those leaks you found to your teacher and make sure they get a plumber in to get it fixed or replaced!

research

Technology improves everyday. It is up to you to keep updated about what new water-saving technologies are out there that can be used in your school. Go on the internet and find out what other schools in other countries are doing and how you can improve the efficiency of water usage in your school.

You can also find out more details about any of the topics in this booklet to help you and your friends understand them better.



river report card

Our streams, rivers, lakes and wetlands are far more than just a part of the scenery - they are the lifeblood of the environment. They provide homes for wildlife and plants, water supplies for homes and industries, and places of recreation and enjoyment for all of us. In addition, rivers reflect the health of the surrounding land because they are the collection point for water coming from all around.

But how can you tell if a river is healthy? It is actually quite simple to estimate the overall condition of the river. You do not need high-tech equipment or chemicals, but you will need your senses, your common sense and a genuine concern for the river.

In the next page, we have proposed categories in which you can make judgments on your local river. In each category, you can rate your river and then combine your scores to come up with an overall rating for the area. You can then compare different rivers or different sites along the same river. Keep good notes on each site, recording the location, date and details on anything special that might vary from visit to visit. This is important so you can compare your scores if you visit the site over time.

Site Description

Name of waterway / site :

Date :

Time :

Weather :

**Has it rained in the past 24 hours?
(if yes, was it heavy?)**

Name :

Contact details :

School / organisation :

Crew size :



**Global Environment
Centre**



category 1

land use

List down the different land uses in the area.

rating

characteristics

- 0-1 Lots of industry nearby, most land are cleared, bare soil, disturbed environment
2-4 Some industry, some land cleared
5-9 Some commercial, recreational and residential use
10 No human use at all, in its natural state.

Create a list of places where the water is coming from.

Your Rating

category 2

rubbish

Make note of the type of rubbish that can be found in the water or surrounding area (this include human made waste and natural litter such as leaves and animal faeces) and how much there is.

rating

characteristics

- 0-1 Lots of human made rubbish such as tyres, plastics and cans, oily films and excessive algae growth
2-4 A lot of human made waste such as cans and plastic, or algae
5-7 Some human made waste such as garden waste and plastics
8-9 One or two pieces of human made waste and local vegetation such as leaves floating in the water
10 No human use at all, preserved in its natural state

★ If rubbish seems to collect in one area, take photo of the area each time you monitor your site so you can compare rubbish build up.

Your Rating

category 3

pipes & drains

Look for pipes, drains or trenches leading into your waterway. Record what's coming out of the pipes, drains or trenches.

rating

characteristics

- 0-1 A number of pipes from industry and/or sewage treatment and/or urban storm water
2-4 Some pipes or trenches
5-7 No pipes from industry, but some urban storm water drainage
8-10 No pipes or drains

Your Rating

category 4

extra structures/modifications

Record any extra structure/modifications along the river at the site such as weirs, concrete banks, piers or any artificial modification of the water flow

rating

characteristics

- 0-1 A number of artificial structures, large modifications of river's natural flow
2-4 Some artificial structures or some flow modifications
5-7 No concrete structures or minimal modifications of water flow
8-10 No extra structures or artificial modifications

Your Rating

category 5

smell

Take a water sample and record the smell.

rating

characteristics

- 0-1 Very strong, unnatural chemical smell
2-4 Strong, unnatural smell
5-7 Stronger decaying smell, or slight, unnatural smell
8-9 Very slight smell, perhaps natural decay
10 No smell / natural smell

Your Rating

category 6

water conditions

What colour is the river's water? Is the water clear or turbid?

rating

characteristics

- 0-1 Milky brown or green colour with particles and scum. You can hardly see through it!
2-4 Cloudiness and/or greenish colour with particles or film
5-7 Some colour and particle
8-9 A little colour
10 Colourless and as clear as tap water

★ Record the flow of the water (slow, rapid, not flowing).

Your Rating

category 7

vegetation



Your Rating

Look at the banks and the land extending from the river. Note if vegetation is natural or introduced and whether erosion occurs or not.

rating

characteristics

- | rating | characteristics |
|--------|--|
| 0-1 | Lots of introduced plants, much clearing, bare ground, pasture. Extensive erosion. |
| 2-4 | Mixed plants, much clearing, large, eroded areas |
| 5-7 | Mixed native and introduced plants. Some clearing. Small corridor of vegetation. Minor erosion. |
| 8-9 | Mainly native plants, minor clearing. Natural vegetation extending up to 30m from water. No erosion. |
| 10 | Mainly undisturbed native plants, extending up to 30m from water. No erosion. |

category 8

vertebrate animal life

(birds, reptiles, fish, amphibians & mammals)

Sit by your river and look for vertebrate animal activity. Record both the variety and number of animals. Look for fish and listen for frogs.

rating

characteristics

- | rating | characteristics |
|--------|--|
| 0 | No animal life visible at all |
| 1-2 | One type of animal life |
| 3-5 | Two types of animals found |
| 6-8 | Three types of animal life found |
| 9-10 | More than three types of animal life found |

Your Rating



Using bird books, learn the names of the birds found around the site and compile a list.

category 9

water movement

(voice of the river)

How fast does the water flow?

rating

characteristics

- | rating | characteristics |
|--------|--|
| 0-1 | Stagnant, still and shallow |
| 2-4 | A little movement of mixing of water, shallow depth |
| 5-7 | Movement at the speed of a slow walk, wind waves |
| 8-9 | Good movement, the speed of a fast walk, wind waves |
| 10 | The speed of running or faster, wind waves, bubbly sound |

Your Rating

map your area

Draw your local area map here and use a key to identify and record the different types of land use/human activities or other points of interest.

Write down scores for each category and total them up.



OVERALL RATING

What do you think of this site?

(Draw a mouth for the face according to the total score)



Mouth guide
Scores





water mapping

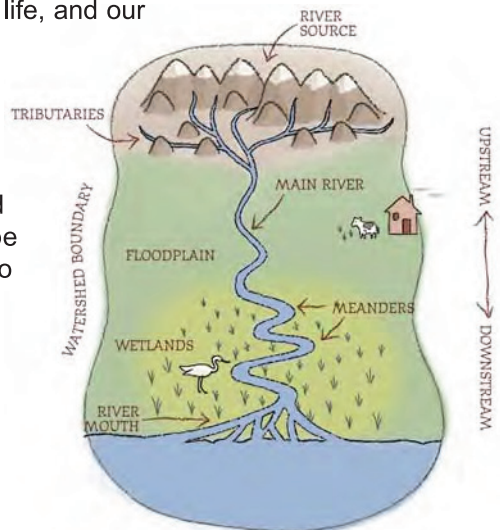
1

river basin studies

A river basin is the entire area where all the water flows into the same waterbodies due to the shape of the land. This means, anything that happens to the water quality in an area will also affect the rest of the water supply in the basin. Therefore, it is important to carry out river basin studies to know what the status of your river basin is in and how this may be affecting your water quality.

The first thing is to study the **ecology** of your river basin. Are there many trees left along the riverbanks? Are there living things in the rivers? Rivers support living organisms, and it also depends on them for certain functions. If rivers are polluted, they are unable to support life, and our water quality will be affected too.

Good **hydrology** is also important for the health of our rivers and quality of our water. This includes aspects such as depth, width, velocity and volume of water. There should be different varieties of all these in a river to maintain its natural flow.



2

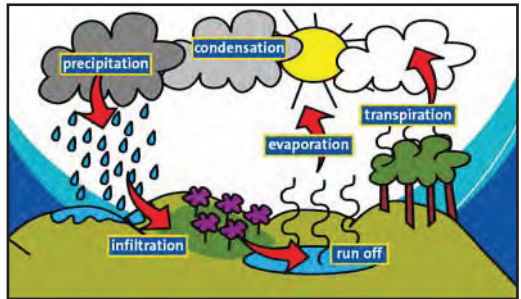
river basin mapping

River basin mapping involves studying your river basin and all the inlets and outlets of water in the area. You should find a map of your area, and identify any rivers, lakes, or ponds, and all the drains that are leading into the river. These are all interconnected, and when it rains, everything on the land is washed away into our drains and into our rivers. In Malaysia, all drains eventually lead to rivers. Drains are only meant for rainwater, but many people still throw litter on the ground and in the drains and this ends up polluting our rivers. You also need to note the nature of land use and activities going on beside the river that could contribute to its pollution.

water quantity

Malaysia is blessed with a large amount of freshwater resources. We have 1800 rivers, and receive over 2500-5000mm of rain annually, which is 20 times more than some Middle-Eastern countries. We receive water from 4 main sources - pipes, rain, surface water (runoff) and groundwater.

Treated water is basically the water from our taps which has been cleaned at a water treatment plant. This water comes from our RIVERS. In fact, in Malaysia, 97% of our drinking water comes from our rivers. This kind of water should only be used for consumption, or hygiene purposes like bathing, cooking and washing dishes.



Rainwater is a resource that many people are not making use of. Rainwater can be used to wash our cars and outside areas, water plants, and also to flush our toilet bowls! If all of us used rainwater for these 3 activities, imagine how much clean (treated) water we will be saving? We will also be saving money as we would be paying less on our water bills!

Surface water is water from rain or other sources (drains) that flows over land surfaces and is a major component of the water cycle. When runoff flows along the ground, it can pick up soil contaminants such as petroleum, pesticides, fertilizers, and anything else in the environment such as all sorts of litter and waste, which eventually discharges into our rivers as pollutants.

Groundwater exists almost everywhere. It exists underground in the spaces between particles of rocks and soil, or in crevices and cracks in rocks. In certain parts of the world, groundwater is their main source of drinking water. It is also important for agriculture and industries.



water mapping

This involves mapping out all your sources of water, and where it is going to. Outside, it means looking at where your drains and gutters are leading to. In a building, it means looking at where all your pipes are leading to and what kind of water it is carrying - clean water, grey water or black water. With this knowledge, you can think about how you can re-do your pipes to carry certain types of water so that it's not all wasted.

And...remember your ABC's on Water Conservation!

- A** Add a few drops of food coloring to the toilet tank. Wait 15 minutes without flushing. If color appears in the bowl, you have a leak.
- B** Before you turn on the water in the bathtub, put in a stopper.
- C** Check faucets and pipes for leaks. Even a small drip can waste 90 litres a day.
- D** Don't clean the driveway or sidewalk with the hose; use a broom
- E** Extra flushes waste water and money. Don't use your toilet as an ashtray or wastebasket.
- F** Find the main water shutoff valve. You may need it in an emergency.
- G** Get advice from local experts (NGOs) on how to manage water wisely.
- H** Hazardous materials such as oil, paint and insecticides go in special dumps, not down the drain.
- I** Install aerators with flow restrictors on all faucets.
- J** Join your neighbors in practicing water conservation.
- K** Keep in mind to use recycled water. Water used for washing hands, vegetables and rinsing dishes can be used again for watering plants or for flushing the toilet.
- L** Launder your clothes in the least amount of water possible.
- M** Make an effort to tell friends about water conservation.
- N** Nutrient rich water is in the fish tank. When you change the water, give it to the plants.
- O** Order water in a restaurant only if you plan to drink it.
- P** Place a weighted plastic bottle in the tanks of conventional toilets to save water with each flush.
- Q** Quit wasting water.
- R** Replace old showerheads with new low-flow heads.
- S** Shorten your showers to 5 minutes.
- T** Two-thirds of indoor water use is in the bathroom.
- U** Use faucets at less than full pressure.
- V** Vegetables should be rinsed in a pan of water or stoppered sink, not running water.
- W** While brushing your teeth, turn off the faucet.
- X** X-out extravagant water-use habits.
- Y** You can save about 22 litres of water a day by stoppering the sink when you shave, rather than running the tap.
- Z** Zero in on new products that use less water and still provide quality, service and comfort.

have your say!

Don't let all your information go to waste. We hope that you will compile all your information on a monthly basis, and send it over to us! We'd love to hear about your water auditing and conservation progress. We'll also be sending any reports we get to the relevant agencies and authorities to look at, so that your school will be recognized for its efforts to conserve our water.

The information and data that you may collect is invaluable, and will give fresh insight into the usage of water in schools in Malaysia. Come and be the first in contributing to this database!

Please contact us or send your monthly reports to:

address Global Environment Centre
2nd Floor, Wisma Hing, No. 78 Jalan SS2/72
47300 Petaling Jaya, Selangor D.E., Malaysia.

phone +603 7957 2007
fax +603 7957 7003

email kalithasan@genet.po.my

address Federation of Malaysian Consumers Associations (FOMCA)
No 1D-1, Bangunan SKPPK, Jalan SS9A/17,
47300 Petaling Jaya, Selangor D.E., Malaysia.

phone Tel : +603 7876 2009
fax Fax : +603 7877 1076

email E-mail : fomca@fomca.org.my

WATER CONSUMPTION AUDIT REPORT

AUDIT INFORMATION

NAME:

.....

SCHOOL NAME:

.....

GRADE:

.....

DATE:

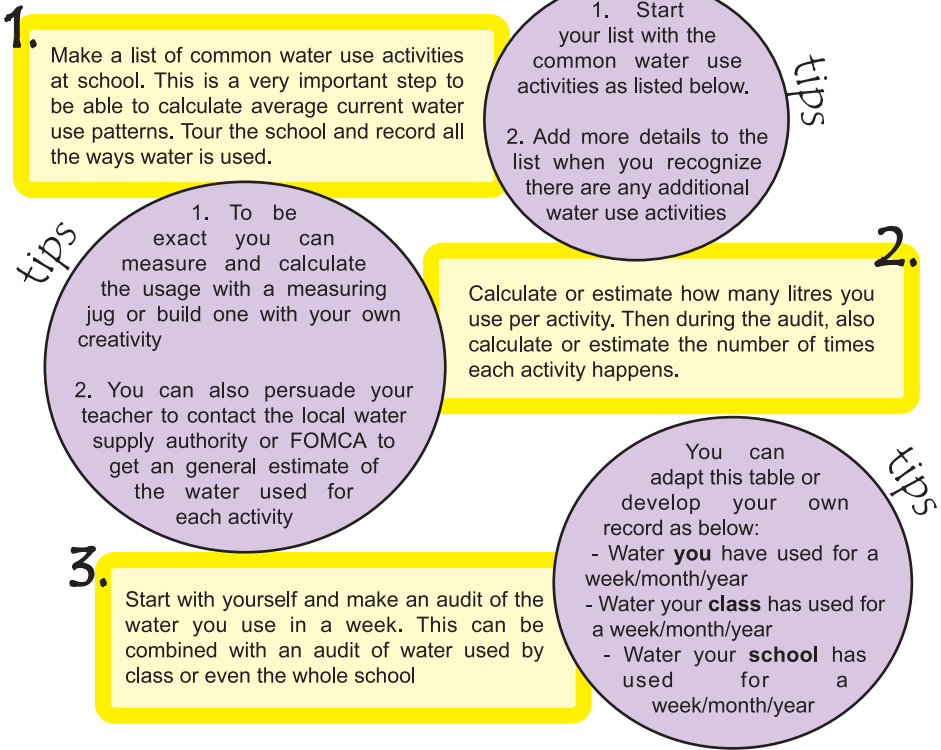
.....



PREPARATIONS:

1. Duplicate copies of the tables for activity 1 and 2 each time you conduct an audit.
2. Refer to the audit instructions provided in the yellow box each time you start a particular section of an audit.

ACTIVITY 1: WATER USE ACTIVITIES IN SCHOOLS use table in next page



ACTIVITY 2: WATER USE ACTIVITIES AT HOME use table in next page

To conduct a water audit at home, follow the same procedures as done in schools. The only difference would be the water use activities and estimation of usage level. The table below can be referred to as a guide to conduct your water audit at home.

ACTIVITY 3: CHECKING YOUR WATER AUDIT

When you think everyone's water use is audited in your school/home, you can check off results against the meter reading of through the water bills at home or in school (follow the instructions given in the topic 'Understanding Your Water Bill').

Since there were assumptions made to gauge the usage of water, compare your audit results with other friends to calculate the average

If your audit results shows LESS water being used than what the water meter shows, then:

1. You may have missed measuring an important water use activity (ask a friend to recheck your measurements).
2. Your calculations might be wrong (ask your teacher to check your calculations).
3. There might be a leaking pipe/tap/toilet bowl somewhere (walk around the school and if you do find any leaking pipes, let your teacher know about it)

table for activity 1

[illegible]

ACTIVITY 4: TIME TO TAKE ACTION

The following are some ways that you, your school and your family could practise to help conserve water. Tick the ways that are already being practised in your school / home and the ways that you would like to practise in future.

ways to conserve water	already practising	i'll start today!
During a shower, turn off the tap when soaping or shampooing	<input type="radio"/>	<input type="radio"/>
Use a glass instead of a running tap when brushing teeth	<input type="radio"/>	<input type="radio"/>
Use a half flush for flushing liquid waste instead of a full flush	<input type="radio"/>	<input type="radio"/>
Use a filled sink to wash dishes or vegetables	<input type="radio"/>	<input type="radio"/>
Re-use the water from washing of vegetables to water plants	<input type="radio"/>	<input type="radio"/>
Use a wash-tub instead of running tap when hand-washing clothes	<input type="radio"/>	<input type="radio"/>
Wash with a full load on alternate days instead of a half-load daily when using washing machines	<input type="radio"/>	<input type="radio"/>
Re-use rinse water from laundry for cleaning and flushing of toilets	<input type="radio"/>	<input type="radio"/>
Use a mop and bucket instead of a running hose to wash the floor	<input type="radio"/>	<input type="radio"/>
Use two buckets instead of a running hose to wash car.	<input type="radio"/>	<input type="radio"/>
Check for leaks from worn-out tap washers and leaking pipes	<input type="radio"/>	<input type="radio"/>

Suggest some other ways that you can think of to conserve water.

Below are some of the water conservation gadgets which are widely used in Malaysia. Audit your school/home to see if you have any of these gadgets in use and also try to collect information such as quantity available in your school or home and the daily usage. This will further provide you with calculations on how much water you save using these items.

		A	B	C
item	☞ tick if it's there!	quantity	water usage per minute*	daily usage (times/person)
Tap	<input type="checkbox"/> Ordinary tap <input type="checkbox"/> Tap inserts (to change the flow pattern) <input type="checkbox"/> Flow restricting valves <input type="checkbox"/> Retro-fit self closing taps (with sensor) <input type="checkbox"/> Renewing washer if there is dripping <input type="checkbox"/> Others :			
Toilets	<input type="checkbox"/> Normal, single flush system <input type="checkbox"/> Smaller cisterns (6 liters and below) <input type="checkbox"/> Dual or Triple flush system <input type="checkbox"/> Water efficient toilet tanks / flush <input type="checkbox"/> Placing a bottle of water in the cistern <input type="checkbox"/> Others:			
Shower	<input type="checkbox"/> Conventional shower head <input type="checkbox"/> Low pressure shower head <input type="checkbox"/> Others:			
Washing Machine	<input type="checkbox"/> Auto top loader <input type="checkbox"/> Auto front loader <input type="checkbox"/> Semi auto / twin top / others <input type="checkbox"/> Water saving washing machine <input type="checkbox"/> Wash by hand (few clothes) <input type="checkbox"/> Only washing clothes on full load <input type="checkbox"/> Others:			
Gardening	<input type="checkbox"/> Using watering cans <input type="checkbox"/> Using hose without control head <input type="checkbox"/> Using a hose with control head <input type="checkbox"/> Water butt / rainwater harvesting <input type="checkbox"/> Others:			
Wash Stand	<input type="checkbox"/> Description:			
Basin	<input type="checkbox"/> Ordinary <input type="checkbox"/> Plug in place (to encourage using water in basin & not running tap)			
Swimming Pool	<input type="checkbox"/> Description:			

* you have to measure this for yourself

To find the amount of water saved for a month by using any water-saving gadget, use the table below which will guide you in calculating the amount of water saved. You still have to refer to the previous table to calculate the total amount of water used per item.

item	total amount water used (A x B x C)		amount of water saved (X-Y)	number of people using item (Z)	total amount of water saved per item (X-Y) x (Z)
	ordinary item (X)	water-saving gadget (Y)			
Tap					L
Toilet					M
Shower					N
Washing Machine					O
Gardening					P
Wash Stand					Q
Basin					R
Swimming Pool					S

total amount saved per school/home per day (t) = L+M+N+O+P+Q+R+S

total amount saved per school/home per month = (t) x 30/31 days

ACTIVITY 5: RESULTS LEAD TO ACTION

Once you have gathered the details and conducted the water quantity audit, take the results to the next step by discussing if you have enough resources to create an action plan. This will be based on the level of satisfactory results. The following table will help you analyze the data you gathered.

issues	needs further research	needs to be addressed	needs further action
Water audit results			
The variance between audit result and meter reading			
Water distribution			
Water use			
Existing water conservation efforts			
Plans to embark on water conservation efforts			
Other concerns			

Let us know about your audit, the result and your future plans to conserve water. This can be an example to fellow students or schools around the country.

glossary

aquifer

Underground water source - water-bearing rock and soil strata.

biochemical oxygen demand (BOD)

The quantity of dissolved oxygen in water (mg/l) consumed under test conditions during a given period (5 days) through the microbiological oxidation of biodegradable organic matter present in wastewaters. One of the standard tests used to characterize effluent quality.

biodegradability

Ability of substance to decompose without adding chemicals.

catchment

Area drained by a river or river system. Also area drained by a sewerage system.

chemical oxygen demand (COD)

The quantity of oxygen equivalent to the amount of oxidizing agent consumed in oxidizing the majority of organic matter present in wastewaters. Does not distinguish between the organic matter liable to be degraded readily by biological means and the more intractable forms. Can include the oxygen demand of some inorganic substances such as sulphides. Measured by testing a sample of the wastewater with potassium dichromate and sulphuric acid.

chlorination

The application of chlorine to water for the purpose of disinfection.

coarse screen

A screen used for removing gross solids from domestic or industrial wastewater, with spaces between the bars at least 50mm wide.

coliform bacteria

A group of bacteria found in the intestine and faeces of most animals. Coliforms can sometimes be found in untreated water. The treatment process removes them and disinfection prevents their reappearance in the distribution system. In water receiving discharges, faecal coliform bacteria are used to indicate the presence of sewage.

disconnection

Separation of a customer's supply from the public water network.

disinfection

The destruction of pathogens by physical or chemical means.

dissolved oxygen (DO)

Oxygen dissolved in a liquid, the solubility depending on temperature, partial pressure and salinity, expressed in milligrams per litre. Tables giving values for the solubility of oxygen in water have been published in standard methods.

E. coli (Escherichia coli)

A bacterium taken as an indicator of faecal contamination.

glossary

ecology

The study of interrelation between living organisms and their environment.

fluoridation

Application of fluoride to drinking water at the request of health authorities as a preventive measure against dental decay.

groundwater

Water occurring in permeable underground strata, eg chalk and sandstone.

hydrology

Branch of science concerned with the properties of the Earth's water, and especially its movement in relation to land.

mains

Pipes which carry treated drinking water.

meter

A device for measuring the quantity and flow rate of water.

ozonation

The addition of ozone, particularly to a raw water or biologically treated sewage to decolorise and disinfect it. Also termed 'ozonization'.

pathogen

An organism which is capable of producing disease.

screenings

The gross solids, including rags and plastics, in sewage are intercepted by screens and removed manually or by raking mechanisms.

sedimentation

The process by which settleable solids are removed from sewage by passing it through a tank at a rate that allows the solids to gravitate to the floor to form sludge.

septic tank

A type of sedimentation tank in which the sludge is retained sufficiently long for the organic content to undergo anaerobic digestion. When sludge is eventually removed to a sewage treatment works, some is left in the tank to act as a 'seed' to initiate further digestion. Used for receiving the sewage from houses and other premises which are too isolated for connection to a foul sewer.

service reservoir

A reservoir where treated water is stored.

sewage (or wastewater)

Water-borne wastes from domestic uses of water, derived from households or similar uses in trade and industry. Storm sewage is that flowing to a treatment works in wet weather or discharged from storm overflows, when the sewage is diluted to a greater or lesser extent with rainwater.

glossary

sewer

A pipe conveying wastewater or sewage discharged into it from two or more house drains.

sewerage

A system of pipes and mechanical appliances for the collection and transportation of domestic and industrial wastewaters.

storage reservoir

A reservoir for storing untreated water.

supply/demand balance

The extent to which the demand for water and the water resources available are in balance, taking variability of supply and demand into account.

supply pipe

That portion of pipe which conveys water from the main to the customer's house and which is on the customer's property.

surface water

The run-off from paved and unpaved roads, buildings and land.

suspended solids

In sewage analysis, those solids retained after filtration.

total dissolved solids (TDS)

The concentration of dissolved solids in a wastewater or effluent, ie the residue after evaporation and drying, expressed in milligrams per litre of sample.

turbidity

Interference with the passage of light rays through a liquid, caused by the presence of suspended matter.

ultraviolet (UV) treatment

Treatment of drinking water or effluent with UV rays to neutralize bacteria.

unit costs

The total cost divided by a measure of output; usually volume of water delivered or sewage taken away.

important contacts and websites

organisations

Ministry of Energy, Water
and Communications

<http://www.ktak.gov.my>

Department of Environment,
Malaysia

<http://www.doe.gov.my/>

Indah Water Konsortium

<http://www.iwk.com.my>

World Water Day

<http://www.worldwaterday.org>

Water Watch Penang

<http://www.waterwatchpenang.org/>

Department of Irrigation
and Drainage, Malaysia

<http://www.water.gov.my/>

Melbourne Water

<http://www.melbournewater.com.au>

Sydney Water

www.sydneywater.com.au/

Water Partners International

<http://www.water.org/resources/waterfacts.htm>

water saving tips and resources online

Water - Use it Wisely!

<http://www.wateruseitwisely.com/>

Save Water

<http://www.savewater.com.au/>

Water Saving Tips

<http://www.watersavingtips.org/>

Rainwater harvesting

<http://www.rainwaterharvesting.org/index.htm>

49 ways to Save Water

<http://www.americanwater.com/49ways.htm>

Water Guide, UK

<http://www.water-guide.org.uk/tips.html>

Water IQ

<http://www.wateriq.org/tips.php>

Kids' Water Zone

<http://njawwa.org/kidsweb/Default.html>

U.S. EPA Water for kids!

<http://www.epa.gov/water/kids.html>

Complete rainwater solutions

http://www.rainharvesting.com.au/rain_water_harvesting.asp

Water facts and figures

http://www.ramsar.org/wn/w.n.3wwf_wwf2.htm

