



Delo i presye - Annou servi li byen!

TEACHERS GUIDE

WATER

AND HOW TO USE IT SUSTAINABLY

SEPTEMBER 2012

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Pedagogical objectives

1. Enhance teachers' understanding of sustainable water management issues in Seychelles
2. Inspire teachers to help children in their writing of DILANS' story on the theme of sustainable water management in Seychelles
3. Build teachers' capacity to promote more sustainable use of water at school and at home

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PURPOSE OF THIS TEACHERS GUIDE

Water is a vital source of energy for many living things. All plants and animals need water to live. Human beings which are on top of the food chain as the highest consumer also needs water to survive and for other daily activities such as bathing, washing cooking and cleaning. It is said that we can live for days without food but we cannot live without water for long.

About three quarters of the earth's surface is made of water but most of it is seawater. Sea water is not drinkable because there are too many salt in it but can become drinkable if it is treated by an expensive process called desalination (removal of salt and other impurities for the sea water).

This guide has been specially designed to provide teachers with information on sustainable water management in Seychelles and ideas on how to address this in lessons and extra-curricular activities. The guide was produced with the support (and on the request) of the ISLANDS project implemented by the Indian Ocean Commission and funded by the European union, as part of a regional campaign to encourage schools to address the key challenges needed to achieve sustainability.

WATER IN THE SEYCHELLES' CURRICULUM

In Seychelles, water is covered as a topic in both primary and secondary science. The following science curriculum topics address aspects of water, aquatic habitats, pollution, water treatment and water conservation:

Cycle 1: Materials & Water, Effect of Weather on Living Things

Cycle 2: Dissolving Things in Water, Force of Water

Cycle 3: Water Sources, Treatment & Conservation, Movement in Water, River Habitat

Cycle 4: Water management and conservation, Human Impact on the Environment

Cycle 5: Purification, Ecosystems, Chemicals in Industry

Even though water use is most directly addressed in the science curriculum, the topic of water can be addressed through any subject area. Indeed, teachers can and do create lessons in languages, maths, PSE, arts, geography and other subjects to help their students grapple with the issue of how people in Seychelles can get and use water more sustainably.

The Technology and Enterprise curriculum for secondary schools addresses water throughout the agriculture theme and can also be used as an opportunity for teaching about sustainable water use.

The lesson plans included in this guide give ideas for incorporating the topic of sustainable water management into a range of different subjects.

Many schools have extra-curriculum clubs and activities and these can also focus on the theme of sustainable water use. This guide should be a useful resource for the world water day activities organised by many schools every year in March.

WATER USE IN SEYCHELLES

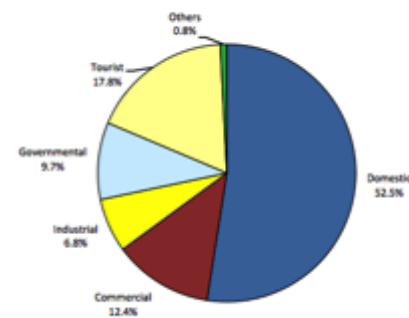
Compared to many other countries in the global south, Seychelles uses a lot of water per capita! The table below shows how much PUC water is purchased by the different sectors in our society:

Table 3.1 - Water Sales for the Year 2009 for Seychelles

User Category	Total (m ³)	Percentage (%)
Domestic	3 899 774	52.5
Commercial	924 932	12.4
Industrial	503 551	6.8
Governmental	718 573	9.7
Tourist	1 324 072	17.8
Others	60 949	0.8
Total	7 431 851	100

Source: PUC

Figure 3.2 - Water Sales by User Category for Seychelles (2009)



Source: PUC

The table shows that the biggest consumer of water is the domestic sector – our homes. The second biggest consumer is the tourism sector. The graph shows the same information in a different format.

One way of comparing our water use to other countries is by looking at how much water each person uses every day (per capita per day). The table below shows how much water we use. Interestingly, La Digue seems to have the highest per capita consumption!

Table 2. Average water consumption in 2009 (Source: Gibb's Water Master Plan)

	Litres person/day	Litres/room/day		
	Residents	Tourists - large hotels & luxury villas	Small hotels	Guest houses
Mahe	150	1500	600	300
Praslin	159	1000	600	300
La Digue	179	2000	600	300

Tourists use at least twice as much water per day as Seychellois. The figures for tourism take into account all water use in hotels: for the tourist's rooms, laundry, swimming pools, staff toilets, kitchens,

etc. This is why the bigger hotels and resorts use so much water – the more facilities they have, the more water they use.

The amount of water that each person in Seychelles uses per day is still very high. The numbers in the table above only include consumption of PUC water – many people also use river water, well water and rainwater but no records are available.

The table below compares our daily treated water consumption to some other countries. Remember this does not include river and rainwater! We use less than many other countries but we could also find many ways to conserve water and use it more wisely – at home, school and work.

Country	Average daily domestic water consumption per person (Litres)
Seychelles	150
USA	575
Australia	493
France	287
Phillippines	164
Mauritius	160
UK	149
China	86
Kenya	46
Ethiopia	15
Haiti	15
Mozambique	4
World Water Poverty Line	50

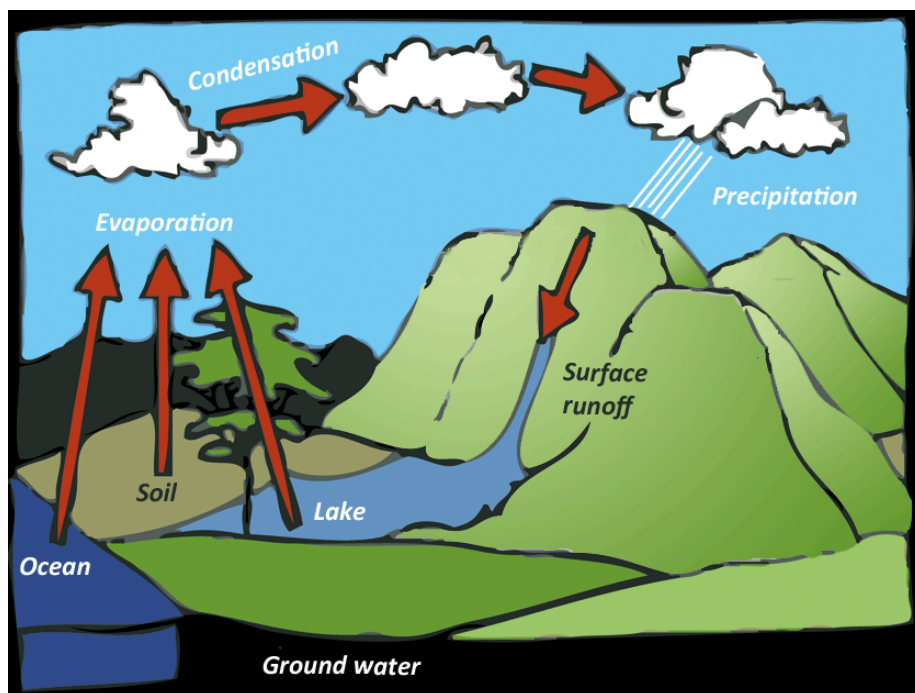
Source: http://www.data360.org/dsg.aspx?Data_Set_Group_Id=757 and <http://www.oecd.org/countries/mauritius/38562882.pdf>

WHERE DOES OUR WATER COME FROM?

In Seychelles we have one main source of water – rain!

When rain falls on the surface of the landscape some of it absorbs down through the forest floor and seeps out from a crack – this is what we call a spring or “sours delo”. Some people collect water right at the source – this water is usually clean and uncontaminated since it comes straight out of the ground and is naturally filtered. Springs often dry up during drought periods.

Some of the rainwater flows over the surface and drains through the forest floor and forms rivers that flow toward the sea. People often create a small catchment or “basen” on rivers above their homes and then divert some of this water that collects in the catchment into pipes that lead to their homes. Even if it hasn’t rained for a while, some of the larger rivers continue to flow with water that was stored in the forest floor. River water can be contaminated with bacteria from rats, other animals or people.



The water that flows in rivers is basically rainwater running over the surface of the landscape. When the water flows down hill to the coastal plateau, some of it is absorbed into the ground under wetland areas and forms a fresh water layer (lens) underground.

On La Digue PUC pumps up some of this water. Some people and also farmers have a well and pump this water out for personal use or agriculture. Some buildings collect rainwater off the roof and store it in buckets, barrels or even underground tanks. Well water and rainwater are commonly used on islands that don’t have PUC services, such as Cousin, Aride, Bird, Desroches, etc.

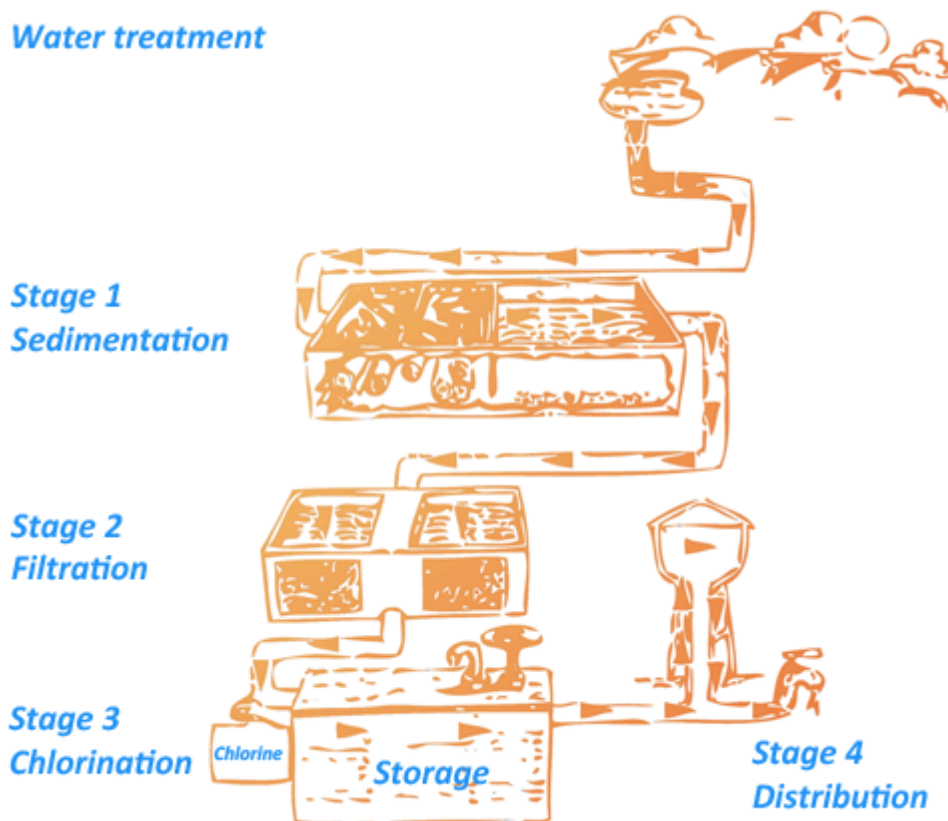
HOW DOES OUR WATER TREATMENT AND DISTRIBUTION SYSTEM WORK?

In Seychelles, most people on Mahe, Praslin and La Digue get their treated water supply from the Public Utilities Corporation (PUC). PUC gets most of the water from rivers, except on La Digue where they also draw water up from underground. The river water is stored and captured in small and large dams, reservoirs and tanks, then pumped to special water treatment plants. The water treatment removes impurities and bacteria from the water. The clean treated water is then pumped out through pipes under the roads to our houses.



We get a lot of rain in the granitic islands of Seychelles – over 2m per year! But because we do not have much space for building large dams or reservoirs, we can't store very much water at a time. If the rain stops for a few weeks or months, our supply of water in the reservoirs runs out. La Gogue is our biggest reservoir but in the dry season it becomes nearly empty. Because of this problem, the government has set up desalination plants which take in seawater and remove the salt through an energy intensive process so that we can use it for drinking, bathing, washing etc.

Water treatment



The system of water treatment and distribution uses a lot of electricity or energy, especially desalination. This is why when we save water, we also save energy and help reduce the amount of greenhouse gases going into the atmosphere from electricity production.

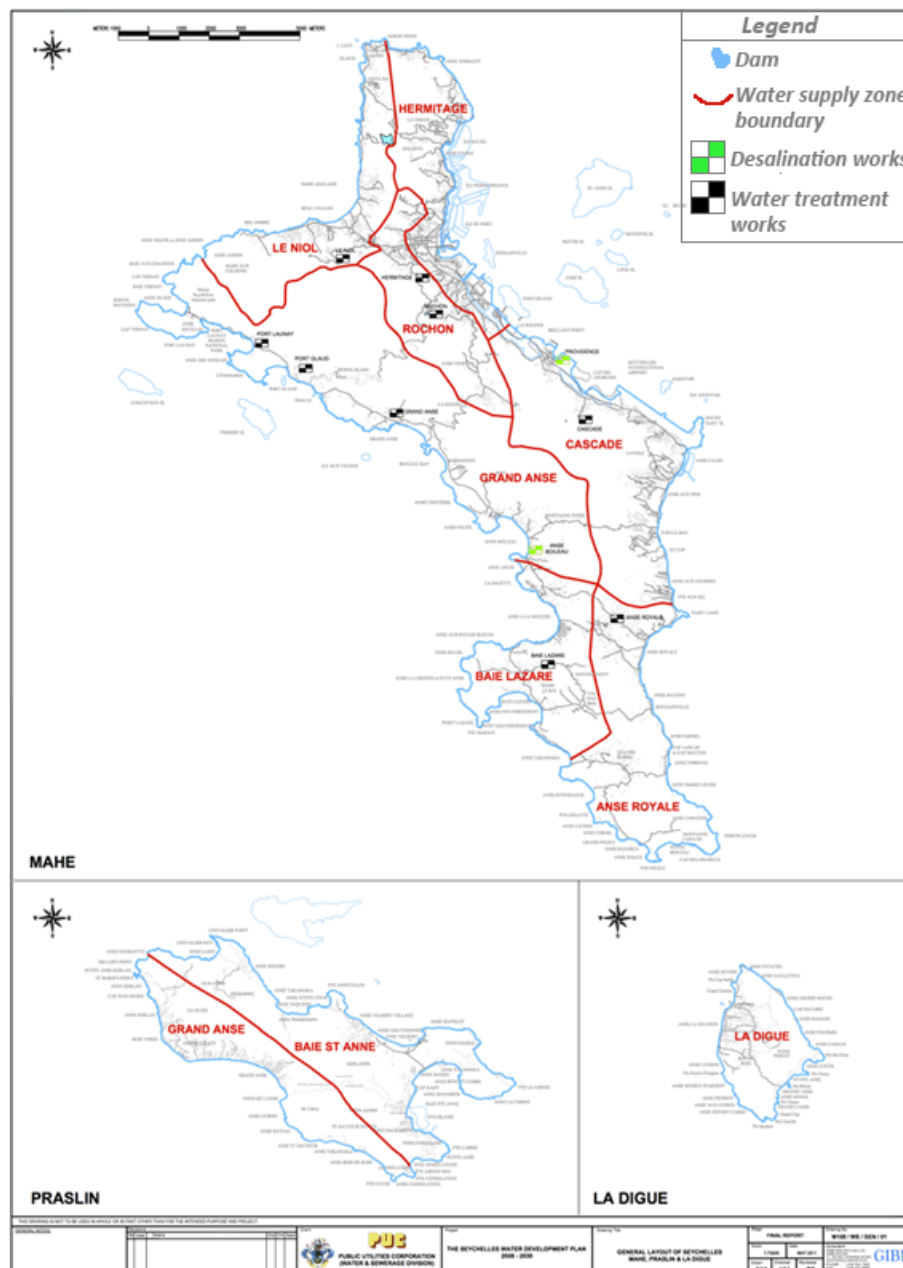
Here is a list of water treatment plants in Seychelles:

Mahé: Hermitage, Providence Desalination, Perseverance Desalination, Rochon, Cascade, Anse Royale, Baie Lazare, Grand Anse, Anse Boileau Desalination, Le Niol

Praslin: Grand Anse Praslin, Baie Ste Anne, Baie Ste Anne Desalination

La Digue: La Digue, La Passe Desalination

Here is a map of the PUC water treatment system on Mahe, Praslin and La Digue.



SOME FACTS ABOUT WATER IN SEYCHELLES

In Seychelles, we get a lot of rain, much more than many other countries around the world! If we had a lot of space to store this rainwater, and we used it wisely, we would not have any water problems. Here are our main problems:

1. We do not have enough reservoirs and dams – this is partly because we have very limited land area. Where would we build dams? Think about how people and nature would be affected by the construction of large dams on rivers.
2. Buildings do not have tanks. If all buildings, large and small were constructed with a big tank in the foundation or attic to store rainwater or PUC water, that would add up to a lot of storage area, almost equivalent to Rochon dam!
3. Old PUC pipes underground burst causing large amounts of water to leak. Pipes are slowly being replaced but we lose a lot of water this way.
4. People have leaky taps, hoses, pipes and toilets at home that waste water.
5. People waste water at home, school and work.
6. Tourists and tourism establishments waste water.

Ways we waste water:

- High capacity flushing toilet cisterns
- Overflowing toilet cisterns (you can hear water running or dripping)
- Worn out tap washers that cause dripping
- Leaving the tap on when taking a bath/shower, brushing teeth, washing kitchen utensils
- Using large amount of water to defrost frozen food
- Using lots of treated water for watering garden or washing cars
- Leaks in hose
- Pipes damaged by large transport or during construction

Our water problems in Seychelles are caused by humans, not nature! This is why it is very important for each every person to take their responsibility to use water sustainably.

IMAGINE IF EVERY HOUSEHOLD HAD A TANK?

La Gogue Reservoir capacity: 1,000,000 m³

Rochon Dam capacity: 250,000m³

25,000 households with 2m³ storage each:
50,000 m³

If each household had tanks to hold 5 m³ it would be the same as Rochon Dam!

TIPS FOR USING WATER MORE WISELY

The first step towards using water sustainably is water conservation.

This section provides a list of ideas for using water more carefully at school and at home.

USING WATER WISELY AT SCHOOL

Many schools in Seychelles are already actively trying to conserve water and make sure that their staff and students are all involved. Some of the problems schools face regarding sustainable water use include:

PROBLEM	SOLUTION
Automatic toilet flushing – toilets are flushed automatically on a timer whether needed or not in order to keep the bathrooms clean.	Many schools have disconnected this feature and toilets are only flushed when needed.
Leaky pipes and taps – this is a common problem and delays in fixing them sometimes occur because of administrative procedures.	Report the problem immediately and turn the supply valve off where possible. Secondary students may be able to enlist help of the TE teacher and students to fix the problem.
Taps left on in toilets or kitchens	Install faucets that turn off automatically. Put up signs above sinks reminding people not to waste water.
Running toilets – after flushing you can hear them filling up continuously if the ball valve mechanism is not working properly.	Keep all plumbing equipment in good repair. Ask the maintenance staff to monitor toilets and taps to make sure they are working.
Pressure too strong in taps – more water than you need comes out and sometimes it splashes and makes a mess	Install flow reducers (they can be screwed on to the faucet) to reduce the pressure of water coming through taps

USING WATER WISELY AT HOME

Each of us needs to take responsibility for using water wisely, whether we are adults or kids. There are many ways we can use water more sustainably – both reducing our water use and storing water so that more is available during the dry season. Here are some everyday ways of saving water at home; some are also relevant for schools.

BATHROOM & TOILET

- Turn the water off while brushing teeth, or use a glass.
- Take short but effective showers; Turn off the tap while soaping up
- If your toilet has two options, use a short flush for liquid waste and a long flush for solid waste. For regular toilets..."if it's yellow, let it mellow, if it's brown, flush it down!"
- You can put a brick or plastic bottle filled with water into your toilet cistern to reduce the amount of water by a few litres.
- Fix overflowing or dripping toilet cisterns, the ball and valve might need to be changed;
- If you handwash your clothes, do it in a basin or bucket, not under running water;
- Wash clothes with a full load in the washing machine;
- Change worn out tap washers to avoid water wastage;
- Close taps properly after use;
- Fix leaking pipes;
- Collect rainwater to wash clothes and for bathing. It is best to filter the water to keep leaves and other impurities out.



KITCHEN

- Fill up a container with water to wash vegetables or dishes and then use the water to water your plants;
- To wash very dirty dishes, fill a container or the sink with warm soapy water;
- Use rice-washing water to water plants;

OUTDOORS

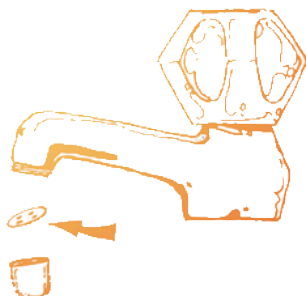
- When you wash your car, don't use the hose – fill up a bucket with water instead. Make sure the dirty water drains into the soil, not into a drain or river.
- Collect rainwater to water the garden, wash car or to clean concrete surface;
- Use the same water after rinsing vegetables or fruits to water plants;
- Call PUC breakdown services if you see any broken pipes on the road.



WATER SAVING DEVICES

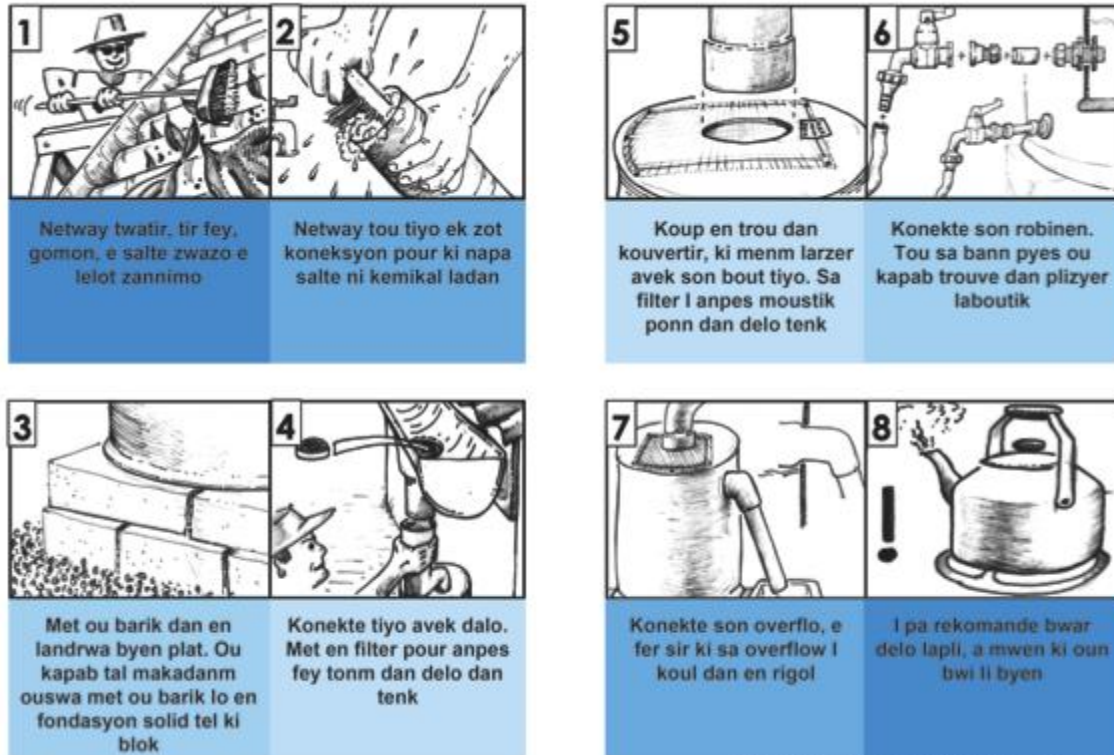
If you manage to adopt the above practices you will save money, which you can then invest in various water saving devices which are increasingly available on the local market:

- A low capacity flushing cistern which uses 3.5 to 4.5L of water per flush compared to a high capacity (13L) or dual flush cistern which uses 4.5 to 9L per flush;
- Constant flow regulators with the kitchen tap which keeps the water flow at a regular rate of 8 to 12 litres a minute;
- Use of thimbles to reduce excessive water pressure and flow from taps;
- A water tank for PUC water will also reduce the water pressure in taps and help you use less water.
- Spring loaded nozzles for hoses cut off water flow temporarily when water is not needed



RAINWATER HARVESTING

Rainwater harvesting is becoming increasingly popular – hopefully soon every house will be practising this sustainable alternative to treated water. It costs a bit to set the system up but it will save you money and inconvenience in the long term. You can have a very simple system with just a bucket on the ground collecting drips, or a regular system with gutters and downpipes connected to a tank with a tap on it, or a more complex system with the rainwater connected to the plumbing in your toilets and other appliances. Here are the basic steps for setting up a raintank:



Ekri e desinen par Jacques Harter pour Sustainability for Seychelles

TEACHING ABOUT WATER

Water and sustainable water use are topics that are already incorporated into the formal curriculum, and addressed by schools through extra-curricular activities such as competitions, clubs and events to celebrate World Water Day in March each year.

Managing water sustainably is one of the most important environmental challenges Seychelles faces today. The situation here reflects the global situation where more people are getting worried about their water supply. Things could get worse – scientists predict that global climate change will have an impact on rainfall patterns in many parts of the world, including Seychelles. Teachers can play a vital role in helping Seychelles solve our water problems by getting students motivated to learn and to do something to manage our water more sustainably. To motivate students, it is critical that teaching and learning about water be fun, relate to real life situations, and also be hands on, giving young people a chance to learn and practice more sustainable behaviours.

IDEAS FOR LESSONS

PEOPLE IN THE WATER CYCLE

1

1. Remind students of what they learned about the water treatment system in P5, where the water comes from, how it is treated and how it gets to their house.
2. Write the steps of the water cycle (including the system humans use) on A4 paper, one step per sheet, e.g. Rain falls, rain absorbed by forest, mountain streams, water collected in reservoirs, pipe, water treatment plants, pipe, pumping station, pipe, water meter, pipe, home, sink, shower, toilet, garden tap, soak away, drain, river, ocean, sewage treatment plant, etc. Ask the children to put the steps in order.
3. Look at a map and trace the route the water takes to get to their houses, the school, and other buildings.

WATER BILLS

2

1. Ask children to bring in an old PUC bill
2. Look at one of the bills together and see where it says how much water the household has consumed and how much they have to pay that month. 1 unit is equivalent to 1000 litres. Calculate how many litres the family used. Bring in a large PET bottle to show what 1 litre looks like.
3. Compare different bills the children have brought in. Help them understand that the more water you use the more you pay.
4. Give a round of applause to the children whose households have the lowest water bill! Discuss tips to help the families with high bills use less water.

The serial number corresponds with the number on the bill



The numbers in the window tell you how many litres of water have been used. The black on white numbers represent cubic meters (1000 litres) and are used on the water bill.

There are 3 or 4 white on red numbers that move quickly when the water is being used and they measure litres. The fourth one (on the right) measures 1/10th of a litre.

WATER USE IN THE SCHOOL

3

1. Discuss all the ways that the school uses water – students, teachers and other staff.
2. Go for a tour around the school and observe every place water is used: taps, toilets, outdoor hoses, pipes to water tanks etc.
3. Find out where the school water meter is and compare the meter to the ones at home. Take a reading of the meter, and do this once a week to measure water use by the school.

STORIES ABOUT WATER

4

1. Discuss what makes a story interesting – funny, surprising, suspense, sad, interesting characters, etc.
2. Ask the students to share interesting real stories of things that happened to them or their families that are related to water somehow.
3. Make a chain story about water. One person starts with a first sentence and then others add one sentence or part of a sentence at a time. It could get silly!
4. Review the main parts of a good story: a beginning introducing the characters and the plot, development of the plot, something exciting happens (good or bad), and then wind down and conclusion.
5. Brainstorm different possible good story plots involving water – sad, funny, happy, silly.
6. Ask children to write a short story of their own about water. Try using the crab character Dilans from the ISLANDS project – he's good at giving advice to help humans use water more sustainably.

COMIC STRIPS

5

1. Look at a few examples of comic strips (you can find them in the library, newspaper, or ask students to bring some in from home). Discuss which ones the students like best and why. What makes them funny? How does the artist draw the characters to show movement, expression, etc. How do the shape of the speech bubbles change for talking, shouting, thinking?
2. Make up 2-3 characters for the story. Try using Dilans the crab, a clever character from the Indian Ocean islands who tries to help people live more sustainably. Ask the children to try to make up other characters that could feature in a comic strip.
3. Brainstorm a list of possible water related messages, story lines or jokes that could be in the comic strip. For example: fixing a leaky tap, putting out a bucket to collect rainwater, washing car in a bucket vs wasteful method with tap and hose, etc.
4. Have students work in groups to design a short comic strip with a water conservation related punch line.

WATERSHED MAPS

6

1. Use a map of your district to look at the location of rivers
2. Invite the students to identify the location of their home in relation to rivers
3. Discuss who gets water directly from rivers, and how their neighbours use the river water
4. Go and visit a river near the school. Observe how humans are using it, what kinds of wildlife can be found there, and also if there are any problems such as pollution, littering, removal of vegetation along river banks, conversion of the river from a living habitat into a drain or ditch.
5. Draw your own maps of the watershed the school is found in, showing the location of rivers, where people are concentrated, and any water supply infrastructure like pumping or treatment stations.

WATER SONG

1. Ask students if they know of any popular songs about water. If they do, ask them to share them, if they don't, ask why no-one writes songs about water if it is so important!
2. Make a list of very short phrases describing water, its importance, its beauty, how we use it, how we can use it wisely.
3. Brainstorm different styles of songs and agree on a style. Using the phrases, put together simple lyrics for the song, and a melody. Encourage children who are gifted at music (playing drum beat on desks, or singing, or inventing melodies) to take the lead. This activity could be done as a whole class or in groups as part of a music or language lesson.

8

SAVING WATER

7

1. Ask children to list things they do at home to save water, especially in times of drought. Write their ideas on the board.
2. Introduce them to some of the other ways you can save water listed in the previous section
3. Ask them to work in groups, give them paper to design posters to put up around the school to remind people to save water. Each poster should only have one message. Encourage kids to use bright, simple colours and images, and minimal wording.



RAINWATER HARVESTING

1. Ask children if they harvest rainwater at home and to share how they do it. Some families just use a bucket to catch water, others have gutters, downpipes and tanks, and yet others connect their tanks to the indoor plumbing. Discuss the different systems.
2. If your school has a tank, go and look at it (if not try to arrange for a visit to a nearby home with a rain tank and gutter system). Observe the different components: roof slope, gutter, downpipe (with bends), raintank, overflow hole, tap and if relevant, pipes connecting the tank to the indoor plumbing.
3. Estimate the size of the raintank. Try to guess how quickly the tank can fill up if it is raining (this depends on how hard it is raining, how big the roof is, and how long the gutter is to collect water off the roof).
4. Find out what the school is doing with the rainwater. Discuss the best ways to use rainwater, and the dangers of drinking it or using it in cooking or washing food if it is not filtered or boiled first (it could be contaminated with animal droppings or other contaminants from the roof and gutters and make people sick).
5. Ask the children to work in groups to draw and label a rainwater harvesting system. You can watch the short film by Sustainability for Seychelles that explains the steps for setting up a system.
6. They can turn their drawings into posters to encourage people to harvest rainwater. If some of the drawings are good, make a copy and send them to PUC or other organisations to use for an education campaign. Put some of the posters up on the parents noticeboard or at the community centre.



SCHOOL WATER AUDIT

A school water audit will help you learn about:

- 1) how much water the school uses and for what
- 2) how much water the school wastes
- 3) what the school can do to save water

The first step is to check the school water meter.

- ✓ **Check for leaks:** Take a reading at night when everyone has left and no more water is being used. Take another reading in the morning before everyone arrives. If no water was being used and there are no leaks, the meter reading should be the same. (check if security guard uses water and estimate how much). It is best to do this every day for one week.
- ✓ **Check how much is used during the day:** Take a reading in the morning just before everyone has arrived, and another reading at the end of the day. Calculate the total number of units used during the day and multiply by 1000 litres. This is how much the school used in a day. Take that number and divide by the number of kids & adults in the school and you will get the number of litres of water used per person per day.

✓ School check-up

The next step is to walk around the school and check for leaks and places where water use could be reduced. Start with this simple checklist:

- ☐ Are there signs around the school to remind people to save water?
- ☐ Does the school have continuously flushing urinals (that need to be turned off at night and weekends)?
- ☐ Does the school collect and use rainwater?
- ☐ Are all the taps turned off tightly?
- ☐ Are there any leaky toilets and taps?
- ☐ Is the maintenance person aware of any leaks?
- ☐ Is the school making an effort to fix any leaks?



To go into more detail, you can divide the school up into different sections and divide students into groups to audit each section. Their main task is to look for leaks and problems the school can improve on. Each group should locate all the water sources in their section (e.g. taps, toilets, sinks, hoses) and observe if they are working well or leaking.

	Total #	# leaking	Note location of most serious leaks
Toilets			
Bathroom Sinks			
Outdoor taps			
Kitchen Sinks			
Hoses			
Pipes			
Other:			
Other:			

Measure Leaks

If you find any leaks, work together to try to measure how much water is being wasted. You can do this with a measuring cup and a watch. It's a good math activity!

Use the watch to time how long it takes to fill up 100ml of water: _____

Multiply by 10 to calculate how long it would take to collect 1000ml (1 litre): _____

Calculate how many litres this leak wastes in one hour: _____

Calculate how many litres this leak wastes in one day: _____

If you find all the leaks and do this calculation you can find out how many litres of water are wasted through leaks in an hour, or in day. You can compare this result to the meter readings on how much water leaks in the night when no one is there.

Recommendations

Make a list of recommendation on how the school could use water more wisely and provide it to the school management. Your class can offer to help implement the recommendations. The recommendations might include:

- Fix specific very bad leaks (you can include information about how many litres of water wasted per day)
- Put signs near taps to remind people to turn them off tightly
- Make posters about water conservation for the noticeboards
- Use rainwater

REFERENCES AND FURTHER READING

There are many local and international resources available to help schools address the issue of using water more sustainably.

Here are just a few to get you started:

There are many local and international resources available to help schools address the issue of using water more sustainably. Some of the documents listed here were used to develop this guide but can also be very useful for teachers who want to find out more

Publications

1. Government of Seychelles. (2012). *Seychelles Sustainable Development Strategy 2011-2020*. (Chapter 7 on water, sanitation and waste management).
2. Government of Seychelles. (2011). *The Seychelles Water Development Plan 2008-2030*.
3. Nature Seychelles. (2003). *Learning for Sustainable Living in Seychelles* (teachers guide available in all school libraries and resource rooms – includes a fantastic chapter on water with background info and ideas for lessons)
4. Public Utilities Board, Singapore. (n.d.) *Save water, detective programme for schools*.

Useful websites for teaching/learning about water:

1. Seametrics Water Lesson Plans: <http://www.seametrics.com/water-lesson-plans>
2. Melbourne school water audit: http://library.melbournewater.com.au/content/education/every_drop_counts/secondary/water-audit.pdf
3. Water is Life Educational Resource: <http://watermatters.worldvision.org.nz/documents/34508%20Water%20Is%20Life%20teacher%20guide.pdf>
4. Rio, the Water Detective - Teacher's Guide: <http://www.ose.state.nm.us/water-info/conservation/RioTheWaterDetective/Rio-TeacherGuide.pdf>
5. The Down the Drain Project: <http://ciese.org/curriculum/drainproj/>