

TOPIC 4. WATER WORKS!

Chapter 4(A): One Resource — Many Users

Purpose

To look more closely at the two basic ways we use water (withdrawal and instream use); to compare Canada's use of water with that of other countries; and to provide an overview of the many and competing users of water in Canada.

Subject areas

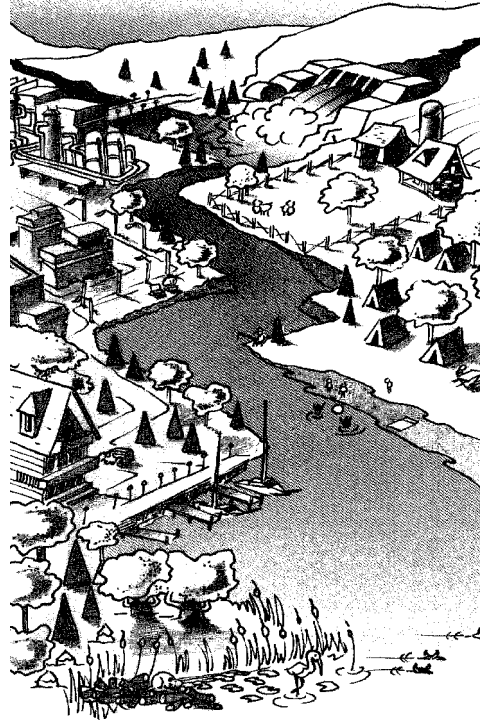
Social Studies, Language Arts, History/Geography, Math, Environmental Studies, Science

Procedure

1. Conduct an informal survey with the students.
 - Ask them how many ways Canadians use water. Stress here that you mean Canada as a whole, not individual water use around the home.
 - Write their answers on the board and lead them to consider uses they may not have mentioned that are covered in this chapter, for example:

transportation	fisheries	recreation
waste disposal	wildlife	manufacturing
hydroelectricity	thermal power	
agriculture	mining	

2. Discuss with the students how water is used in each of these examples. They will be able to think of lots of ways they use water for recreation, both summer and winter, but they may have trouble with thermal power or mining. Explain some of the more difficult concepts to them — you will find background information in Freshwater Series A-4.



3. Go over the difference between instream water use and withdrawal use and show where each of the above uses belongs. Point out to them that both kinds of use can contribute to pollution if care is not taken.
4. Take some time to discuss municipal water use. Point out to the students that this is where we use water in and around our homes. Ask them how many ways they and their families use water personally. Discuss with them that Canadian homeowners use much more water than people in many other countries. This will be dealt with more extensively in the section on conservation (Topic 6).

Note: If they do the survey of water users in their community help them phrase the questions carefully. Some users may not be too environmentally friendly and may resent a blunt question. Ask them to compare results at the end of the survey.

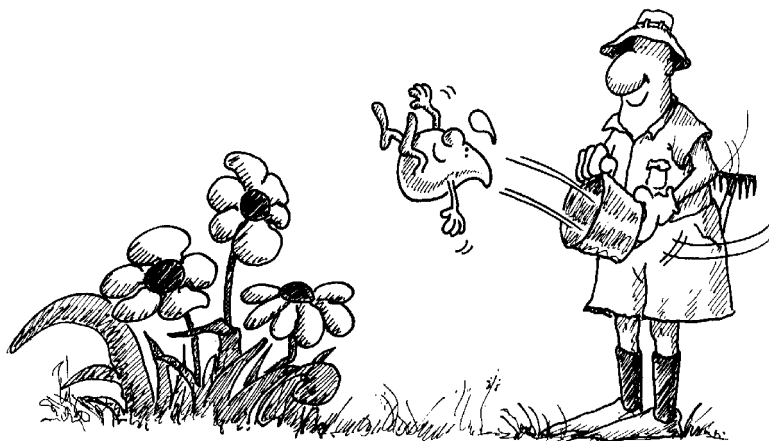
Vocabulary

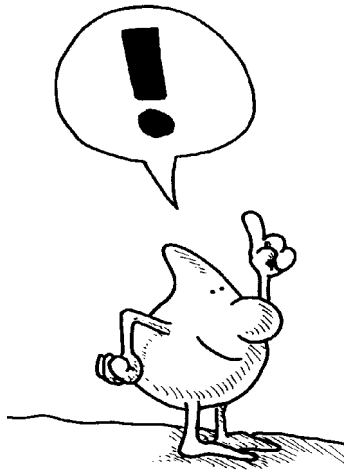
hydroelectricity
instream

withdrawal

References

- Freshwater Series A-4: “Water Works!”
- *A Primer on Fresh Water*: “Water — How we use it”





TOPIC 4. WATER WORKS!

Chapter 4(A): One Resource — Many Users

How many ways do we use water?

Quick! Take a survey around the room and make a list of the ways we use water in Canada. You can easily think of things such as recreation for swimming, sailing, and skating, but would you have thought of transportation? After all, water transportation is one of the best ways to move goods around the world — it's hard to imagine shipping oil or wheat by air, isn't it?

Did anyone come up with fisheries or irrigation? If you live in the prairie provinces, irrigation may have been one of the first things you thought of, but if you live in other parts of Canada, such as the Atlantic provinces

or the west coast, your first thoughts might have been of the fishing industry. Or, if you come from more industrial regions, such as those in Ontario or Quebec, you might have mentioned **hydroelectricity**.

Did You Know?

As early as 5000 B.C., our ancestors used irrigation to increase crop production. And water-flushed toilets have been found dating back to around 2750 B.C.

As you read through this information about the many and varied uses of water, you will see that water has always been essential, not only for our survival, but for providing the quality of life that we enjoy in Canada. And you will also note that some of the ways we use water make it

unfit for others to use unless the water receives expensive treatment. What we have to remember is that *everyone lives downstream from everybody else*. We might also take this further to say that, in the long run, we all live downstream from ourselves.

Indian Proverb: *The frog does not drink up the pond in which he lives.*

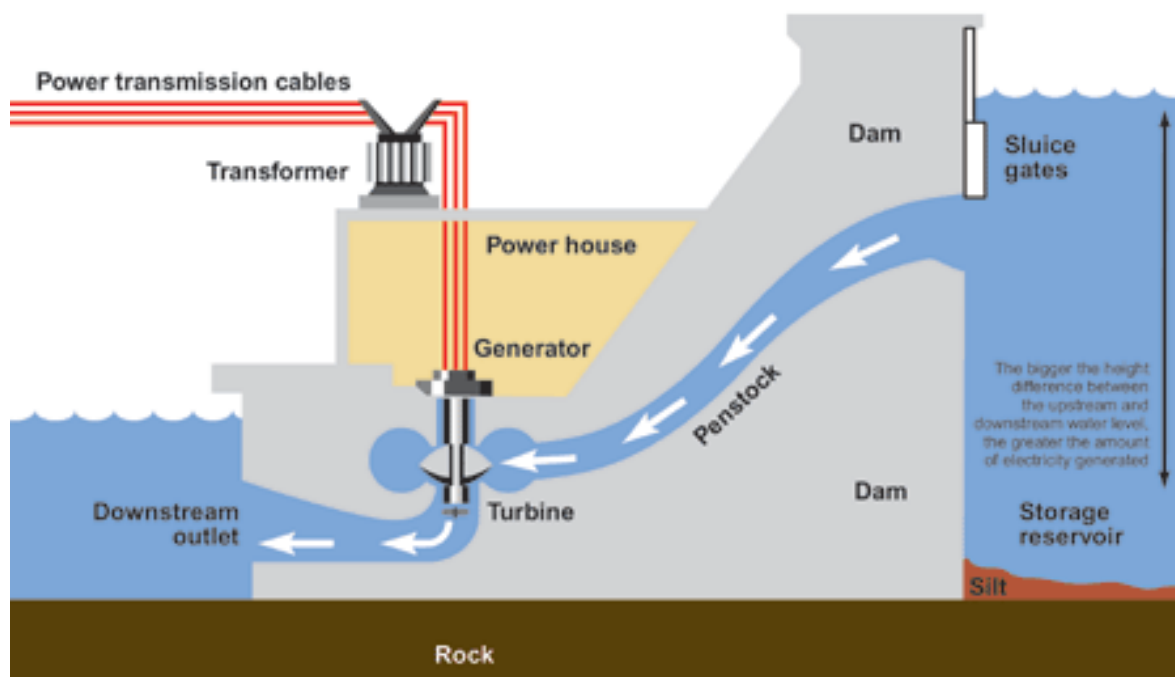
Canada's use of water

Water has always played a very important role in helping Canada grow as a nation, and today Canadians are among the biggest water users in the world.

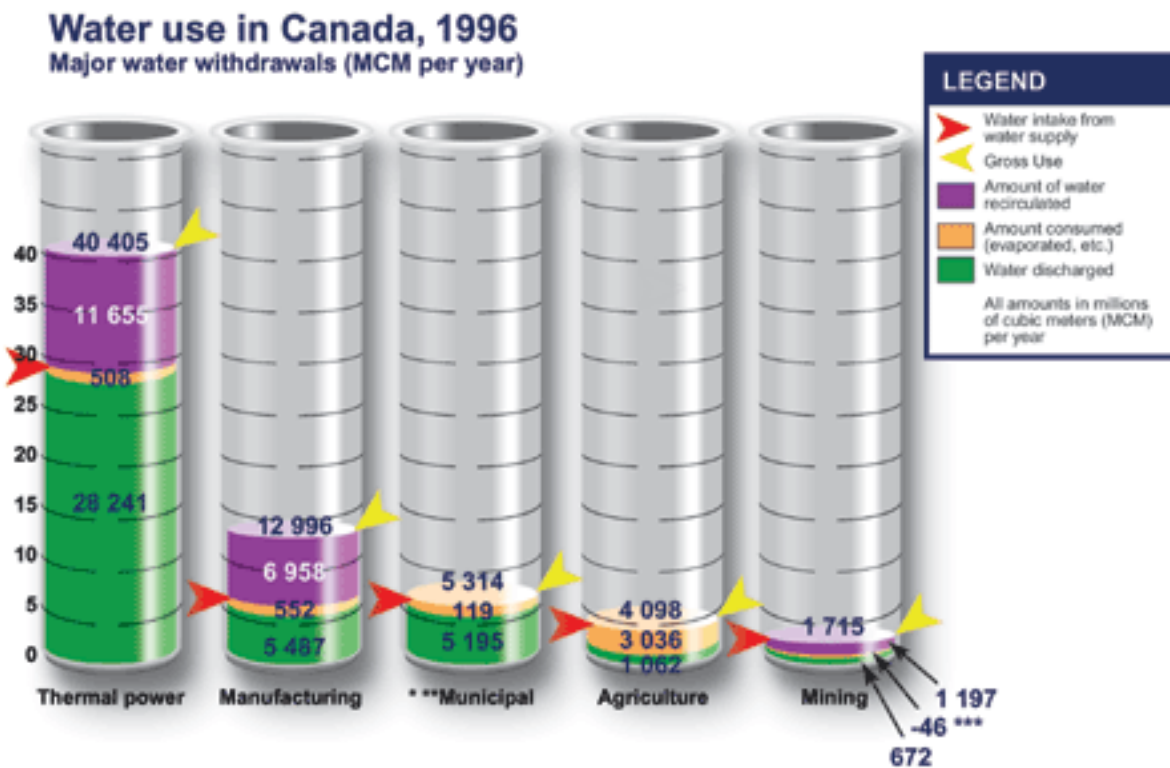
Let's take a look at the many uses we make of water, and let's group these uses under the two basic ways: **instream** and **withdrawal** uses.

1. *Instream use* is when water is used in its natural setting “in the stream.” These include:
 - Hydroelectric power generation — This is energy produced by the force of falling water. In Canada, hydroelectric plants provide 62% of electricity demands.

Hydroelectric power generation

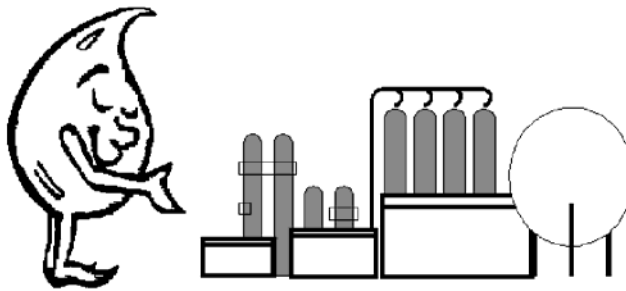


- Transportation — Inland waterways, such as the St. Lawrence River and the Mackenzie River, have played an historic role for getting Canadian goods to market. These same waterways took early European explorers into the interior of our country.
- Freshwater fisheries — We have hundreds of thousands of lakes and rivers, and these water sources provide sport fishing and commercial fishing industries.
- Wildlife — Many wildlife species depend on water, and most Canadians participate in some form of wildlife-related activities such as hunting, photographing, and studying.
- Recreation - Canadians have always enjoyed outdoor recreation, especially around water. Activities include swimming, boating, canoeing, fishing, camping, and skating.
- Waste disposal – For centuries Canadians have used lakes, rivers and oceans as places to dump human and industrial wastes. As we discussed in earlier chapters, water's natural purification process is less and less able to clean these wastes and many of our waterways are becoming overloaded.



2. *Withdrawal use* is when water is taken from the stream and used on land. These uses include:

- Thermal power generation — Next to fuels, water is the most important resource used in large-scale thermal power production.
- Agriculture — Water is used for irrigation and livestock watering, especially in the south of British Columbia and in the three prairie provinces.
- Manufacturing — Water is the lifeblood of industry. To manufacture one automobile requires at least 120 000 litres of water.
- Municipal — This includes all the ways we use water in the communities where we live.
- Mining — The mining industry uses water to separate ore from the rock, to cool drills, to wash the ore during production, and to carry away unwanted material.



African Proverb: *Water may flow in a thousand channels but it all returns to the sea.*

Water use and water quality

Both instream users and withdrawal users can harm the water supply. Contaminants get into the water supply directly with “instream” use, for example, when spills occur or contaminants leak into the water, or during “withdrawal” when water is withdrawn for use and gets only partial treatment before it is returned to nature. Most water use lowers the quality of the water.

Water Rule: Using water includes the responsibility of cleaning it up after its use, before it passes to the next user downstream. We must do unto others what we would have them do unto us.

Did You Know?

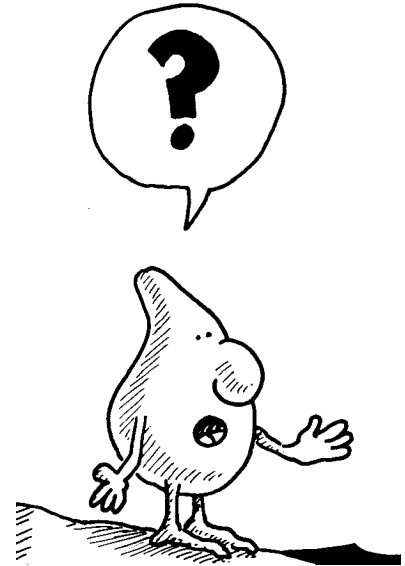
During the summer months, about half of all treated water is sprayed onto lawns.



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Chapter 4(A): One Resource — Many Users

Activity 1 — Math



Using the chart below, complete the exercises which follow.

Water Withdrawals in Canada, 1996 (MCM per year)

Region	Thermal Power	Manufacturing	Municipal*	Rural*	Agriculture	Mining	Regional Total
Atlantic	2 372	480	285	134	14	206	3 491
Quebec	809	1 173	1 351	278	103	38	3 752
Ontario	23 228	3 011	1 496	291	173	56	28 255
Prairies	2 337	368	534	141	3 030	61	6 471
British Columbia*	4	1 008	668	135	778	158	2 751
National Total	28 750	6 040	4 334	979	4 098	519	44 720
Percent of Total	64.289	13.506	9.691	2.189	9.162	1.161	99.998

*These municipal and rural estimates include: residential, commercial/institutional, and other uses (i.e., not industrial).

** Sectoral data for Yukon, Northwest Territories, and Nunavut are included with British Columbia.

Note: Data for some sections have been extrapolated and rounded.

Source: Environment Canada water use surveys and studies.

- Which region or province uses the least thermal power? What is the difference between this amount and the amount used by Ontario?
- The prairie provinces have the most water intake for agriculture. What is the total amount used by the other regions?
- Use the information from the chart and prepare five math problems for a classmate. Make sure you can answer the questions yourself.
- Use a pie chart to present clear information at a glance. Take the “percent of total” on the bottom line, round off the numbers to the nearest whole number and show the information on a pie chart.

Activity 2 — History/Geography

Water played an important part in the development of our nation and it continues to play a vital role in the development of Canada.

From the following list, select one of water's major uses, and show how important water is to Canadians.

- transportation
- manufacturing
- power/energy
- trade/shipping
- fisheries
- agriculture
- recreation



Make your presentation more interesting by using illustrations to describe the role that water plays. (Imagine, flying oil and timber to a market, using candles or oil lamps for light, making products by hand or simple machine.)

Activity 3 — Environmental Studies, Research/Interview/ Survey

Research: Find out who the big users of water are in your community. Then find out from them how much water they use and how they use the water.

- Brainstorm with the class and identify all the major users of water in your community, for example, manufacturing/industry, recreation facilities, transportation, agriculture, etc.
- Don't forget to check small businesses like dry-cleaners, hair salons, and car washes; and places like fire stations, hospitals, community centres, etc.
- Work alone or in a small group and select one water user each. Prepare a report for the class.

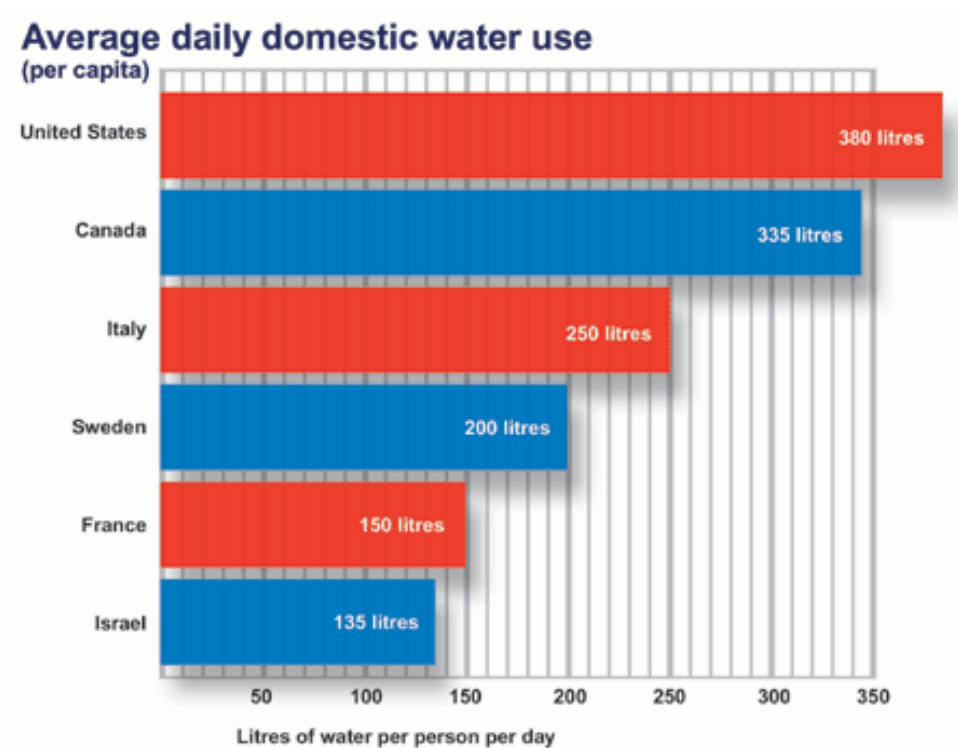
Guidelines for interviewing water users:

- Within your group identify who will do the interview. Make sure only one contact is made with each place.
- Within your class draw up a list of questions to ask. Make sure your teacher approves the list.
- Plan what you want to know. For example:

How much water do they use? How? What is the yearly and monthly cost? Is there any recycling? Do they try to conserve? If so, how? Are they in favour of higher water costs for those who use the most water?

Activity 4 — Social Studies, Math

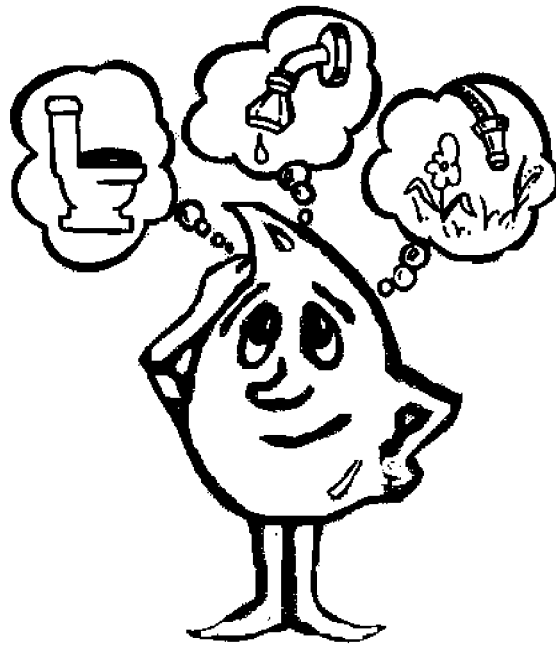
Look at the graph “Average daily household water use (per capita).” What does this graph show? Ask yourself why we use so much water in Canada. Do we need to? Compare your use with other countries — how much more do we use than Sweden? France? Israel? Why are there such differences? Do you really think we are cleaner?



Based on the information from the graph, make up five math questions for your class.

Activity 5 — Social Studies, Language Arts

Look back to the information which outlines some water facts about how we use (and maybe misuse) water in Canada. Do we really need “clean” water in our toilets? Find out more about “greywater.” Write a paragraph of about 100 words presenting your views on the uses of treated water.



Read the “Water Rule” from your information sheet again. Work with another person and draw up a list of five other water rules you think people should live by.

Activity 6 — Science

Look back at the diagram “Hydroelectric Power Generation.” Study this diagram and research in the library for other diagrams explaining how water provides energy.

- Either using a simple diagram or by building a model, demonstrate how a hydroelectric power dam works.

Activity 7 — Environmental Studies

Different households or families use varying amounts of water. There are different reasons for this. Read through the list of factors below and write at least one sentence to explain how each might affect the use of water. For example, in the category “What the family owns,” you might write:

If the Martins did not own a swimming pool they might use less water in the summer months.

Factors:

- number of family members
- ages
- size of family property/yard
- what the family owns
- some family activities
- time of year

Activity 8 — Environmental Studies

You've heard about harvesting crops and harvesting fish from the sea. What about harvesting water? Some families catch water in a rain barrel or other large container — harvesting water which falls on the roof of their homes during a rainfall. They use this to water their lawns or crops, or to wash their cars and sometimes for their clothes.

Talk to your parents about how you could do this at home and what you could use this water for. Why would you do it?



TOPIC 4. WATER WORKS!

Chapter 4(B): What Will This Cost Me?

Purpose

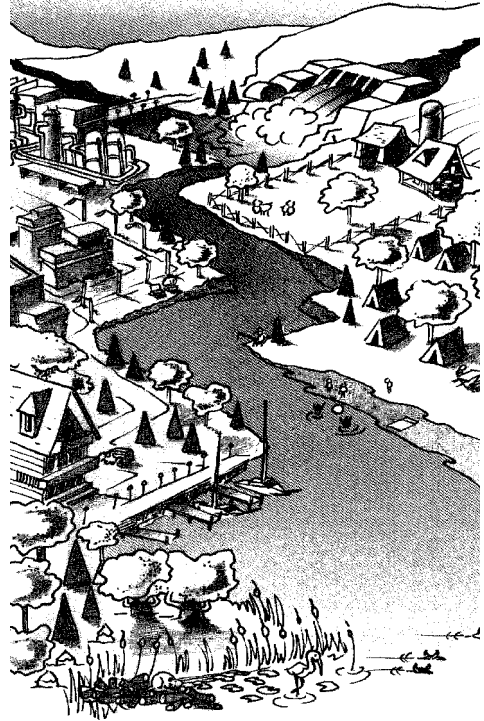
To have students recognize that Canadians get a real bargain with their water and to explore whether we would use and waste less if we had to pay a more realistic cost.

Subject areas

Math, Social Studies, Language Arts, Geography, Art, Environmental Studies

Procedure

1. Ask the students, “Why do you have to pay for water anyway? After all, water is all around us.” Find out if they have any idea how much they pay for water now.
 - Remind them to ask their parents tonight how much water costs for their household.
2. After they have read the Student Information sheets, discuss the different activities together and help them interpret the charts if there are any problems. Each chart can lead to a more in-depth discussion about the ways we use water and the price we pay for water in Canada.
 - Point out to the students that in Canada there is a large gap between the cost of providing water to Canadians and the price we pay for water use. This gap will have to be closed and we will have to pay a more realistic price for the water we use.
3. There are a number of math problems with the activities, but you may want to develop more. The charts will help you do this.
4. If you have research facilities available, you might want to have students try to find out why prices for water are so much higher in countries like Australia.

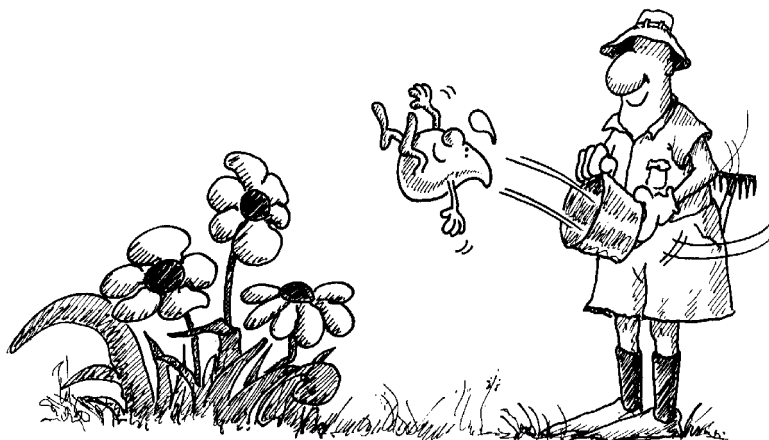


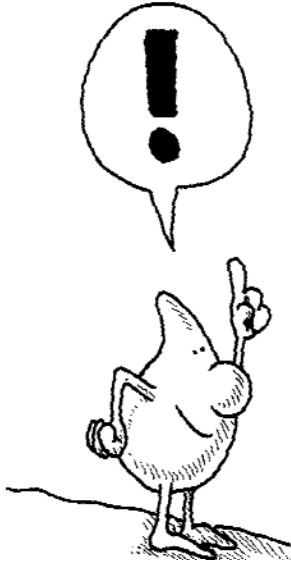
Vocabulary

<i>flat rate</i>	<i>metered rate</i>
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References

- Freshwater Series A-4: “Water Works!”
- *A Primer on Fresh Water: “Water — How we use it”*
- *Municipal Water Rates in Canada: Current Practices and Prices*





TOPIC 4. WATER WORKS!

Chapter 4(B): What Will This Cost Me?

Pay to use water? You're kidding!

Can this happen to you? It's ten o'clock — still early morning as far as you are concerned and you are on your way from gym to math. You stop to get a drink from the water fountain in the hall. What's this? The fountain has a coin slot! You must be kidding! Who pays for water around here?

How come no one told you about this before?

Your good friend reminds you what the announcements over the past two weeks have been telling you. From now on if you want a drink of water at school, you have three choices: you can bring your own, pay at the fountain, or buy bottled water. Seems you haven't been paying attention. You haven't felt the need until now— when you're really thirsty.

You probably think, “What do you mean, pay for water? It's all around us. Nobody in Canada should have to pay for water.”

It's time to pay for the pipes

Well, somebody has to pay for water. The water you drink and use in school and at home has to come from

somewhere that guarantees it is safe for human use. And that costs money. It costs a lot of money to pump, store, move, and treat water, and then to take away the waste. Check at home. You will probably find that there is a monthly water and sewage bill to cover some of these costs. But is it enough?

Several studies show that what Canadians pay for water is not enough to cover costs of operating, repairing, upgrading, or expanding. Right now, across Canada, the water-related infrastructure in many cities and towns is in need of major repairs.

What is infrastructure, you ask?

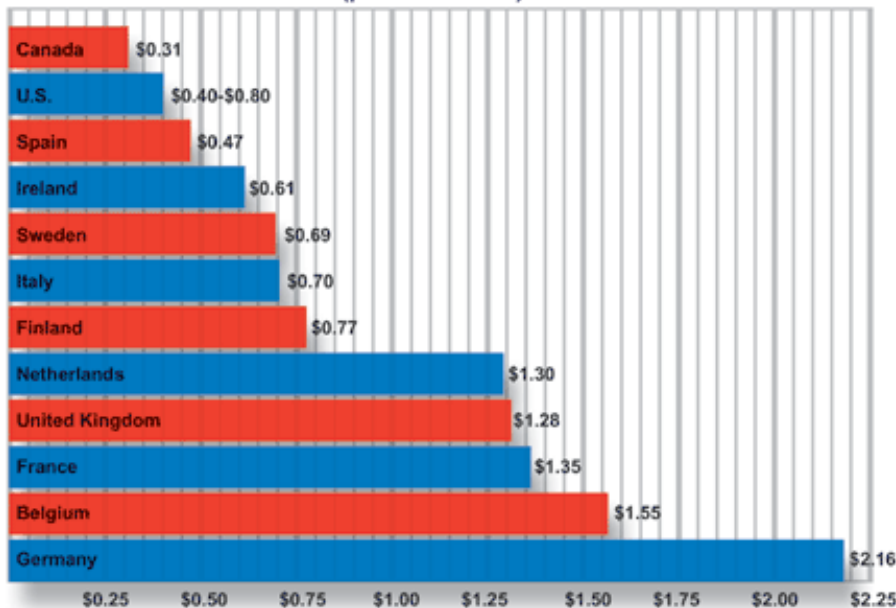
By infrastructure we mean:

- water and wastewater
- treatment plants
- water mains and pipes that carry water
- towers and reservoirs that store water
- sewer pipes that carry away wastewater
- wastewater

Somebody has to pay for the upkeep of these utilities; they don't get looked after by magic.

Right now you do pay for water, one way or another. Your household may receive a regular bill charging you for the use of water and all parts of the infrastructure. Or, if you live in a condominium or an apartment, the water and wastewater charge may be part of your monthly fee. In some provinces it is included with taxes. And in rural areas where people own their own wells and septic systems, each individual is responsible for the upkeep of the infrastructure.

Typical municipal water prices in Canada and other countries (per cubic metre)



How much does this cost?

Water prices across Canada are generally low. The average householder in Canada pays about \$33 per month for water delivered to the residence. Monthly bills range between \$19 and \$52, the lowest being in areas of the west and east coasts, and the highest in the prairie provinces. As you can see from the diagram “Typical municipal water prices,” Canadians pay less than many other countries for their water.

There are four basic ways that Canadians pay for water use:

1. Flat Rate — all customers pay the same amount whether they use the same amount of water or not. This does not encourage conservation because the careful water watcher pays the same amount as the water waster. Doesn't seem fair, does it? In 2001, 32% of people in Canada are charged the flat rate.

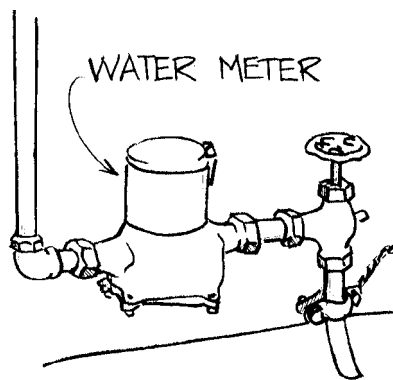
2. **Constant Rate** (commonly called the metered rate) — here you pay for each unit of water that you use. With this system, you are more likely to monitor water use. In 2001, 40% of Canadians pay a metered rate.
3. **Declining Block Rate** — this method does not encourage water conservation. It means that if you are a big user of water, you pay less per “block” (or specific volume) as you get beyond the first blocks. Eight percent of people in Canada pay a declining block rate in 2001.
4. **Increasing Block Rate** — this method is just the opposite of the declining block rate. It means that if you are a large consumer of water, for example, some industry, then you will pay increasing rates as you use more volumes of water. Twenty percent of Canadians payed this rate in 2001.

The two most common ways of charging for water use are constant or **metered rates** and **flat rates**. Which rate scheme would you encourage?

What is a fair price?

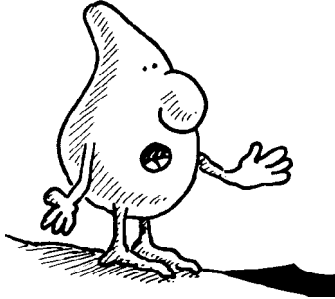
Think about how important water is to our lives. We rely on a good supply of water, and our health depends on safe water — yet even now we do not pay the true cost of water. On average, we in Canada pay \$1.14 for 1000 litres (which includes the cost of waste treatment) — a bargain at twice the price. If you don't think so, compare the price of good water from your tap with what people pay for bottled water: approximately \$1500 for 1000 litres. Over a thousand times as much!

So what do we do to close gap between what we do pay and what we should pay to cover the cost? One clear way to with the problem is to pay a realistic price for the we use. This means that those who use more should pay more — also means that our use should be metered because comparisons show those with metered use less water than households with flat rates.



A lot of the water we use this in our households is wasted by such things as leaky faucets, faulty plumbing, and overuse of deal water for watering the lawn and washing the car. water Much of this waste could be reduced if we had to water pay a fair price for water. which You would tend to think water

twice about leaving the hose running if you knew it was valuable water going rates down the drain.



TOPIC 4. WATER WORKS!

Chapter 4(B): What Will This Cost Me?

Activity 1 — Social Studies

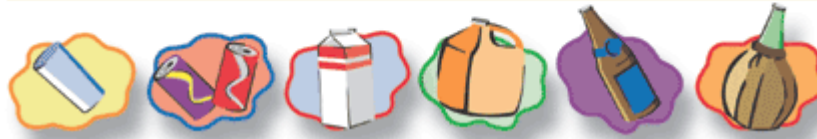
Some cities and municipalities have meters which tell exactly how much water you use. And this is what you are charged for. Others have a flat rate, which means that no matter how much you use, you still pay the same amount. Which do you think is the better system? Why?

In Alberta, Edmonton households are metered, while most Calgary households pay a flat rate. A study which compared use in both cities showed that the unmetered houses used 50% more water. The study also showed that metered users in both cities used about the same amount.

- Why do you think the unmetered houses used more water?
- Do you pay a metered or a flat rate?
- Find out what your monthly water and sewage bill is.
- Do you think we should pay enough for our water use to cover the full costs of water delivered to the tap and taken away as waste?
- Even at twice the price, water is still the best bargain around compared to other liquids we drink. (Look at the table on the following page.) Would your family be willing to pay more for water?

Typical prices for popular beverages
(\$/1000 litres)

Beverage	Cost *
Tap water **	1.14
Cola	850.00
Milk	985.00
Bottled water/Mineral water	1 500.00
Beer	2 500.00
Wine	9 000.00
Whiskey, gin...	26 700.00



* All amounts are in 1992 Canadian dollars.

** Only tap water includes automatic delivery to the user. This figure includes the cost of waste treatment.

Activity 2 — Math

Champagne bath anyone?

Back in the grand old days of Hollywood, people used to talk about celebrating by taking a bath in champagne.

- Look back at the table in Activity 1 showing typical prices for popular beverages. (Champagne is a type of wine, only generally more expensive.)
- Figure out how many litres of liquid bathtub holds. Brainstorm with your group or class for ideas of how to do this.
- Then estimate how much it would cost for a champagne bath, a bath in milk, or a sticky bath in cola.
- Compare this cost with a good old water bath.
- Using the chart, make up two math problems for other students to solve.
- Look at the cost of bottled water. your How much would it cost to take a bath in bottled water? (Talk about really taking a bath!)

Activity 3 — Math

1. Study the diagram from the Student Information sheets which shows water prices in different countries and make up 10 math problems. For example:
 - True or False: Canada and the United States together pay less than France.
 - How many times does Canada's price divide into Australia's?
2. Using another type of graph or diagram, show the same information from the bar graph.

Activity 4 — Geography, Research

Ask your teacher for a blank map of the world. Using an atlas, find each of the countries from the diagram used in Activity 3 and on your blank map enter the price each country pays for water.



Find out why the prices are higher in three of these other countries.

Activity 5 — Environmental Studies, Art

A fair price for water!

Prepare a bumper sticker or a poster to convince people about the importance of paying a fair price for water used. Some of the themes you can use are listed below, but try to create a really catchy slogan.

- Paying a fair price will encourage us to avoid waste and to use water efficiently — and we will conserve water.
- The reduced demand will put less pressure on water resources in the environment.
- The costs will be shared equally by those who benefit most.
- By conserving water we will produce less waste and this will reduce infrastructure costs.
- Fair pricing will bring in money to cover the cost of water supply and waste disposal



Activity 6 — Art

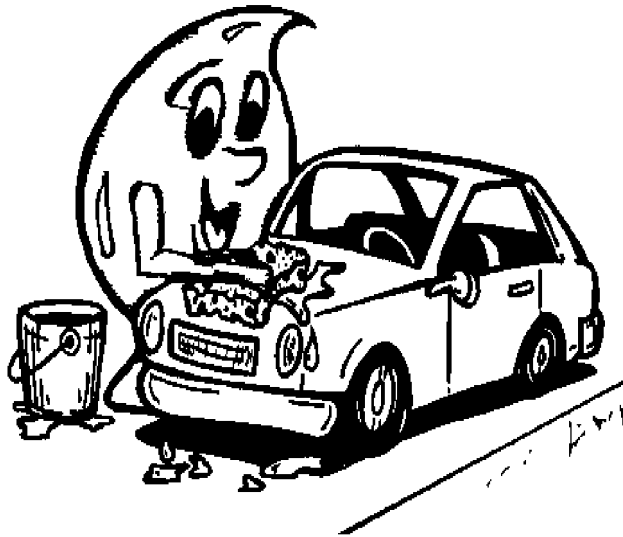
Working alone or with a friend, use pictures from magazines to make a collage of all the ways we use water.

**Activity 7 — Environmental Studies,
Language Arts**

How do you use water?

Make a list of all the ways you have used water during the past twenty-four hours.

- Write down everything you and your family have done that involved the use of water around your home and at school.
- Divide these uses into two groups: those that are necessary or essential, and those that are nice but you could survive without.
- Write down those uses where you think water was wasted — or where less could have been used.



- Summarize what water means to you by completing the following statement: “Water is . . . “. Compare your statement with those of others in the class.
- Art: Suppose you were trying to tell what water means to you to someone who did not understand your language. Make a drawing to illustrate your “Water is . . .” statement.

