



Watering the Seeds of Change: Water Issues and Disparities; Canada and Nicaragua



A Secondary School Teaching Module

Prepared by

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We hope that this resource will offer both teachers and students an opportunity to reflect on their existing knowledge of the issues relating to water and development and encourage a fundamental understanding of clean water as a foundation of development.

INTRODUCTION

This teaching module was produced by the CIDA-funded CARA project (Central American Water Resourced Management Network). The goal of the CARA project is to increase the capacity of Central American countries to educate and train human resources in the area of hydrogeology and integrated water resource management. This is being accomplished by building partnerships between Canadian and Central American universities. An important activity of many CIDA projects is development education, that is, informing Canadians about the development issues which are being addressed through the CARA project. After considerable consultation and reflection, it was decided to focus CARA's development education activities on secondary school students as they are old enough to understand complex global issues yet young enough to think of them objectively and with an open mind.

This manual is designed to be a teacher's guide for the delivery of a teaching manual centered around the video: '*Watering the Seeds of Change: Global Water Issues and Disparities, Canada & Nicaragua*'. This package contains a variety of suggestions for activities to be used at the teacher's discretion. We encourage the teacher to adapt the various activities to their own teaching style as well as the interests and academic learning styles of their students.

1 TEACHERS PREPARATION AND BACKGROUND INFORMATION

1.1 How to Use This Guide

Note: We recommend that you copy, distribute and discuss the glossary of terms with students prior to screening the video. We also recommend that teachers view the video prior to screening it in class.

The content listed below is an outline of the information within the video. This information is meant to be used as a guide to some of the concepts and content.

1.2 Video Concepts & Content

Diversity and Disparity

- What are the differences between Canada and Nicaragua in terms of water resource management?

Overseas Development Assistance

- Canada's role in international development
- Volunteerism, careers in development, finding solutions

Environmentalism

- Water pollution (causes, actions & consequences)
- Water conservation

Sustainable Development

- Waste management
- Participatory community development
- Long-term planning as a necessary component

Health & Sanitation

- Water born diseases (causes, available treatments)
- Governments' role (funding, corruption)
- Education

Economic development and National Interests

- Security
- Foreign aid
- Foreign debt
- Global trade (free trade and protectionism)

Interdependency

- At global, national and community levels in terms of resources

2 PRE-VIDEO ACTIVITIES

- 1) Students collect and report on a current event related to water and/or development issues in a domestic and/or international setting. Students bring their information and share it with the class.
- 2) During class discussion, students brainstorm the various ways in which water is consumed on a daily basis across different settings (e.g. at home, at school, in the community etc.) Students assemble into groups and discuss ways in which this consumption can be decreased. Each group delegates a representative to share their ideas with the class.
- 3) Pre-video tester: This 'quiz' asks students to answer multiple choice, true/false and fill in the blank questions about the concepts that will be addressed in the video. This activity is designed to raise both the teachers' and students' awareness of their existing knowledge of the issues prior to their discussion in the video. Students should check their answers while watching the video.

After the video, the teacher can follow- up with the correct answers and lead a discussion about the students' preconceptions: What did they know? What did they learn?

- 4) Students are asked to imagine 'a day in the life' of a high school student in Managua and write a short paragraph or discuss in small groups their thoughts. This writing or discussion should be done in class. After the video, students are then asked to compare their ideas to those presented in the video in order to address their misconceptions and examine what they learned by viewing it.

**This activity can further be complimented by students writing or discussing their own 'day in the life'.

4 VIDEO ACTIVITIES

- 1) Students answer a series of comprehension questions (worksheet provided) while watching the video.
- 2) Students check their answers to the pre-test (see pre-video activities).
- 3) Have students take notes on the similarities and differences between the Calgary and Managua contexts that are apparent in the video. This can be the basis of a group discussion or follow-up assignment.

5 POST-VIDEO ACTIVITIES

- 1) Suggested Follow-up Assignments:
 - a. Take one concept from the video and expand on it through a research/oral project E.g. From a list of programs which have developed 'solutions' to the problems of development and water management (eg. CARA, PASOS etc.) Groups choose one program, look at what it is doing, and critically assess it. Is the program complete? What ideas would they contribute to the project if they were part of it? Is the program important? Why or why not?
 - b. Students spread the word:
 - i. Students identify a water usage problem in the community (e.g. a leaky faucet at a restaurant). Students write a letter to that member of the community expressing the reasons for their concerns, their recommended solutions, and how the student feels that solving this one small problem will have an impact on the bigger picture.
 - ii. Teaching another class or relevant group about the issue and its management
 - c. Written report comparing the similarities and differences in the ways that people around the world obtain, consume and/or value water
 - d. Oral presentation on related topics (e.g. water pollution, interdependence of ecosystems, careers paths related to development and/ or water, the role of health in development)
- 2) Divide the class into groups. Each group is responsible for collecting information from the video and other resources on a specific concept e.g. Surface water, health risks-sanitation, quantity and quality of water, Canadian impact on development, global context- trade barriers etc. Each group spends a few days/week researching their assigned concept and discusses their conclusions by presenting to the class.
- 3) Test Questions

- 4) Journals: Students spend anywhere from 2 days to a month compiling a water consumption journal. Students write in this journal on a daily basis noting all of their water consumption patterns. Students are given a worksheet outlining how much water is used on average in daily activities. A copy of such a worksheet is located in the appendix of this manual. Feel free to photo copy it for your class.

Students do the math. This activity enables the student to reflect on the amount of water they consume in their daily lives. Teachers should also have an idea of other ways that large quantities of water can be used so that they can contrast those usages with those of the students' e.g. 'x' L of water would fill a swimming pool.

- 5) Through a personal experience, students demonstrate the differences between regions where water is readily available and where water is a limited resource. Students volunteer to carry two 4L milk jugs of water with them throughout the day to raise awareness of restrictions on water quantity. This is the only water that they are allowed to use for their daily activities. Students write a report or orally present their experiences to the class. What difficulties did they encounter? What did the student learn? Has this changed their perspective on water usage?
- 6) Classroom Debate: The teacher sets up a fictional scenario in the classroom in which there is a water crisis in a community. The class is divided into groups; each group will take on the role of an interest group or stakeholder in that community e.g. Municipal government, NGOs, residents, businesses, women etc. All of the groups will come together in a round table discussion in order to discuss possible solutions to the problem. The students must understand the perspectives of the different stakeholders in order to represent their interests authentically and create/critically assess solutions to the problem as seen from their perspective.
- 7) Engineers Without Borders "Water for the World" Presentation: University students and recent graduates with expertise in engineering, sciences, international development and social sciences will lead a presentation about global and local water issues. They will incorporate an interactive water "trivia" game, a water filter making activity and a "calgary water system" skit where the students become the stars of the show. Review from the CARA video is covered along with additional information that skims on the functions of the United Nations, World Bank and NGOs (Non-governmental organizations). Furthermore, it highlights the water crises that have occurred in Canada and the functioning of Calgary's own water purification system. If interested, please contact the Engineers Without Borders Outreach Program Leader at ewboutreach@yahoo.com

3 RESOURCES

www.sacredbalance.com

www.thewaterpage.com

www.worldwater.com

www.epa.gov/water

www.afn.ca/programs/health%20secretariat/environment%20health/drinking_water

www.magna.com.au/~prfbrown/gaia_int.html

www.cbc.ca/news/indepth/background/groundwater2.html

www.ec.gc.ca/water/en/e_quickfacts.htm

www.ec.gc.ca/water/en/info/pubs/primer/e_prim04

www.calgarywaterworks.com

www.caragua.org

National Survival Institute. (1984-85) Water Wiz-Dom

Hicks, D. & Steiner, M. (1989) Making Global Connections: A World Studies Workbook. Oliver & Boyd: New York

Suzuki, D., Vanderlinden, K. Eco-Fun. David Suzuki Foundation: 2001

Government of Canada. (1996) The State of Canada's Environment Ottawa: Supply and Services. www.ec.gc.ca/library/elias/bibrec

Gaia Atlas of the Earth

GLOSSARY OF TERMS

Aerate - The process of bubbling air through sewage sludge to provide oxygen to the microorganisms that are breaking down the sludge during sewage treatment.

Agrochemicals – synthetic chemicals used in agriculture to improve food production. Examples include insecticides, herbicides, fungicides, and chemical fertilizers.

Aquatic Ecology - the study of how organisms interact and relate their non-living environment in a water setting.

Water-borne disease – a disease caused by contaminants present in water that people use or come in contact with.

Attenuation – The process of reducing the amount of harm done by something.

Banned Pesticides – Pesticides whose use has been prohibited by most governments of more developed countries due to the danger they present to humans, and/or ecosystems. An example of this is DDT. The use of such pesticides is common in less developed or 'developing countries' because they normally have few environmental regulations controlling pesticides, and because banned pesticides are often very effective.

Biochemical Oxygen Demand – The amount of oxygen a substance will remove from water it is released into. Normally materials high in organic matter (ie sewage) have a high biochemical oxygen demand. If too much oxygen is removed from the water no animals can live in it.

Chemical Coagulation – a method of removing contaminants during water treatment where chemicals are added which bind to unwanted substances in the water to make them easier to remove.

Contaminants – components in water that are potentially harmful and exceed recognized standards for healthy water.

Developing Countries - Countries whose economies are mostly dependent on agriculture and primary resources (i.e. raw materials) and do not have a strong industrial base. These countries generally have a gross national product below \$1,890 per capita (as defined by the World Bank in 1986). The term is often used synonymously with less developed countries and underdeveloped countries. These countries are typified by lack of good infrastructure and sanitation for most citizens.

www.kisanwatch.org/eng/glossary/glos_d.htm

Disinfection – The process of adding chemicals to water during water treatment to kill potentially harmful micro-organisms. This process often uses chlorine and can leave potential harmful bi-products in the water after treatment.

Exxon Valdez disaster – A large oil spill which occurred in the 1980's when an Exxon owned oil tanker sunk off the coast of Alaska killing many millions of marine animals, and devastating the economies of nearby fishing villages.

Fresh water – water that does not contain a significant amount of salt.

Greenhouse gases – Gases such as water vapour, carbon dioxide, CFCs and methane, which contribute to the warming of the earth by trapping outgoing radiation reflected by the earth's surface.

Groundwater – Water that is underground in permeable layers of rock and soil called aquifers. It can reach the surface in springs and wells.

Groundwater Recharge – The process where surface water refills groundwater stores by percolating into the ground. This process is prevented by urbanization, which causes much of the ground to be covered in concrete, asphalt and buildings.

Intensive Livestock operation – A very high density method of farming animals where they are crammed together very tightly and have poor living conditions. This damages watersheds because runoff from animal manure carries coliform bacteria and nutrients into ground or surface water.

Microbiological contaminants – dangerous microorganism such as ecoli bacteria, which are sometimes found in water, and cause problems in drinking water.

Nutrients – In the context of aquatic ecology these are things like nitrates and phosphates which organisms in the water need to live. If they are added to water in too much abundance can cause excessive growth of algae, or water plants.

Particulates – very small pieces of solid matter in water.

Patriarcl societies – male dominated and controlled societies, this is the norm for traditional societies throughout the world (with exceptions of course).

Pathogens – microorganisms which cause diseases.

Recharge Area – The area where water from the surface enters an aquifer to increase the amount of water in the aquifer.

Pollute - the act of interfering with a natural system in a harmful way. Any addition of an unnatural component to a natural system is pollution.

Riparian areas - An area of streamside vegetation including the stream bank and adjoining floodplain, which has different vegetation, soils, and topography than upland areas nearby. <http://www.ag.iastate.edu/centers/iawetlands/Glossary.html#R>

Safe drinking water – Water that does not cause or contribute to sickness in people who drink it. This water should have few or no chemical and microbiological contaminants in it. Different areas have different standards for deciding what constitutes clean drinking water. The WHO states that drinking water should have no more than 0.01 mg/L or arsenic in it.

Sanitation – the means to obtain the cleanliness necessary to stay relatively free of disease.

Sedimentation - A method of removing very small solid particles that are suspended in water. This method normally involves slowing down the flow of water so the solid particles cannot be carried by the water anymore.

Septic System – A method of treating wastewater used by most people who live on farms, and acreages in Canada if they are not connected to a municipal sewer system.

Surface Waters - water on the surface of the earth, such as water in lakes, rivers, ponds, wetlands etc.

Surface Water eutrophication – a process where most or all of the oxygen is removed from surface water, which kills the animals that rely on that oxygen to live. This is often a result of the addition of nutrients to water by human activities.

Tertiary wastewater treatment- A method of sewage treatment which removes phosphates and nitrates from the wastewater, as well as the actual solid waste. This is a better method of treatment because it prevents algal blooms and associated problems.

Urbanization – A process where many people move from rural areas and small villages to large areas. This is a major trend throughout the world, and often puts enormous strain on water resources because of intensive use and pollution by many people in a small area.

Upper watersheds – The higher elevation part of a watershed where higher amounts of precipitation fall. This is especially important to protect since it is upstream of everything else in the water shed, so any pollution here affects everything downstream of it.

Walkertons, North Battlefords – This is referring to two separate tragedies which occurred relatively recently in Canada where people were poisoned by pollution in their water, which was related to runoff from farms.

Water Quality Standards – Legal standards for controlling the amounts of potentially harmful substances allowed in water. These standards are put in place by governments to protect their citizen's health as well as the environment.

Water infiltration – A term used to describe how water seeps into the ground from the surface and joins the groundwater to recharge groundwater.

Watershed –A geographical portion of the Earth's surface from which water infiltrates downward to the groundwater zone or runs off to a single place such as a river. The area where the water in an aquifer, river, lake, etc comes from originally after it hits the ground as precipitation.

APPENDIX

Tips for Conserving

Kitchen:

- Keep a container of water in the fridge rather than running water until it's cold
- Take food out of the freezer ahead of time to avoid thawing it under water
- If you wash dishes in the sink, do not leave the water running when rinsing
- Steam veggies instead of boiling them; you'll use less water and preserve more of the nutrients in the vegetables
- Use dishwashers for full loads only; each load uses 40L of water

Bathroom:

- Do not leave the tap running while brushing your teeth or shaving
- Turn off the shower while lathering
- Fill a plastic water container with water and put it in the holding tank of the toilet; the bottle displace water and in turn less water goes down the drain when the toilet is flushed
- Flush less: "If it's yellow it's mellow. If it's brown flush it down!"

Laundry Room:

- Wash only full loads of laundry or set the dial on the washing machine so that it uses only the water necessary
- Use cleaning products that won't harm the environment when it goes down the drain e.g. Phosphate-free detergents

Other:

- Every time you want to wash your car, put it off for another day
- Put a bucket out to catch rain water, then use it to water the garden

Alberta Environment. (Sept.1991) *Using Water Wisely: A Personal Guide to Water Conservation*

Student Evaluation Questions

Please check the appropriate box

	Disagree	Somewhat Disagree	Unsure	Somewhat Agree	Agree
I would recommend this resource to others					
I feel that because of this resource, my awareness of water resource management is greater					
This resource has motivated me to continue learning about these concepts independently					
I feel that the information in the video is complete					
I feel the activities helped me to learn					

Comments: _____

Teacher Evaluation Questions

Please check the appropriate box

	Disagree	Somewhat Disagree	Unsure	Somewhat Agree	Agree
I would recommend this resource to others					
The video and activities were well received by the students					
The video content fit the course objectives					
The teacher's manual provided the necessary suggestions and support for presenting the material in an effective manner					
This resource educates students about development issues related to water					
The video content is current and up to date					
This resource presents the material in an objective manner and encourages the students to think critically about the issues					
This resource enabled students to make connections between contexts and understand their interdependency					

Comments: _____

Water Worksheet

The audit worksheet allows you to keep track of household water use on a daily basis and to calculate your weekly water use.

Water Audit Worksheet		for the week _____ to _____								
calgarywaterworks.com										
What you do	How many times each day							Total times used	Maximum volume per use	Total
	1	2	3	4	5	6	7			
In the bathroom										
toilet flushes									x 20 L	
showers (per 5 minutes)									x 40 L/ 5 min	
baths									x 150 L	
teeth brushing (per minute)									x 19 L/min	
shaving, with sink running (per minute)									x 19 L/min	
In the kitchen										
cooking									x 19 L	
dishes by hand (include wash and rinse water)									x 57 L/ 3 min	
dishwasher									x 40 L	
In the laundry room										
clothes washing									x 193 L	
Outdoors										
garden/lawn watering (per hour)									x 950 L/hour	
Other										
running a tap (per minute)									x 19 L/min	
Total estimated weekly water use										

Instruction: Every time you wash a load of laundry, run a tap, or flush the toilet, mark it on the worksheet. At the end of the week, add up the number of times each activity was done and multiply this by the amount of litres shown under the "maximum volume per use" column.

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