



## Rainwater Harvesting, a Practice for Puerto Rico?

### Summary:

Rainwater harvesting could be a reasonable means for people in Puerto Rico to meet some of their water needs at a sensible cost.

### Background information:

People have drained water resources in Puerto to the point that water has been in short supply in certain places at times. All but two rivers in Puerto Rico have been altered, with embankments, human-made channels, and impoundments, to assure that there is as much water as possible to be available for human purposes.

Underground sources for water have been tapped to the point that the water table has dropped considerably, a water debt. Fernando Gomez of the USGS in Puerto Rico stated that over the past 15 years the island freshwater lens [water table] has dropped from 500 feet down to 300 feet.

Gomez also stated several other water characteristics about Puerto Rico. 65% of the rainfall on Puerto Rico evaporates. Rainfall has declined about 5" annually over the past century. Of the water that flows overground, 75% of it runs off, not percolating into the soil (there are 60,000 miles of roads on Puerto Rico). Daily per capita use of water on the island is 80 gallons, typical of Alabama and North Carolina. Fortunately, the population growth rate has decreased to 30,000 people per year.

Gomez senses Puerto Rican philosophy as "Take your money [insert "water resources"] and run with it." Mari, a teacher in Puerto Rico, mentioned that as long as the flow of water and electricity is uninterrupted, people do not concern themselves about these issues.

Near Puerto Rico, in the U.S. Virgin Islands, it is required by law to have rain catchment systems. India has promoted a rainwater harvesting program to help people meet their water needs through government promotions.

Gomez sees Puerto Rico on the verge of water collapse, especially by 2010.

### Grade Level: 7-12

**Goal:** Understand that rainwater harvesting interventions may help Puerto Rico to better meet water demand.

**Key concepts:** water resources are finite; there are different means for getting water; rainwater harvesting may be a practical method for gathering and storing water.

### Objectives:

By the end of this lesson, students will:

- 1.) Understand that there are a variety of sources of water.
- 2.) Understand that there are a variety of means for acquiring water.
- 3.) Understand the practicality of water catchment systems.

### Teaching location:

Classroom  
Computer lab with internet connections

### Lesson time:

Activity 1: 20 minutes  
Activity 2: 60 minutes

### Subject areas for infusion:

Science  
Social studies

**Materials:**

- Websites -- see the resource list below.
- Public service CD from India, promoting rainwater harvesting.
- TV with DVD connected to it.

**Set-up:**

Get a TV with a DVD player connected to it  
Pre-arrange use of the computer lab.

**Procedure:****Introduction:**

There are many sources from which to secure water for human needs and enterprises: groundwater, rivers, lakes, desalinated ocean water, and rainwater. The means for retrieval may be, by degree, simple and inexpensive, or complex and expensive. Rainwater harvesting is a way of capturing and holding fairly clean water from precipitation, water that in many areas would not seep into the ground to replenish aquifers because of barriers of impermeable caps of pavement and other human structures. Why not retain this water that has been interrupted from the natural water cycle, to apply it to human needs and wants?

**Activity 1:**

Have students discuss from where people can get water to meet their needs and wants. Share information from the website below and use as background information:  
John Hopkins School of Public Health “Population Reports”  
[http://www.infoforhealth.org/pr/m14/m14chap2\\_2.shtml](http://www.infoforhealth.org/pr/m14/m14chap2_2.shtml)

See and share the text in the introduction. Help students to realize that run-off water is a lost water resource. Explain that underground water tables have been dropping markedly as people draw water from this source.

Show the India public service announcement promoting rainwater harvesting.

**Activity 2:**

In the computer lab, have students look through the rainwater harvesting websites from the reference list below. Allow students to branch out online to search and share the

**Standards:**

## Science

A.8.3	C.8.5
A.8.5	C.8.7
A.8.6	C.8.10
A.12.3	C.8.11
A.12.5	C.12.1
C.8.1	C.12.2
C.8.2	C.12.5
C.12.7	

## Social studies

A.8.11
C.8.7
C.12.8
E.8.5

## Environmental Education

A.4.1
A.12.1-3
B.4.8-12
B.8.18

**Vocabulary:**

**Freshwater lens:** a convex-shaped water table, under an island's surface, which sits atop a layer of underground sea water. (See websites in the reference section for more detail.)

**Catchment:** capturing and retaining precipitation.

**Rainwater harvesting:** a means of capturing rain and holding it for later use.

different strands of the websites to examine the rationale for pursuing such initiatives and the practicality; for establishing them. If possible, use a computer projector to display websites with particularly good sections that students find.

Have students explore the websites for different rainwater harvesting systems, traditional and contemporary, in rural and in urban settings.

**Assessment:**

Have students explain the practicalities of applying rainwater harvesting for community and individual needs. They may write this up, illustrate it, or create some models that show how this concept would work.

**References:**

UNESCO Freshwater lens illustration and explanations:

[http://portal.unesco.org/en/ev.php-URL\\_ID=13604&URL\\_DO=DO\\_PRINTPAGE&URL\\_SECTION=201.html](http://portal.unesco.org/en/ev.php-URL_ID=13604&URL_DO=DO_PRINTPAGE&URL_SECTION=201.html)

Geological Society of America Freshwater lens explanations:

[http://gsa.confex.com/gsa/2002AM/finalprogram/abstract\\_45062.htm](http://gsa.confex.com/gsa/2002AM/finalprogram/abstract_45062.htm)

Rainwater Harvesting Organization websites from India:

<http://www.rainwaterharvesting.org/jalswaraj2.htm>

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

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

<http://www.rainwaterharvesting.org/Urban/Model-Projects.htm>

<http://www.rainwaterharvesting.org/Solution/Water-Arithmetic.htm>

See actual rainwater harvesting systems from Rainwater Harvesting Org:

<http://www.rainwaterharvesting.org/Urban/Practices-and-practitioners.htm#chen>