GLOBAL VERSION

DROPS OF KNOWLEDGE FOR RIVERS OF CHANGE

GLOBAL TEACHING AND LEARNING MATERIAL

A hands-on guide to teaching
and learning about
water, sanitation, hygiene,
and the environment

SWAROVSKI
WATERSCHOOL

ACKNOWLEDGMENTS

Swarovski Waterschool Drops of Knowledge for Rivers of Change teaching and learning material was prepared for D. Swarovski KG by the Swarovski Waterschool International Team led by Donna Goodman, Clemens Scheiber, and Bruno Maia.

WITH SPECIAL THANKS TO SWAROVSKI WATERSCHOOL LEADERS WORLDWIDE:

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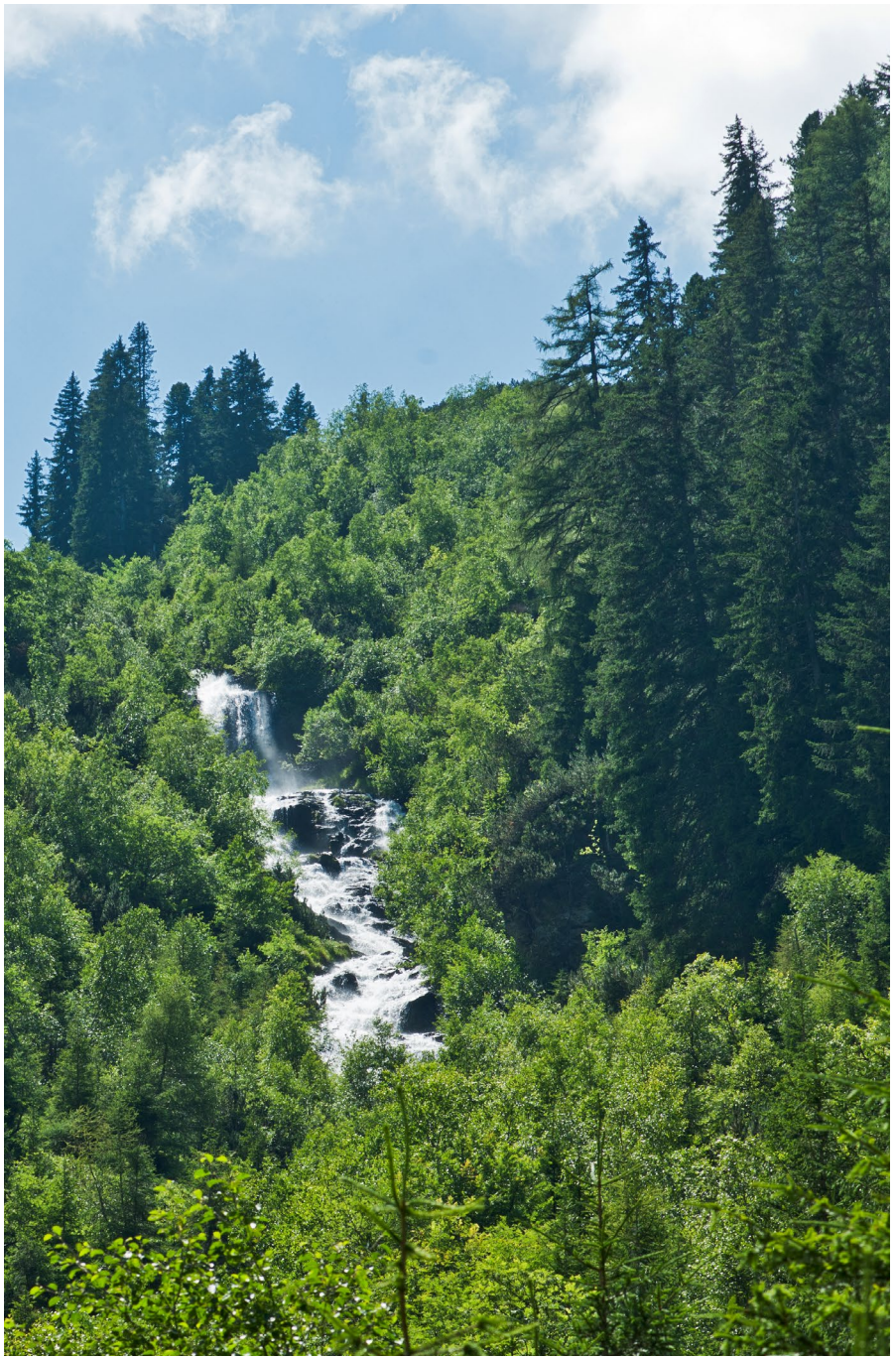
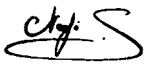


Swarovski began making crystal 120 years ago, in a valley high in the Austrian alps. One thing convinced my great-great grandfather to set up his new business here – the abundance of water. Water not only offered the clean sustainable energy of hydro-electricity, it was essential for the technique he had invented to cut and polish crystal. The rivers that flowed from the mountains provided an inexhaustible supply.

Today Swarovski is one of the most recognised brands in the world, and our headquarters is still in the same valley. Water continues to be fundamental to our company, and more than ever we understand its place as the source of all life on the planet. This is why, in everything we do to give back to the wider world, we choose to put water first.

Seventeen years ago we set up Swarovski Waterschool, the company's flagship community investment program. It too began in Austria, but it has since reached hundreds of thousands of young people along the world's major rivers. Using innovative methods, such as those herein, Swarovski Waterschool Drops of Knowledge for Rivers of Change, has taught them safe hygiene practices and the importance of fresh water – how to use it, to conserve it and to cherish it.

There will be no more important resource in the future than water. By reaching young minds through our Waterschool programs, Swarovski aims to ensure that the source of life will be safeguarded for many generations to come.



NADJA SWAROVSKI
Member of the Swarovski Executive Board

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"It is necessary that you treat each other amicably, offer one another assistance and support, and neither compete nor place obstacles in one another's way. ... We can only create great things by working together."

– DANIEL SWAROVSKI[1]

1 From a speech to Swarovski employees, on the occasion of his 90th birthday, in 1952.

WELCOME TO SWAROVSKI WATERSCHOOL DROPS OF KNOWLEDGE FOR RIVERS OF CHANGE TEACHING AND LEARNING MATERIAL

Swarovski Waterschool (SWS) welcomes you to our vision of a future world where every drop of water flows cleanly and clearly. It is a world where every child has more than enough safe, clean water for drinking and washing. It is a world where all the forms of life on this planet—in rivers, forests, deserts, oceans, mountains, and even in hidden, underground places—thrive in healthy ecosystems that provide nutrient-rich food, medicine, and renewable energy.

Access to water is a basic human right and our bodies need water to live. It is also essential to supporting children's access to education and, therefore, the ability of every child to fulfill her or his unique destiny on Earth. Through the Swarovski Waterschool participatory approach, each person in each school can join together, contributing and sharing drops of knowledge, to form rivers of change, leading to an ocean of peace and plenty.

This guide is a map to the often-unseen treasures of water. Just as a glimmering Swarovski crystal reflects the colors of the rainbow, each drop of water holds a rainbow of possibility. By revealing the many links between water and our lives, we hope the activities outlined in Swarovski Waterschool Drops of Knowledge for Rivers of Change Teaching and Learning Material will engage and inspire you to discover the value of every drop of water and to understand our interconnectedness with all things.

DID YOU KNOW? Nearly half the world's population is under 20 years old, and 90% of all these young people live in developing countries.

SOURCE: UNICEF, The State of the World's Children 2011: Adolescence – An Age of Opportunity, New York: United Nations Children's Fund, February 2011, p. 20. Available at: http://www.unicef.org/publications/index_57468.html

This material aims to help students develop a personal understanding of where our water comes from, answering such questions as "How does water get to our homes?" and "Where does it go when it flows down the drain or is flushed from a toilet?" Designed to help students learn to respect and love water, the guide offers educators an opportunity to discover practical tools

that can help students learn and grow as stewards of the planet in all ways, always.

Beginning with the basics of water, the reader is encouraged to dive into deeper levels of awareness to explore our relationship with water, most personally through our own human bodies. Did you know that our bodies are made up of about 70% water, and that around 70% of our planet's surface is covered by oceans? All of the water in the world is the same substance!

There is only a finite amount of water, and it is continuously recycled in different forms. The water in your sweat last week in one country might have been in a wading pond for dinosaurs on another continent in another era. A thousand years from today, those droplets might be floating in a vast ocean on the other side of the world. As our bodies depend on water to keep us alive and healthy, our families depend on water for washing, cooking, and recreation, to name just a few of the ways we use water every day.

Extending beyond the personal, the learning journey ripples out to the world around us as we explore the dynamics between water and our schools and the larger community; gardens and tree planting, traditional practices, sanitation, and hygiene. Next, we explore the wider world of water. Can you imagine how the water in your home and school interacts with the water inside and outside every other living thing in every place? When the wind blows, a cloud might carry your local water to a place many miles away.

After we learn about biomes and explore our planet's ecosystems, our journey moves on to networking. As Swarovski Waterschool programs around the world connect schoolchildren with one another through local action and interactive media, a web of experience comes to life.

INTRODUCTION

HOW TO USE THIS GUIDE

This Global Edition of Swarovski Waterschool Drops of Knowledge for Rivers of Change Teaching and Learning Material gathers activities and knowledge developed by hundreds of Swarovski Waterschool programs in seven countries around the world. In 2017, nationally focused editions will be available for Austria, Brazil, China, India, Thailand, Uganda and the United States of America. Designed to meet the diverse interests and needs of teachers, parents, and youth group leaders, this global guide contains nine modules:

MODULE 1: SWAROVSKI WATERSCHOOL PROGRAMS
MODULE 2: WATER BASICS
MODULE 3: WATER AND ME
MODULE 4: WATER AND FAMILY
MODULE 5: WATER AND SCHOOL
MODULE 6: WATER AND COMMUNITY
MODULE 7: WATER AND BIOME
MODULE 8: WATER AND PLANET
MODULE 9: THE SWAROVSKI WATERSCHOOL NETWORK

Each module begins with background information on the topic, then highlights the important thematic concepts that will be covered in the activities. Each activity is clearly delineated by number and title, which are followed by a brief introduction and details on:

- **Minimum amount of time it will take to conduct the activity**
- **Thematic areas for curriculum alignment**
- **Goals for student learning**
- **List of materials required for the activity**
- **Process of the activity, step by step**
- **Ideas for observation and discussion, if any**
- **Additional resources, if any**

The overall age range for Swarovski Waterschool programs is 8–18 years old. This guide recognizes that, along with age differences, there may be learning disparities related to urban and rural settings, the country context, or socioeconomic groups. Therefore, the materials provide flexibility for adapting

an activity to the local context. Unless noted otherwise, the activities in this guide are appropriate for students ages 8–18, and the educator may wish to organize activity sessions with groups of younger children (ages 8–12) or older students (ages 13–18).

DID YOU KNOW? The guide is presented in an activity-focused, modular format to provide flexibility for teachers or facilitators, and to allow them to use it in the way that will be most effective according to their individual learning styles and teaching goals.

Users are encouraged to adapt and make the materials their own by adding local context and content, using locally available alternatives to the suggested materials, and adjusting the activities as appropriate for their schools and communities.

Further insight into the topics has been provided via short case studies that illustrate concepts through Swarovski Waterschool actions; thematic concepts, interesting facts and figures highlighted in **"DID YOU KNOW?"** boxes; and quotations from notable experts, students, teachers, and Swarovski Waterschool coordinators that illustrate perspectives on learning about water from all around the world.

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Modules and activities can be experienced in a school group, after-school club, or in any other way that can be imagined. Follow the suggested progression of topics from the personal to the global, or use different sections at different times, working with the themes and activities that are most compelling and appropriate for your community, region, or country.

The Swarovski Waterschool approach is participatory and interdisciplinary.

Participatory teaching with and for children inspires them to be curious, to think critically, and to be creative. It is designed to be interesting and fun!

Facilitation of a lively and engaging child-centered approach helps children grasp serious and wide-ranging information related to the consequences of their actions, and encourages them to make good decisions and healthy choices. For example: If you drink dirty water, what will happen? All the dirt, garbage, and other such items in the water will enter your body, you will be exposed to germs and harmful substances, and you might become sick. What happens when you are sick? Questions of this type bring children's personal perspectives and experiences into the learning process and are featured throughout the guide.

WHY WORK WITH CHILDREN AND YOUNG PEOPLE IN SWAROVSKI WATERSCHOOL PROGRAMS?

Swarovski Waterschool activities focus on students ages 8–18. Children and young people are not just young: they are also concerned, thoughtful citizens capable of participating in and changing the society of which they are a part. The impressions and beliefs formed during children's developmental years go a long way in shaping their knowledge, opinions, and actions. Children in this age range are curious about everything around them and want to learn and understand. They are at an age when they absorb ideas about respect and discipline, what is wrong and what is right, how to conduct themselves, and how to share with others.

Adolescence brings challenge and opportunity to all children. During this passage of life from childhood to adulthood, young people are absorbing many social norms and learning about the cycles that impact human society. As children take a few steps away from the secure nest of home and family, they are challenged by the changing nature of their own bodies, while the outer world brings increasing opportunities and threats. This is an age when girls in some places need to drop out of school because they have inadequate support to manage menstruation; In other places, their daily chore of fetching water or wood for the needs of their families can be transformed into a perilous journey by threat of rape or abduction.

DID YOU KNOW? There is a global treaty on children's rights through which governments agree to fight disease and malnutrition by providing nutritious food and clean drinking water, taking into consideration the dangers of environmental pollution.

Participating governments also promise to make sure that all segments of society, especially parents and children, are informed, have access to education, and are supported in using basic knowledge on children's health, including hygiene and environmental sanitation.

SOURCE: Convention on the Rights of the Child, Article 24, 2 (c, e). Available in Arabic, English, French, Russian, and Spanish at: www.unicef.org/crc.

Children and young people are in a phase of development that is ideal for learning about some of the most important aspects of life and survival:

water, sanitation, and hygiene. Swarovski Waterschool programs recognize the different realities, capacities, and needs of children, as well as how—regardless of gender, race, and cultural situation—children and young people have the power to make a difference in their local communities and in the world.

Further consideration of gender-responsive participatory approaches for engaging with children and young people in their communities can help turn the challenges posed by water scarcity or contamination into an opportunity to build all children's skills regarding sustainable development. Best practices and lessons learned from local actions are part of our Swarovski Waterschool programs in each country, and many of them are included in this international guide.

Swarovski Waterschool Drops of Knowledge for Rivers of Change Teaching and Learning Material is designed to support the mainstreaming of water education in local curricula to ensure the long-range sustainability of Swarovski Waterschool programming. The thematic areas noted in the activities, for example, include science, geography, mathematics, environmental education, health, social studies, and language arts, among others. These indicate some of the ways that learning about water can be integrated into other classroom subjects.

It is our hope that you, as a user of this guide, will make it your own. We are always working to improve these materials, so please feel free to let us know what you are doing in your school and how you are able to use the activities and information. In the future, we hope for these resources to be even more interactive, but for now, we welcome your comments and feedback by email at: office.waterschool@swarovski.com.

INTRODUCTION

"It is the vision of our Waterschool program to contribute to the long-term availability of water for the benefit of people and nature and for the maintenance of the world's cultural and biological diversity."[2]

2 Maplecroft, "Swarovski Sustainability Report 2013," Wattens, Austria: D. Swarovski KG, Corporate Responsibility Department, December 2013, p. 92. Available at: http://www.swarovskigroup.com/S/aboutus/Swarovski_Sustainability_Report_2013.pdf.

BACKGROUND INFORMATION

In Swarovski Waterschool (SWS) programs, everything revolves around water—the Earth's most precious resource. Swarovski's flagship community investment program embodies the company's integral relationship with and to water. The company's respect and concern for the environment was established by Daniel Swarovski, who founded the company in Wattens, Austria, in 1895. Water has always been essential for making Swarovski's high-quality crystal products, and for more than 100 years, the company has harnessed water as a source of electricity.

Swarovski Waterschool programs are designed to encourage respect for the human and environmental importance of sustainable water policies and practices, contributing to the long-term availability of water for the benefit of communities, ecosystems, and biodiversity. The goal of Swarovski Waterschool activities is to engage and empower current and future generations as stewards of our planet, supporting access to plentiful, safe, clean water and adequate sanitation for all.

An international icon, Swarovski designs, manufactures, and markets crystals, genuine gemstones, and created stones, as well as jewelry, accessories, and lighting. The company also makes precision optical instruments, such as telescopes and binoculars, and tools for grinding, drilling, and sawing. Today, water remains fundamental to Swarovski's production processes, particularly cooling, cutting, and polishing.

Although water is readily available in Austria, the situation is very different in many parts of the world, where shortages, droughts, and environmental pollution endanger communities and vulnerable groups—including children. In response to these issues, Swarovski's management places great emphasis on developing Swarovski Waterschool as a worldwide educational program on the use and preservation of water.

The first Swarovski Waterschool program was developed in Austria, in collaboration with Hohe Tauern National Park. In 2000, the program was implemented in schools located in the National Park regions of Tyrol, Salzburg, and Carinthia. Over the years, the program has been extended to schools along the banks of some of the world's largest rivers, from the Danube in Austria to the Ganges in India (2006), the Yangtze in China (2008), the Nile in Uganda (2009), the Amazon in Brazil (2014), the Ping in Thailand (2016), and the Mississippi in the United States of America (2016). All Swarovski Waterschool programs are carried out with non-profit partners who have knowledge of local communities and environmental challenges.

All Swarovski Waterschool programs feature participatory teaching and learning, centering on water as the primary theme and extending to hygiene education and access to sanitation. The programs also recognize that children are proven to be the most effective ambassadors in communicating messages related to healthy lifestyles to their families and communities.

Engaging with children and the adults who influence their lives, Swarovski Waterschool programs teach sustainable and responsible usage of water, good hygiene, and the importance of adequate sanitation in a practical and imaginative way, both in schools and through less formal outdoor activities. Encouraging active engagement with the topics through experimentation, practical action, games, music, art, and theater—all tailored to the local culture, environment, location, and school type—helps to develop meaningful understanding.

ADDITIONAL RESOURCES:

International Commission for the Protection of the Danube River (ICPDR), icpdr.org/main/danube-basin/austria

Ministry of Water and Environment, Water and Environment Sector Performance Report 2014, Government of Uganda. Available at: mwe.go.ug/index.php?option=com_docman&task=cat_view&gid=15&Itemid=223

Swarovski Waterschool, swarovskiwaterschool.com

UNICEF, FAO and SaciWATERs, Water in India: Situation and Prospects, New Delhi and Andhra Pradesh: United Nations Children's Fund, Food and Agriculture Organization of the United Nations and South Asia Consortium for Interdisciplinary Water Resources Studies, 2013. Available at: scribd.com/doc/186905052/Final-Report-water-management#scribd

ACTIVITIES FOR SWAROVSKI WATERSCHOOL PROGRAMS

The activities in this section are for Swarovski Waterschool coordinators, teachers, facilitators, and other adult users of this guide. They are intended to support groups in defining the overall objectives and plans for delivering a sustainable Swarovski Waterschool program.

ACTIVITY 1.1: TEAM BUILDING (TANGLE/UNTANGLE) EXERCISE

This activity is designed to be used at the beginning of a Swarovski Waterschool teacher-training workshop to focus on cooperation, team building, and participation.

Group Size: 8–20 / **Time:** 15–20 minutes / **Goal for Learning:** Demonstrate that cooperation and team efforts are effective problem-solving techniques.

Materials: None

ACTIVITY STEPS:

1. Ask one person to volunteer as the "director" and have them stand off to the side. Ask the other participants to form a circle standing shoulder to shoulder. Then, have each person reach out and join right hands with anyone in the circle who is not next to them and repeat with left hands to form a human knot.

2. After the participants have formed the knot, the director is asked to untie them. Everyone must follow the director's instructions cooperatively. They may not move unless told to do so. Keep track of the time this takes.

3. When the group has been untied, the director is asked to join the circle and to form the knot once again. This time, they must untie the knot by themselves, without the help of a director, who represents outside influence. (Note: It should be much easier.) Keep track of the time this takes, and compare the times with and without the director.

MODULE 1

4. Ask the group what they thought the exercise was about. They will likely comment on teamwork, cooperation, not relying on one director, etc. Encourage this to evolve into a discussion on the issue of teamwork for leading a Swarovski Waterschool.

SWS BRAZIL, TEAM BUILDING ACTIVITY

ACTIVITY 1.2: SETTING SWAROVSKI WATERSCHOOL GOALS AND INDICATORS

This activity is designed to be used at the beginning of a Swarovski Waterschool teacher-training workshop that engages participants in program development. Before starting the activity, set a few ground rules with the group to help ensure it is conducted successfully.

Group Size: 8–30 / **Time:** 60–90 minutes / **Goal for Learning:** Arrive at a group definition of Swarovski Waterschool program goals and set indicators to measure progress toward those goals.

Materials: ☐ Flip chart paper / ☐ Markers / ☐ Masking tape

RULES TO CONSIDER INCLUDE:

RESPECT – One person speaks at a time, and all participants give undivided attention to the person who is speaking.

NONJUDGMENTAL APPROACH – It is OK to disagree with another person's point of view or behavior, but it is not OK to insult another person.

INCLUSIVE APPROACH – Be aware that participants may have different cultural backgrounds or sexual orientations, and promote a nondiscriminatory attitude in which the group is careful not to make insensitive remarks.

TIMEKEEPING – All group members arrive at the agreed time and finish on time. If someone cannot attend, she or he should notify another group member or leader, and agree to follow the decisions the group makes in her or his absence.

ACTIVITY STEPS:

1. Introduce the group to the three pillars of Swarovski Waterschool, as illustrated and described here. Share basic information about your country, district, or school regarding water, sanitation, and hygiene education.

2. Ask participants to form small groups of four to six people. Within the groups, each person will write down three words that come to mind when she or he hears the word "Waterschool." After the groups share these words with each other, collect all the responses, and display them for everyone in the workshop to see.

3. Using the pdf on the three pillars as a guide and agree on a unified definition that is aligned with the three pillars: this will be used as the goal for the Swarovski Waterschool. Then let the small groups brainstorm and list ways to track the progress of their learning on an ongoing basis.

4. Display the groups' lists of indicators to everyone in the session to discuss, clarify, and summarize. Compare the indicators with the goal of the Swarovski Waterschool and with the three pillars, and ask the participants to consider next steps for implementing the goal and integrating the indicators into their plan of action.

SWS, THREE PILLARS

CASE STUDY, PARTNERSHIPS AND PLANNING, SWS BRAZIL

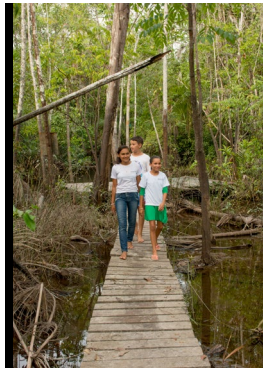
Established in March 2014, Swarovski Waterschool Brazil, which in Portuguese is named Escola d'Água, is one of the newest gems of the Swarovski Waterschool network. It is located in the municipality of Santarém in the State of Pará, at the confluence of the Amazon and Tapajós Rivers. Swarovski Waterschool Brazil is working to build capacities of teachers and students from 35 schools in the municipality to preserve the Amazon region habitat through promotion of water, environment, and sanitation education of good quality, while contributing to local actions and shift of behavior and values among those involved in the educational process.

Planning ahead for long-range sustainability, Swarovski Waterschool partner Earth Child Institute established local partnerships with the Municipality and Secretary of Education in Santarém, the Federal University of Pará in Amazon, EMATER (Extension Services of the State of Pará for Technical and Rural Assistance), and UNICEF. Together with these key stakeholders, the Swarovski Waterschool team visited each of the 35 schools to conduct a survey of knowledge, attitudes, and practices.

The senior technical adviser in Santarém, Professor Lucineide Pinheiro, explains, "We intend to help train a new generation of people who can treat the environment with more respect. Seeing children as protagonists of their history, the Waterschool seeks to empower them and bring them to a critical reflection on the role of water in relation to the way that they treat their body, home, school, and the community. We understand that we are in the Amazon region and the importance of taking care of what is ours."

The survey findings indicate that the issue of annual flooding is getting worse and, at the beginning of the flood season, there is a great deal of water-related illness linked to poor sanitation. In addition, the increasing prevalence of agricultural chemicals being spilled into the river presents a health challenge to the communities during the rainy season. Although schools are often surrounded by water, in many cases, it is not safe to drink, and many schools do not have filters or access to safe drinking water.

After two workshops in September 2014, Marluce de Pinho, coordinator of the project for schools located on the rivers, affirms that "the greatest intention is to put into practice the actions that have already been developed and assimilated in the first stage of the seminars."



SWS BRAZIL

MODULE 1

TRADITIONAL PAINTING, SWS CHINA

"Knowledge without wisdom is like water in the sand."

–GUINEAN PROVERB

BACKGROUND INFORMATION

Water resources on our planet can only be understood within the context of the water cycle. The global water cycle is a closed system in which the same water moves through the different states of solid (ice), liquid (water) and gas (steam) in a continuous loop through all of time. The sun is the "motor" of the water cycle. On the surface, water flows across the land and underground, settling eventually in rivers, ponds, lakes, and oceans. As the water is heated by the sun, it evaporates and enters the atmosphere in the form of steam to make clouds.

Another term for the water cycle is "hydrologic cycle"; "hydrologic" comes from the Latin words hydro (water) and logic (knowledge).

RAINY SEASON IN BRAZIL

THEMATIC CONCEPTS

Water as a human right – As stated by the United Nations, "On 28 July 2010, through Resolution 64/292, the United Nations General Assembly explicitly recognized the human right to water and sanitation and acknowledged that clean drinking water and sanitation are essential to the realisation of all human rights."[3]

Solid, liquid, and gas – When steam in the atmosphere cools, it condenses and, depending on the climate and temperature, returns to the planet in the form of different types of precipitation such as rain, snow, sleet, and hail.

Groundwater – Liquid water found underground in the cracks and spaces in soil, sand, and rock, which is stored in and moves slowly through geologic formations of soil, sand, and rock called "aquifers."[4]

Surface water – Liquid water on the surface of the planet, such as a stream, river, lake, wetland, or ocean. Surface water can be either salty (saline), as in the ocean, or fresh (nonsaline), as in rivers and lakes. When freshwater is discharged by a river into the ocean, it becomes salty.

Precipitation – The amount of rain, snow, hail, etc., that has fallen at a given place within a given period of time, usually expressed in centimeters (or inches) of water.

Ice – Water in its frozen (solid) form. Glaciers are huge masses of ice that slowly flow over land and melt very slowly over time.

3 International Decade for Action: Water for Life, 2005–2015, "The Human Right to Water and Sanitation," United Nations Department of Economic and Social Affairs and UN Water, May 29, 2014, un.org/waterforlifedecade/human_right_to_water.shtml. **4** The Groundwater Foundation, "The Basics: What Is Groundwater?," Lincoln, Nebraska, groundwater.org/get-informed/basics/groundwater.html.

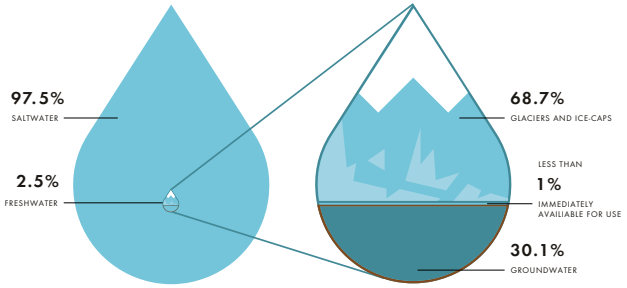
ACTIVITIES FOR WATER BASICS

ACTIVITY 2.1: LOOKING AT THE GLOBE AND UNDERSTANDING THE PERCENTAGES AND FORMS OF WATER

Although around 70% of the Earth's surface is covered with water,[5] approximately 97% of the blue water that we see on a globe is saline (salty) ocean water that is not suitable for drinking by humans or animals. About 2% of the Earth's water is freshwater that is frozen in glaciers, permanent snow, and ice caps—so less than 1% of water is available for the use of all the humans and animals on Earth.[6] This is water falling from the sky and moving into streams, rivers, lakes, and groundwater. This activity demonstrates the ratio of available freshwater to all the rest of the water on Earth.

Time: 50 minutes / **Thematic Areas:** Science, Mathematics, Social Studies / **Goal for Learning:** Gain understanding of how water is distributed around the world in different forms and different amounts.

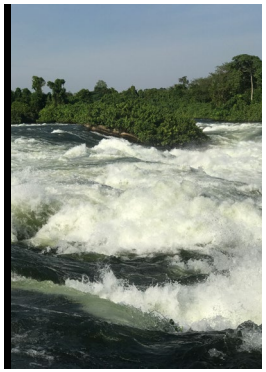
Materials: ☐ Globe or map of the Earth (as available) / ☐ 1 glass or plastic jug filled with water (3.8-liter/1-gallon size) / ☐ 1 teaspoon (holds 5 milliliters of liquid) / ☐ sheets of green and blue paper / ☐ black markers or crayons



Source: https://water.usgs.gov/edu/earthhowmuch.html

5 USGS Water Science School, "How Much Water Is There On, In, or Above the Earth?," U.S. Geological Survey, March 19, 2014, https://water.usgs.gov/edu/earthhowmuch.html. **6** Windows to the Universe, "The Water Cycle: A Climate Change Perspective," National Earth Science Teachers Association, www.windows2universe.org/earth/Water/water_cycle_climate_change.html.

ACTIVITY STEPS:

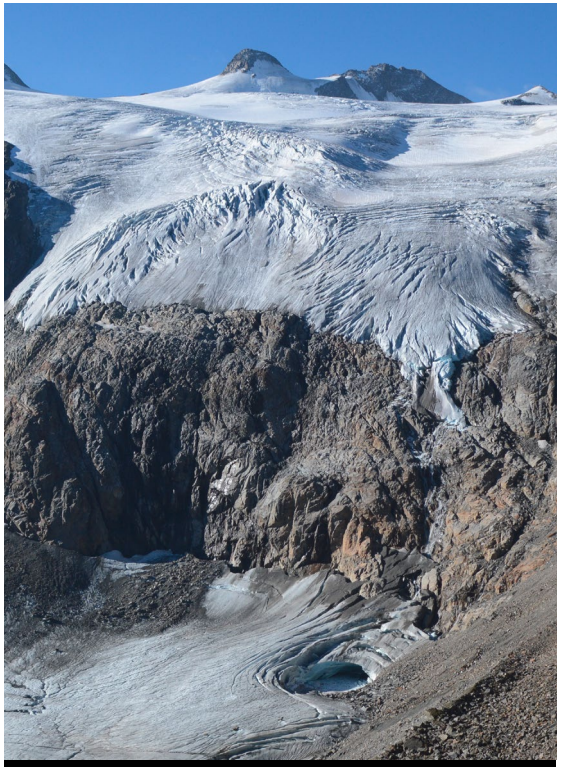


WATER

1 Begin by showing a globe or map of the Earth, explaining that 70% of the planet's surface is covered by oceans. Note that, of all the water on our planet, around 97% is salt water, 2% is frozen in icebergs and glaciers and is inaccessible to human beings, and less than 1% of drinkable freshwater is accessible from groundwater, rivers, lakes, and streams.

2 Next, hold up the jug of water and a teaspoon to show the difference, explaining that the jug represents all the water on Earth and the teaspoon represents how much is available to us as freshwater. Note that water is a limited resource with unlimited use, and encourage students to think about how important it is that we keep the water in this teaspoon clean and safe.

FOG



ICE, GLACIER

3 Organize students in groups of four and give each group one blue sheet of paper and one green sheet of paper.

4 Explain that the blue paper represents drinkable freshwater, while the green represents the rest of the water on Earth. Then ask them to tear both sheets of paper into 100 pieces.

5 Ask students to estimate the ratio of potable (drinkable) water and non-potable water in the world by setting aside a total of 100 blue and green pieces. Not all the ripped pieces will be used. Once their estimates are done, explain the real ratio: **1/** Three pieces of blue paper represent all the freshwater on Earth, including in glaciers and ice caps; in lakes, rivers, and underground aquifers; and in the atmosphere (3%). **2/** 97 pieces of the green paper represent all the rest of the water that we cannot use (97%).

6 Tell students that, of the three pieces of blue paper: **1/** Two pieces represent water that is frozen in glaciers and ice caps and is hard to reach. **2/** One piece represents water from surface water and groundwater sources that we can access.

OBSERVATION AND DISCUSSION:

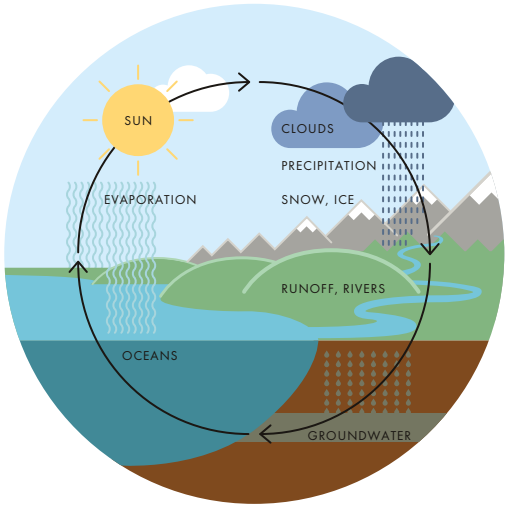
Discussion prompts include: Are there any freshwater sources in our community? Is there water in the soil? When you dig a hole in the ground, is the soil very wet, moist, or dry?

ADDITIONAL RESOURCES:

EPA New England, "All the Water in the World," Boston: U.S. Environmental Protection Agency, April 25, 2014. Available at: https://www.epa.gov/education

ACTIVITY 2.2: WATER CYCLE IN A BOWL AND ROLE-PLAY (Adapted from Swarovski Waterschool Austria)

All the Earth's water resources are interconnected in the global water cycle. The sun provides the energy that keeps water continuously circulating, as its radiation causes water on the surface of the oceans, and on the surface of the land underground throughout the world (in the form of rivers, lakes, and streams), to evaporate.



Source: http://www.srh.noaa.gov/jetstream/atmos/hydrocycle_max.html

When the rising water vapor/steam cools in the higher levels of the atmosphere and condenses, tiny water droplets come together to form clouds, which are blown around by the winds. Because cool air within the clouds can hold less water than warmer air, these drops fall to the Earth in the form of rain, snow, or hail. The precipitation is affected by gravity, and collects in streams and rivers. Then, it either evaporates back into steam or ultimately flows into the oceans. Some rain drains into the ground, where the soil absorbs it like a sponge. Trees and plants absorb water from the soil, and that water is then released into the environment in the form of water vapor. And the cycle continues forever. In some places, like big cities where concrete covers many ground areas in the form of roads and buildings, the soil is not able to absorb the water, and flooding occurs, threatening daily life on the surface.

THIS ACTIVITY HAS TWO PARTS: an experiment with a bowl of hot water and ice cubes, plus an optional step for a warm day, and staging a play about the water cycle. Younger children may particularly enjoy watching older students perform the play.

PART 1 creates a miniature water cycle of "rain" in a bowl, demonstrating that it is a closed system in which water becomes part of our daily lives and that no part of the water is lost.

PART 2 encourages everyone to use their imagination. The play is designed to help students develop an understanding of the water cycle concept by acting out the parts of water drops and the sun. The topics it covers include evaporation, water vapor, condensation, clouds, raindrops, groundwater, plants, transpiration, and the atmosphere.

PART 1: EXPERIMENT TO DEMONSTRATE PRECIPITATION

Time: 50 minutes / **Thematic Areas:** Science, Art, Theater / **Goal for Learning:** Foster a deeper understanding of the cycle of water on our planet.

Materials: ☐ 1 large clear plastic or glass bowl / ☐ Hot water (not boiling) / ☐ Clear plastic wrap / ☐ Cellophane, or a piece of a clear plastic bag (large enough to cover the top of the bowl / ☐ 1 large rubber band / ☐ Several ice cubes

Optional Extension: ☐ 1 glass and cold water

ACTIVITY STEPS:

1. Put enough hot water in the bowl to fill it about ⅓ of the way.

2. Stretch a layer of clear plastic wrap over the top of the bowl, smooth it down on all sides so that the bowl is airtight, and secure the plastic with the rubber band.

3 Watch as the water begins to evaporate and rise. Soon it will begin to drip back down from the clear plastic wrap ... it is "raining."

4 Place several ice cubes on top of the clear plastic wrap, and watch the "raindrops" form and fall more rapidly.

5 Explain that water vapor in our atmosphere gets cold and changes back into liquid, forming clouds. This is called "condensation." If the air is really cold, raindrops turn to snowflakes or ice (hail or sleet).

Optional Extension:

6 On a hot day, pour cold water into a glass. Watch what happens: drops of water form on the outside of the glass.

7 Explain that the water did not leak through the glass, but came from the air. Water vapor in warm air turns back into liquid when it touches the cold glass.

WATER CYCLE IN BOWL

PART 2: "ALINA AND VIKTOR EXPLORE THE GLOBAL WATER CYCLE"

(Script for the play, provided in ANNEX A., page 151)

Materials: ☐ 1 large piece of blue cloth to represent a puddle of water / ☐ 1 yellow cloth to represent the sun (or use a sun made of paper or cardboard) / ☐ 1 gray cloth to represent a cloud / ☐ A gong or other loud noisemaker to simulate thunder / ☐ 1 brown cloth to represent the ground / ☐ A leafy branch from outdoors to represent a tree (or use a branch made of paper or cardboard)

ACTIVITY STEPS:

1 This short play can take place on any area that can be cleared and set up for a performance; the instructions in Annex A simply refer to "the stage."

2 Before the play starts, gather the materials listed above, and ask everyone in the group to read through the script

3 Three children will volunteer to be Alina, Viktor, and Tony. One child will act as the sun, and several other children, depending on the size of the group and the stage, will appear as more water drops. Other children will be needed to spread the cloths out on the stage, and to fold them up and take them away.

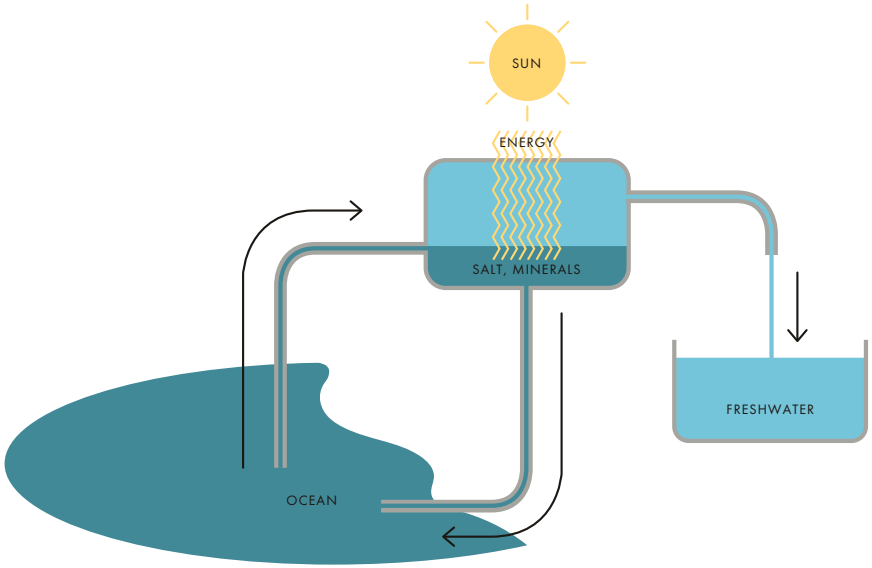
4 A teacher or group leader will read the script throughout the performance

OBSERVATION AND DISCUSSION:

Spark discussion about the water cycle on Earth and how it relates to the experiment. Ask students to share their observations from the experiment and the performance.

ACTIVITY 2.3: DOES THE SALT COME OUT OF SALT WATER? IF SO, HOW?

Desalination, or the distillation of salty water into safe, drinkable water, is one of the earliest forms of water treatment and is still a popular method used throughout the world today. In ancient times, many civilizations used this process on their ships to convert seawater into drinking water. Today, desalination plants are used to convert seawater to drinking water on ships and in many dry and drought-stricken regions of the world, as well as in other areas to treat water that is fouled by natural and unnatural contaminants. In this activity, students will use the sun to desalinate water and see for themselves how it works.



Source http://water.usgs.gov/edu/drinkseawater.html

Time: 90 minutes / **Thematic Areas:** Science, Mathematics, Geography / **Goal for Learning:** : Learn about freshwater compared to salty or brackish water in the context of both ecological balance and human consumption.

Materials: ☐ 720 milliliters (3 cups) of water / ☐ 1 large mixing bowl / ☐ 22.5 grams (1½ tablespoons) of regular table salt / ☐ 1 shallow cup or small, light bowl / ☐ Clear plastic wrap, cellophane, or a piece of a clear plastic bag (large enough to cover the top of the bowl) / ☐ 1 large rubber band / ☐ 3–4 small rocks (or substitute materials, i.e.: a small stack of magnets might create a heavier weight with a smaller surface area

Optional Extension: ☐ The students can experiment with options such as a stack of coins / ☐ 1 glass half filled with water / ☐ 1 egg (in the shell) / ☐ A container of salt (enough to use freely) / ☐ Kitchen scale (if available)

ACTIVITY STEPS:

1. Pour the water into the mixing bowl and ask students to mix the salt into the water, stirring thoroughly until it is fully dissolved.
2. Place the cup or smaller bowl so it floats in the mixing bowl, taking care to keep the salty water out of the cup
3. Stretch a layer of clear plastic wrap over the top of the mixing bowl, smooth it down on all sides so that the bowl is airtight, and secure the plastic with the rubber band.
4. Take a small rock (not too big or it will break the plastic-wrap seal) and place it in the middle of the plastic wrap, so that all of the plastic slants slightly toward the middle of the bowl, where the cup is.
5. Put the whole setup in full, hot sun, and wait. Within an hour, you should see water droplets begin to form on the underside of the plastic. They will flow and drip into the center of the bowl, and into the cup.

6 Wait several hours, and then take the plastic off. A good amount of water should now be in the small cup.

7 Invite students to taste the water in the cup; it is no longer salty. Explain that the water turned to steam in the heat of the sun, and then returned to its liquid state. Salt is heavier than water, so it stayed in the large bowl.

Optional Extension:

8 Fill a glass half full with water. Place an egg, in the shell, into the water–it will sink because it is denser than the water.

9 Start adding salt to the water one tablespoon at a time. Help the salt dissolve by stirring. What happens? How much salt do you have to add to get your egg to float?

10 Explain to students that adding salt to the water makes the water denser than the egg, so now it will float.

11 If a kitchen scale is available, weigh a cup of salt water and a cup of freshwater. Compare the weights. The salt water will weigh more than the freshwater even though it is taking up the same amount of space (a cup). This is because the salt water is denser than the freshwater.

OBSERVATION AND DISCUSSION:

Look at a map of your country and discuss the nearest ocean or salty lake. Ask if students have tasted the water and/or what they know about drinking salty water.

Talk about places nearest to your community that are facing drought situations.

MODULE 2

"Individuals should never underestimate their own influence and the role they can play in changing things for the better."

–KOFI ANNAN, FORMER UNITED NATIONS SECRETARY-GENERAL[7]

7 As quoted in: Swanson, Peter, Water: The Drop of Life, Minnesota, USA: NorthWord Press, 2001, p.13.

BACKGROUND INFORMATION

Clean water is vital to every aspect of human life—we cannot survive without it. But dirty water is dangerous and can be deadly, especially for infants and young children. UN Water reported that, as of 2013, 2.5 billion people, including almost 1 billion children, did not have even basic sanitation. Every 20 seconds, a child dies as a result of poor sanitation, unsafe water, and lack of good hygiene—that equals 1.5 million deaths each year that could be prevented with access to sanitation, good hygiene, and safe water. [8]

Up to 80% of untreated sewage comes from human settlements. Another primary source of water pollution is related to waste from industrial and agricultural activities. Two million tons of sewage and other waste drain into the Earth's waters on a daily basis, without any treatment. [9]

All living beings—humans, animals, plants, and trees—need water to survive, and also release water in different forms. One of the ways that people release water from their bodies is by exhaling breath. (A simple exercise is to take a deep breath and exhale onto a mirror, then look at all the water that comes out.) Perspiration is another way that the human body releases water. Transpiration is water being released as mist from the leaves of plants when they breathe. In the Earth's natural processes, evaporation is water being transformed to mist in the environment from the heat of the sun.

DID YOU KNOW? More than 700 million people lack access to improved sources of drinking water, and more than one-third of the global population—around 2.5 billion people—do not use an improved sanitation facility.[1]

These deprivations cause illnesses that can be fatal, particularly for children. Nearly one out of every five deaths among children under age 5 is due to diarrhea—more than AIDS, malaria, and measles combined.[2]

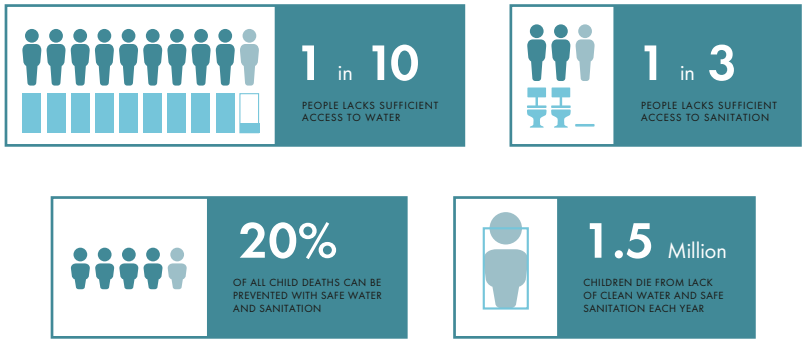
SOURCE: (1) Joint Monitoring Programme for Water Supply and Sanitation, Progress on Drinking Water and Sanitation: Update 2014, Geneva and New York: World Health Organization and UNICEF, 2014, p. iv. Available at: www.wssinfo.org. (2) UNICEF and World Health Organization, Diarrhoea: Why Children Are Still Dying and What Can Be Done, 2009, p. 1. Available at: www.who.int/maternal_child_adolescent/documents/9789241598415/en

8 UN Water, "Factsheet: Sanitation," 2013. Open PDF from: www.unwater.org/fileadmin/user_upload/watercooperation2013/doc/Factsheets/sanitation.pdf. **9** UN Water, "Water Quality," web page and factsheet, www.un.org/waterforlifedecade/quality.shtml. **10** Centers for Disease Control Additional Resources, https://www.cdc.gov/healthywater/global/wash_statistics.html

MODULE 3

"An estimated 801,000 children younger than 5 years of age perish from diarrhea each year, mostly in developing countries. This amounts to 11% of the 7.6 million deaths of children under the age of five and means that about 2,200 children are dying every day as a result of diarrheal diseases."

– CENTERS FOR DISEASE CONTROL ADDITIONAL RESOURCES[10]



THEMATIC CONCEPTS

Safe water – Safe water is water that will not harm you if you come in contact with it. To be safe, the water must have low concentrations of contaminants to avoid sickening the people who use it. The list of harmful contaminants includes bacteria, viruses, protozoans, pesticides, organic solvents, petroleum products, and other toxic substances. [11]

Dehydration – Dehydration is the condition that results from excessive loss of body water. In severe acute malnutrition, dehydration is caused by untreated diarrheal disease that leads to the loss of water and electrolytes. Diarrheal disease is caused by poor cleanliness and contact with contaminated food or water. It is widespread in developing countries, where more than 700 million people do not have access to clean water and 2.5 billion people do not have access to basic sanitation.[12]

WASH – Water, sanitation, and hygiene are frequently mentioned together and referred to as "WASH." Because poor water, sanitation, and hygiene have serious consequences for children's lives around the world, many worldwide organizations have WASH programs. Without proper WASH, sustainable development will not become a reality.[13]

11 U.S. Geological Survey, "How Do You Define Safe Water?" www.usgs.gov/faq/categories/9814/2864. **12** UN Water, "Facts and Figures," www.unwater.org/water-cooperation-2013/water-cooperation/facts-and-figures/en. **13** See, for example: UN Water, Investing in Water and Sanitation: Increasing Access, Reducing Inequalities – Global Analysis and Assessment of Sanitation and Drinking-Water, Geneva: World Health Organization, 2014. Available at: www.who.int/water_sanitation_health/publications/glaas_report_2014/en.

ACTIVITIES FOR WATER BASICS

ACTIVITY 3.1: MAKING WATER SAFE TO DRINK

Depending on what we plan to use it for—drinking, cooking, personal hygiene, cleaning, or laundry—there are different types of treatments to make water safe. Home and school-based water purification makes good sense and "good cents" because they are simple, low-cost methods which help protect us from drinking or washing with unsafe water that can cause disease. For drinking water, treatments include disinfecting the water with heat (boiling), chemicals (chlorine), or sunlight. Another common treatment is to pass the water through a ceramic (clay) or sand filter.

Boiling is one of the most effective methods to make water safer to drink by killing disease-causing organisms, including viruses, bacteria, and parasites. If the water is cloudy or contains debris, it must be filtered first. Then the clear water must be brought to a rolling boil for three minutes and then cooled.

DID YOU KNOW? Water that has been boiled to purify it should be handled carefully, stored in a covered container, and used within 24 hours to prevent recontamination.

Sunlight can be used to disinfect small quantities of water, by filling clean bottles with pre-filtered, clear water and setting them out in the sun (usually on rooftops) for six hours.

SOURCE: UNICEF, Water, Sanitation and Hygiene for Schoolchildren in Emergencies: A Guidebook for Teachers, New York: United Nations Children's Fund, November 2011, p. 21. Open PDF from: www.unicef.org/wash/files/WASH_in__Schools_in_Emergencies_Guidebook_for_teachers_.pdf.

After an emergency, such as a flood, hurricane, or earthquake, drinking water may not be available or safe. As a result, residents often have to find a source of safe drinking water or know how to treat their water for drinking, cooking, washing hands, and brushing teeth. Even without disasters, many types of foreign materials and contamination make their way into our waterways. In developing countries, inadequate infrastructure for water treatment poses great danger to people's health and to the ecosystem.

In this activity, the participants will add a variety of pollutants to the water and experience the ease or difficulty in removing them by using different kinds of filters. While the experiment is not intended to teach children how to filter water, it is designed to encourage curiosity and stimulate experimentation, developing students'

problem-solving abilities related to methods for making water safe.

Time: 50 minutes / **Thematic Areas:** Health, Science / **Goal for Learning:** Introduce the concept of filtering water at school or at home, and encourage students to learn more about making water safe.

Materials: ☐ 2 large, wide-mouthed clear glass or plastic jars / ☐ Water (cool or room temperature) / ☐ Miscellaneous small items, such as gravel, seeds, leaves, paper clips, shredded paper, flower petals, seasoning, such as pepper, cinnamon or other organic or nonorganic material / ☐ Small objects made of iron and a magnet, if available / ☐ Liquid food coloring / ☐ Strainer (large enough to cover the top of the jars) / ☐ Basket-style coffee filter, light cloth or robust paper towel

Optional Extension: ☐ One-liter clean/recycled soda bottle(s) filled with dirty water / ☐ WADI device (a solar water disinfection device)

"I was selected to participate in Escola d'Agua (Swarovski Waterschool) because I like to show my friends and family how to use the clay water filters."

–ODIRLE IA, AGE 12,
E SCOLA SÃO BENIDITO,
AMAZON RIVER.

SELF MADE CLAY WATER FILTER,
SWS BRAZIL

ACTIVITY STEPS:

1. Fill one jar more than halfway with water.
2. Add the miscellaneous small items, iron objects, and food coloring.
3. Let the mixture sit for a while, allowing the pollutants to settle. Ask students to notice the turbidity (cloudiness or haziness) of the water in the jar and to guess ways to make the water clean again
4. If using iron objects, wave the magnet around under the water and attempt to pull these objects out of the jar.
5. Hold the strainer over the second jar and pour the contents from the first jar through the strainer. Notice and discuss what was filtered out and what is left in the water.
6. Attach the coffee filter or paper towel to the top of the empty jar and pour the water through, filtering it one more time.
7. Use other types of household materials, such as a cotton t-shirt or a kitchen colander to filter water. Also try the filtering process with sand or charcoal, as available.

Optional Extension:

8. Put one or more recycled plastic soda bottles filled with contaminated water into the sun. Place the WADI device next to the bottle(s). When the smiley face appears, the water is safe for drinking.

LOCALLY ADAPTED WATER FILTER ACTIVITY, SWS CHINA

OBSERVATION AND DISCUSSION:

Talk about how easy or difficult it is to remove materials and contamination from the water. After it is filtered, does the water return to normal? Is it clear and colorless, or do some stubborn contaminants stay behind? Talk about what kinds of contaminants these might represent (chemicals, bacteria, etc.) How could you filter these types of contaminants?

Learn more and talk about the ways water is actually prepared for human use in your area. How is sewage treatment handled? If there is a water treatment plant nearby, consider making arrangements to visit. To find local water utilities, refer to the national environmental protection agency, ministry of environment, or rural development agency. Here are two examples: Uganda Ministry of Water and Environment, Rural Water Department, www.mwe.go.ug/index.php?option=com_content&view=category&layout=blog&id=19&Itemid=182, and U.S. Environmental Protection Agency, Local Drinking Water Information, http://water.epa.gov/drink/local.

Compare and contrast the means of sanitation in other areas of the world.

Learn more about water, sanitation, and hygiene (WASH) at the UNICEF websites: "Water, Sanitation and Hygiene" (www.unicef.org/wash) and "WASH in Schools" (www.unicef.org/wash/schools). To find out more about water and health, see: World Health Organization, "Health Topics: Water," www.who.int/topics/water/en, which is available in Arabic, Chinese, English, French, Russian, and Spanish.

ADDITIONAL RESOURCES:

CELF, "Meet the Pathogens," Chappaqua, New York: Children's Environmental Literacy Foundation, 2014. Available at: http://www.celfeducation.org/Websites/celf/images/Meet%20the%20Pathogens%20.pdf

Prüss-Üstün, Annette, et al., Safe Water, Better Health, Geneva: World Health Organization, 2008.

Open PDF from: http://apps.who.int/iris/bitstream/10665/43840/1/9789241596435_eng.pdf

USAID Hygiene Improvement Project and Academy for Educational Development. "A Compendium of Resources: Integrating Water, Sanitation and Hygiene into Primary Schools and Teacher Training," Washington, DC: United States Agency for International Development, June 2009.

Open PDF from: http://pdf.usaid.gov/pdf_docs/Pnadw496.pdf

Water Project, "Lesson Plan: Dirty Water ... So What?" Concord, New Hampshire,

http://thewaterproject.org/resources/lesson-plans/dirty-water-so-what

Water Supply and Sanitation Collaborative Council, "Global WASH Campaign,"

http://wsscc.org/global-sanitation-fund/

The WADI is a solar powered UV-measurement device that serves as an indicator for the process of solar water disinfection.

https://www.helioz.org/index.php

"Water and sanitation are among the most powerful preventive medicines available to governments to reduce infectious disease. Investment in this area is to killer diseases like diarrhoea what immunization is to measles —a life-saver."

–UNDP HUMAN DEVELOPMENT REPORT 2006[14]

14 Watkins, Kevin, UNDP Human Development Report 2006: Beyond Scarcity; Power, Poverty and the Global Water Crisis, New York: United Nations Development Programme, 2006, p. 6. Available at: www.undp.org/content/undp/en/home/librarypage/hdr/human-development-report-2006.html.

MODULE 3

ACTIVITY 3.2: GERM DETECTION AND HAND WASHING

Most of the germs that cause diarrhea, cholera, and other waterborne diseases come from exposure to human and animal feces. Many illnesses can be prevented by good hygiene and access to sanitation. Much of the health benefit of water supply and sanitation is realized through changes in our behavior. Hygiene education and promotion of good hand-washing practices, especially in primary schools, can save lives.

Do your students wash their hands after visiting latrines and before eating? Do they use soap? Each year, nearly 22 million school days are lost to the common cold alone. When children practice healthy habits, they miss fewer days of school. Thoroughly washing hands is the single most important thing students can do to keep from getting sick or infecting others. The typical person's hands contain millions of microbes. Most are naturally occurring and are harmless, but some may be disease-causing germs. Vigorous hand washing—for at least 20 seconds and using soap—is the best way to lift off the microbes and rinse them away.

Source: http://www.cdc.gov/features/handwashing

15 Centers for Disease Control and Prevention, "Stopping the Spread of Germs at Home, Work & School," Atlanta: United States Government, September 4, 2014, www.cdc.gov/flu/protect/stopgerms.htm.

The experiment in this activity vividly shows students the importance of hand washing. It can be conducted with an ultraviolet (UV) light, also called a "black" light, and powder or gel that simulates the presence of germs on students' hands. Examples include products that are commercially available from Glo Germ (www.glogerm.com) or Germ Juice (www.germjuice.com).

Time: 50 minutes / **Thematic Areas:** Science, Health, Life Skills / **Goal for Learning:** Students learn that "clean" hands may not be so clean after all and discover the critical importance of washing their hands to prevent the spread of disease.

Materials: ☐ Pens/crayons and paper / ☐ Gel that simulates the presence of germs on students' hands / ☐ UV light / ☐ Place for washing hands with soap (sink, basin, or other) / ☐ Towels

ACTIVITY STEPS:

1 Ask students, "How do you think germs are spread? If one person has a cold, how can you catch it?"

2 Students will give many answers, such as "If you sit next to them"; "If you drink out of their cup"; and "If they sneeze on you." Write these answers down

3 Next, ask students to develop a chart that will help them score how clean their hands are. Divide a large piece of paper into five sections. Trace the outline of a hand in each section. Now have students use pens or crayons to shade their idea of completely dirty, very dirty, dirty, and slightly dirty hand. Label the completely dirty hand as ++++, the very dirty hand as +++, and so on. Use a minus sign (−) to represent the "completely clean" hand.

4 Spread some of the germ-simulating gel, paint, or powder evenly on both of a student's hands, including the backs of the hands and the skin next to and under the fingernails. Allow the material to dry completely on the student's hands (this should take a minute or two). Then place the student's hands under the UV light.

MODULE 3

5 Under the light, the "germs" will show up. Have other students use the chart to determine the cleanliness of the student's hands that are covered in germs

6 Have the student wash her or his hands for 5 seconds. Stop and check the cleanliness of the hands under the light. Record this as "5 seconds."

7 Have the student wash her or his hands for an additional 5 seconds. Stop and check under the light. Record this as "10 seconds."

8 Repeat the procedure two more times, for 15 and 20 seconds. Each time, have students record the level of cleanliness. 9. Change roles and repeat the activity until everyone has had a turn being the hand washer.

Optional Extension:

9 If gels and UV lights are not available, you can substitute either a nontoxic, water-soluble children's paint or a mixture of vegetable oil, baking flour, and food coloring. In this case, one student will smear the paint or mixture on her or his hands, then shake hands with the group, and all can check their hands to see how the "dirt" travels from one person to another.

GIRLS WASHING HANDS

OBSERVATION AND DISCUSSION:

Discuss with students what they have learned from the hand-washing experiment; that it is not easy to remove germs. It is necessary to use both soap and water, to wash hands for at least 20 seconds, and to rub vigorously.

Discuss with students how germs can be picked up or spread through inadequate hand washing. Cold viruses can be spread by touching people or objects. Many waterborne diseases such as diarrhea are spread through contact with contaminated water. Young children can put a toy in their mouth and then give it to another child, who picks up germs from the toy. Ask children to think about other examples. Hand washing protects you from illness, and also protects other people you may encounter.

Explain to students that because germs are living organisms, they require certain conditions to live. The "environment" is the surroundings and conditions external to the host that cause or allow the disease to be transmitted. Some diseases live best in dirty water. Others survive in human blood. Still others, such as E. coli, thrive in warm temperatures but are killed by high heat (such as boiling water).

ADDITIONAL RESOURCES:

Crawford, Elizabeth O., "Water and Sanitation for All: Bringing the Issue Home – An Early Childhood Unit (Pre-K to 2)," New York: TeachUNICEF, 2010. Open PDF from: http://teachunicef.org/sites/default/files/units/Water-and-Sanitation_PreKto2.pdf

Global Public-Private Partnership for Handwashing with Soap, "Global Handwashing Day," 2015, http://globalhandwashing.org/global-handwashing-day

Khamal, S., et al., Joyful Learning on Hygiene, Sanitation, Water, Health and the Environment: A Source Book for Lesson Plans, Delft, The Netherlands: IRC International Water and Sanitation Centre, 2004. Available at: www.wsp.org/Hygiene-Sanitation-Water-Toolkit/Resources/ReadingsLifeSkills.html

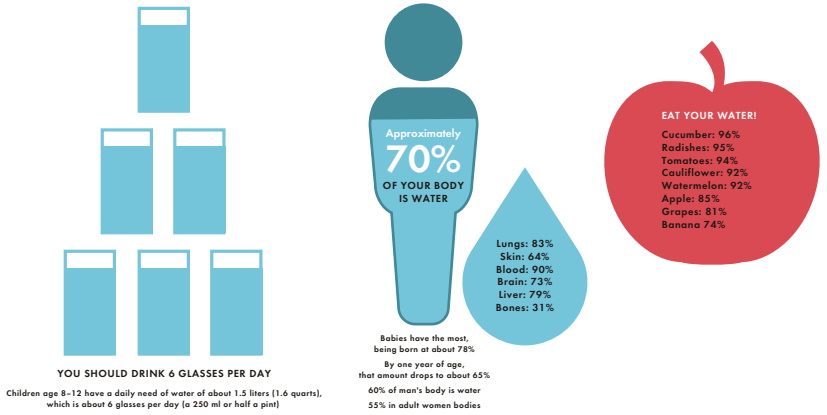
ACTIVITY 3.3: WATER IN OUR BODIES AND DEHYDRATION (Adapted from the Swarovski Waterschool programs in Austria, Brazil, and Uganda)

Without water, we would not exist and life on the Earth would not be possible. The water content of a child's body is about 60%. If she or he weighs 25 kilograms (55 pounds), the water content is about 15 kilograms, or 15 bottles of water. Children ages 8–12 have a daily need of water of about 1.5 liters (1.6 quarts)—so they need to drink about 1 liter (1 quart) of water a day, gaining the rest of the water content they need from the food they eat. An apple, for example, has a water content of 85%.

All people lose water through respiration, perspiration, and excretions. Usually, this is a healthy process that removes waste from our bodies. Small decreases in water do not cause problems and, in most cases, they go completely unnoticed. But not drinking enough to keep up with the loss of fluid can sometimes make a person feel quite sick.

DRINKING ENOUGH WATER IS IMPORTANT

When someone gets dehydrated, it means the amount of water in her or his body has dropped below the level needed for normal bodily functions. One common cause of dehydration in children is gastrointestinal illness. This type of sickness causes our bodies to lose fluid through vomiting and diarrhea, which in many places is caused by contaminated water. You can also get dehydrated from playing sports or other extensive physical activities. If you do not replace fluids lost through heavy sweating, you can become dehydrated, especially on a hot day. Be sure to drink plenty of water to keep active!



Source: http://water.usgs.gov/edu/propertyyou.html

For a simple way to demonstrate dehydration over time, gather two flowers, the same kind and size. Place one in a glass of water on a sunny windowsill or ledge and set the other on the surface of the ledge. You and the students can observe and comment on what happens to the flowers as the days go by. After a few days, show and compare the fresh and withering flowers: one flower was able to "drink" the water through the capillaries in its stem, while the other was experiencing water stress and therefore withered.

Time: 50 minutes / **Thematic Areas:** Health, Science / **Goal for Learning:** Encourage awareness that humans and all living creatures are alive through water: drinking enough water is essential for healthy living, and fruits and vegetables are also important sources of water.

Materials: ☐ 15 bottles of water (liters or quarts); ask students to bring in clean, recycled bottles and fill them with fresh water / ☐ Water drop fact sheet for each participant (a sample is provided in Annex B on page 156) / ☐ Pencils/pens and paper to write on / ☐ Scissors/ ☐ Cellophane tape

Optional Extension: ☐ Solar food drier / ☐ Scale / ☐ Fruit (an apple is good, if available) / ☐ Mushroom, potato, or other vegetables

ACTIVITY STEPS:

1. To demonstrate the water content of a human body one student stands up and is surrounded by 15 bottles of water (the other students could help place the bottles around their classmate). Explain that these bottles equal the content of water inside the student's body.

2. After clearing away the bottles, ask students to make a list of how they think water functions in their bodies. Then pass out a copy of the water drop fact sheet to each student. (You might want to make two versions: one with empty water drops that the students can fill in with their ideas and one with the text included.) Discuss the different ways water helps you stay healthy, comparing the students' ideas to the fact sheet.

3. Ask students to cut out the water drops from their fact-sheet page(s). Then have them tape the water drops to their body in a place that is appropriate for the function described. For example, the drop that reads "water is important to my body because it helps me cool down when I am hot" can be placed anywhere on the skin to indicate sweat. The water drop about removing wastes can be placed on the kidneys (lower back), and so forth. (As an alternative to taping the drops on themselves, students could make a large drawing of a person on plain wrapping paper, then tape the drops on the drawing.)

4. Once students have placed all the water drops, discuss each function and have students check how water works inside their bodies. This could include talking about perspiration, saliva, or excrement (urine and feces removing waste from the body). Questions could include: When do we sweat, and where does that water come from? Do you notice that your mouth feels dry when you are really thirsty after running? What are the ways that we can keep our bodies hydrated?

Optional Extension:

5. Obtain a food drier or build a solar food drier. Have students weigh a few food items such as an apple, a mushroom, and a potato, and write down the weight of each item.

6 Let students add these food items to the drier, then predict what the foods will look like when they are dry.

7 After drying is complete, weigh the dehydrated food and then compare that weight to the "before" weight. The difference equals the amount of water that has evaporated from the food into the air. How much water did the food contain?

OBSERVATION AND DISCUSSION:

Discuss the similarities and differences between the way water leaves our bodies—and how that can cause dehydration and the way water leaves the fruits and vegetables.

Talk about what happens to our bodies when we lose water through perspiration, and how the water can be replenished, for example, by drinking water and eating fruits and vegetables.

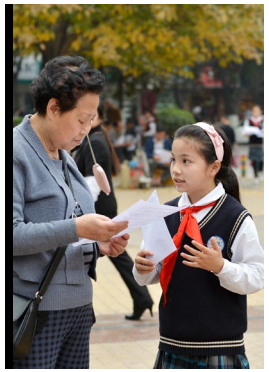
ADDITIONAL RESOURCES:

Science Buddies, "Staining Science: Capillary Action of Dyed Water in Plants," Scientific American, August 16, 2012, www.scientificamerican.com/article/bring-science-home-capillary-action-plant

UNICEF and Alliance of Youth CEOs, "Sample Activity: How to Make a Solar Cooker," Climate Change: Take Action Now!, pp. 70–72. Open PDF from: www.climatecentre.org/downloads/files/Youth%20docs/AYCEOs_climate-change_take-action-now_EN.pdf

USGS Water Science School, "The Water in You," U.S. Geological Survey, March 19, 2014, http://water.usgs.gov/edu/propertyyou.html

MODULE 3



SWS CHINA, CHILDREN AS WATER AMBASSADORS

"Not only has my son brought back water saving methods into our home, but he has also shared this with his uncles and aunts. Now they also use laundry water to flush toilets!"

—PARENT, SWAROVSKI WATERSCHOOL CHINA

BACKGROUND INFORMATION

Day to day activities and survival of every family, regardless of size, composition, nationality, or social and economic status, depends on water. All families everywhere need water for preparing food, bathing, cleaning our homes and clothes, and for activities such as growing vegetables or fishing. Recreation is an important part of children's development, and clean waterways provide a place for many people to have fun swimming, hiking, or traveling by boat.

Although the need for water is universal, the amount of water that we use—how we receive, store, and dispose of it—is not equal between countries or in different areas of the same country.

Many people overuse and waste a lot of water without thinking, while others do not have enough to stay clean and healthy. Some people are able to turn on the tap, and water flows to meet their needs. For others, having water at home can mean walking long distances to fetch just enough water to meet the family's needs for a day or two. When considering the safety of water for drinking, if supplies must be transported by hand, it is important to remember that containers for carrying and storing water must be kept clean and covered.

For many children in low-income countries, especially girls, carrying water takes time away from going to school, depriving them of the education that can increase their opportunities for earning wages as adults. Having a water source inside or near the home helps keep water free of contamination during transportation, and reduces the time required to collect water, thereby improving safety and opportunities for education, productive activities, and recreation.

DID YOU KNOW? We use 70% of our worldwide water sources for agriculture and irrigation, and only 10% for household purposes.[1]

Pressure on water resources is partly due to increasing demand for feeding livestock: producing meat requires 8–10 times more water than producing grain does.[2]

SOURCE: **(1)** AQUASTAT, "Water Use," Rome: Food and Agriculture Organization of the United Nations, 2015, http://www.fao.org/nr/water/aquastat/water_use/index.stm. **(2)** UN Water, "Statistics Detail," 2014, www.unwater.org/statistics/statistics-detail/en/c/211815.

All over the world, people both rich and poor are drinking water that is mostly of unknown quality from plastic bottles that create waste. In the United States, the Natural Resources Defense Council conducted a four-year review of the bottled water industry and the safety standards that govern it. The study included a comparison of national bottled water rules and national tap water rules, as well as independent tests of more than 1,000 bottles of water. The conclusion was that there is no assurance that just because water comes out of a bottle it is any cleaner or safer than water from the tap. In fact, an estimated 25% or more of bottled water is really just tap water in a bottle, sometimes treated, sometimes not.[16]

THEMATIC CONCEPTS

Water footprint – The water footprint of a product is the volume of freshwater it takes to produce the product, including the water consumed and polluted during the various steps along the supply chain. This indicator can be used to measure both the direct and indirect water use of a consumer, a manufacturer, or an entire country.

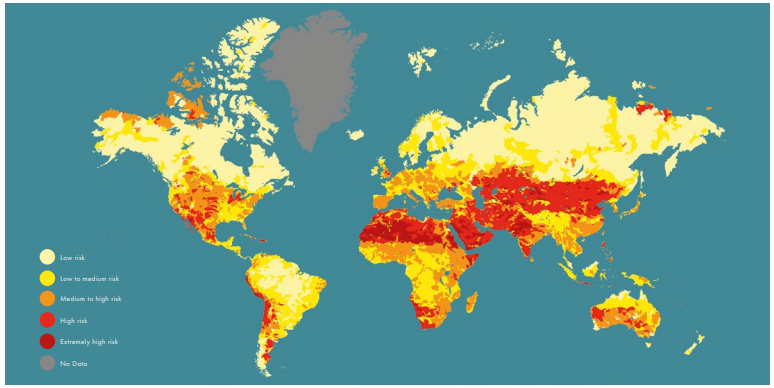
Blue and green water – "Blue" refers to water that is used for irrigation and in processing. "Green" water is from precipitation (rain or snow). In regions with high amounts of precipitation, not so much blue water is needed, which explains why the same product growing in different parts of the world may have a different water footprint in each region. In India, growing 1 kilogram (2 pounds) of cotton consumes 11,000 liters (2,905 gallons) of water; 41% of that amount is rainwater, the rest is from irrigation.

Virtual water – Large quantities of the world's water are used for agriculture and industry, and "virtual" water is the water that has been used to produce the food we eat, the things we use, and even the clothes we wear.[17]

16 NRDC, "Executive Summary: Bottled Water – Pure Drink or Pure Hype?," New York: Natural Resources Defense Council, July 15, 2013, www.nrdc.org/water/drinking/bw/exesum.asp. **17** Water Footprint Network, "What Is a Water Footprint?," Enschede, The Netherlands, www.waterfootprint.org.

ACTIVITY 4.1: IS THERE ENOUGH WATER TO GO AROUND?

When access to water is limited, interpersonal communication, compromise, and understanding are critically important. When people are faced with limited supplies of this essential resource, the question of control will invariably surface. Who is allocating the water? Who owns the rights to the water? If someone owns the land over groundwater or adjacent to water in rivers and lakes, do they own the water? This activity is designed to encourage students to vicariously experience water shortages and find ways to work among themselves to share water equally.



Source: http://www.un.org/waterforlifedecade/scarcity.shtml

Time: 30 minutes, on 2 consecutive days / **Thematic Areas:** Social Studies, Life Skills / **Goal for Learning:** Students will be able to understand the concepts of water shortages and cooperation.

Materials: ☐ 1 jug of water / ☐ Paper cups or glasses (1 per student)

ACTIVITY STEPS:

1 Ask the students not to drink any water early in the day, and if it is possible, go outside or do some physical movement before you begin the activity. Even two or three minutes of running in place or jumping will build up thirst.

MODULE 4

2 Make sure that the amount of water in the jug will not be enough to serve everyone in the room. Give each student a cup and begin to pass the jug of water around so each person can pour some into her or his cup and take a drink.

3 Pay close attention to the facial expressions and remarks made by the students who do not get a drink. Engage all of the students in a discussion about how this situation can be changed. Are some students more cooperative than others? Do the thirsty students appear to be more demanding or more engaged in the process?

4 Talk about what is happening and consider if there is always enough water where you live. (Note: In wealthy countries, some weather emergencies/ natural disasters can cause water and power outages that create temporary scarcity of water.)

5 Ask students how they cope when water is limited. Can they understand the need to restrict water use in some places so that there will be enough to go around?

6 The next day, repeat Steps 1–3 and begin by passing the water jug to the students who did not get any water the day before. Do they approach the process differently? Now that they have experienced the shortage, will they try to gauge their water use so that there will be enough to go around?

OBSERVATION AND DISCUSSION:

Ask the students who do not get any water to talk about what it felt like to be left out. Did they have the same understanding of the situation before the activity?

Ask all of the students how they feel about the person who was supplying the water to others but left them feeling thirsty.

ADDITIONAL RESOURCES:

CELF, "The Weight of Water." Chappaqua, New York: Children's Environmental Literacy Foundation, 2014. Available at: http://www.celfeducation.org/Websites/celf/images/The%20Weight%20of%20Water%20.pdf

Goodman, Donna, Every Body Counts, Every Drop Matters, New York: United Nations Department of Public Information, 2003, p. 68

New York City Department of Environmental Protection, "Environmental Education," www.nyc.gov/html/dep/html/environmental_education/index.shtml

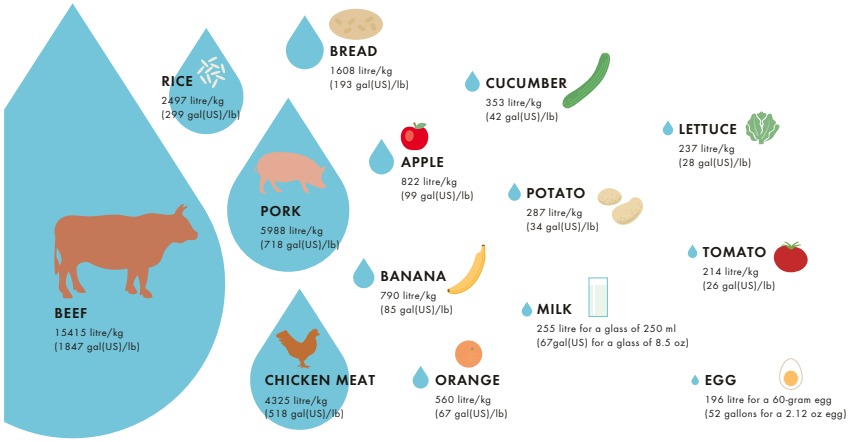
ACTIVITY 4.2: WATER IS EVERYWHERE – THE HIDDEN MYSTERY OF WATER IN OUR HOMES (Adapted from the Swarovski Waterschool China)

Water and family life are very closely linked. We need to use water for all kinds of household activities–from preparing the meals we eat each day to washing, cleaning, growing flowers, or caring for pets. Where tap water is available, we see the water coming out of a pipe. We also see water in cups and bottles, washing machines and sinks, showers and bathtubs, and toilets. But is the water we see the only water that is used by households?

Water is also essential for making almost everything we use at home, even though we may not see any water in these products. The factories that produce food need water for steaming, boiling, marinating, and fermentation. Soy sauce, vinegar, soft drinks, and juices are all mostly made up of water. If we eat chicken or drink milk, we should be mindful that water was needed to raise the livestock that provided this food. Water was also used in making the dough for the bread we eat.

Then there is the electricity that was used to manufacture goods and process food, as well as the electricity that we use at home for lighting, heat, and power. The power plants that generate electricity use huge amounts of water for cooling.

MODULE 4



Source: http://waterfootprint.org/en/resources/interactive-tools/product-gallery/

Electric power generation in the United States, for example, is responsible for more than 40% of all freshwater withdrawals in the country, or around 100 billion gallons a day.[18]

When we look closely, we see that water is an indispensable part of all our household items, including furniture, electrical appliances, cleaning products, and toiletries. So, water use is both visible and invisible!

In this activity, students will carry out a survey of household goods to learn about the "hidden" water used to make everyday items. This will enhance their awareness of the importance of water in our daily lives, particularly their awareness of the fact that water is everywhere.

18 Union of Concerned Scientists, "How It Works: Water for Electricity," http://www.ucsusa.org/clean-energy/energy-water-use/water-energy-electricity-overview **19** Siegle, Lucy, "Arjen Hoekstra's Innovation: The Water Footprint," The Guardian, October 2, 2010, www.theguardian.com/environment/2010/oct/03/innovator-arjen-hoekstra-water-footprint. **20** United Nations Environment Programme, "Water Footprinting," http://www.unep.fr/scp/publications/details.asp?id=DTI/1411/PA.

They will also learn about the water footprint—the unseen water used in consumer products and services—a concept originated by Arjen Hoekstra in 2002 to enhance awareness of how water is being misused, not only for entire countries, but also at the personal level.[19] The water footprint also applies to environmental impacts. As defined by the United Nations Environment Programme, for example, the water footprint "is based on the pure measure of water quantity used and the associated (direct and indirect) environmental impacts resulting from the use of it such as: damages on freshwater resources, ecosystems and human health."[20]

On a daily basis, knowing the water footprint of a consumable item can help us make choices that will conserve water. For example, an apple weighing 150 grams (5,3 ounces) has a water footprint of 125 liters (33 gallons), the average cup of coffee has a water footprint of 130 liters (34 gallons), and a hamburger can have a water footprint of 2,400 liters (634 gallons). A team of researchers from universities in the Netherlands, South Africa, China, and Spain has developed a calculator you can use to measure your own water footprint; see the Water Footprint Networks web page, "Personal Water Footprint," at http://waterfootprint.org/en/waterfootprint/personal-water-footprint.

Time: 50 minutes **/ Thematic Areas:** Science, Mathematics, Social Studies **/ Goal for Learning:** Students gain an understanding of the water used to produce everyday items, and learn how to apply the water footprint concept to their own lives.

Materials: ☐ Paper / ☐ Pens, pencils, rulers, etc. (that students will use to design their water footprint survey of household goods)

ACTIVITY STEPS:

1 Briefly introduce the concept of hidden water in our homes, and note that the processes used to manufacture all household goods result in wastewater. Then set out tasks for the students, who will be searching their homes for items that have hidden water and making a record of what they find.

2 This activity step can be adapted according to the students' ages and home-life situations. As needed, help the students design an investigation chart, explaining that they should independently choose the information or statistics to be recorded. First, they will list all the household goods that are relevant to them, and select the items that they are most interested in investigating. Second, they will count up other goods in the house that can be investigated.

3 At this stage, teachers should provide guidance on the water footprint concept and how it can be used. Students will then collect and record all the relevant data for the chart they have designed, including the number of items with hidden water, and learn about calculating the water footprint statistics for these items.

4 After calculating the water footprint of various items, students will carry out their investigation and complete their survey chart.

5 Organize a class conference as a platform for students to share their research process and results with their classmates, and for teachers to expand on the water footprint concept. Students can use this knowledge in daily life when considering the water footprint of the items they consume and use.

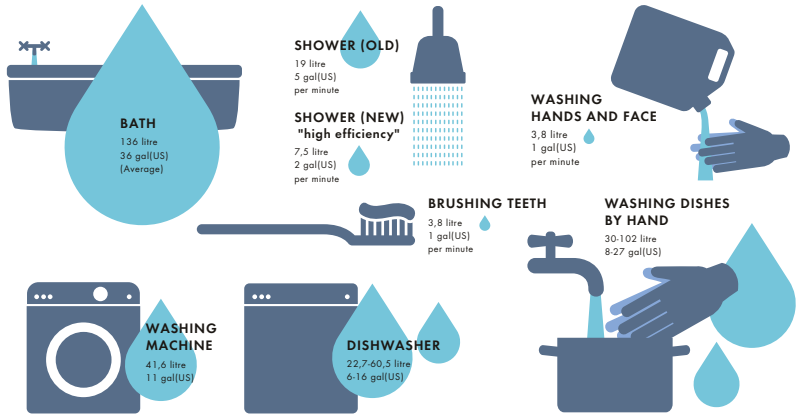
ADDITIONAL RESOURCES:

Grace Communications Foundation Water Program, "Water Footprint Calculator," www.gracelinks.org/1408/water-footprint-calculator; "Water Saving Tips: Food Choices," www.gracelinks.org/2975/water-saving-tips-the-water-in-your-food; and "The Hidden Water in Everyday Products," http://www.gracelinks.org/285/the-hidden-water-ineveryday-products

Save Our Water, "How You Can Help!" Association of California Water Agencies and California Department of Water Resources, 2015, http://saveourwater.com/what-you-can-do

ACTIVITY 4.3: HOW OUR FAMILIES USE WATER

This activity is designed to foster children's dialogue with other children and with their families and neighbors, creating better understanding of how water is used in our communities. Do we have piped water? Surface water such as a lake or river? Other sources of water? How does the community interact with water? Do people travel by boat? Are there bridges? Is there a treatment plant? These are just some of the questions that can be asked and answered.



Source: http://water.usgs.gov/edu/activity-percapita.php

Time: 30 minutes / **Thematic Areas:** Civics, Social Studies / **Goal for Learning:** Comprehension of how much water we use, where the water comes from, and where it goes.

Materials: ☐ Pencils / ☐ Paper

ACTIVITY STEPS:

1 Ask students to make a list of all the activities their family uses water for, then estimate how much water is used in each activity. Note that water can be saved during daily activities such as brushing your teeth, taking a bath or shower, and watering the garden.

2 Ask them to find out where the water they use comes from and, if possible, make arrangements to visit the source. (Note: If the source is an underground well or public distribution system, continue to Activity 4.4 to learn about pumping.)

OBSERVATION AND DISCUSSION:

Ask students to talk about what happens to the water after it is used.
For example, when you flush the toilet, where does it go? Have you ever seen water being reused?

Ask students to share some examples of how water can be reused.
Mention the various times when they can save water, and ask if they have other ideas.

ACTIVITY 4.4: PUMPING WATER UP

After an underground source of water is found, the next step is bringing the water to the surface for access. Delivering water from an underground source such as an aquifer requires a pump. Pumps of all kinds use air pressure to create suction that draws the water up out of the ground.

Suction is created when an opposing force is removed. A drinking straw can be used for a simple demonstration of this principle. When you place a straw in a glass of water, the air pressure pushing down on the water inside the straw is the same as the air pressure pushing down on the water outside the straw. All is in balance. This is the same principle that is used when a pipe is installed to reach an underground aquifer. In a water-delivery system, the pump removes the opposing force inside the pipe by creating a vacuum. The air pressure outside the pipe does all the work.

Time: 30 minutes / **Thematic Areas:** Science, Mathematics / **Goal for Learning:** Discover the science behind water pumping.

Materials: ☐ Drinking straw / ☐ Clear glass of water / ☐ Eye-dropper or turkey baster

ACTIVITY STEPS:

1. Place a straw in a glass of water. Note that the level of water in the glass and in the straw is the same. Explain to students that this is because the air pressure in the straw and in the glass is equal.

2. Hold a finger securely on top of the straw and lift the straw out of the glass: the same amount of water will remain in the straw. When you release your finger (and so, the air pressure), the water will fall out.

3. Place the empty straw back in the glass and use your breath to remove the air pressure from inside the straw, creating suction that causes the water to be drawn up into your mouth. As long as you continue to suck the air pressure out of the straw, the water will continue to rise and flow; the moment that you stop, the flow also ends.

4. Explain that water pumps use different mechanisms to create the same effect, drawing water out of an aquifer and into a tap.

5. To extend the activity, conduct this simple demonstration of pumping water with the use of an eyedropper or turkey baster: when you place the eyedropper or baster into the water, nothing happens until you squeeze the bulb (exhaling the air from the tube and creating a vacuum). As you release the bulb, the water is drawn up into the tube. The tube of the eyedropper or baster is now full of water. If a hole and another tube were added to distribute the water, it would function as a water tap.

OBSERVATION AND DISCUSSION:

Ask students to brainstorm examples of places where water is pumped in their own lives. For example, how does the water get into their homes? Consider visiting a local water source or utility and talk about how the water travels.

MODULE 4

WATER PUMP, SWS INDIA

"Water is fundamental to life and is the common denominator of all sustainable development challenges. We need water to produce food and we need water to produce energy. Improving access to freshwater is about enabling millions of girls to go to school instead of walking kilometres to fetch water."

—IRINA BOKOVA, DIRECTOR-GENERAL, UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION (UNESCO)[20]

21 UNESCO, "Message from Ms Irina Bokova, Director-General of UNESCO, on the occasion of World Water Day," March 22, 2014. Available at: www.unesco.org/new/en/unesco/events/prizes-and-celebrations/celebrations/international-days/world-water-day-2014.

BACKGROUND INFORMATION

Most children in the world spend a considerable amount of time at school, not only learning, but also playing and using facilities such as toilets, kitchens, and gardens. This provides a great opportunity for teaching about water at school. Sanitation and hygiene, for instance, are two important topics to discuss with children and also for everyone to practice on a daily basis when performing any activities that involve water, such as using the lavatory and washing hands before lunch.

Another important topic to explore is the local environment surrounding the school. Is it dry or wet? Does it rain a lot, or are their droughts? Does it become flooded very often? Is it close to a river, a lake, or the sea? Or is it far from natural waterways? These are just some of the water-and-school topics you can talk about.

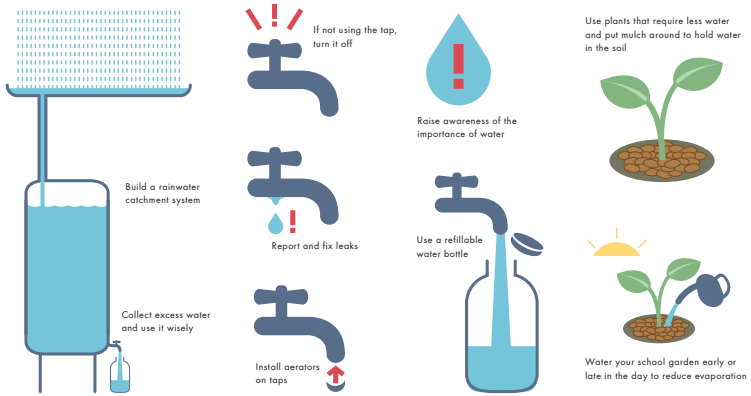
After pinpointing characteristics of the local ecosystem, teachers and students can discuss how we use water for hand washing, toilet flushing, drinking, activity cleanup, preparing food, and many other purposes. All of these ideas can prompt students to consider the next question: How can we improve the way we use water at school?

Module 5 aims to empower students and teachers to identify water-related issues at school, then make a plan and take action. Does your school have safe water to drink? Does the school's sanitation system pollute the local river? Do you know anyone who has had a disease caused by unsafe water? Through these questions and related activities, we are assessing our water use at school and preparing for the challenges we might face today or in the future.

DID YOU KNOW? Almost half of all schools in low-income countries do not have access to water and sanitation facilities. When there are no clean, safe toilets and washing facilities, girls are especially vulnerable to dropping out of school.[1]

Worldwide, children have been losing 443 million school days a year due to water-related diseases[2] that could often be prevented through better sanitation and hand-washing facilities.

SOURCE: **(1)** UNICEF, "Raising Even More Clean Hands: Advancing Health, Learning and Equity through WASH in Schools," New York: United Nations Children's Fund, 2012, pp. 2, 17. Available at: www.unicef.org/wash/schools. **(2)** Watkins, Kevin, UNDP Human Development Report 2006: Beyond Scarcity; Power, Poverty and the Global Water Crisis, New York: United Nations Development Programme, 2006, p. 6. Available at: www.undp.org/content/undp/en/home/librarypage/hdr/human-development-report-2006.html



Source: http://www.melbournewater.com.au/getinvolved/saveandreusewater/pages/save-water-at-school.aspx

Sometimes, the issues we face are beyond our capabilities to solve and require we get assistance from local government or specialists in water resources and health. Rather than being a setback, dealing with these other kinds of organizations can be a great opportunity to learn about different professions and the way things work at school and in the community. Students and teachers can then apply the knowledge they have gained in their communities and at home to improve everyone's quality of life.

Now it is time to take action. Because issues related to water are not simple, and involve multiple subjects, it will be important to consider all the possibilities for learning, teaching, and taking action. An excellent first step is to organize a committee of teachers who will address the issues from different perspectives. Collaboration among teachers, staff, students, school directors, parents' groups, and local education authorities will enable the school community to take action together to benefit everyone.

SWS INDIA

THEMATIC CONCEPTS

Water and sanitation – Access to sanitation, the practice of good hygiene, and a safe water supply could save 1.5 million children a year.[22]

Rainwater harvesting – Schools and communities that are facing water shortages could dramatically boost supplies by collecting and storing rain falling freely from the clouds.[23]

Gray water and black water – Wastewater is composed of domestic gray water (water from baths, sinks, washing machines, and kitchen appliances) and black water (water from toilets), as well industrial wastewater that may have additional chemical contaminants. The wastewater pollutes natural water systems, resulting in a range of negative impacts that can be avoided by treatments.[24]

"I'd like to ask all the kids in the world to help clean up the garbage and plastic bottles at their schools and to tell people not to put rubbish in the water, especially plastic."

– MARIA JULIANA, AGE 11, ESCOLA DOM FLORIANO, RIO TAPAJÓS, BRAZIL

22 UN Water, "Sanitation," 2013. Open PDF from: www.unwater.org/downloads/sanitation.pdf. **23** See, for example: UNEP, "Harvesting Rainfall a Key Climate Adaptation Opportunity for Africa," Nairobi: United Nations Environment Programme, November 13, 2006, http://www.unwater.org/downloads/Rainwater_Harvesting_090310b.pdf. **24** Environmental Performance Index, "Water Resources," Yale University, 2015, http://epi.yale.edu/our-methods/water-resources.

ACTIVITY 5.1: CHILD-LED SCHOOL WATER, SANITATION, AND ENVIRONMENT MAPPING

Before beginning this activity, review the basic terms with your students: a "hazard" is a human-made or natural danger that causes damage to people, property, and the environment; a "risk" is the potential for something to go wrong or for something harmful to occur. A "risk assessment" is a survey that investigates, monitors, and anticipates factors that could combine to harm children and adults in a community. Managing or reducing risk means acting to limit the possibilities for something to go wrong and being prepared to deal with the effects of a disaster if one occurs, so that individuals and communities can prevent or reduce damage or even loss of life.

During a school mapping project, the children in your group can interact with their peers and the wider community while collecting and recording data. This technique builds knowledge, provides a participatory method for monitoring and evaluation, and strengthens risk-reduction capacities. The mapping exercise will also enhance children's understanding of the links between the natural environment, health, and personal empowerment. The exercise is designed to be fun and participatory, and teachers are encouraged to adapt it in new ways. Children can plot vital features of their community—schools, health centers, toilets, water points, environmental hazard zones, and so forth—by placing icons on a grid. Characteristics that describe each feature in more detail can also be assigned to these icons.

Encourage your students to be detectives! The school environment can provide some unlikely but very effective opportunities for addressing environmental issues. Help students map the physical location of their schools and the child-friendly services within them, such as safe water points and separate latrines for girls, boys, and staff; school and classroom infrastructure, including the presence of informal learning centers; school gardens, canteens, or food services; and environmental hazards such as stagnant water and solid waste.

Time: 90 minutes / **Thematic Areas:** Science, Geography, Social Studies / **Goal for Learning:** Work with children to map their school grounds for hazards, and identify opportunities for children to contribute to making improvements.

Materials: ☐ Marking pens/markers (different colors if available) / ☐ Poster paper

ACTIVITY STEPS:

1 Work with the students to develop and write out a checklist of things that could be mapped. The samples listed here should be adapted for your school:

Energy use – electricity (for lighting, heating, etc.)
Energy use – cooking
Water use – drinking (add other uses)
Sanitation – where facilities are located, where they are needed
Waste – where it comes from, where it ends up
Pollution – where it comes from
Environmental problems – where they are located
People – Where are we? Where are the people our age?
Programs, community groups – Where do they take place or meet?

2 Questions to consider for the investigation can be decided as a group. These questions could include:

- Does the school have latrines? How many? What kind? What is the condition of the latrines? Are there sufficient cleansing materials? If there are no latrines, where do students and teachers go to relieve themselves?
- Does the school have a place to wash hands? With soap? Water? Are there enough places to wash hands for the school's population?
- Where do students and teachers get drinking water? Is it safe, e.g., from a pipe, or treated and stored properly?
- Does the school have a clean courtyard or school grounds? Animals? Trash?
- Do teachers give any lessons on hygiene? Do the lessons cover hand washing, safe drinking water, and using latrines?

3 Draw a baseline map of the school that shows basic information, such as the locations of water points, toilets, gardens, and playgrounds. Then divide the participants into groups and allocate tasks that are required to conduct the survey of resources and risks. For example, if the school has toilets, is soap available for hand washing? Is anything broken? Do doors lock from the inside for safety and privacy? Are existing pit latrines cleaned out regularly?

MODULE 5

If the map indicates a playground, is there garbage on the ground? If so, where does it come from and what can be done to clean it up and prevent future rubbish from accumulating? Are there puddles or other areas of standing water on the playground that could be slippery for children or breeding grounds for mosquitoes?

What is the condition of the school garden? Is there a compost bin? Are paths kept clear of debris? What is growing in the garden? Is there a nearby source for watering?

OBSERVATION AND DISCUSSION:

Draw the students' findings on a map of the school, then cross-check the accuracy of the information on the map with experts in the community. After the map is finished, display it in a public place in the community.

Discuss and analyze the information obtained, especially information about risks and resources. Use the map as a guideline for developing a Swarovski Waterschool action plan.

WATER MAPPING, SWS THAILAND

ACTIVITY 5.2: MAKING A RAINWATER CATCHMENT SYSTEM

We use water in many different ways. In some places, people are fortunate to have easy access to water that is safe, clean, and readily available in homes and schools at the turn of a tap. But millions of people around the world still do not have easy access to safe water nearby. Many children, and women, must make long, difficult journeys to collect water from unsafe sources. In some cases, students are kept from school in order to collect drinking water for their families.

Rain is the greatest source of freshwater. It can be stored and reused, offsetting the need for processed or treated water. Many of the activities for which we use water—such as watering our gardens, cleaning our houses, and flushing toilets—can be done safely with harvested rainwater. It is important to note, however, that this water cannot be used as a source of safe drinking water unless it is filtered and treated.

Rainwater harvesting allows individuals and communities to manage their own water supplies. The term "rainwater harvesting" refers to the collection and storage of rainwater that runs off surfaces as it falls from the sky. Rainwater harvesting directs water from rooftops or other built surfaces into barrels or tanks. The water stored in these vessels can be used to carry out many everyday tasks.

In this activity, children will create a simple rainwater catchment system and learn its key components. This project is most likely to be appropriate for older students, ages 12–18.

Time: 90 minutes / **Thematic Areas:** Science, Environmental Education / **Goal for Learning:** Gain access to water for schools, homes, or the wider community by catching rainwater and storing it.

Materials: ☐ Small, clean plastic bottles (1 for each student to use as a "rain barrel") / ☐ Scissors / ☐ Mosquito netting or other finely meshed fabric; each student's rain barrel will need a piece of netting approximately 30 × 30 centimeters (12 × 12 inches) / ☐ Cellophane tape or glue stick / ☐ 1 piece of aluminum foil for each barrel, 30 × 30 centimeters (12 × 12 inches) / ☐ 1 straw for each barrel / ☐ 1 cup of water for each student

MODULE 5

ACTIVITY STEPS:

1. Cut the water bottle evenly across, around one-third of the way from the top. Students will use the bottom part of the bottle for a rain barrel and the top part can be used to make the funnel. Make sure the bottom part is securely placed on a surface and able to stand on its own.

2. Cover the top of the bottle with the mosquito net or fabric, and secure the covering with tape or glue. Emphasize that all rainwater catchment devices must be covered at all times to keep the water from being contaminated by debris, animals, insects, etc.

3. Ask students to use the aluminum foil, the straw, tape/glue, and scissors to create a device that will funnel water into the container, but not through the netting on top of the container. Encourage students to innovate and engineer the best way to get the water into the container. Then reset the devices firmly on a flat surface.

   HINTS – Cut a hole in the side of the container, closer to the top than the bottom; the top of the water bottle or aluminum foil can be shaped into a funnel that drains into the container through the hole. The straw could also be inserted into the container through the hole. Students may need to prop the funnel part up against a wall or a box.

4. Test the students' devices by pouring a cup of water into the channeling funnel or straw, without touching the device or the container. Note that if it is raining hard, or if water is poured too quickly, the funnel will overflow, causing flooding below. A catch basin can be very helpful in capturing and using this overflow in a constructive way. The aim is to represent a real-life water-harvesting system, in which rain is captured as it falls, without human intervention, while minimizing the damage that can be caused by excess water, i.e., flooding.

ADDITIONAL RESOURCES:

GardenGate Magazine, "How to Harvest Rainwater," www.gardengatemagazine.com/52droughttolerant

GrowNYC, "Rainwater Harvesting," 2105, www.grownyc.org/openspace/rainwater-harvesting

McClain, Michael E., "Balancing Water Resources Development and Environmental Sustainability in Africa: A Review of Recent Research Findings and Applications," AMBIO: A Journal of the Human Environment, 2013, vol. 42, pp. 549–565. Available at: http://link.springer.com/article/10.1007%2Fs13280-012-0359-1

Nelson, Ben, "Build a Rainwater Collection System," Mother Earth News, July 24, 2013, www.motherearthnews.com/diy/build-a-rainwater-collection-system-zb0z1307zsal.aspx

Stockholm Environment Institute, Rainwater Harvesting: A Lifeline for Human Well-Being, Nairobi: United Nations Environment Programme, 2009. Open PDF from: www.unwater.org/downloads/Rainwater_Harvesting_090310b.pdf

UNEP, "Potential for Rainwater Harvesting in Africa: A GIS Overview," United Nations Environment Programme, October 2005. Open PDF from: https://www.researchgate.net/publication/265842568_Mapping_the_Potential_of_Rainwater_Harvesting_Technologies_in_Africa_A_GIS_Overview_on_Development_Domains_for_the_Continent_and_Nine_selected_Countries

WATER CATCHMENT SYSTEM EXPLAINED BY A STUDENT, SWS BRAZIL

RAINWATER TANK, SWS UGANDA

"The rain water enlivens all living beings of the Earth ... both movable and immovable ... and then returns to the ocean with its value multiplied a million fold."

–CHANAKYA, 300 BC

ACTIVITY 5.3: BUILDING A "BANANA CIRCLE" TO FILTER GRAY WATER AND REDUCE POLLUTION

Wastewater includes household gray water–from baths, sinks, washing machines, and kitchen appliances–and black water that comes from toilets, as well industrial wastewater that may have additional pollutants and toxic chemicals. In many communities around the world, wastewater pours into natural water systems without any treatment, causing pollution and the associated damage to ecosystems. This can be avoided by applying techniques for treating gray water that are practical and can even be fun!

The banana circle is a permaculture method that filters gray water and provides food at the same time, transforming waste into a valuable food source. All the nutrients from the gray water are absorbed by the bananas planted in the circle and by microorganisms in a compost pile in the middle of the growing banana plants. It is also possible to use other plants, such as papaya, sweet potatoes, or cassava, but bananas have the advantage of being "heavy feeders" that use (and filter) a lot of water.

BANANA CIRCLE, SWS BRAZIL

Soap and some detergent residues can go into the banana circle, but do not let detergents or other liquids that contain harsh chemicals into the system–they are likely to kill beneficial bacteria in the soil. Any product containing boron should be avoided completely because it is toxic to plants even in small amounts. Many "green" cleaners can be used instead of high-strength (possibly toxic) products.

MODULE 5

An environmentally friendly substitution for chlorine bleach, for example, is hydrogen peroxide, which breaks down quickly in the environment.[25] Vinegar, which is safe and bio-degradable, can be used instead of ammonia.

In September 2014, a group of Swarovski Amazon/Brazil Waterschool participants learned about the banana circle eco-technique during a workshop at the Irma Dorothy School. They were motivated to explain to others how this technique works and their experience is reflected in the activity outlined below. (Note: If banana plants are not complementary to your local environment, other fruit trees can function in a similar manner to filter gray water; please research other options that are suitable for your region) The suggested age for this activity is 13–18 years old.

Time: 90 minutes (sustainable building and upkeep will take a longer period of time) **/ Thematic Areas:** Science, Environmental Education, Horticulture **/ Goal for Learning:** Strengthen students' knowledge of the power of natural (eco-) filtration of water, which can reduce common forms of gray water pollution in waterways.

Materials: ☐ 6 banana plants (or other fruit trees, as appropriate to your location) / ☐ Organic matter / ☐ Shovel / ☐ Hole digging tool

ACTIVITY STEPS:

1. Select an area to build the banana circle, for example, near a drainage pipe located between the school kitchen, baths, or sinks and a nearby waterway.

2. In the soil of the area you have chosen, mark a circle that is 2 meters (6.5 feet) wide.

3. In the center of the circle, dig a hole that is 50 centimeters to 1 meter (2–3 feet) deep. Pile the soil from the hole around the edge to create a mounded garden bed, adding organic matter to enrich the soil.

25 Marshall, Glenn, "Greywater Re-Use: Hardware, Health, Environment and the Law," Permaculture Association of Western Australia, 1997, http://permaculturewest.org.au/ipc6/ch08/marshall/index.html.

4 Make six small holes in the mounded bed around the larger hole, and plant the banana plants in the small holes around the rim of the basin.

5 Cover the large hole with organic matter (branches and leaves); this will later be used as the space for a compost pile

6 Water the banana plants and make sure that they have taken root before the banana circle starts to receive wastewater. Then make sure the wastewater drainage pipe (or gutter) flows to the circle or that wastewater is carried to it. (Note: Use the large hole in the center as a compost pile for organic matter, such as egg shells, coffee grounds, fruit peels and skins, etc.)

OBSERVATION AND DISCUSSION:

Ask students to think about (and research) the ingredients in the soap and shampoos they use for washing dishes or their bodies. Prepare a list of ingredients and discern hazardous and eco-friendly additives, and explain the findings to the group.

Discuss why harsh chemicals cannot be used in a banana circle, explaining that if chemicals are highly toxic, they will kill the plants.

ADDITIONAL RESOURCES:

Global Islands Network, "Kiribati," www.globalislands.net/greenislands/index.php?region=9&c=53

Permaculture Research Institute, "Banana Circles," April 8, 2014, http://permaculturenews.org/2014/04/08/banana-circles

PointReturn, "A Banana Circle," December 13, 2009, http://pointreturn.com/2009/12/a-banana-circle

Wickboldt, Beau, "Banana Circle Permaculture Kitchen Garden, Thailand," Rak Tamachat Permaculture Education Center, www.raktamachat.org/banana-circle-kitchen-garden

MODULE 5

"Until you dig a hole, you plant a tree, you water it and make it survive, you haven't done a thing. You are just talking."

—WANGARI MAATHAI

PLANTING A TREE, SWS INDIA

ACTIVITY 5.4: PLANTING A SCHOOL GARDEN

School gardens are interactive areas where students can learn by doing. A garden can enhance and build students' values and appreciation for the environment, while strengthening their understanding of the use of water. As students care for their plants every day, they can also learn about different subjects by observing how food is grown and the interdependence between plants, water, trees, birds, and insects, among other important resources and beings of the planet.

Fostering patience can be part of the educational process: some plants take a long time to grow, sometimes years, before they can provide food, shade, or a pleasant environment for learning and playing. Some plants grow more quickly, and vegetable and flower gardens can serve as laboratories where children can learn from an interdisciplinary approach that considers real-life experiences and stimulates participation and action.

Time: 90 minutes to introduce (NOTE: the time for planning and planting a garden seems more time consuming. Could be listed as 4–5 hours/week for setup and 1– 2 hours/week for upkeep) **/ Thematic Areas:** Science, Health, Horticulture **/ Goal for Learning:** Stimulate understanding of the importance of water to all forms of life, and develop appreciation and values related to caring for local environments and the planet.

Materials: ☐ Seeds / ☐ Organic matter / ☐ Shovel / ☐ Soil / ☐ Hole digging tool

SCHOOL GARDEN IN CHINA

ACTIVITY STEPS:

1 Decide who will be responsible for the garden. At first, it can be an experienced teacher; she or he will then gradually engage a group of students to take responsibility for building up and caring for the garden.

2 List the tools, equipment, seeds, and seedlings that will be needed. The cost need not be high, and it is always better to start a small garden with the possibility of expanding it in the future. The plantings and size of the garden will also depend on the available space.

3 Find the best place for starting the garden. It is very important to consider access to water: watering is one of the main activities for garden maintenance.

MODULE 5

4 Decide what plants to grow, always considering space and climate. Children should participate in the decision of what to grow, but also be sure to choose plants that are easy to cultivate. (Note: You might want to plant a tree to see how much longer it takes to grow versus a particular flower or vegetable.)

5 Set a schedule for who will perform what tasks. Children can maintain the garden, and tasks can be divided among different groups. School gardens should be supported by the school director, teachers, parents, and the community in order to be a great success.

SCHOOL GARDEN IN CHINA

6 Prepare the soil to receive the plants, always considering organic approaches.

7 Plant seeds and saplings, considering the appropriate distance between them. Keep a timeline of growth benchmarks, such as the first sprout, the first flower, and the first full plant, vegetable, etc.

OBSERVATION AND DISCUSSION:

Talk about why it is important to water the garden and discuss with students the best timeline for watering (daily, twice a day, every two days) as required to keep the plants green and healthy.

Brainstorm the connection between caring for the garden and other parts of our lives.

ADDITIONAL RESOURCES:

ANIA (Association for Children and Their Environment), Peru, www.aniaorg.pe

FAO, Setting Up and Running a School Garden: A Manual for Teachers, Parents and Communities, Rome: Food and Agriculture Organization of the United Nations, 2005. Available in web and PDF format at: www.fao.org/docrep/009/a0218e/A0218E01.htm

School Garden Wizard, United States Botanic Garden and Chicago Botanic Garden, http://schoolgardenwizard.org

MODULE 5

"Even if I knew that tomorrow the world would go to pieces, I would still plant my apple tree."

– MARTIN LUTHER KING JR[26]

26 Inspiring Quotes by Martin Luther King Junior, www.biography.com/news/martin-luther-king-famous-quotes

BACKGROUND INFORMATION

Water is not only a product we buy or sell. Like the air we breathe, it is a natural resource that is essential for life. Because water is an element we share with our families, our communities, and every living thing on Earth, respect for all others is very important to consider when using water.

DID YOU KNOW? Globally, 90% of power generation is "water intense," requiring large quantities of water to produce energy. By 2030, energy consumption will increase by 50 %. [1]

Already, the increased severity of droughts, heat waves, and local water scarcity has interrupted electricity generation, with serious economic consequences. At the same time, constraints on available energy have limited the delivery of water. [2]

SOURCE: **(1)** Water for Life, International Decade for Action, "Water and Energy," United Nations Department of Economic and Social Affairs and UN Water, 2015, www.un.org/waterforlifedecade/water_and_energy.shtml.

(2) UNESCO, et al., United Nations World Water Development Report 2015: Water for a Sustainable World, Paris: United Nations Educational, Scientific and Cultural Organization, 2015. Available at: www.unwater.org/publications/publications-detail/en/c/281166, p. 56.

Just as we may be challenged by our neighbors' use of water, our neighbors are impacted by our actions. We share water with those who live both near and far from us. The same is true for trees and plants and animals of all kinds: we all share the same rainwater, surface water, and groundwater.

The same river can run by houses and through communities, countries, and continents—carrying everything that was left behind for many months (upstream and downstream)—until it finds a bigger body of water, which could be another river, a lake, a sea, or an ocean. If the community close to the river does not have a good water treatment system, all the other communities along the way will be affected and can face severe consequences.

Water is considered sacred in many religions, and many cultures have legends related to water. Sometimes water is the most prominent element in a community's life. In other cases, people do not realize the importance of having clean water to drink, or recognize how their water use is directly connected to other people and the environment. Many communities around the world rely on water to survive, not only to drink, but also to provide food and transportation. Also, this precious element can generate energy for the entire community.

"Shared waters" governance is one way to reduce risks of poor water use and to distribute the benefits of water equitably. In some countries, watershed committees include every person or institution involved with a specific body of water. As they all share the same water, they all come together to discuss the impacts and the potential for managing this resource. After identifying and reaching out to the stakeholders in a particular area, the watershed committees discuss crucial issues, work to develop the best possible solutions, and then take action to preserve water quality and correct water-related problems.

MODULE 6

"I understood how water is closely related to trees and air and consequently us. It helped me become more conscious of how my actions are not just limited to immediate consequences. It affects a variety of things."

—STUDENT, SWAROVSKI WATERSCHOOL INDIA

THEMATIC CONCEPTS

Shared waters – A cooperative approach to advance peace, secure environmental protection, and enhance better water management to promote sustainable development in communities worldwide.[27]

Hydropower – Hydropower refers to harnessing the energy of water to generate electricity, and is used to supply about 20% of the world's electricity.[28] Small hydropower development can be very effective for many communities. Larger hydropower dams, however, can potentially cause negative social and environmental impacts.[29]

Upstream and downstream – Because most rivers cross community boundaries, cooperation is necessary to share the water resources of a trans-boundary river basin between upstream and downstream users with different and sometimes conflicting needs, claims, and cultures.[30]

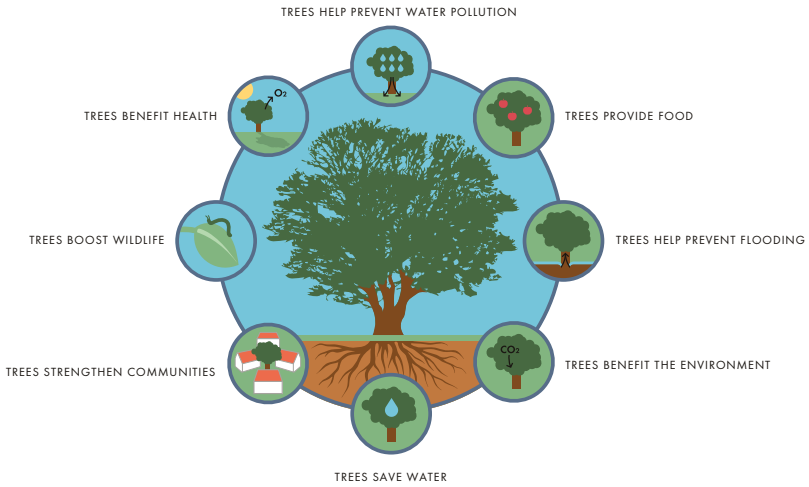
Energy and water – Producing all sources of energy, including electricity, requires water in various processes, including the extraction of raw materials, cooling and cleaning, cultivation of crops for biofuels, and powering turbines. In turn, energy is required to make water resources available for humans to use, for example, for pumping, transportation, treatment, or desalination.[31]

27 UNDP Water Governance Facility, "Shared Waters Partnership," www.watergovernance.org/sharedwaters. **28** World Water Assessment Programme, "Facts and Figures," UNESCO, www.unesco.org/new/en/natural-sciences/environment/water/wwap/facts-and-figures/all-facts-wwdr3/fact-6-hydropower. **29** International Rivers, "Environmental Impacts of Dams," www.internationalrivers.org/environmental-impacts-of-dams. **30** UN Water, "What is Water Cooperation?," 2013, www.unwater.org/water-cooperation-2013/water-cooperation/water-cooperation/en/. **31** UN Water, "Water and Energy," United Nations Department of Economic and Social Affairs, www.un.org/waterforlifedecade/water_and_energy.shtml.

MODULE 6

ACTIVITY 6.1: WATER AND TREES

This activity has two parts. Part 1 is the script for a role-play on how it would feel to be a tree, moving and growing in response to and in harmony with your neighbor. Part 2 involves the students in preparing a nursery and planting trees. For this part of the activity, all the tools and materials should be at hand, and teachers are encouraged to prepare integrated lessons using the tree nursery as an outdoor laboratory. Apart from the practical tree-growing activities, such as seedbed and pot preparation, sowing and planting seedlings, and watering and transplanting, you might also consider ways for the students to monitor and keep records of the process.



Source: https://www.treepeople.org/resources/tree-benefits

Before planting the trees, help the students learn about growing trees in your region, with consideration for what tree species you will want to plant. Consider what benefits the trees could bring to your community. How will they affect the soil where you are planting? Can these trees survive and thrive in the local climate conditions?

Time: 50 minutes / **Thematic Areas:** Science, Mathematics, Social Studies, Environmental Education / **Goal for Learning:** Understand and see each tree as a member of the community that provides shade, cleans the air, preserves soil quality, and is home to many forms of life.

Materials: ☐ Tree seeds or saplings / ☐ Shovel / ☐ Water

ACTIVITY STEPS:

PART 1: "Be a tree" role-play. Read the text below as you lead the students in this role-play.

1. Trees, like people, are the connection between sun and water and soil ... we both need to reach for the sun ... Can everybody reach up toward the sun like a tree waving its leaves around? [Encourage students to make a big stretch.] ... Oops, did you bump into the person next to you? What happens when trees bump into each other? Sometimes they hug ... sometimes they turn and stretch out the other way. Try this out with the people standing around you.

2. Now, grow roots ... How would it feel to be rooted into the ground where you are standing? Put your feet together tight and straighten up ... you might be a little wobbly ... What if we spread out our roots? (Move your feet apart as if they were roots.)

3. Pretend you have a small tree that is about to be planted. Look at it before we put it in the ground. Now, we know about the roots growing into the soil and the branches stretching out to the sun. (Ask the participants what all of this has to do with water.)

4. Trees hold water ... they distribute it into the ground and into the atmosphere ... and they also help to keep it clean ... these roots connect us through the water to every other person and every other tree in the world ... they are acting locally, with global results.

MODULE 6

5. There are 2.2 billion kids under the age of 18 on Earth today, and if everyone plants a tree, that will be a lot of trees! Each tree that we plant today is part of this community of girls and boys around the world who believe in peace and happiness for everybody, everything, and every drop of water on Earth.

PART 2: "Planting the trees

1. Trees, like people, are the connection between sun and water and soil ... we both need to reach for the sun ... Can everybody reach up toward the sun like a tree waving its leaves around? [Encourage students to make a big stretch.] ... Oops, did you bump into the person next to you? What happens when trees bump into each other? Sometimes they hug ... sometimes they turn and stretch out the other way. Try this out with the people standing around you.

2. Prepare the site. Young seedlings will grow best if they are in healthy, well-draining soil, and in a 50% shaded area, away from burning sun and protected from strong winds, rainwater runoff, and nibbling animals.

3. Obtain seeds or seedlings. Seeds can be collected from "parent trees" or bought if there are no good local seed sources for a particular species. When buying seeds, it is important to ask the supplier about the requirements for storage and pretreatment methods. As an alternative to planting seeds, cuttings can be used to produce new trees.

4. Prepare the seedbeds or pots. In wetter areas, it is best to use seedbeds: the seedbeds should be prepared and the seeds sown and kept moist. When they are large enough, they should be transplanted to a transplant bed. For drier areas, the method for potted seedlings is best: the pots or containers should first be prepared, and the seeds sown and kept moist. The pots should be moved every two weeks to prevent taproots from growing out of the pots.

5. Prepare an action plan. Work together to decide who will do what and when for the upcoming weeks' nursery activities. The calendar of activities should consider the seedlings' growth cycle so that planting and caring for

the young trees fits within the school term. If needed, volunteer helpers could be mobilized to cover holidays and months when school is not in session.

6 Before planting, ask each student to hold her or his tree. Ask students to close their eyes for a moment, and feel themselves as part of the tree and the tree as part of them.

7 Put the trees into the ground. Protect the saplings with soil and let each child pour a small cup of water to nourish the trees.

OBSERVATION AND DISCUSSION:

Ask students to reflect on the activity and share their experiences with the group. Prompt discussion by asking if anyone knows why trees are so important as our partners for life on Earth.

Ask if anyone feels a personal connection with a tree, and encourage students to share stories about these connections.

ADDITIONAL RESOURCES:

Gizmos, "Photosynthesis Lab," Charlottesville, Virginia: ExploreLearning, www.explorelearning.com/index.cfm?method=cResource.dspDetail&ResourceID=395

Ketcham, Sandra, "Teaching Photosynthesis," LoveToKnow, http://home-school.lovetoknow.com/Teaching_Photosynthesis

Pearson Education, "Photosynthesis Worksheet," 2007. Available at: www.teachervision.com/photosynthesis/printable/52371.html

SWAROVSKI WATER TREATMENT, AUSTRIA WATTENS

CASE STUDY: SWAROVSKI'S WATER TREATMENT IN WATTENS, AUSTRIA

Efficient and sustainable use of water and energy, one of Swarovski's fundamental principles, is seen in a number of its initiatives, and the company is continuously working to reduce its water consumption and optimize its water treatment and recycling facilities.

In Wattens, Swarovski has implemented an extensive wastewater treatment program that includes a "closed-loop" system. Complex water treatment facilities have been set up to process the water that has been used for grinding, polishing, and other processes. Up to 98% of the grinding water remains in the production circuit, while up to 95% of the polishing water is retrieved and recirculated into the production circuit. An operational wastewater treatment plant handles the remaining 2% and 5%, respectively, of the grinding and polishing water. After municipal water treatment is completed, clean water is returned to the Inn River.

Swarovski also runs several small hydropower plants that generate electricity from local rivers. The heat produced by the turbines is then used to heat water for domestic and industrial purposes. Today, the company produces more than 16% of its energy requirements at Wattens through hydropower produced on-site. In addition, in its Männedorf office in Switzerland, water from Lake Zurich is used to heat and cool the building, as required.

ACTIVITY 6.2: INTRODUCTION TO WATER AND ENERGY – CREATING A WATERWHEEL

"Energy" is defined as the capacity for doing work or "usable power," such as heat and electricity, and also refers to the resources for producing such power. As explained by UN Water, "Water and energy are closely interconnected and highly interdependent. Choices made and actions taken in one domain can greatly affect the other, positively or negatively. Trade-offs need to be managed to limit negative impacts and foster opportunities for synergy." [32]

Because water has a high density, pumping and flow require a lot of energy. [33] In natural systems, water travels from a source at a higher elevation (such as a waterfall) to another location due to gravity, which works in "partnership" with air pressure to move the water with relatively low energy expenditure.

There are two kinds of energy: stored (potential) energy and working (kinetic) energy. In many types of energy generation, large amounts of water are used for cooling and to obtain raw materials such as coal or uranium. Hydropower is a clean, renewable, and reliable energy source that converts kinetic energy from falling water into electricity, without requiring that more water be used to power the system.

In this activity, students will build a miniature waterwheel to show how electricity can be made – leading to a discussion of how water is provided to people, the energy it takes to supply water, and ways to produce energy with water.

Time: 50 minutes / **Thematic Areas:** Science, Social Studies / **Goal for Learning:** Provide knowledge on how water generates energy.

Materials: ☐ 8 small plastic spoons, thin, straight stick, or Popsicle sticks / ☐ A large ball (Styrofoam or organic material of similar round shape, i.e.: orange, apple) / ☐ A 45-centimeter (18-inch) wooden dowel or skewer / ☐ Tape or Glue / ☐ Two 2.5-centimeter (1-inch) pieces of plastic drinking straw / ☐ A sink

32 UN Water, The United Nations World Water Development Report 2014: Water and Energy, Vol. 1, Paris: UNESCO, 2014, p. 9. Available at: www.unwater.org/wwd14/home/en. **33** Ibid., p. 24.

MODULE 6

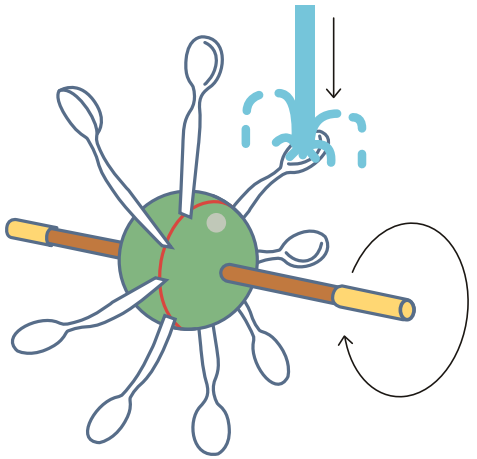
ACTIVITY STEPS:

1. Draw a line around the diameter of the ball, then push spoons into the line, like spokes on a bicycle wheel. The bowls of the spoons should all be facing in the same direction in a line around the middle of the ball. They will represent the blades of the waterwheel.

2. Insert the wooden dowel all the way through the center of the ball and out the other end so that there is an equal amount of dowel on either side of the ball: this is the axle. Tape or glue the axle in place. You have made a waterwheel!

3. Slide a piece of the straw onto each end of the axle. Hold the waterwheel by the straws so that you can see the inside of the bowls of the spoons. Blow on these blades. The blades will catch the wind and turn the wheel.

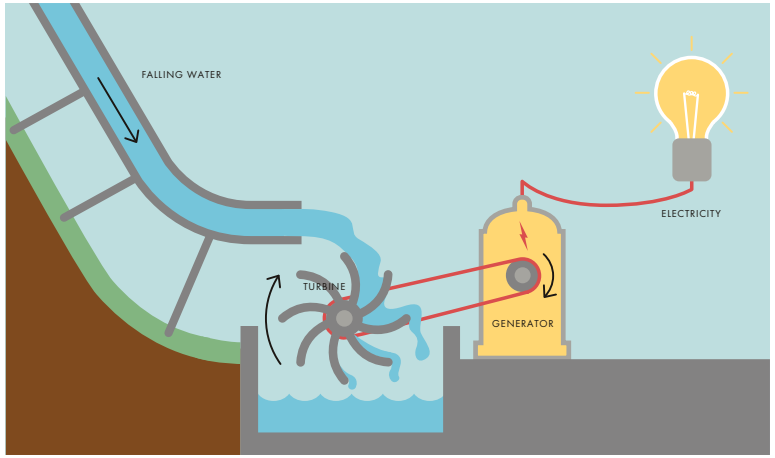
4. Hold your waterwheel by the straws on both ends under running tap water in your sink to see how water moves the blades.



OBSERVATION AND DISCUSSION:

What is the energy source for the waterwheel? How does it work? Discuss how the movement of the water is influenced by the experiment and how it generates energy.

If possible in your area, schedule a class trip to a modern hydropower station, or visit a historic waterwheel that shows how water was used to generate energy in earlier times.



Source: http://water.usgs.gov/edu/hyhowworks.html

ADDITIONAL RESOURCES:

eSchoolToday, "Renewable Energy Sources: Water Power," http://www.eschooltoday.com/energy/renewable-energy/hydro-energy

Hansen, Roger D., "Water Wheels," www.waterhistory.org/histories/waterwheels

TVA Kids, "About Dams," Tennessee Valley Authority, www.tvakids.com/river/aboutdams.htm

U.S. Energy Information Administration, "Energy Kids: Hydropower," Washington, DC: U.S. Department of Energy, www.eia.gov/kids/energy.cfm?page=hydropower_home-basics

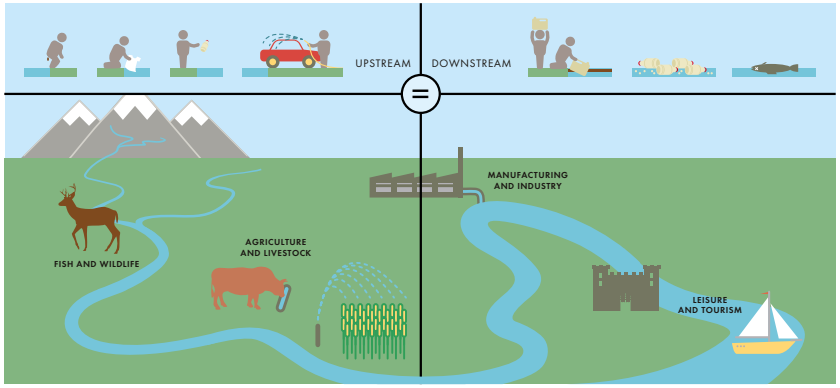
MODULE 6

"Student representatives gave a report on campus, introducing all aspects of what they saw, heard and felt on their expedition to the Han River. Through sharing their experiences, they called on all students to take action in saving water resources and protecting local rivers. One student wrote in his diary, 'If only all people living on the river banks were to take action, those living downstream would have access to clean water."

– SWAROVSKI WATERSCHOOL CHINA STUDENTS AT DAXING ROAD PRIMARY SCHOOL, AFTER THE INVESTIGATION OF THE HAN RIVER

ACTIVITY 6.3: THE WATERSHED

A watershed can be defined as "the area of land where all of the water that is under it or drains off of it goes into the same place. ... Watersheds come in all shapes and sizes. They cross county, state, and national boundaries." The source of the water is always at a higher elevation, or "upstream," and by the force of gravity and the force of the flowing water itself, the water travels "downstream" to a lower level. The destination of this water could be a river, a river system, a pond, a lake, or an ocean.



Source: https://www.epa.gov/cleanwaterrule/why-clean-water-rules

As the water runs from one place to another, it collects debris from the surface and absorbs chemicals or waste products that have been dumped into the watershed by humans, as well as minerals and other elements that occur naturally. In this activity, students will be "building" a river and tributaries made by people holding hands and illustrating how rain and dirty water travel from upstream to downstream in a watershed. This will help students feel and understand the connectedness between all the communities in a watershed.

To carry out this activity, you will need a larger group, with enough students to form three lines, and a space that is big enough to accommodate the formation. The materials to be passed along the lines can be adapted according to local availability and will represent living things such as fish and plants (beans), pollution (paper), and debris (flower petals). Recycled shopping bags or grocery bags can be used to hold the materials.

MODULE 6

Time: 50 minutes / **Thematic Areas:** Science, Social Studies / **Goal for Learning:** Show how all communities in a watershed are interconnected through the water.

Materials: ☐ 1 paper bag filled with beans / ☐ 1 paper bag filled with small pieces of paper / ☐ 1 paper bag filled with flower petals / ☐ 1 large bucket / ☐ 3 sturdy chairs or footstools

ACTIVITY STEPS:

1. The goal is to organize students into three lines: one that represents a major river or waterway, and two others that represent smaller streams or tributaries that flow into the larger waterway.

2. Ask three students to be the materials carriers, giving one of the bags to each of them. Explain that the beans are like natural materials that flow into and down the river, such as living things (fish and plants) and gravel, while the paper represents pollution, and the flower petals represent waste debris.

3. Form a group of students into one large line, at least two students wide. This line represents the river or waterway. The student at the beginning of the line will stand on a chair or footstool to represent the elevated water source in the mountains or hills.

4. Form the rest of the students into two smaller lines (one student wide) to represent tributaries, or streams feeding into the river. These two tributaries should connect to the river at different places on either side, and the student who is farthest away from the main river should stand on a chair or footstool to show that the water is flowing downward toward the main river.

5. Place the empty bucket at the feet of the last two students in the "main river" line. This represents the water basin (the water's destination as it flows downstream).

6. Ask the students to imagine it is raining lightly. Tell the group that when there is a light rain, they should pass the beans, paper, and flower petals slowly

down the stream. The students holding the bags will move around to the students at the beginning of the lines, where the student on the chair will grab a handful of material to be passed from student to student along the tributaries and the river, then dropped into the bucket at the end.

7 Next, ask the students to imagine that it is raining very hard and that the beans, paper, and flower petals are all moving at a very rapid pace.

8 In the end, demonstrate how the bucket, which represents the watershed basin, is full of beans, paper, and flower petals. It may even be overflowing because so much material entered the water rapidly during the "heavy rain" part of the exercise.

OBSERVATION AND DISCUSSION:

Discuss how what happened to the bucket might happen with the basin of a river. Ask students to think about the small streams or other waterways that flow through their communities and gather waste materials on a rainy day. Have they considered the connection between local waste materials and the way they end up in a river, lake, or ocean?

Inform students that water always moves downward due to the force of gravity. Gravity is an invisible force on Earth that holds everything and everybody to the planet. If you jump up, you must come down ... ask them to try it. To this day, scientists do not know why gravity works, just that it does exist and that it is constant across the globe.

ADDITIONAL RESOURCES:

Children's Water Education Council, "Teacher's Notes: Down the Hill – Your Watershed" and "The Rain Recipe." Available at: www.cwec.ca/Educ_Teachers

National Geographic, "Mapping the World's Watersheds," http://education.nationalgeographic.com/education/activity/mapping-watersheds/?ar_a=1

Project Wet: Water Education for Teachers, www.projectwet.org

WATERSCHOOL ACTIVITY, SWS INDIA

CASE STUDY: GRAVITY FLOW SCHEME, SWAROVSKI WATERSCHOOL UGANDA

"Being here is a humbling feeling. It makes you feel grounded and grateful. It has a positive effect on your mind. You see the basics of life – like water. You think about how you can get it right, how privileged we are at home."
– ROBERT BUCHBAUER, Member of the Swarovski Waterschool Executive Board

Swarovski Waterschool Uganda celebrated the success of its Banyara Gravity Flow Scheme on August 19, 2012. The scheme succeeds in making clean water available to local communities, in particular, by improving the supply of clean water in schools. Robert Buchbauer, Member of the Executive Board, was in Uganda for the occasion and joined the honorable Prime Minister of Uganda, Amama Mbabazi, other dignitaries, and local people for the official commissioning. While on-site in Uganda, Mr. Buchbauer had the opportunity to experience the entire project in a detailed tour, which allowed him to see the results it is achieving.

Around 15,000 local people benefit from the Gravity Flow Scheme, which includes approximately 43 kilometers (26.7 miles) of pipeline, four reservoir tanks, five break pressure tanks, and 56 tap stands. This system has a huge impact on reducing the amount of time women and children must spend searching for clean water. Instead of

fetching water, children can now go to school, and their parents have more time for employment and to be with their families.

Safe water is also being supplied to local schools, health units, churches, and households. A number of schools have been supplied with water-boiling equipment to purify water, resulting in a significant drop in school absenteeism due to waterborne diseases. This in turn improves literacy and opens up opportunities for a better future for the next generation.

Water, sanitation, and hygiene (WASH) clubs in schools and community-based creative dance and drama help to educate members of the local community and lead by example regarding the importance of using water in a sustainable way. The children become "water ambassadors," sharing their gained knowledge on the responsible and sustainable use of water with their families and communities.

In support of this and other Swarovski Waterschool projects, members of the Swarovski Crystal Society purchase special crystal figurines to make a direct contribution to Swarovski Waterschool programs all over the world.

WATER BOILING FACILITY AT SCHOOL, SWS UGANDA

NEW WATER TAP AT SCHOOL, SWS UGANDA

MODULE 6

WASH CLUB, SWS UGANDA

BACKGROUND INFORMATION

Biomes are regions defined by their climate type, plants, and animals. Forest, tundra, aquatic, grassland, and desert are some examples of biomes around the world. Scientists classify biomes in different ways, but the most important way is by a region's distinguishing features – its climate, flora, and fauna. As with all of the Earth's beings, the biomes depend on water and allow only the particular types of life that are adapted to survive within them.

Different countries have different biomes, but they are all connected to each other, and any change in one biome will affect another. For instance, changes in the Andes Mountains in South America have an impact on the forests in the Amazon. Changes in the Sahara Desert have an impact on the forests in Central Africa. At the same time, changes in the Indian and Pacific Oceans have an impact on the tropical forests in Asia.

In each biome, water plays a vital role by supporting life and connecting ecosystems. Aquatic biomes, for example, are represented by marine and freshwater regions. Considering marine biomes, oceans are the largest and most diverse of the ecosystems. Salt water coming from the oceans evaporates and turns to rain, which falls on the land regions, sometimes in forests, sometimes in grasslands, sometimes in tundras. At the same time, freshwater regions are the most important sources of freshwater for drinking, and include lakes, ponds, streams, and rivers around the world. They are crucial to our existence on Earth, and only a very small part of all water on this planet is freshwater.

DID YOU KNOW? Around 30% of the world's freshwater is stored underground in the form of groundwater (in shallow and deep groundwater basins up to 2,000 meters below the surface, and as soil moisture, swamp water, and permafrost). This constitutes about 97% of all the freshwater that is potentially available for human use

SOURCE: United Nations Environment Programme, "Global Water Resources," August 2006 [Adapted from: UNEP (2002). "Vital Water Graphics: An Overview of the State of the World's Fresh and Marine Waters," http://new.unep.org/dewa/vitalwater/index.html]

Freshwater is not only on the surface: sometimes it is in the atmosphere, crossing different biomes and different countries. The "flying rivers" phenomenon in South America, for example, brings water vapor from the Amazon in Brazil, in the equatorial zone, to Argentina, in the temperate zone. The humidity carried by these flying rivers is responsible for much of the rain that falls in the south and southeast of Brazil, in places like São Paulo and Rio de Janeiro, which are thousands of kilometers from the Amazon.

Rivers also run underground in aquifers, the reservoirs for groundwater. Aquifers fill with water from rain or from melted snow that drains into the ground. Wells drilled into them provide water for drinking, agriculture, and industry. Conserving our biomes and our biodiversity, therefore, is crucial for the water and for our quality for life.

WATER TESTING, SWS BRAZIL

"Protect the Earth for children. We must safeguard our natural environment, with its diversity of life, its beauty and its resources, all of which enhance the quality of life, for present and future generations. We will give every assistance to protect children and minimize the impact of natural disasters and environmental degradation on them."

– UNITED NATIONS, A WORLD FIT FOR CHILDREN[34]

34 United Nations, "Resolution Adopted by the General Assembly: A World Fit for Children," New York, October 11, 2002, A/RES/S-27/2, paragraph 7, section 10. Available at: www.unicef.org/specialsession/wffc.

THEMATIC CONCEPTS

Underground water – A large part of the available freshwater in the world is stored in underground aquifers, which provide 50% of all drinking water, 40% of industrial water, and 20% of water for irrigation. [35]

Ecosystems – An ecosystem approach integrates the management of water, the associated land, and living resources in a way that maintains ecosystem health and productivity, in balance with sustainable water use by humans. [36]

Watershed – Watersheds supply drinking water, provide recreation, and sustain life. A watershed approach involving all stakeholders is essential to address today's water resource challenges. [37]

ACTIVITY 7.1: THE SOIL FILTER (WATER AND SOIL) (Adapted from Swarovski Waterschool Austria)

Good-quality soil is essential for plant growth, the recycling of dead materials, regulating and filtering water flow, supporting buildings and roads, and providing habitats for many plants and animals. Healthy soil provides us with food and filters our water.

An ecosystem can be disturbed by natural disasters (hurricane or drought) or human causes such as roadways and other construction, and by the use of pesticides and other chemicals. When we mismanage, pollute, or overexploit our land, we cause a disruption of the ecosystem that affects the land's fertility and healthy production capacity.

35 WBCSD, "Facts and Trends: Water," Geneva: World Business Council for Sustainable Development, 2006, p. 1. Open PDF from: www.unwater.org/downloads/Water_facts_and_trends.pdf. **36** UNEP, Water Security and Ecosystem Services: The Critical Connection, Nairobi: United Nations Environment Programme, March 2009. Open PDF from: http://www.unepdhi.org/publications. **37** EPA, "A Watershed Approach," Washington, DC: U.S. Environmental Protection Agency, September 12, 2013, http://water.epa.gov/type/watersheds/approach.cfm.

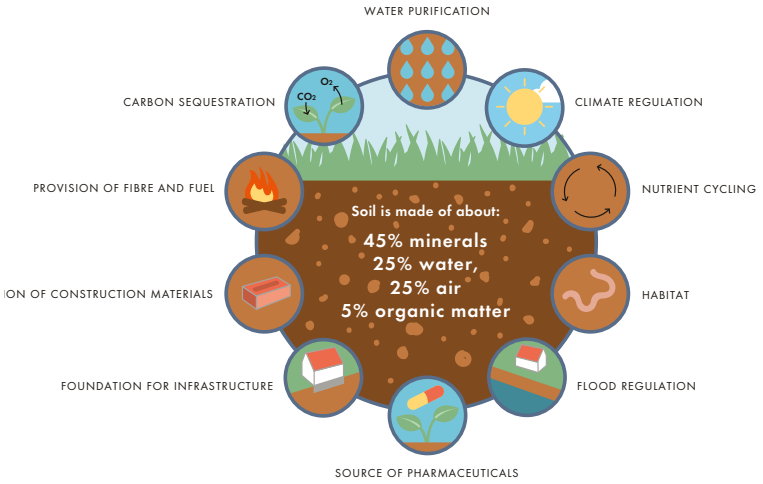
MODULE 7

"Information about climate is fundamental to an assessment of the land's capability and suitability for various kinds of use. Areas of uniform climate are also used to identify ecosystem units because climate acts as the primary input of energy and moisture into the system. As the climate changes, the kinds and patterns of dominant life forms of plants and animals change, as do the kinds of soils."

– ROBERT G. BAILEY[38]

38 Bailey, Robert G., "Ecological Climate Classification," USDA Forest Service, Inventory & Monitoring Institute, November 21, 2003, p. 1.

The simple experiment in this activity is designed to promote students' understanding of water in the Earth and stimulate discussion on aquifers. Before beginning the activity, prepare the students by discussing the following questions: When water flows across roads, paths, or other surfaces, the dirt and debris it picks up are often clearly visible. Rainwater will also contain various pollutants that we cannot see, such as fertilizers from agriculture. How can it be that we still find clean water? Why can you drink spring water that gushes out of the ground? How does rainwater become clean in a natural system?



Source: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/oh/soils/health/?cid=stelprdb1143889
http://www.fao.org/soils-2015/en/

Time: 30 minutes / **Thematic Areas:** Science, Mathematics / **Goal for Learning:** Gain an understanding of how water sinks through the various layers of soil and is filtered and cleaned in the process; become aware of the natural purification system of the soil and the fact that the cleansing effect can decrease with heavy contamination.

Materials: ☐ 1 plastic cup sized a half-liter (2 cups), plus 2 transparent cups of a quarter-liter (1-cup) size / ☐ Small knife or scissors / ☐ Drinking straw / ☐ Glue or caulk applicator, duct tape or packing tape / ☐ Clean gravel, sand, soil, and moss / ☐ 1 shallow bowl / ☐ Ink, washing-up liquid, salt, coffee, oil, etc. (the "contaminants") / ☐ 1 gallon of water, or running water, if available from a tap

WATER FILTER ACTIVITY, SWS BRAZIL

ACTIVITY STEPS:

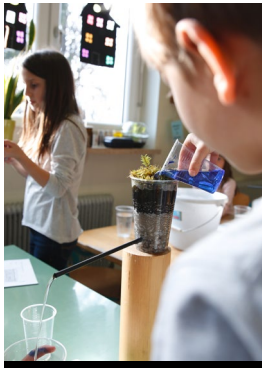
1. Take the larger plastic cup and make a small hole in the side toward the bottom with a knife or scissors. The hole should be big enough that the straw fits in well.

2. Stick the straw halfway into the cup so that one end sits in the center of the bottom of the cup. Then glue or caulk the edges around the straw, on the inside and outside of the cup, so the straw is secure and watertight.

3. Add a layer of gravel in the bottom of the cup, making sure it covers the straw, then add layers of sand and soil, placing the moss on top.

SOIL FILTRATION ACTIVITY, SWS AUSTRIA

4 Put the cup on a platform, such as a block of wood or a sturdy cardboard box, and place the shallow bowl under the end of the straw.



SOIL FILTER, SWS AUSTRIA

5 Pour clean water from one of the smaller cups into the larger cup (the "filter") and watch the water sink. Discover how groundwater reaches the bottom of the cup, then flows out of the straw like a spring.

6 Now, test the function of the soil filter by making a mixture of "contaminants" and water in one of the smaller cups. Pour a portion of contaminated water into the soil filter and observe whether it is possible to purify the water in this way. Compare the appearance and smell of the water that has flowed through the soil filter with the remaining contaminated water in the cup. Note that a similar process happens with aquifers (underground water), and that there is clean water in the soil that we can extract and use in our daily life.

OBSERVATION AND DISCUSSION:

After the first filtering of the contaminated water, pour the water from the shallow bowl back into a cup. Then pour the purified water from the shallow bowl repeatedly through the soil filter. Does the water get cleaner and clearer each time it goes through the cycle? Or is there a point where the filter is not as effective?

Even if the filtered water looks clean and clear, beware! It still may not be safe to drink.

ADDITIONAL RESOURCES:

Dr. Dirt K–12 Teaching Resources, "Soil Is a Filter," www.doctordirt.org/teachingresources/soilfilter

Oregon Agriculture in the Classroom Foundation, http://AITC.oregonstate.edu

Play with Water, "Introduction into the Water Cycle," Coordinated by the University of Applied Sciences Zurich, https://www.zhaw.ch/de/lsfm/dienstleistung/nachwuchsfoerderung-angebote-fuer-schulen/play-with-water/cleaning-water-with-plants/introduction-into-the-water-cycle/

Soil Science Society of America, "Soil Experiments and Hands-On Projects," www.soils4kids.org/experiments

SWS BRAZIL

DID YOU KNOW? On the Earth today, there is just as much water as when the planet was formed. There is no water lost; everything remains in the circuit.

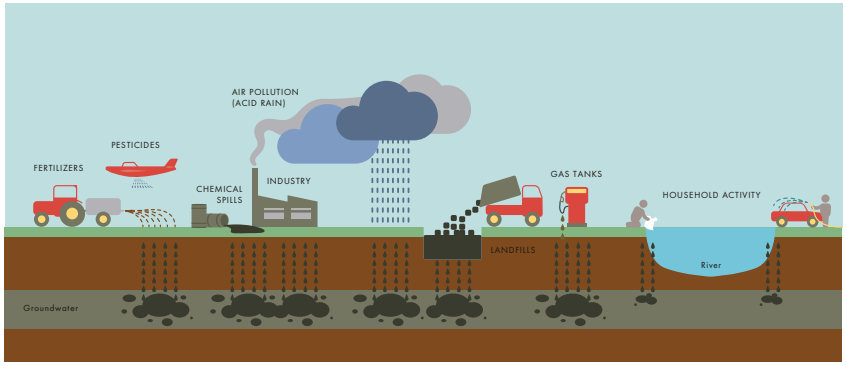
The distribution of water volumes, however, is unequal geographically and seasonally. For example, the groundwater level near a river rises and falls as the water level in the river becomes higher in rainy seasons and lower during dry seasons.

SOURCES: Lenntech, Water Facts and Trivia, http://www.lenntech.com/water-trivia-facts.htm, US Geological Survey's Water Science School, The Watercycle: Freshwater Storage, May 2016 http://water.usgs.gov/edu/watercyclefreshstorage.html

ACTIVITY 7.2: HOW WATER IS STORED AND DISTRIBUTED UNDERGROUND

The term "groundwaters" has been internationally defined as "the hydrologic system composed of a number of different components through which water flows, both on and under the surface of the land. These components include rivers, lakes, aquifers, glaciers, reservoirs and canals. So long as these components are interrelated with one another, they form part of the watercourse."[39]

Part of the available freshwater in the world is stored in underground aquifers. Communities all around the world rely on aquifers for access to drinking water, demonstrating the necessity of protecting these sources of water on Earth. This activity is designed to illustrate how water is stored in an aquifer, how groundwater can become contaminated, and how this contamination can end up in a drinking-water source.



Source: http://www.groundwater.org/get-informed/groundwater/contamination.html

Time: 20 minutes / **Thematic Areas:** Science, Geography / **Goal for Learning:** Gain a clear understanding of how careless use and disposal of harmful contaminants above the ground can lead to them ending up in the drinking water below the ground.

39 UN Watercourses Convention Online User's Guide, "Article 2: 2.14 Groundwater," Scotland: Centre for Water Law, Policy and Science, University of Dundee, 2015, www.unwatercoursesconvention.org/the-convention/part-i-scope/article-2-use-of-terms/2-1-4-groundwater.

MODULE 7

Materials: ☐ 1 clear plastic cup 7 centimeters deep × 8.25 centimeters wide (2.75×3.25 inches) / ☐ Sand, enough to cover the bottom of the cup with a layer around 0.6 centimeters (1/4 inch) deep / ☐ 1 bucket of clean water and a small cup for dipping water from the bucket / ☐ Clay, enough to make a flat circle about 5 centimeters (2 inches) around / ☐ Approximately ½ cup of gravel (not artificially colored) or small pebbles / ☐ Red food coloring

ACTIVITY STEPS:

1. Pour the sand into the cup, completely covering the bottom. Pour water into the sand, wetting and mixing it in completely (there should be no standing water on top of the sand). Observe how the water is mixed around the sand, but is not absorbed into the sand particles, just as it would be in the ground.

2. Flatten the clay like a pancake and cover half of the sand with the clay, pressing closely to seal off one side of the cup. The clay represents a "confining layer" that keeps the water from passing through it. Pour a small amount of water onto the clay and observe that the water flows into the sand below only where the clay does not cover the sand.

3. Use the gravel or pebbles to form the next layer of earth. Place the gravel over the sand and clay, covering them entirely. Slope the gravel on one side of the cup to form a high "hill" and a "valley." Then observe that these layers represent some of the many layers in the Earth's surface.

4. Pour water into the "aquifer" until the water level in the valley is even with the top of the hill. You will see the water stored around the gravel. These rocks are porous, allowing storage of water within the pores and openings between them. Notice that a surface supply of water (a small lake) has formed. You are now able to see surface and ground water supplies, both of which can be used for drinking water.

5. Put a few drops of food coloring on top of the gravel hill as close to the inside wall of the cup as possible. Observe the passage of the color not only into the rocks, but also into the surface water and into the sand below. This shows one way that pollution can spread through an aquifer over time,

demonstrating, for example, how when people use old wells or surface areas to dispose of chemicals, trash, or used motor oils, it can impact the drinking water below

OBSERVATION AND DISCUSSION:

Learn about and discuss as a group other traditional ways of finding water.

Look into what happens when too much water is taken out of aquifers. Think about the household chemicals that are used in your home and talk about how to keep the groundwater clean in your area.

Take note of the more protected layer beneath the clay in your cup and how a deeper well might be able to access a cleaner source of water.

ADDITIONAL RESOURCES:

Groundwater Foundation, www.groundwater.org

Vital Water Graphics, United Nations Environment Programme, http://new.unep.org/dewa/vitalwater/index.html

Worldwatch Institute, www.worldwatch.org

"Approximately 40 percent of the world's population lives in river and lake basins that comprise two or more countries, and perhaps even more significantly, over 90 percent lives in countries that share basins."

– UN WATER[40]

40 Task Force on Transboundary Waters, "Transboundary Waters: Sharing Benefits, Sharing Responsibilities," Zaragoza, Spain: United Nations Office to Support the International Decade for Action "Water for Life" 2005-2015, 2008, p. 1

ACTIVITY 7.3: EXPLORING YOUR RIVER – WATERWAY MAPPING AND HABITAT ASSESSMENT (Adapted from Swarovski Waterschool China)

As a main source of freshwater on Earth, the river network not only nourishes the land on which human civilizations are developed, but also plays a significant role in the evolution of the ecosystem. A river provides a habitat for the many plants, animals, and organisms that utilize water and nutrition from the river and produce "waste" for other organisms to use. Organisms in a "healthy" river can absorb excessive organic matter to clean the water. They are also part of food chains through which energy and nutrition can be fully used through the cycle of the system. As vessels of the biosphere, the rivers in a network also transfer water and nutrition to other freshwater biomes such as lakes, ponds, deltas, wetlands, and grasslands through on-the-ground and underground channels.

Human activities are changing the natural landscape. In rural areas, water withdrawal and pollution caused by agriculture, domestic usage, and industry are changing the water quantity and quality of rivers. In cities, issues of water shortages and pollution are even more serious. Artificial rivers such as canals and waterway transformation projects are radically different from rivers in nature, but they can still support life within or alongside them.

STUDENTS EXPLORING THEIR RIVER, SWS CHINA

A river is not merely running water: it is a delicate system in which water, environment, and all kinds of organisms interactively support each other. How are rivers in nature, villages, and urban areas supporting human activities and other living things? What kinds of plants, animals, insects, and other organisms live in the river ecosystem? What are the criteria and indicators to measure whether a river is healthy or not? This activity allows students to explore a selected river near their school, so they can learn by themselves and find answers of their own. The suggested age for this activity is 12–18 years old.

Time: 90 minutes / **Thematic Areas:** Geography, Environmental Education / **Goal for Learning:** Enhance students' awareness of the interrelatedness of the life-support system of rivers to humans and other species, and therefore promote understanding of the importance of conserving river ecosystems.

Materials: ☐ Map of the area where the activity will be performed / ☐ Gloves / ☐ Checklist and pens or pencils to record observations (see Step 3 below) / ☐ Bottles (to hold water samples) / ☐ Magnifying glass / ☐ Poster board or cardboard / ☐ Colored pencils or markers

ACTIVITY STEPS:

1 SELECTING THE SITE: Before beginning the activity, teachers should select a small section of a river, stream, or creek near the school or neighboring community as the site for observation, water sample collection, and measurement. When choosing a site, consult with a local administrative department to make sure the area is safe.

The site should be an open area where students can safely get access to the water. The riverbank at the selected site should not be too steep, and a site with trails going from the bank to the water edge is preferred.

WATER QUALITY TESTING, SWS CHINA

2 GENERAL INVESTIGATION: Using an amplified map of the area, students should investigate the stream and surrounding land and note locations and information on: **>** the patterns of land use, such as farming, grassland, uncultivated land, or forest **>** possible pollution sources, such as industry, factories, and wastewater outlets **>** environmental problems, such as soil erosion or littering **>** landmarks, including roads, drains, buildings, fences, and bridges

3 STREAM HABITAT ASSESSMENT: Stream habitats include the aquatic zone (the habitat found in the water) and the riparian zone (the habitat around the water). These zones are related to each other. Students should examine these zones and note the characteristics of different areas and types of vegetation and small animals found in specific areas, filling out a checklist similar to the one below.

Zone	Area type	Characteristics	Vegetation	Animals
Aquatic	Ripples	Shallow, rock or gravel …		
	Pools	Deeper areas, slow-flowing water …		
	Runs	Deeper than ripples and faster than pools …		
Riparian	Top of bank			
	Face of bank			
	Sandbar zone			
	Toe of bank			

Students can collect water samples from different sites in the same watershed areas and compare them using a magnifying glass. They can record the findings from each of the places and compare the sediment concentration and other properties of the samples. If time permits, the students can draw conclusions relating to comparison of the samples with the local environment from which the samples were collected.

4 Observing the stream: Students should choose a site to take notes for one hour during a day or over a few days about the activities on or near this water resource. They should make a detailed list of how the water is used, by whom, and for what reasons.

5 Mapping the stream: Mapping involves drawing a detailed sketch of the site area, showing all the important features that affect the habitat or water quality. Use different colors and symbols to add information the students have collected through the investigation and habitat assessment to a basic map of the area. Ask the students to point out locations where they made the habitat assessment and recorded water usage activities. When these maps and lists are finished, display them in the classroom and discuss them

Optional Extension:

6 Additional physical-chemical assessments could be made, according to the students' course schedule and capabilities, and conditions at the observation sites. By measuring water temperature, depth, flow rate, and quality, students will gain a comprehensive understanding of how these factors are affected by and influence the riverbank's structure, including rocks, soil, and vegetation.

Regular monitoring of the biological, physical, and chemical changes at the site could be carried out so that students will see how supportive or destructive changes in one element or several affect the waterway and surrounding vegetation. The students' monitoring results can be used to generate conservation actions to protect the health of the stream.

OBSERVATION AND DISCUSSION:

What kinds of vegetation and animals live in the different zones of river habitats?

How do these various organisms utilize water resources? What supportive and destructive effects are they facing in their survival? How do you think these organisms have developed to adapt to their environment?

MODULE 7

How do humans directly or indirectly utilize the water resources? How did artificial construction change the river habitat?

What criteria do you think could be used to determine if the river is healthy or not? Do human activities positively or negatively influence the health of the river?

ADDITIONAL RESOURCES:

Southwest Florida Water Monitoring District, "Water Quality Monitoring," www.swfwmd.state.fl.us/education/kids/watermonitoring

U.S. Environmental Protection Agency, "World Water Monitoring Day," water.epa.gov/type/rsl/monitoring/monitoringmonth.cfm

"This activity made me realize that all the components in the ecosystem are interconnected. I planted trees in my school and also the village because they purify air and give out oxygen."

–STUDENT, AGE 12, SWAROVSKI WATERSCHOOL INDIA

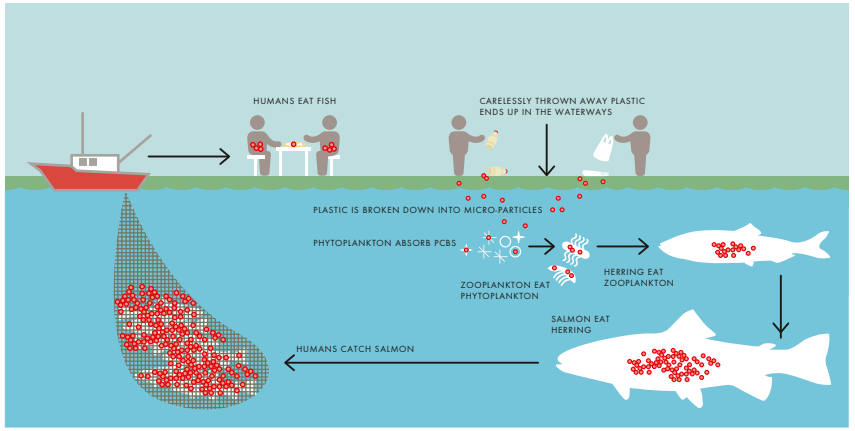
SWS INDIA

ACTIVITY 7.4: ECOSYSTEMS – THE WEB OF LIFE (Adapted from Swarovski Waterschool India)

Ecosystems are complex and interactive "neighborhoods" that are in place in many different climates and types of terrains or zones on our planet. Within a given ecosystem, the many different forms of life are dependent upon one another within the circle of life. In this case, all living things (plants and animals) are dependent upon water and other Earth elements for food webs and habitat formation. In India, the Swarovski Waterschool led by WWF refers to this complex system of give and take as a "holon"—a concept that is related to the theories of Professor Arthur Koestler and Nobel Laureate Herbert Simon.

This activity is designed to promote students' understanding of the meaning of "ecosystem." They will learn how to illustrate an interdependent system of life and discover ways to analyze a conflict occurring in nature by using the ecosystem model. This activity is ideal for students ages 10–18. The first part is a drawing session, and the second part is a role-play.

Time: 90 minutes **/ Thematic Areas:** Ecology, Science **/ Goal for Learning:** Gain the ability to express the characteristics of ecosystems as interdependent systems of life.



Source: http://www.ecy.wa.gov/programs/hwtr/RTT/pbt/

MODULE 7

PART 1: Drawing and discussion on ecosystems (50 minutes)

Materials: ☐ Student workbooks / ☐ Colored pencils or markers / ☐ Flip chart paper / ☐ Rope (long enough for each person in the group to hold it at the same time)

ACTIVITY STEPS:

1. Divide students into groups of four or five and let each group pick a different theme for their ecosystem such as a mountain, river, forest, village, etc. Have them include the various characteristics like human beings, animals, plants, water, or the sun.

2. Let them draw and write about the ecosystem on a sheet of the flip chart paper, noting all the other aspects that are associated with their particular theme. They should be encouraged to include all the components of the ecosystem, whether big or small, and show how they are connected.

3. After 10 minutes, ask the groups to present their work and discuss it with the other groups. Ask them to describe their experience making the chart and what it meant for them.

4. Review the characteristics and structure of ecosystems, using the drawings they have produced and explaining connections and dependence between components.

DID YOU KNOW? Every part of the world, including each country, is divided into different ecological climate classifications, or "ecoclimatic" zones.

These zones are based on many factors, including short-term weather patterns, climate (the prevailing weather conditions over a long period of time), and examinations of vegetation within a particular ecosystem.

SOURCES: Bailey, Robert G., "Ecological Climate Classification," USDA Forest Service, Inventory & Monitoring Institute, November 21, 2003, p. 1.

PART 2: Web of life role-play (40 minutes)

Materials: none

ACTIVITY STEPS:

1. Ask the students to form a circle, and designate a name for each student based on an ecosystem component: for example, sun, grass, water, bird, fish, rabbit, tiger, vulture, gorilla, human, and so on.

2. Ask the "sun" to hold one end of the rope, then pass the rope along the different components (students) in order of their position in the food chain. Ensure the rope is held taut.

3. Once all students are holding the rope and the "web" they have created is complete, ask one of the components to step away. Gradually ask other students representing different points on the web to step away until only a few remain.

4. Examine the condition of the web at this point. Ask the students what they observe. Is the rope still held up? Explain how this relates to the concept of interconnectedness in biodiversity and within a biome (or ecosystem).

5. Facilitate a brainstorming discussion to talk about which points affected others, why this happens, and what students can do to prevent the web of life (ecosystem) from being damaged. Observations might include: "Even the smallest components have utility, and all the components are impacted by one another."

OBSERVATION AND DISCUSSION:

Explore other examples of ecosystems in our daily lives, their components, and whether they are part of other ecosystems. What are the kinds of cooperation or conflict that we observe within and across ecosystems?

What is the relevance of this session to our local community? Ask students to note down their thoughts and feelings in their workbooks.

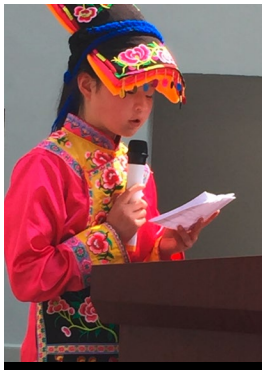
ADDITIONAL RESOURCES:

American Association for the Advancement of Science, "Chapter 5: The Living Environment," Science for All Americans Online, 1990, www.project2061.org/publications/sfaa/online/chap5.htm

Barrow, Mandy, "Food Chains," Primary Homework Help, www.primaryhomeworkhelp.co.uk/foodchains.htm

National Center for Ecological Analysis and Synthesis, "World Biomes: Freshwater," 2004, http://kids.nceas.ucsb.edu/biomes/freshwater.html

Shah, Anup, "Why Is Biodiversity Important? Who Cares?," Global Issues, January 19, 2014, www.globalissues.org/article/170/why-is-biodiversity-important-who-cares



STUDENT GIVING A SPEECH ON WATER PROTECTION, SWS CHINA

CASE STUDY: COMMUNITY PROJECT, BAZHU RIVER, CHINA

The Bazhu River is a tributary of the upper reaches of the Yangtze River in Yunnan Province, and is the primary source of water for drinking and agriculture for the Tibetan village of Bazhu. There is a strong connection between the local community and the watershed: indigenous knowledge, traditional practices, and cultural values play an important role relating to water conservation. For this reason, teachers and students have been very successful in their community outreach work, and have collaborated on activities such as a river cleanup and the development of eco-friendly livelihoods.

In 2013, a Bazhu conservation team was established with three staff from the Shangri-la Institute for Sustainable Communities and six local villagers to implement watershed monitoring and protection activities. The team chose to focus on investigating the seasonal changes and impact of human activities on the Bazhu River, as well as on learning about the significance of the local forest in conserving Bazhu's water resources.

During the months of September and October, a team of 13 people completed GPS mapping of the entire Bazhu River watershed. They discovered the watershed includes 23 sources, four branches, and around 30 sub-branches of the Bazhu River, as well as eight mountains and two water sources that are regarded as sacred.

A three-day workshop introducing information about the river's watershed was organized at the Bazhu Community Learning Center for about 40 participants from 21 villages in the Community Nature Reserve. Sustainable development from the perspective of Tibetan traditional culture was also discussed with participants during the workshop.

Taking into account the villagers' use of fertilizers at the beginning of April each year, as well as the burning of incense and other traditional religious activities that may affect the environment, the research team will continue to monitor quarterly changes in water quality. Data collected will be publicly posted and events will be held to raise local villagers' awareness of the effect of their daily behavior on local water resources.

WATER TESTING, SWS CHINA

MODULE 7

TRADITIONAL PAINTINGS ON WATER, SWS CHINA

RIVER RESEARCH, SWS CHINA

BACKGROUND INFORMATION

All of the water on our planet is connected to all forms of life in one way or another, as we have experienced throughout the activities and information presented in this teaching and learning resource.

This module focuses on bringing the elements of water on Earth together as a catalyst for cooperation. Two-thirds of the world's major rivers are shared by several countries. In the past hundred years, the world population has tripled, while demand for water has increased sevenfold. The signs of a looming water crisis are showing in many parts of the world. Since water is essential to every aspect of life, this crisis affects everything—from health to human rights, the environment to the economy, poverty to politics, and culture to conflict. Just as water defies political boundaries, the crisis is also well beyond the scope of any individual country or sector and cannot be dealt with in isolation.

The need for integrated, cooperative solutions is particularly urgent in the 261 river basins that are shared by two or more countries. Whether we live upstream or downstream, in cities or in rural areas, water issues link us in a common effort to protect and share this resource equitably, sustainably, and peacefully. The concept of "sustainable consumption"—living within our means and sharing water and other global common resources—can lead to a better quality of life for everyone, for both the present and future generations.

DID YOU KNOW? Worldwide, an estimated 768 million people do not have access to an improved source of water. [1]

In 2014, UN Water stated: "Water scarcity already affects almost every continent and more than 40 percent of the people on our planet. By 2025, 1.8 billion people will be living in countries or regions with absolute water scarcity, and two-thirds of the world's population could be living under water stressed conditions." [2]

The economic benefits of achieving universal access to sanitation and drinking water have been estimated at US$171 billion per year. [3]

SOURCE: **(1)** United Nations, "Millennium Development Goals and Beyond 2015: Goal 7 – Ensure Environmental Sustainability," 2015, www.un.org/millenniumgoals/environ.shtml.

(2) United Nations, October 7, 2014, www.unwater.org/statistics/statistics-detail/en/c/211807.

(3) Hutton, Guy, Laurence Haller and Jamie Bartram, "Economic and Health Effects of increasing Coverage of Low Cost Household Drinking-Water Supply and Sanitation Interventions to Countries Off-Track to Meet MDG Target 10," Geneva: World Health Organization, 2007, p. viii.

Challenges related to widespread misuse and pollution of our waterways are formidable, and every country in the world needs to improve its stewardship of water resources. Swarovski is supporting development and implementation of Swarovski Waterschool programs with and for children (representing nearly one-third of the population worldwide) in the belief that these children—who are learning about, exploring, and respecting water in themselves, in one another, and in their local environments today—are best positioned to achieve these goals.

As a fundamental determinant for life, water, even a small drop or mist, is the most sought-after element that scientists and astronauts are trying to find in their exploration of other planets, including Mars, and of the Earth's moon.

"Water is needed in all aspects of life. The general objective is to make certain that adequate supplies of water of good quality are maintained for the entire population of this planet, while preserving the hydrological, biological and chemical functions of ecosystems, adapting human activities within the capacity limits of nature and combating vectors of water-related diseases."

—UNITED NATIONS EARTH SUMMIT, 1992[41]

41 United Nations Conference on Environment & Development, "Agenda 21," Rio de Janeiro: United Nations, June 1992, Article 18.2. Available at: https://sustainabledevelopment.un.org/index.php?page=view&nr=23&type=400.

THEMATIC CONCEPTS

Climate change – The Earth is getting warmer because human activities are adding heat-trapping gases to the atmosphere, mainly through the burning of fossil fuels. These gases are called "greenhouse" gases. Warmer temperatures are causing other changes around the world, such as glacial melting and stronger storms. These changes are happening because the Earth's air, water, and land are all linked to the changing climate.

Climate change is expected to bring more droughts and floods, and to continue raising sea levels around the world, which will make finding clean, nonsaline water more difficult. Droughts and flooding affect water quality by damaging sanitation pipes and causing human waste to leak into water supplies, and by increasing the salinity of groundwater. Dirty water and poor sanitation can lead to disease, and when less freshwater is available, people are likely to save it to drink and use less of it to wash their hands and keep clean. Water shortages also have the potential to cause conflicts when people try to protect their supplies, and can increase migration if people must move to find places where water is available.

Sustainable consumption – The concept of sustainable consumption has emerged to address the growing concern that rapid population expansion and human activities have an impact on the Earth's natural systems, causing damage to ecosystems that places human survival in danger. Sustainable consumption can lead to a better quality of life for everyone, for both the present and future generations.

Ecological footprint – This is a measure of how fast we consume resources and generate waste compared to how fast nature can absorb our waste and regenerate ecosystems. To avoid irreversible damage, our rate of consumption must be reduced to balance the Earth's capacity to absorb waste.

MODULE 8

"The quality of water and the quality of life in all its infinite forms are critical parts of the overall, ongoing health of this planet of ours, not just here in the Amazon, but everywhere. ... The hardest part of any big project is to begin. We have begun. We are underway. We have a passion. We want to make a difference."

– SIR PETER BLAKE[42]

The three "Rs" – Reduce, Reuse, Recycle – Reduction, and particularly waste avoidance, is a great alternative to overuse of the Earth's limited resources. For example, adding less packaging to products reduces the demand for raw materials. Reuse of products and materials prevents the return of the carbon within the materials to the environment for as long as possible. Recycling reduces the need for raw materials, and keeps valuable resources from being disposed of and further contributing to greenhouse gas emissions. What can be recycled? Glass, aluminum, some types of plastic, and most types of paper and cardboard.

42 Sir Peter Blake (1948–2001), last journal entry before being murdered by pirates on the Amazon River.

ACTIVITY 8.1: WATER WITHIN AND AROUND US (Adapted from Swarovski Waterschool Brazil)

This planet has no passengers. We all are the crew. Environmental awareness and sustainability are our common concerns. We need local actions for environmental and global awareness in order to establish and nurture better understanding and dialogue between people in different parts of the world.

If there is a pond or lake nearby, this activity can be conducted outdoors. If not, use a deep bowl, birdbath, or small pool to represent the body of water.

Time: 20 minutes / **Thematic Areas:** Language Arts, Social Studies / **Goal for Learning:** Introduce a cultural perspective of water as a shared global resource that connects us all, both inside and out, through ceremony and language.

Materials: ☐ Small bottle of water (each student to bring from home) / ☐ Crayons or colored markers / ☐ Paper

ACTIVITY STEPS:

1. Begin with this simple ceremony that demonstrates the way in which we are all deeply connected to one another and to the water of the Earth. Gather at a pond or set up your "pond" indoors, and create a very special atmosphere for this water ceremony. If you are indoors, you might want to play music that has the feeling of water in the background.

2. Ask students to sit in a circle and think about this question as they feel gratitude for the water: "What would your life be like without clean water?"

3. Ask each student to come up and add her or his water to the pond. As the students add their water, ask them to share one word that represents what water means to them personally. You might also want to join in singing a traditional song about water.

4. Once all of the students have finished and are seated, ask them if they can say the word for water in any other languages. Some suggestions are included in the table below. Writing in some languages, such as Chinese, is based on pictograms (pictures that represent a word, phrase, or idea) instead of the letters of an alphabet. Share the table of words for "water" and show students the Chinese character for "three drops of water":

5. Distribute the crayons or markers and paper and ask students to draw a picture of what water means to them that could be understood by people living in a country where a different language is spoken.

THE WORD FOR "WATER" FROM AROUND THE WORLD:			
Arabic – ma'a	French – eau	Icelandic – vtan	Russian – voda
Chinese – sounei	German – wasser	Korean – mul	Spanish – agua
English – water	Hebrew – maim	Maori – wai	Swahili – maji
Finnish – vesi	Hindi – paani	Portuguese – agua	Swedish – vatten

OBSERVATION AND DISCUSSION:

Discuss and brainstorm the importance of water around the world. How does water allow people to connect to one another?

Have students discuss the cultural importance of rivers, such as the Ganges River in India, to the people who live near them.

ROLE PLAY ACTIVITY, SWS BRAZIL

"The ocean has become a global repository for much of the waste we generate. Marine debris includes timber, glass, metal and plastic from many different sources. Recently, the accumulation and possible impacts of microplastic particles in the ocean have been recognized as an emerging environmental issue. ... Despite international efforts to stem the flow of plastic debris, it continues to accumulate and impact the marine environment."

–UNEP YEAR BOOK 2011[43]

43 Kershaw, Peter, et al., "Plastic Debris in the Ocean," UNEP Yearbook 2011, Nairobi: United Nations Environment Programme, 2011, p. 21. Available at: http://hqweb.unep.org/yearbook/2011.

ACTIVITY 8.2: WATER AND THE PROBLEM WITH TOO MUCH PLASTIC

"Waste" is any unwanted material—rubbish, trash, garbage, or junk. Solid waste material that has found its way to the marine environment is called "marine debris." It is known to cause the injury and death of numerous animals and birds, because they either become entangled in it or mistake it for food and eat it. In many places, uncollected waste is often mixed with human and animal excreta and dumped in the streets indiscriminately, causing drains to clog. This contributes to flooding, the breeding of insects and rodents, and the spread of diseases.

To rethink overconsumption, we must stop thinking of the Earth's natural resources—fossil fuels, water, and trees—as a never-ending supply. Recycling plays a crucial role. If we do not want to exhaust our supply of natural resources, the three "Rs", Reduce, Reuse, Recycle—need to become second nature to us in daily life. This will help us minimize and prevent further environmental damage, avoid unnecessary use of our natural resources, conserve energy, and lower pollution levels.

DID YOU KNOW? Plastic can be recycled and reused; for example, you can wash plastic forks and plates to use them again. Some countries have programs to recycle plastic by melting it down and making new things out of it. But less than 3% of plastic bags around the world get recycled today. [1]

In Austria alone, researchers estimate that 4.2 tons of plastic are washed into the Black Sea by the Danube River every day. [2]

SOURCE: **(1)** Douglis, Carole, "Theo and the Giant Plastic Ball," United Nations Environment Programme, December 2004. Open PDF from: http://wedocs.unep.org/handle/20.500.11822/8466.

(2) Lechner, et al., "The Danube So Colourful: A Potpourri of Plastic Litter Outnumbers Fish Larvae in Europe's Second Largest River," Environmental Pollution, May 2014, vol. 188, no. 100, pp. 177–181.

Time: 60 minutes **/ Thematic Areas:** Environmental Education **/ Goal for Learning:** Understand sustainable consumption and explore ways to avoid waste.

Materials: None

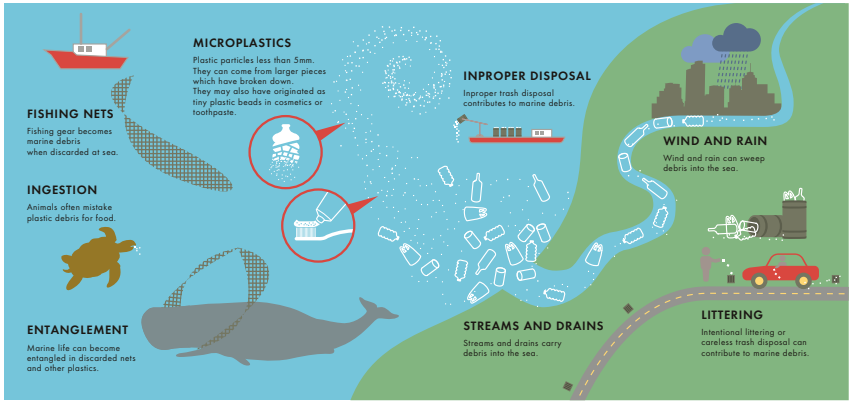
ACTIVITY STEPS:

1 Explain some of the challenges related to plastics and water to the students

2 Ask them to look around their homes and communities and notice items made from plastic, then bring a list of these items back to school to be shared with the class.

3 Work with students to collectively plan local action. This could include:

- Organizing a cleanup of your school, neighborhood, or local waterway (a river, stream, pond, or lake).
- Keeping a basket or canvas bag at home, on your bicycle, or in the car so it is always available if you go shopping; consolidating purchases from different stores into one bag; and reusing bags for subsequent shopping trips.
- Asking your favorite local shops to stop giving out plastic bags for free or to offer money back for not using them, and encouraging the shops to provide recycling drop-off bins and to stock products made from recycled bags.
- If your town has a recycling program, making sure you recycle your waste plastic. If not, you could encourage your family to dispose of waste properly. If you do not have garbage collection services, bury plastics deep in the ground (burning plastic creates toxic fumes).
- Joining an environmental club to learn more about the plastic menace and how you can make a difference.



Source: http://www.oneworldoneocean.com/blog/entry/plastics-breakdown-an-infographic

MODULE 8

DEAD ALBATROSS

OBSERVATION AND DISCUSSION:

Have students brainstorm ways to reuse material found in their homes and schools. Share these ideas, and the importance of reusing and reducing as a whole, with the community.

Discuss how plastic is hazardous to wildlife and ways improper disposal can be avoided to help protect animals living in the ecosystem.

TURTLE

UNTANGLING PLASTIC WASTE FROM MARINE LIFE

ACTIVITY 8.3: CLIMATE CHANGE INTERGENERATIONAL SURVEY

Accessing freshwater is essential for life, health, and livelihoods, and understanding the past and present gives us a vision into the future. In the case of climate change, the future is expected to bring more droughts and floods, and rising sea levels, which will make finding clean, nonsaline water more difficult for many people.

In its technical paper on water and climate change, the Intergovernmental Panel on Climate Change predicts with high confidence that "higher water temperatures and changes in extremes, including floods and droughts, are projected to affect water quality and exacerbate many forms of water pollution. ... Changes in water quantity and quality due to climate change are expected to affect food availability, stability, access and utilisation." [44]

DID YOU KNOW? In 2030, 47% of all people in the world will be living in areas of high water stress, and most population growth will take place in areas that already have limited access to safe drinking water and adequate sanitation.

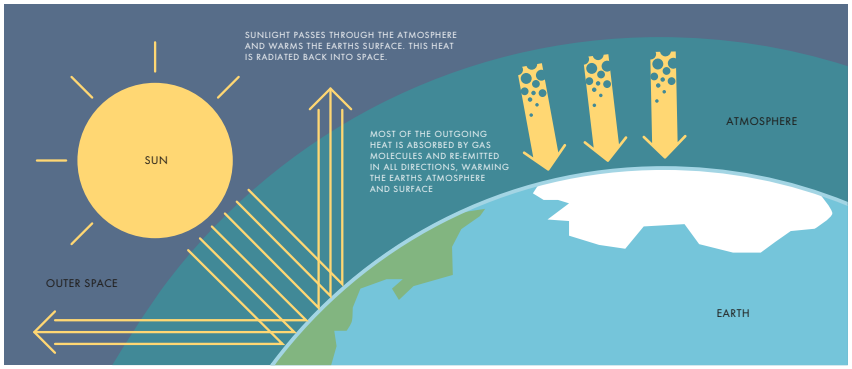
SOURCE: World Water Assessment Programme, "Facts and Figures: Demographics and Consumption Are the Main Pressure on Water," UNESCO, www.unesco.org/new/en/natural-sciences/environment/water/wwap/facts-and-figures/all-facts-wwdr3/fact1-demographics-consumption.

While droughts and flooding affect water quality by damaging sanitation pipes, causing human waste to leak into water supplies, and by increasing the salinity of groundwater, climate change will also have an impact on the world's forests. Warmer conditions and higher levels of carbon dioxide in the air will cause trees to grow more quickly. However, byw growing faster, trees will use the stocks of nutrients in the soil more quickly and may eventually deplete them. [45] With fewer trees, more places will be prone to flooding, causing sedimentation and erosion.

This activity is designed to gather personal knowledge and reflections on climate change from adults, particularly those who are older and have been living in the community for many years.

Time: 50 minutes introduction (Conducting this survey may span a few days) / **Thematic Areas:** Social Studies, Language Arts, Science **/ Goal for Learning:** Facilitate dialogue between children and elders about the environment in which we live, how it has changed, what this means, and why it matters.

Materials: ☐ Paper and pencils for drafting the interview worksheet / ☐ Printouts of the final interview



The greenhouse effect is a phenomenon that occurs when the heat from the sun gets trapped in Earth's lower atmosphere. The heat gets trapped in by gasses such as methane, carbon dioxide, and water vapor, which then makes both the atmosphere and the Earth's surface warmer.
Source: http://climate.nasa.gov/causes/

ACTIVITY STEPS:

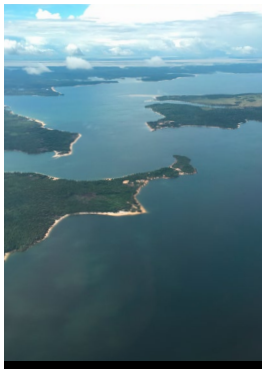
1. Work with the students to develop an interview form. A draft format is suggested below. Alternatively, you could divide the students into groups of four or five and have them make up their own interview questions, providing guidance on the purpose of the interview.

2. Plan for each student to interview an adult in the community and record the responses on a sheet such as the draft shown here. The guidance that is offered by teachers or facilitators should include practical tips on selecting the person to be interviewed, such as a neighbor or family member, and should always consider students' safety.

3. After students have completed their interviews, gather the responses for discussion and analysis.

44 Bates, Bryson, et al., editors, Climate Change and Water: IPPC Technical Paper IV, Geneva: Intergovernmental Panel on Climate Change, 2008, p. 3. **45** United Nations Framework Convention on Climate Change, Report on the technical workshop on water and climate change impacts and adaptation strategies http://unfccc.int/resource/docs/2012/sbsta/eng/04.pdf.

CLIMATE CHANGE AFFECTING WATER AVAILABILITY



OBSERVATION AND DISCUSSION:

How will climate change affect the future? Engage students in a discussion of the short- and long-term effects, and how we can act now to help alleviate some of these changes.

Also consider ways that students can help prepare their community to withstand the effects of climate change.

ADDITIONAL RESOURCES:

NASA, "Climate Kids," http://climatekids.nasa.gov/menu/teach

Scholastic News Kids Press Corps, "Lesson Plan: How to Conduct an Interview," 2015, www.scholastic.com/teachers/lesson-plan/how-conduct-interview

UNDP, Human Development Report 2014: Sustaining Human Progress – Reducing Vulnerabilities and Building Resilience, New York: United Nations Development Programme, 2014.

DRAFT INTERVIEW WORKSHEET

NAME: _____ GENDER: _____

AGE: _____ How long have you lived in this area? _____

What was the environment like when you moved here or when you were a child? _____

What, if anything, has changed in the natural environment since you have lived here? _____

Are there more or fewer people in the village/community now than there were when you came here or when you were a child? Why do you think this is happening? _____

Which of the following items have you noticed during the past 25 years in our region? Please explain or give examples:

- ☐ Less water available _____
- ☐ Higher cost of water _____
- ☐ Fewer trees _____
- ☐ Harder to get fuel for cooking and heating _____
- ☐ Hotter temperatures _____
- ☐ Changing weather _____
- ☐ More natural disasters _____
- ☐ More traffic _____
- ☐ More pollution _____
- ☐ More mosquitoes or other insects _____
- ☐ Less rainfall in certain seasons _____
- ☐ More people getting sick _____
- ☐ Harder to grow crops _____
- ☐ More people moving somewhere else to live _____
- ☐ Less soil (because it has been washed or blown away) _____
- ☐ Colder temperatures _____
- ☐ Other _____

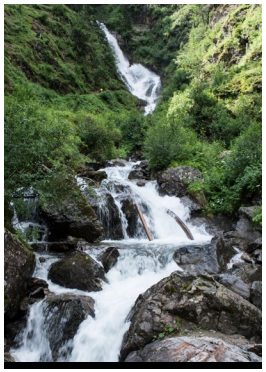
ADDITIONAL RESOURCES:

Available at: http://hdr.undp.org/en/reports/global/hdr2006

UNICEF and the Alliance of Youth CEOs, Climate Change: Take Action Now! Available at: www.climatecentre.org/news/322/climate-change-take-action-now

ACTIVITY 8.4: WATER AVAILABILITY

In many countries, young children, especially girls, are responsible for collecting water, and often carry large amounts in a pot or bucket on their head. Pots can weigh up to 20 kilograms (44 pounds). Carrying water is not only hard work, but also takes a lot of time. One of the most serious effects is that girls who have to fetch water may not have time to attend school. As noted in UNESCO's 2015 report, "Long distances to travel and the lack of good water and sanitation in schools disproportionately impact girls' chances of staying and completing their education. A one hour reduction in the time spent walking to a water source increases girls' enrolment by eighteen to nineteen per cent (18–19%) in Pakistan and eight to nine per cent (8–9%) in Yemen."[46]



WATER

This activity is designed to help students in industrialized countries understand the value of access to safe water for family use and help them understand, through role-play, the importance of water in our lives. In the activity steps, the questions for teachers to ask appear in quote marks, and answers or stage directions are enclosed in brackets.

Time: 50 minutes / **Thematic Areas:** Mathematics, Drama, Environmental Education / **Goal for Learning:** Gain an understanding of the value of water and be able to act accordingly.

Materials: ☐ One 3.8-liter (1-gallon) water jug / ☐ A sink with taps

ACTIVITY STEPS:

1 Begin by asking the following questions: "Have you used any water today? If so, how did you use the water?" Make a list of the responses. Remember to include all water use, including water used for pets and plants.

46 UNESCO, EFA Global Monitoring Report: Gender and EFA 2000–2015 – Achievements and Challenges (Gender Summary), Paris: United Nations Educational, Scientific and Cultural Organization, 2015, p. 4. Available at: http://unesdoc.unesco.org/images/0023/002348/234809E.pdf.

2 Hold up the filled water jug and ask, "How many liters (or gallons) of water do you think you use each day?" Let students guess, and note what figures they come up with for their total daily water use.

3 Discuss how much water each activity actually uses. For example, a 10-minute shower uses about 189 liters (50 gallons), one flush of the toilet averages 11–18 liters (3–5 gallons), and brushing teeth with the water running uses about 57 liters (15 gallons). Review with the group their estimates of personal water use. If the numbers are close to 380 liters (100 gallons) a day, they are correct.

4 "How do we get our water at home?" [Turn the tap.] Demonstrate the simplicity of this action. Ask your students to imagine living in a place where people cannot simply turn on the tap and get clean water. Where would their water come from? [From a local well or a stream.]

5 Pretend to go outside to a local well for water. "What is a well?" Use the example of digging a hole in the sand at the beach and having it fill with water as an illustration of a well. "What will you need to bring with you?" [A bucket, a lantern at night, and warm clothing during the winter.] "Now, we get ready to go fetch water!" [The role-play begins. All students can participate or one or two students can act it out in front of the class.]

6 Have students walk for about 5 or 10 minutes to the 'well.' "Walk to the well, set down your lantern and bucket, and lower the well bucket to get water. Hoist the full bucket and empty it into the bucket you will carry home. Carry the bucket carefully. Why?" [You do not want to spill any water.] Have students carry the full bucket back.

7 "Bring the bucket inside and lift it onto a table. How did that feel?" [Heavy, a lot of work.] "Imagine having to gather water that way all the time. Think about having to carry that water 2 miles or more. How would you feel about this water?" [That the water is valuable, important, needs protection.] "Would you be careful with the water you use at home, or would you waste it?" [Careful, because you would not want to have to gather more water unnecessarily.]

8 "How much does water weigh?" Pass around the jug of water, and ask students to estimate its weight. A liter of pure water, without any sediment that might come from a surface water source, weighs around 1 kilogram (a gallon of water weighs around 8 pounds). "How much would an 18-liter (5-gallon) bucket weigh?"

OBSERVATION AND DISCUSSION:

Lead a discussion about this activity, asking students how it relates to their own lives and the lives of girls and boys in other parts of the world.

As a group, research water use in different countries and how girls and boys in other parts of the world can help conserve the amount of freshwater found on the planet. Then brainstorm the different ways students can conserve the amount of water they use locally on a daily basis.

MOTHER CARRYING WATER, SWS UGANDA

ADDITIONAL RESOURCES:

For a lesson plan in which students investigate how water is reflected in various cultures in Africa and then write about their own impressions of how water permeates all aspects of life, see: World Wise Schools (Peace Corps), "A Sense of Water: Water in Africa," 2014, https://eric.ed.gov/?id=ED457077.

EDUCATIONAL OUTDOOR TRAINING, SWS AUSTRIA

CASE STUDY: SUPPORTING JAMES BALOG'S RESEARCH ON GLACIERS

With the help of unique images from time-lapse cameras, geoscientist, photographer, and mountaineer James Balog provides clear evidence of how glaciers across the globe are shrinking. From Mount Everest to Greenland to the Rocky Mountains, Balog and his team install cameras that capture a series of photographs from the same position for several years at a time. Vivid images from these installations were used in the award-winning documentary Chasing Ice to demonstrate the dramatic effects of global warming.

In July 2014, Swarovski supported the installation of two time-lapse cameras on Stubai Glacier, in Europe's Central Eastern Alps. As explained by Nadja Swarovski, Member of the Executive Board, "We are honored to support the installation of two cameras on Stubai Glacier, the first in the project to observe glacier melt in an Alpine setting. James told us that 50% of the rise in global sea levels is caused by Alpine glaciers melting, not by polar ice melt, and that the Stubai Glacier is retracting at the rate of at least two meters per year. This really brought home to me the impact of our actions on our immediate environment as well as the wider world."

The partnership is a project in the Extreme Ice Survey, a long-term photography program launched by Balog in 2007 that integrates art and science to give a “visual voice” to the planet’s changing ecosystems. Through 2017, Swarovski staff will regularly inspect the cameras at Stubai Glacier and send the images to the Extreme Ice Survey home site in Colorado.

The project is particularly relevant to Swarovski because the Stubai Glacier flows directly into the Inn River, which is the company’s water source and which generates 40% of the electricity used at its headquarters in Wattens, Austria, via hydropower. Swarovski’s support for the project is consistent with the company’s commitment to environmental sustainability and builds on its historically close relationship with, and respect for, the natural environment.

SWAROVSKI EMPLOYEES MAINTAINING EIS CAMERAS

EIS CAMERA INSTALLATION AT A GLACIER IN AUSTRIA

MODULE 8

GLOBAL NETWORK

BACKGROUND INFORMATION

After exploring the first eight modules of Swarovski Waterschool Drops of Knowledge for Rivers of Change Teaching and Learning Material, and discovering how water connects every being on Earth, the next step is to take local action for global change together. Networks are interactions between different people and places, working in collaboration. Similar goals and objectives provide common ground to share, learn and grow in cooperation with others.

Swarovski Waterschool programs are operating in seven different countries: Austria, Brazil, China, India, Thailand, Uganda, and the United States. Drops of Knowledge for Rivers of Change, is an open source resource for teachers, parents, and youth group leaders to use and enjoy. Similar to the worldwide network that has been created by the 2,500 Swarovski stores, which engage with more than 30,000 employees and their families, Swarovski Waterschool school networks are active within each of the seven countries and across the globe.

DID YOU KNOW? The first six Swarovski Waterschool programs are located within the biggest fresh water ecosystems on the planet—the Amazon, Danube, Ganges, Mississippi, Nile and Yangtze Rivers.

School clubs can provide a place for students, teachers, and other community members to discuss local environmental challenges and opportunities and take action related to water, sanitation, and environmental issues. These clubs can often grow to become social structures that help improve resilience and quality of life for everyone.

This module includes techniques for "educommunication," which support the idea of spreading the message and giving voice to students who are often not otherwise heard. Applying such techniques will help to create a conscious community, while empowering peers to take local action on water issues and to share in the benefits.

WATER CONNECTS EVERYTHING

MODULE 9

"Over the past 6 years, through the joint efforts of all those who have participated in the project, we have planted green seeds in the hearts of countless students. Cultivating the gratitude and respect children have for nature has a lifelong impact. This is of particular importance in light of China´s rapid economic development, and the government´s recent revisions of environmental laws. Thanks to the support from Swarovski we can increase our efforts to restore our surroundings, and I believe that China´s environment will get better."

– SHI LI, SWAROVSKI WATERSCHOOL CHINA PROJECT OFFICER

"In today's Waterschool workshop, I have learnt that we should pay attention to nature and that water is an essential and valuable resource. From now on I will handle these resources more carefully and with more responsibility because it is our living space. That means if we carry on with destroying and exploiting the nature, we will destroy ourselves."

– MARTIN, AGE 10, HAUPTSCHULE OBERVELLACH, SWAROVSKI WATERSCHOOL AUSTRIA

THEMATIC CONCEPTS

School WASH and Environmental Action clubs – School WASH and Environmental clubs can raise awareness among students, teachers, and parents about sustainable water management, fostering improved sanitation and hygiene practices in schools and communities and stimulating groups to take action on water issues.

Educommunication – Integrates educational practices with the use of various media platforms to create "communication ecosystems" that can empower students, teachers, and other individuals in communities around the world to act as journalists and connect with other communities.

ACTIVITY 9.1: ORGANIZING A WASH AND ENVIRONMENT CLUB

To meet the objective of conducting active outreach in the community, WASH and Environment clubs can be formed by a working group that includes school administrators, teachers, and members of the student leadership team. Membership should represent students from all participating grades, with teacher guidance. The club can organize into committees according to the needs of the school as determined by the child-led mapping exercise that appears in **ACTIVITY 5.1**.

As part of WASH and Environment club activities, students can organize special events that draw the community's attention to WASH – water, sanitation, and hygiene – in the home. These activities can include informational street fairs and rallies, theater and dance, and musical performances. Such events can be organized as the culminating event of the club activities, in which the students who have learned about water issues present findings or lessons to the community in a meaningful and appealing fashion.

Time: 90 minutes per week **/ Thematic Areas:** Social Studies, Language Arts **/ Goal for Learning:** Promote awareness of and develop skills related to water, hygiene, sanitation, and the environment through fun and practical activities. Support students in changing conditions in their schools, as well as in becoming agents of change in their families and communities.

Materials: None

ACTIVITY STEPS:

1 WASH and Environment clubs are typically formed in two ways: (1) teachers who understand the responsibilities and the possible contributions required ask one or two students (gender balanced) from each grade level to volunteer; or (2) each class elects one or two trustworthy classmates to represent them.

2 As a general principle, the club will have an adult adviser who will work with student leaders to guide the group in terms of planning and harmonizing club activities, and a secretary who will keep records and correspondence. If needed, a treasurer will collect, account for, and keep funds in a safe place. Committees will have various tasks and responsibilities, as outlined in Step 4.

3 WASH and Environment club are encouraged to meet after school to develop a program of action, with guidance from teachers and/or parents. The club will train and mobilize students, and work in harmony with the school administration and parent-teacher association to make improvements related to WASH.

4 Roles and responsibilities of WASH and Environment club members include:

- Recruit more volunteer club members
- Train new club members
- Mobilize the school community to conduct cleanup sessions, tree planting, and other activities to enhance the school environment
- Inspect water points, latrines, and hand-washing stands so that they are kept clean, safe, and attractive
- Organize fund-raising projects to construct facilities, buy soap, maintain facilities, etc.

5 Arrange outreach projects and work with communities on activities such as cleanup campaigns, latrine construction, rehabilitation of community water sources, and other locally important WASH improvements.

ADDITIONAL RESOURCES:

Kids Right to Know, "Start a School Club," www.kidsrighttoknow.com/forming-clubs

ACTIVITY 9.2: "EDUCOMMUNICATION" WORKSHOPS (Adapted from Swarovski Waterschool Brazil)

Educommunication, as described by Professor Ismar de Oliveira Soares, University of São Paulo, Brazil, is a way for people to improve their knowledge of how various media platforms work and learn how to use media through their own perspectives. The concept in action uses media tools to create opportunities for learning how to use all kinds of information resources–including press, radio, movies, TV, theater, the Internet, social media, and other forms of exchanging messages.

Essentially, educommunication encourages students to become reporters and act as journalists, reporting on important issues such as conserving water resources and dealing with climate change. Educommunication workshops can be very different depending on the resources available to a school or the community, and the type of media that teachers and students choose to work with. However, the main goal is always the same: promote free communication among people in order to connect, empower, and spread the message. The activity steps for these workshops will vary according to the type of media that the group will be working with.

Time: 60 minutes per week / **Thematic Areas:** Communication, Social Studies, Language Arts / **Goal for Learning:** Empower students and teachers by stimulating the use of their "voices" to share important messages in the community and beyond.

Materials: ☐ Paper and pen (newspaper) / ☐ Digital camera (photo and video) / ☐ Computer (Internet) / ☐ Speaker (radio)

ACTIVITY STEPS:

1 Form a group of students and provide them with samples of information about water published in various local media, such as newspapers, magazines, videos, websites, and photos. After they receive the samples, encourage the students to find their own sources of information to be shared with the group.

2 Ask the students to discuss the information they found, and then identify the main issues related to water in their communities. Facilitate the process of

building consensus within the group to choose and prepare the messages they would like to share, which media they want to use, and the audience they want to reach. The next steps describe ideas for producing their messages.

3 NEWSPAPER: Decide how the newspaper is going to be printed and how many pages you can print; encourage students to write news articles about water, keeping in mind the number of words that will fit in the space they have available. Help the group lay out the paper and prepare it for printing. When it is done, share copies in the school and community, and post it prominently on local bulletin boards.

4 RADIO: Work with the students to produce a radio spot about water, choosing the message, setting the time limit, and writing the script. Record their performance of the message, and play it over the school announcement system or in the community. If students regularly make such announcements, someone in the group could also read it "live" during a public address. Contact local radio stations to find out if they will provide time for a free public service announcement.

5 PHOTOGRAPHY: Ask the students to take photos that demonstrate a message they have prepared – the aim is to create a visual essay to tell a story that is personally and communally relevant. Scout the best locations and subjects in and around your school, as a group and with the teacher's assistance. If you are going to take photos of people or private property, be sure to get permission beforehand. Collect all the photos and ask the students which ones are the best, then edit the photos and show them on a projector, print them out for a display in the classroom or school hallways, or publish them on a blog or social media website for young people.

6 VIDEO: Assist students with finding a good location and making a short movie that demonstrates the water message they want to convey. Prepare a script for the movie shoot, taking into account the available options for editing. When the video is ready, show it on a projector or on a computer. If the group has made several videos, gather an audience for a special screening as a film festival! The students could also research free video-sharing websites, such as Vimeo and YouTube, where the videos can be posted, and links for viewing could be shared with anyone online.

7 INTERNET: The text, photo, and video materials students create for their water messages can be prepared for posting online. Collect contributions for content and decide together which ones are the best for publishing. Start a blog or a social media page to publish the material they have prepared, then share the link with students, parents, and the community.

MODULE 9

ADDITIONAL RESOURCES:

Banda, Fackson, editor, Climate Change in Africa: A Guidebook for Journalists, Paris: UNESCO Series on Journalism Education, 2013. Available at: www.unesco.org/new/en/communication-and-information/resources/publications-and-communication-materials/publications/full-list/climate-change-in-africa-a-guidebook-for-journalists

Bird, Eleanor, Richard Lutz and Christine Warwick, Media as Partners in Education for Sustainable Development: A Training and Resource Kit, Paris: UNESCO Series on Journalism Education, 2009. Available at: www.unesco.org/new/en/communication-and-information/resources/publications-and-communication-materials/publications/full-list/media-as-partners-in-education-for-sustainable-development-a-training-and-resource-kit

Edublogs, "Curriculum Corner – Using Blogs With Students," http://edublogs.org/curriculum-corner-using-a-blog-with-students

Voices of Youth, "Environment," www.voicesofyouth.org/en/sections/environment/pages/environment

ALINA AND VIKTOR EXPLORE THE GLOBAL WATER CYCLE

This short play can take place on any area that can be cleared and set up for a performance; the instructions will simply refer to "the stage." A teacher, group leader, or older student will read the script throughout the performance. The parts to read appear in regular text; instructions for the action appear in *italics*, inside brackets.

Three children will volunteer to be Alina, Viktor, and Tony (feel free to change the names for the local group). One child will act as the sun, and several other children, depending on the size of the group and the stage, will appear as water drops. Other children will be needed to spread the cloths out on the stage, and to fold them up and take them away.

Before the play starts, ask everyone in the group to read through the script, and gather the following **materials:** ☐ 1 large piece of blue cloth to represent a puddle of water / ☐ 1 yellow cloth to represent the sun (or use a sun made of paper or cardboard) / ☐ 1 gray cloth to represent a cloud / ☐ A gong or other loud noisemaker to simulate thunder / ☐ 1 brown cloth to represent the ground.

[Setting: Two children – "Alina" and "Viktor" – represent two drops of water. They are standing on a blue piece of cloth with three or four other children, who gradually start moving around as if they are playing in water.]

One day, there was a wonderful downpour of rain, and a small puddle of cool, clear water settled on the playground. The water drops Alina and Viktor are happy to be playing with the other drops who are their friends.

[The child who plays the sun stands away from the blue cloth and holds up high either the yellow cloth or the paper sun. Two other children enter the stage and slowly fold up the blue cloth to simulate the fact that the puddle is getting smaller. As they fold up the cloth, the children playing water drops leave the stage, leaving only Alina and Viktor standing in the middle.]

But the sun shines heat from the sky for days, and the air, the ground, and the puddle of water get warmer and warmer. The puddle where Viktor and Alina have

ANNEX A

been floating gets smaller and smaller. It shrinks and shrinks, until only the two water-drop friends are left in a tiny puddle on the playground.

Already, many of the other water drops have disappeared. But Alina and Viktor do not know where they have gone. "Hey, what is happening?" Alina says. "I feel so warm and at the same time so light and airy." Viktor answers, "I feel exactly the same way. What is happening to us?"

[The blue cloth is taken away. Viktor and Alina start to wave their arms as if they are flying.]

Viktor and Alina become smaller and smaller. Both of them feel like they are being dissolved and pulled into the air! Weightless, they rise up into the atmosphere and fly toward the sun. "Viktor, we can fly!" Alina shouts. "Such a great feeling. Wow! So this is how the playground looks from above."

[More children representing water drops come back onto the stage and gather around while they flap their arms as if they are flying. Then the other children leave the stage.]

Through the heat of the sun, Alina and Viktor were turned into vapor made up of tiny water molecules. They have evaporated into the atmosphere and are flying higher and higher. But as they climb higher, the air is getting colder...

"We are not the only ones here," Viktor cries. "Look, there are many other water molecules. We all meet in the air. And look, there is Tony from our puddle at the playground!"

[Tony joins the two friends.]

Viktor and Alina both call to their friend, "Hi, Tony!" He answers them happily: "Hello Alina! Hello, Viktor! Do you also feel cold? It seems to me that it is getting colder the higher we go." "Brrrrrr," says Alina. "We should come closer together. Perhaps it will help against the cold."

[All three pretend they are cold, shivering and huddling together. Other students spread out the gray cloth, representing a cloud, on the stage. Viktor, Alina, and Tony step onto it. Other water molecules come back to the stage, and everyone huddles together on the "cloud," moving gently against each other.]

The other water molecules have the same idea! So they align themselves with the three friends. By cooling in the air, they became tiny water droplets. More and more water droplets join together, until they form a cloud. Millions and millions of the water molecules tumble around to make this cloud dense and heavy and huge. Alina, Tony, and Viktor hold hands tightly so they will not lose each other. In a new surprise, they begin to feel heavier and heavier.

[The children on stage all act like they are getting heavy. Someone strikes a gong or other noisemaker to suggest thunder and lightning. Then the children imitate the sound of a strong wind.]

All at once, there is a flash of lightning! A storm is brewing. The thunder rumbles. The three friends are shaken up and tumble around in the cloud. As they move faster and faster, the cloud cannot hold the water any longer. It opens up, and Viktor, Alina, Tony, and all the other droplets fall to the Earth. They have turned into rain.

[The gray cloth is folded up and taken off stage, and the brown cloth is spread out. The branch stands on the brown cloth, with a few leaves scattered below. The other children leave the stage, and Alina and Tony stand on the cloth, where they will be joined by Viktor.]

Splash! Viktor lands on a green leaf on a tree on the Earth. He runs around to touch other leaves, then notices that he is on the ground, where Tony and Alina have been waiting for him.

"Oh, my, this has been so much fun!" says Viktor. Alina and Tony are also very excited. "I want to do that again!" Tony exclaims. They can hardly believe that their adventure began in a puddle, took them up into the sky, and sent them back down to the Earth. But just as they are discussing this marvelous journey, the three friends notice that they are seeping slowly into the ground.

[The three children drop down and lie flat on the brown cloth.]

ANNEX A

"Help! Where are we going?" cries Alina. "What is pulling us into the ground?"

It is the natural force of gravity that takes the water into the Earth, where the roots of the tree will drink it in, absorbing the life-giving liquid that will nourish it and help it grow. Tony, Viktor, and Alina will once again be transported, traveling through the roots of the tree and the trunk and then through the branches to the leaves.

[Alina, Tony, and Viktor stand near the tree. The other children come back onto the stage. All form a circle around the tree. They begin to make slurping sounds, like water being sucked through a straw. Then all the children lift their hands high to show they are up in the tree.]

"Hey, I think I have been here before," says Viktor. Alina thinks about that for a moment, then realizes that, yes, they are all part of the everlasting cycle of water, which moves from Earth to air and back again.

"I think it starts again," she says, "and I have the feeling that it will get easier and easier as we become more familiar with the cycle we are part of." Then the three friends join hands while they remember this journey, and look forward to their next adventure.

The end.

Or is it only the beginning?

[All the water drops move to the front of the stage. Then the sun and the children who helped with props join them, and everyone takes a bow.]

WATER IN OUR BODIES AND DEHYDRATION

Water is important in my body because it ...

ANNEX B

ANNEX C

ANNEX C

RESOURCES [47]

Publications

CELF. "Teaching the LifeStraw: An Educator's Guide to Water Issues Around the World." Chappaqua, New York: Children's Environmental Literacy Foundation, 2014. Available at: http://www.celfeducation.org/waterguide.html

FAO. Setting Up and Running a School Garden: A Manual for Teachers, Parents and Communities. Rome: Food and Agriculture Organization of the United Nations, 2005. Available at: www.fao.org/docrep/009/a0218e/A0218E01.htm

Hutton, Guy, Laurence Haller and Jamie Bartram. "Economic and Health Effects of Increasing Coverage of Low Cost Household Drinking-Water Supply and Sanitation Interventions to Countries Off-Track to Meet MDG Target 10." Geneva: World Health Organization, 2007. Available at: http://www.who.int/water_sanitation_health/publications/who-sde-wsh-07-05/en/

Khamal, S., et al. Joyful Learning on Hygiene, Sanitation, Water, Health and the Environment: A Source Book for Lesson Plans. Delft, The Netherlands: IRC International Water and Sanitation Centre, 2004. Available at: http://www.ircwash.org/resources/joy-learning-participatory-lesson-plans-hygiene-sanitation-water-health-and-environment

McClain, Michael E. "Balancing Water Resources Development and Environmental Sustainability in Africa: A Review of Recent Research Findings and Applications." AMBIO: A Journal of the Human Environment, 2013, vol. 42, pp. 549–565. Available at: http://link.springer.com/article/10.1007%2Fs13280-012-0359-1

Ministry of Water and Environment. Water and Environment Sector Performance Reports. Kampala: Republic of Uganda, 2006–2014. Available at: http://envalert.org/wp-content/uploads/2016/09/SPR-2016_final.pdf

Prüss-Üstün, Annette, et al. Safe Water, Better Health: Costs, Benefits and Sustainability of Interventions to Protect and Promote Health. Geneva: World Health Organization, 2008. Open PDF from: http://www.who.int/quantifying_ehimpacts/publications/saferwater/en/

47 The links to websites owned and operated by third parties are provided for information and convenience only: their inclusion in this list of resources is not to be considered as an endorsement by Swarovski Waterschool. While all links have been verified before publication in the guidebook, web addresses change frequently, and Swarovski Waterschool is not in any way responsible for third-party website availability, functionality, or content.

ANNEX D

Stockholm Environment Institute. Rainwater Harvesting: A Lifeline for Human Well-Being. Nairobi: United Nations Environment Programme, 2009. Open PDF from: www.unwater.org/downloads/Rainwater_Harvesting_090310b.pdf

TeachUNICEF. Water and Environment Unit & Lesson Plans (Pre-K through Grade 12). New York: United Nations Children's Fund. Available at: http://teachunicef.org/explore/topic/water-and-environment

UNDP. Human Development Report 2014: Sustaining Human Progress – Reducing Vulnerabilities and Building Resilience. New York: United Nations Development Programme, 2014. Available at: http://hdr.undp.org/en/reports/global/hdr2006

UNEP. "Potential for Rainwater Harvesting in Africa: A GIS Overview." United Nations Environment Programme, October 2005. Open PDF from: http://www.worldagroforestry.org/publication/mapping-potential-rainwater-harvesting-technologies-africa-gis-overview-development

UNEP. Water Security and Ecosystem Services: The Critical Connection. Nairobi: United Nations Environment Programme, March 2009. Open PDF from: http://www.unepdhi.org/-/media/microsite_unepdhi/publications/documents/unep/the_critical_connection.pdf?la=en

UNESCO, et al. United Nations World Water Development Report 2015: Water for a Sustainable World. Paris: United Nations Educational, Scientific and Cultural Organization, 2015. Available at: http://www.unesco.org/new/en/natural-sciences/environment/water/wwap/wwdr/2015-water-for-a-sustainable-world/

UNICEF and Alliance of Youth CEOS. Climate Change: Take Action Now! A guide to supporting the local actions of children and young people, with special emphasis on girls and young women. Available at: https://www.unicef.org/education/files/Publication_Youth_in_Action_on_Climate_Change_Inspirations_from_Around_the_World_English.pdf

UNICEF, FAO and SaciWATERs. Water in India: Situation and Prospects. New Delhi and Andhra Pradesh: United Nations Children's Fund, Food and Agriculture Organization of the United Nations and South Asia Consortium for Interdisciplinary Water Resources Studies, 2013. Available at: http://www.indiaenvironmentportal.org.in/files/file/water%20in%20india.pdf

UNICEF and World Health Organization. Diarrhoea: Why Children Are Still Dying and What Can Be Done. New York and Geneva: United Nations Children's Fund and World Health Organization, 2009. Available at: http://www.who.int/maternal_child_adolescent/documents/9789241598415/en/

United Nations Conference on Environment & Development. "Agenda 21." Rio de Janeiro: United Nations, June 1992. Available at: http://www.un.org/esa/agenda21/natlinfo/wssd/summarypublication.pdf

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Websites

Earth Child Institute, "Global Action Classroom" A digital and hands-on youth-led exchange project of the Earth Child Institute in collaboration with the Environmental Conservation Education program at New York University. www.earthchildinstitute.org/global-action-classroom

Earth Vision Institute, "Getting the Picture: A Climate Education Resource" This multimedia, interactive educational tool combines art, science, and adventure to foster a fresh perspective on the global environmental challenge of Earth's changing climate. http://earthvisioninstitute.org/education

ANNEX D

Food and Agriculture Organization of the United Nations (FAO), "AQUASTAT" A global water information system that collects, analyzes, and disseminates information on water resources, water uses, and agricultural water management. Offers comprehensive and regularly updated information at the global, regional, and national levels. www.fao.org/nr/water/aquastat/main/index.stm

Global Islands Network An online hub established to promote culturally appropriate, ecologically sound, economically sustainable, and socially equitable development on islands worldwide. www.globalislands.net

GRACE Communications Foundation Water Program Tools, tips, and information to help make water conservation a daily part of our lives; also focuses on water use in energy production, agriculture, and manufacturing, and on how to improve management of water resources and systems. www.gracelinks.org/824/water-program

The Groundwater Foundation Implements programs and provides educational resources to raise interest in and inspire action on groundwater protection and conservation initiatives, both locally and globally. www.groundwater.org

International Commission for the Protection of the Danube River (ICPDR) Presents databases, maps, videos, and technical papers on preserving the river. www.icpdr.org/main/danube-basin/austria

NASA, "Climate Kids" Produced by the Earth Science Communications Team at the United States National Aeronautics and Space Administration's Jet Propulsion Laboratory/California Institute of Technology, this website is chock-full of up-to-date photo galleries, games, projects, activity plans, and other resources for children and teachers. http://climatekids.nasa.gov/menu/teach

Permaculture Research Institute Works with individuals and communities worldwide to expand knowledge and practice of integrated, sustainable agriculture and culture, using a whole-systems approach to permaculture design. http://permaculturenews.org

School Garden Wizard, United States Botanic Garden and Chicago Botanic Garden Provides downloadable teachers' guides for all stages of school gardening, from planning and planting to using the garden as a space for learning. http://schoolgardenwizard.org

Science Kids Offers fun science experiments, facts, online games, free activities, lesson plans, photos, quizzes, videos, and science fair projects, at a site created by a teacher. www.sciencekids.co.nz

Swarovski Waterschool Since 2000, the Swarovski Waterschool has educated children and communities about the ecological, economic, social, and cultural issues that affect water use on a local and global level, and has provided clean drinking water and sanitation in schools and communities. Swarovski Waterschool's vision is for present and future generations to understand and practice sustainable water use, thus ensuring long-term health and availability of this vital resource for society and nature. www.swarovskiwaterschool.com

TeachUNICEF (U.S. Fund for UNICEF), "Water and Environment" A collection of resources for teachers on raising awareness of problems facing children with inadequate access to clean water. Offers units and lesson plans for Pre-K through Grade 12 on Water and Sanitation for All: Bringing the Issue Home. http://teachunicef.org/explore/topic/water-and-environment

TVA Kids (Tennessee Valley Authority), "For Teachers" Information, curriculum material, and activities to help students understand what electricity is and how it is generated, and how the Tennessee River is managed for multiple benefits. www.tvakids.com/teachers/index.htm

UNEP (United Nations Environment Programme), "TUNZA" Tunza, "to treat with care or affection" in Kiswahili, is a youth initiative to develop activities for capacity building, environmental awareness, and information exchange. http://drustage.unep.org/tunza/youth/about

UNICEF (United Nations Children's Fund), "Water, Sanitation and Hygiene" and "WASH in Schools" Press releases, news, publications, and other sources of WASH information. www.unicef.org/wash and www.unicef.org/wash/schools

ANNEX D

UN Water The United Nations inter-agency mechanism on all issues related to freshwater, including sanitation. News, publications, and statistics, plus a special site for the annual World Water Days. www.unwater.org and www.unwater.org/worldwaterday/home

U.S. Energy Information Administration, "Energy Kids" The Energy Kids guide for teachers provides lessons involving science, math, social studies, and language and performing arts, and activities by age level from primary through secondary school. www.eia.gov/kids/energy.cfm?page=teacher_guide

U.S. Environmental Protection Agency (EPA), "Water Science" Research, links, databases, and other tools for understanding water. https://www3.epa.gov/safewater/kids/index.html

U.S. Geological Survey (United States Department of the Interior), "USGS Water Science School" Information on many aspects of water, along with pictures, data, maps, and an interactive center where visitors can give opinions and test their water knowledge. https://water.usgs.gov/edu

World Health Organization and UNICEF, Joint Monitoring Programme on Water Supply and Sanitation Created to accelerate progress toward universal sustainable access to safe water and basic sanitation by 2025, the Joint Monitoring Programme is an authoritative source of global, regional, and national data on sustainable access to safe drinking water and basic sanitation. www.wssinfo.org

World Water Assessment Programme (UNESCO) Monitors and reports on the world's freshwater resources and ecosystems, water use, and management, and identifies critical issues. www.unesco.org/new/en/natural-sciences/environment/water/wwap

World Wise Schools (U.S. Peace Corps), "Global Issues: Environment" Learn how volunteers are working on environmental problems and creating solutions that are vital to a sustainable global future. https://www.peacecorps.gov/volunteer/what-volunteers-do/#environment

Yale University Environmental Performance Index, "Water Resources"
Water Resources tracks how well countries treat wastewater from households and industrial sources before releasing it back into the environment. http://archive.epi.yale.edu/epi/issue-ranking/water-resources