



Mathematics and Water

Overview

Nearly 900 million people around the world do not have access to safe water. For every investment of \$1 in water and sanitation, an average of \$8 is returned. Knowledge of statistics, trends, and mathematical relationships like these provide a more thorough understanding of the global water crisis. By researching data and statistics related to the crisis, students can build their research skills while increasing their understanding of mathematical concepts and relationships. Water scarcity is inherently connected to poverty, development, and other global trends, and connecting these trends mathematically can help foster an understanding of the crisis and its global implications.

Trends

In order to predict the future of the world's water resources, we must analyze past trends and examine how the world will be affected if they continue. The consistent relationship water scarcity has with GDP and HDI, for example, provides insight into the larger implications of the water crisis. Other correlations, like that seen between water resources and education, highlight preventable trends in the developing world. In order to properly prepare the world for the crisis, we must gain an understanding of these trends and their future effects on the world's people and economy.

- What areas are in danger of water scarcity in coming years? What trends suggest scarcity in these areas?
- What economic and social trends contribute to water scarcity?
- What solutions have worked to combat water scarcity?
- What effect has water scarcity had on indicators of developmental and economic success?
- What does current research indicate about the expected time frame for the world's water crisis? When and where will the world's water resources begin running out first?
- How can we reverse the problematic trends we see?

Data and Statistics

Data related to the water crisis can be used to identify trends and examine correlations in the water-scarce areas of the world. Health data, economic indicators, and other statistics that predict development are correlated to water scarcity, and a knowledge of these correlations allows students to connect the important factors that lead to and stem from water scarcity. Correlation coefficients, regression equations, and even simple relative risk ratios can help students connect trends and understand the enormity of the situation.

- What difficulties are encountered when collecting data and statistics related to the water crisis?
- What economic and developmental indicators have high correlations to water scarcity?
- Who collects the important data related to the water crisis?
- What can statistical comparisons reveal about the relative water scarcity worldwide?



- How can we explain the connections between economic indicators, health statistics, and water scarcity?
- How much does water scarcity contribute numerically to HDI and other measures of development?

Important Statistics

- **884 million people** in the world do not have access to safe water. This is roughly **one in eight** of the world's population. (WHO/UNICEF)
- **2.5 billion people** in the world do not have access to adequate sanitation, this is almost **two fifths** of the world's population. (WHO/UNICEF)
- **1.4 million** children die every year from diarrhoea caused by unclean water and poor sanitation - **4,000 child deaths a day or one child every 20 seconds**. This equates to **160 infant school classrooms** lost every single day to an entirely preventable public health crisis. (WHO/WaterAid)
- For every **\$1** invested in **water and sanitation**, **\$8** is returned. (UNDP)
- **No sub-Saharan African country** is on-track to meet the sanitation Millennium Development Goal. (WHO/UNICEF)
- Children living in households with no toilet are **twice as likely** to get diarrhea as those with a toilet. (WEDC)
- **Lack of safe water and sanitation** costs sub-Saharan Africa around **5% of its Gross Domestic Product (GDP)** each year. (UNDP)
- **443 million school days are lost** each year due to water-related diseases.

Lesson Plans

How much water is there ?

<http://www.ciese.org/curriculum/waterproj/mathactivities.shtml>

Students calculate the fresh water available for human consumption and make inferences about the importance of using water resources responsibly

Articles

Water - another global 'crisis'? – <http://www.bbc.co.uk>

-A BBC article that begins with the assertion “If you look at the numbers, it is hard to see how many East African communities made it through the long drought of 2005 and 2006” and continues to support its arguments numerically. According to the article, “by far the strongest driver of HDI on a global scale was access to water and sanitation.”

Why World’s Taps Are Running Dry – <http://www.bbc.co.uk>



World Savvy

-An analysis of who uses how much of the world's water and why it is a problem. Provides insight into the statistics that must change if we are to solve the crisis.

Quality of Bottled Water Questioned in Congress – <http://www.nytimes.com>

-Is bottled water really safer to drink than tap water? Is it worth the negative externalities incurred? Recent studies presented to Congress suggest not.