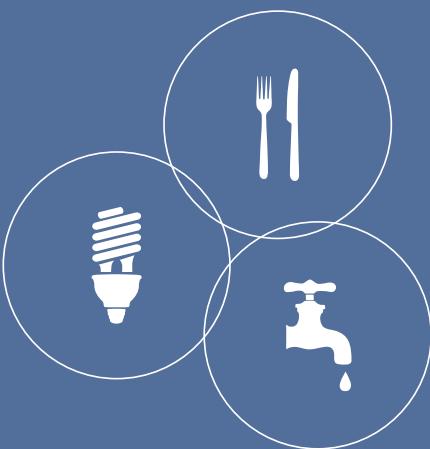


MEET THE NEXUS:

**HOW FOOD,
WATER AND
ENERGY ARE
CONNECTED**



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GRACE

CONSIDER A SLICE OF PIZZA

AT FIRST GLANCE, it seems pretty basic — dough, tomato sauce and cheese. But if you consider where they came from, those three ingredients have a rich story to tell.

Think of the water and energy that go into these three everyday items. You need water to grow the wheat that's milled into flour, you add water to the flour and yeast to make the dough, you need water to produce the gooey mozzarella and it takes water to grow the tomatoes that make up the sauce. You don't see this "hidden water" in your slice of pizza, but it's there.

There's the energy that goes directly into baking the pie, but there's also the hidden energy that goes into farming the crops (think tractors, and fossil fuels required to produce fertilizers and pesticides), processing and distributing the ingredients, and even the energy that was required to manufacture the pizza oven.

You may not have realized it, but even a simple slice of pizza involves a global distribution network, industrial agriculture, fossil fuels and a lot of water.

That's the food, water and energy nexus in a slice.

Flour:
18
gallons

Cheese:
21
gallons

Sauce:
2.5
gallons

Did you know that it takes 42 gallons of water
to make one slice of pizza?



The food, water and energy nexus is simply where and how these three systems interconnect.

- It takes water and energy — and lots of it — to produce the food you eat.
- Energy is used to move water to your home and clean up the water you send down the drain.
- Water is required to run power plants safely and to produce oil, gas and coal.
- Some food crops are turned into fuel for vehicles.

When these three systems come into conflict with each other there are consequences for public health, the economy and the natural world. Events like drought, oil spills and rising food prices all underscore their relationships.

The more you dig into these interconnections the more of a riddle they seem, but don't be overwhelmed. What we do every day affects the food, water and energy nexus, and the nexus, in turn, affects our everyday life. By thinking more broadly about these interconnections, we can build a more sustainable future. ■

NEXUS DEFINED: FOOD



A **FOOD SYSTEM** includes the activities, resources and people involved in bringing food from the farm to the table. Crops, feedlots, trucks, fertilizers, markets and even our own kitchens are all part of the food system.



NEXUS DEFINED: WATER

A **WATER SYSTEM** supplies water for human use, whether for drinking, irrigation or industry, and treats wastewater to protect public and ecological health. Pipes, home faucets, water towers, treatment plants, watersheds and estuaries are key parts of the water system.



NEXUS DEFINED: ENERGY

An **ENERGY SYSTEM** includes everything it takes to generate and distribute electricity, as well as the steps required to produce and distribute fuels. Power plants, rooftop solar panels, transmission lines, coal mines and oil refineries are all part of the energy system.



NEXUS THINKING:

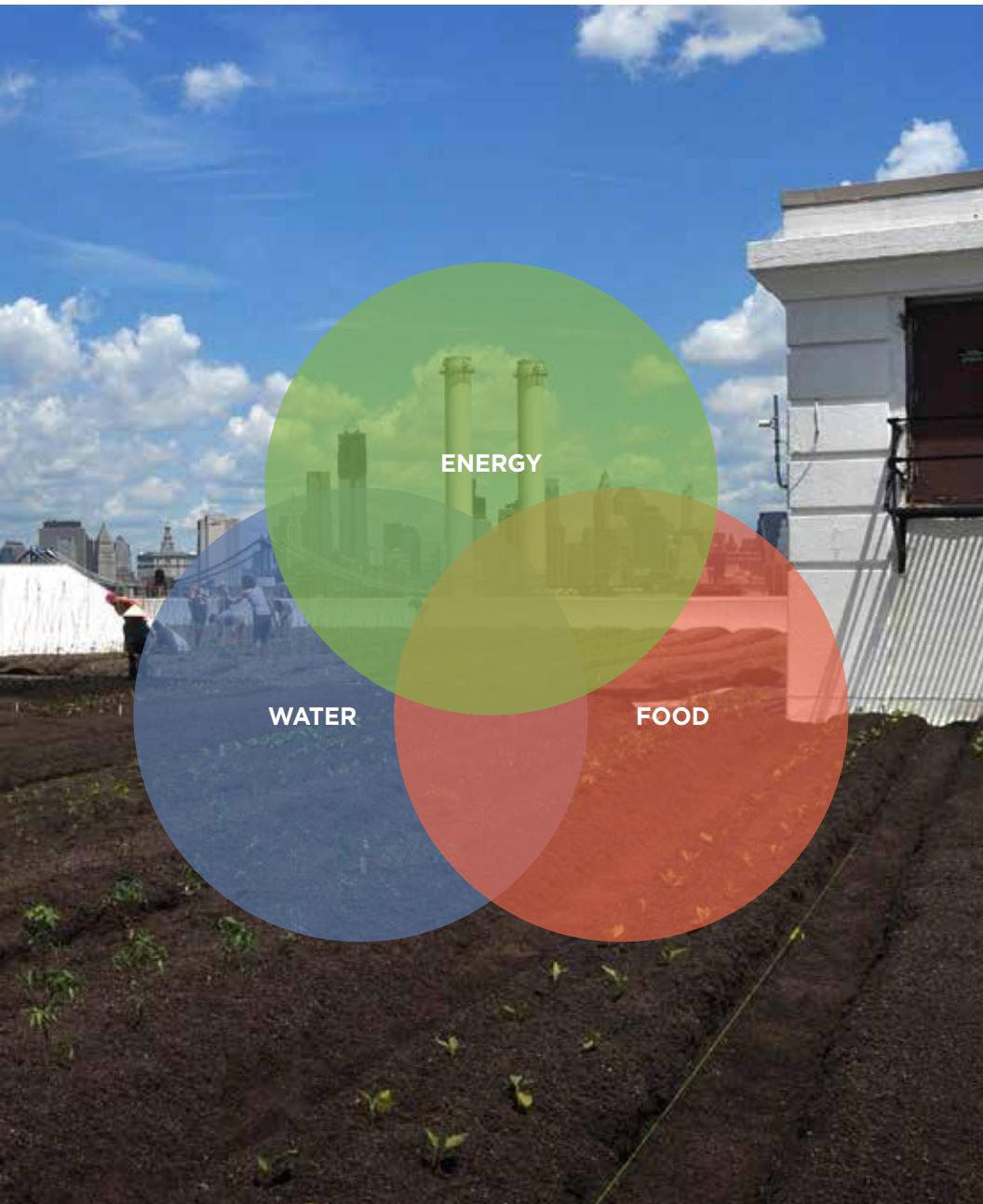


We need to better understand the connections between growing enough food, meeting rising energy needs and providing ample clean water for people around the world.

However, this isn't just the responsibility of industry, corporations and governments. We, as individuals, have an important role to play.

Our everyday food, water and energy choices have a profound effect on each other and the environment. The more we take these connections into consideration — call it “nexus thinking” — the better our chances will be of achieving a sustainable future.

MEET THE NEXUS: HOW FOOD, WATER AND ENERGY ARE CONNECTED



NEXUS FACTS:

Let's look at a few examples of how important it is to take the food, water and energy nexus into consideration, and how nexus thinking can help us make more sustainable choices.



Water/Food: Irrigation

About 80 percent of all freshwater consumed in the US goes to agriculture to irrigate crops. More efficient methods like slow drip irrigation, which applies water directly to the base of plants rather than spraying it into the air over the crops, are a better choice.



Water/Energy: Power Plant Water Use

Conventional power plants withdraw a lot of water for cooling — in some cases over a billion gallons per day — but can shrink their water footprint today by recycling cooling water or using air to cool excess heat.



Food/Energy: Biofuels

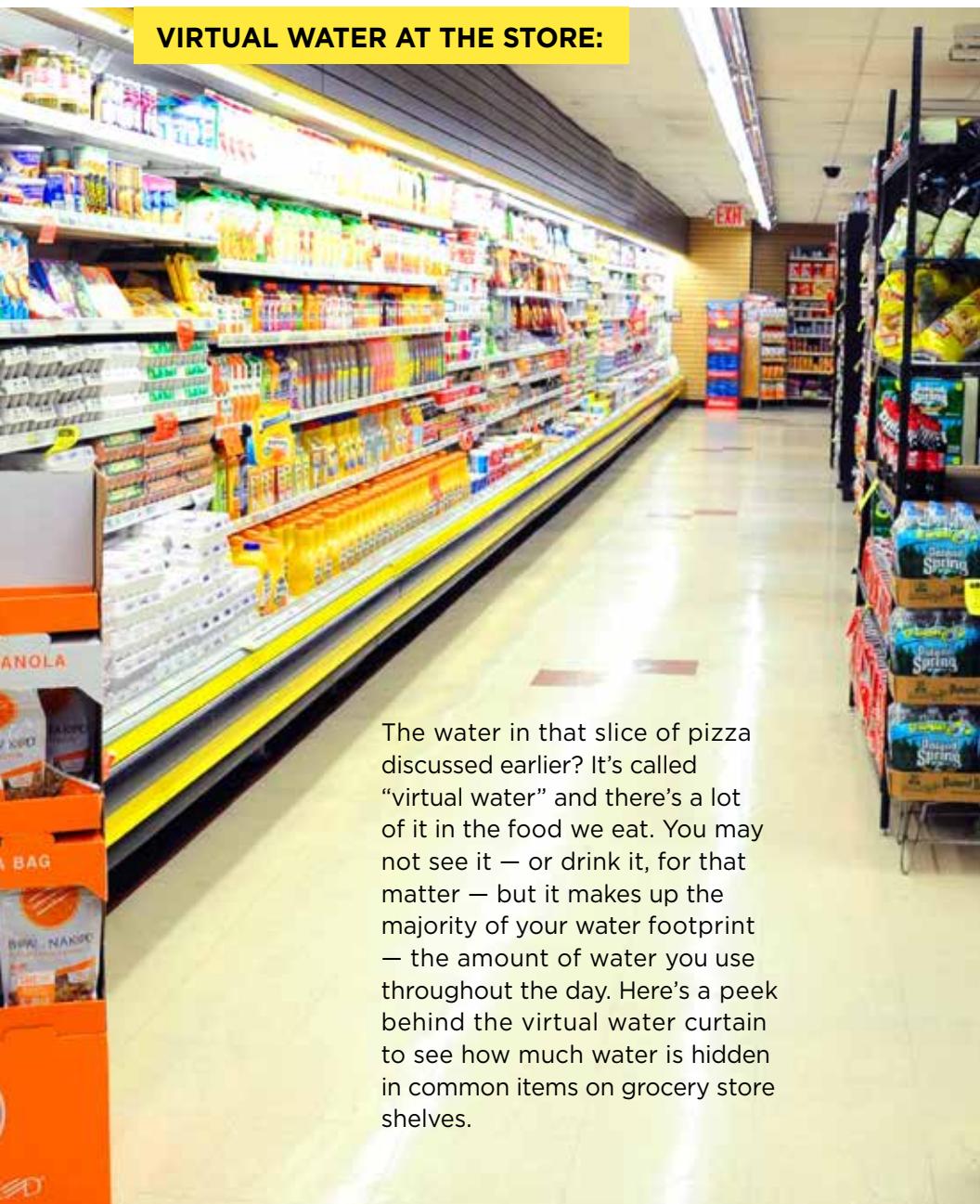
In recent years, 40 percent of US corn was converted into ethanol. Using corn to power our cars and trucks can strain our food supplies. In addition, the industrial production of corn has led to algae blooms in local water ways, harming aquatic life. Advanced biofuels like algae have potential to produce fuel without threatening food supplies and with less demand on water and energy.



Food/Water/Energy: Food Waste

Americans throw 40 percent of their food in the trash every year, costing the average family as much as \$2,275 annually. About 25 percent of water consumed in the US each year goes toward food that never gets eaten. Meal planning is a great way to reduce food waste and to save water, energy and money.

VIRTUAL WATER AT THE STORE:



The water in that slice of pizza discussed earlier? It's called "virtual water" and there's a lot of it in the food we eat. You may not see it — or drink it, for that matter — but it makes up the majority of your water footprint — the amount of water you use throughout the day. Here's a peek behind the virtual water curtain to see how much water is hidden in common items on grocery store shelves.



Note: These are estimates of each item's "global water footprint values." Each value is variable, based on where and how the items were produced.

NEXUS AT HOME:



Solar panels
don't need water
to generate
electricity.

The average
US driver uses
27 gallons of
water a day.

25 percent
of freshwater
consumed each
year is lost to
wasted food.



GOVERNMENT GETTING IT RIGHT:



Wastewater Reuse:

The city of San Antonio, TX is a pioneer when it comes to reusing wastewater. Since the 1960s, the city's wastewater treatment plant has provided water to the city's energy utility.

Today the San Antonio Water System provides up to 16 billion gallons per year for cooling at CPS Energy's power plants, taking pressure off the region's freshwater supplies.



Water and Energy Efficiency:

The town of Windsor, CA helps its residents save energy, water and money through its Efficiency PAYS program. Windsor's creative financing program allows residents to invest in water- and energy-efficient fixtures, lighting, appliances and even landscaping without having to pay for it upfront. Instead, participants pay a surcharge on their water bill. Once the upgrades are paid for through the surcharge, all of the savings go to the homeowner or renter.



Renewable Energy Park

The town of Hempstead, NY built an unparalleled renewable energy park to meet electricity and a portion of heating and cooling needs, of a municipal building. The seaside energy park includes a 120-foot wind turbine, solar-powered buildings, a solar hot water system, a solar car port, a geothermal energy system, a hydrogen and compressed natural gas fueling station, and even a solar- and wind-powered shellfish nursery.

BUSINESSES GETTING IT RIGHT:



Food Waste Disposal:

You've probably heard of farm-to-table, but Wayne Koeckeritz discovered that there's also value in table-to-farm. The South Carolina entrepreneur established Food Waste Disposal LLC to collect food waste from schools, hospitals and restaurants and return it to gardens and farms where this food trash — and the energy and water required to produce it — can be turned into valuable compost.



Meadow Maid Foods:

Meadow Maid Foods, owned and operated by the Ridenour family in Yoder, WY, is a nearly self-sufficient ranch. Almost every bit of their beef cattle's forage diet is grown on the farm and the Ridenours avoid chemical fertilizers on their vegetable crops. Both practices lower their water footprint and their dependence on fossil fuels. Because they graze their cattle, the only input of fossil fuel used to raise the Ridenour's cattle may be in the transportation of the emergency supply of winter hay that's shipped in from a farm 15 miles away.



Growing Power:

Will Allen is an urban farmer based out of Milwaukee, WI. His organization, Growing Power, gives hands-on guidance to groups looking to grow food locally and then share those skills in neighboring communities. Allen shows others how to use vermiculture (worm composting) and aquaponics (raising both aquatic life and plants in one system), both of which reduce energy and water needs.

TIPS: WHAT CAN YOU DO?

There's no doubt that the scope of the food, water and energy nexus can be daunting. Challenges and opportunities exist at every level, from individuals to nations. The good news is that there are plenty of ways you can make a difference. Here are some ideas to get you started.

Food Choices

- *Reduce food waste.* Wasted food adds up to wasted energy and wasted water.
- *Try Meatless Monday.* It takes more water and fossil fuel energy to produce meat than vegetables and grains, so skip meat for just one day a week to shrink your water and energy footprint.
- *Support sustainable farms.* When possible, buy food from sustainable farms that minimize the use of hazardous pesticides and synthetic fertilizers. This reduces energy inputs and protects waterways from being polluted by runoff.



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Water Choices

- **Saving water, saves energy.** By using less water at home — for example, using low-flow showerheads and repairing leaks — less water goes down the drain and has to be piped to and cleaned at a treatment plant.
- **Buy less stuff.** By reusing and recycling products you can reduce your indirect water use, which can lessen your impact on food and energy resources.
- **Say “No” to bottled water.** In 2006 the equivalent of more than 17 million barrels of oil were required just to make the plastic to meet America’s thirst for bottled water.





Energy Choices

- ***Be efficient.*** Purchase energy efficient products (look for the Energy Star label) when you replace your old appliances. You will save energy *and* water.
- ***Go renewable!*** Solar electric panels and many other renewable electric systems require little to no water, unlike conventional power plants.
- ***Switch to green power.*** Use the EPA Green Power Locator to choose green power options available through your utility.



NEXUS RESOURCES:

Are you interested in learning more about the food, water and energy nexus? Dive into the details at gracelinks.org for reports, tools and daily blog posts. Below you'll find our curated list of other key nexus-related reports and organizations.

ORGANIZATIONS

Institute for Agriculture and Trade Policy

IATP works locally and globally at the intersection of policy and practice to ensure fair and sustainable food, farm and trade systems. The Institute focuses on food, water and energy issues among others.

iatp.org

Johns Hopkins Center for a Livable Future

The Center, based out of the Bloomberg School of Public Health, works to research and communicate the complex interrelationships between diet, food production, environment and human health.

jhsph.edu/clf

Natural Resources Defense Council

The Natural Resources Defense Council's purpose is to safeguard the Earth: its people, its plants and animals and the natural systems on which all life depends.

nrdc.org

Pacific Institute

The Pacific Institute works to create a healthier planet and sustainable communities, by focusing on four initiatives:

International Water and Communities, Water Use in Business, Climate Impacts and Adaptation, and Integrity of Science.
pacinst.org

Post Carbon Institute

Post Carbon Institute provides individuals, communities, businesses, and governments with the resources needed to understand and respond to the interrelated economic, energy, environmental, and equity crises that define the 21st century.

postcarbon.org

River Network

The River Network’s “Rivers, Energy & Climate Program” informs the public about how the nation’s energy choices impact not only climate, but also the availability of fresh water resources.

rivernetwork.org

Union of Concerned Scientists

UCS has numerous reports and infographics that explain how the energy-water connection can turn into a collision — with dangerous implications for both.

ucsusa.org

Webber Energy Group

Professor Michael Webber's research group at the University of Texas at Austin has four broad topical areas of research:

- 1) The Energy-Water Nexus; 2) Dynamic Modeling of Complicated Energy Systems; 3) Alternative Transportation Fuels; and 4) The Nexus of Food, Waste and Energy.

webberenergygroup.com

FURTHER READING

Alliance for Water Efficiency

allianceforwaterefficiency.org

American Council for an Energy Efficient Economy

aceee.org

Circle of Blue

circleofblue.org

Eat Well Guide

eatwellguide.org

Sandia National Laboratories

sandia.gov

United States Environmental Protection Agency

epa.gov

United States Geological Survey

usgs.gov

Water, Energy & Food Security Resource Platform

water-energy-food.org

Water Footprint Network

waterfootprint.org

Meet the Nexus: How Food, Water and Energy are Connected

Project manager: Peter Hanlon

GRACE review team: Dawn Brighid, Kristen Demaline, Leslie Hatfield, Chris Hunt, Robin Madel, Kyle Rabin, James Rose, Kai Olson-Sawyer

Design: Katie Sweetman

GRACE Communications Foundation builds partnerships and develops innovative media strategies that increase public awareness of the relationships among food, water and energy systems.

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The logo consists of the word "GRACE" in a bold, white, sans-serif font. A thin, white, curved line arches over the letters, starting from the top left of the 'G' and ending at the bottom right of the 'E'.

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