YOUR WATER FOOTPRINT: The Shocking Facts About How Much Water We Use to Make Everyday Products

Excerpt from the Introduction

Do you know you're wearing water? It takes more than 7,600 liters (2,000 gallons) of water to make a single pair of jeans and another 2,460 liters (650 gallons) to make a T-shirt. And you're eating water too. That morning cup of coffee required 140 liters (37 gallons) of water before it found its way to your table--water that was used to grow, process and ship the coffee beans. If you include toast, two eggs and some milk in your coffee, the water footprint of your breakfast totals about 700 liters (185 gallons).

Furniture, houses, cars, roads, buildings--practically everything we make uses water in the manufacturing process. When we spend money on food, clothes, cellphones or even electricity, we are buying water. A lot of water. Generating electricity from coal, oil, gas, and nuclear or hydro power involves the world's second biggest use of water after food production. Making paper is another very water-intensive process. This book required about 980 liters (260 gallons) of water to produce, or more than your morning breakfast.

We are surrounded by a hidden world of water. This unseen water is called "virtual" or "embodied" water. Even though we don't see the water it took to make a T-shirt, couch or TV, that water is just as real as the water we drink or shower with. Each of us uses far more virtual water than the "regular" water we can see, feel and taste.

According to government statistics, the average American's direct water use (the "regular" water) is around 378 liters (100 gallons) every day for showers, toilet use, washing, cooking and drinking. The virtual water in the things we eat, wear and use during a day averages 7,500 liters (1,980 gallons). That means the average American's "water footprint"--the total amount of direct plus virtual freshwater use--is about 8,000 liters (2,115 gallons) per day. Since 1 liter weighs 1 kilogram (2.2 pounds), that's the weight of four cars you have to haul if you get all that water from a well.

Due to our excessive consumption habits, a North American's daily water footprint (direct plus virtual water) is more than twice the size of the global average. Think of it as running shoes placed side by side: the global shoe is a size 8, while the North American's is a size 18. By contrast, the Chinese or Indian water footprint is a tiny size 6.

The Water Footprint of a Bottle of Cola

To get a better understanding of virtual water and the water footprint concept, let's take a look at one popular product: a bottle of cola. Cola is almost entirely water, so a half-liter (17-ounce) bottle effectively contains 500 milliliters of water. That's the direct water input. But cola is not just water in a bottle. It contains sugar, carbon dioxide and syrup for flavoring. Sugar can be made from sugar beets, sugar cane or corn. All those crops need a lot of water to grow and to

process into sugar, and the amount of water they need varies depending on where they are grown. If the sugar is made from corn grown in the United States, about 30 liters (7.9 gallons) of water was needed to grow and process the corn to make the sugar for our bottle of cola. The syrup flavoring contains small amounts of vanilla extract and caffeine from coffee beans. Vanilla and coffee require shockingly large amounts of water to grow and process. It takes about 80 liters (21 gallons) to grow and process the vanilla and 53 liters (14 gallons) to grow and process the coffee required to make just one bottle of cola.

The plastic cola bottle is made from oil. Water is crucial for the process of getting oil out of the ground and turning it into chemicals and plastics. Roughly 5 liters (1.3 gallons) of water is needed to make one half-liter (17-ounce) bottle. Then additional water is needed for packaging, shipping and so on, although these amounts are relatively small. Add all this together and the total water footprint of a bottle of cola is 175 liters (46 gallons). In other words, drinking a bottle of cola is like consuming 350 bottles of water. Stack them one on top of the other and they'd create a skinny water tower as tall as a 25-story building.

The word *consume* is used because the water footprints in this book represent amounts of water used that are not returned to an accessible location for reuse. Often water can be reused or cleaned, but the water footprint numbers here represent the net amount consumed. In other words, a water footprint is the total amount of water used, minus the clean water returned to a suitable source.

There are different ways to calculate a water footprint, so there may be differences in the numbers of liters consumed for various things. What's important is knowing that we depend on surprisingly large amounts of water in all facets of our daily lives.

Hardly anyone, including the business community and governments, is truly aware of how much water is needed to grow our food or manufacture consumer products. Yet water scarcity is already a reality in much of the world. About 1.2 billion people live in areas with chronic water scarcity, while another 2 billion are affected by shortages every year. And water scarcity is increasingly affecting people in the United States and Canada. By 2025, three in five people may be living with water shortages.

Planet Earth should really be known as Planet Water, since 70 percent of its surface is covered by water. About 97 percent of this is saltwater in the world's oceans. Of the 3 percent that is the planet's freshwater, 68.7 percent is encased in pack ice and glaciers, particularly in Antarctica and Greenland. Another 30 percent of our freshwater is in groundwater, and almost 1 percent in high-latitude permafrost.

Available freshwater is spread very unevenly across the planet. Canada has 9 percent of the world's freshwater, but most of that flows into the Arctic Ocean. Even with this abundance of water, 25 percent of Canadian municipalities have experienced water shortages. Many countries, including those in the Middle East, northern Africa, southern Europe and large parts of Asia, have relatively little water.

Lakes account for just 0.26 percent of global freshwater, while all Earth's mighty rivers amount to only a tiny 0.006 percent. Together rivers and lakes represent only 1/375th of all the freshwater on the planet. That's like a parking lot with 374 red cars and a single, lonely blue one representing all the world's rivers and lakes.

A water molecule--H2O--is made up of three atoms: two hydrogen and one oxygen. That simple configuration has near magical properties. You can freeze it, melt it, heat it and evaporate it. Almost anything can be dissolved in water. We often forget that Earth is literally a closed system, like a vessel in outer space. The total amount of water we have now is the same as it was a billion years ago. Water cannot be manufactured; it can only be moved around. We're very good at moving water around by using pipelines and canals. We're not so good at acknowledging that moving water around always means that some other place will then have less water.

Water is in constant motion. It evaporates from seas and continents, rains down from the clouds and flows from land to ocean through runoff. This is called the hydrological or water cycle. When rain falls, some of it evaporates and returns to the atmosphere; some is absorbed by soil and then taken up by plants. With enough rain, water runs off into a stream or river. Eventually all river water ends up in the world's oceans.

For a river basin or watershed to be sustainable, the amount of water we use should be no more than 20 percent of the precipitation that falls within it. Why not more? First, some of it evaporates. The warmer the temperatures and the drier the air, the more water evaporates. The mighty Great Lakes, containing about 20 percent of the world's surface freshwater, have experienced falling water levels in the past decade, mostly because of increased evaporation caused by warmer winter temperatures and little ice cover. Less than 1 percent of the water in the Great Lakes is renewed each year by rain and snow. The rest is 12,000-year-old water from melting of the ice sheet that once covered much of North America.

The same applies to most groundwater, including aquifers (i.e., natural underground water storage areas). We cannot take more than its natural rate of recharge from precipitation or those sources too will eventually empty, resulting in land subsidence, sinkholes or, if near coastal areas, flooding with seawater. Deep aquifers recharge at a prohibitively slow rate, and fully confined aquifers are considered non-renewable. This water is a one-time gift of nature; once emptied it cannot refill on a human time scale.

To prevent too much water from being taken, withdrawals must be limited to its "sustainable yield." A water body's sustainable yield is the amount of water that can be taken or used without having a negative impact. The second reason for limiting water withdrawals is that nature needs the rest to maintain healthy ecosystems that provide us with vital services. Nature's "green machine" of forests, wetlands and shoreline vegetation both store and clean water, not to mention cleaning the air and producing oxygen.

Humanity faces difficult choices about how best to use the limited amount of water that we have. This has become even more challenging with growing demands on water from a rising population that's expected to add a billion more people by 2030. The era of abundant, low-cost water is fading with growing water shortages, rising costs for the infrastructure that delivers

water to our homes and industries, and the reality that everything we consume or use--from electricity to smartphones--needs water. Even relatively water-rich regions face water challenges, all too often because of poor water management and wasteful policies.

By knowing how dependent we are on water, not only for our health but also for our modern lifestyle, we can reduce waste, change habits and make water-smart decisions about our purchases to save water and money. Ultimately water use is all about choice. We can choose to use our water for drinking, growing food, making clothes, cars, highways, buildings, electronics, or generating energy. And we can choose to do these things using less water.

This book is not intended to list all the water footprints of everything you use in your daily life. The usefulness of the water footprint concept is that it illustrates the depth and breadth of our dependency on water in every aspect of our lives. Water footprints tell us that each North American consumes nearly 3 million liters (0.8 million gallons) of water a year. And that makes it easier to understand how changes in water availability such as drought can have local, regional, national and even globe-spanning impacts.