‘Back to the Tap’: a Global Battle against Bottled Water Industry

Huiju Tsai

Technische Universität Bergakademie Freiberg

Correspondence: tsaihuiju@gmail.com

Abstract

The global bottled water industry has been enjoying great prosperity in the past decade. In 2007, world consumption of bottled water totaled 188 billion liters, with an average annual growth rate of 8.8% from 1997 to 2007. Total revenues of the global bottled water market was $US 66.6 billion in 2007, representing a compound annual growth rate (CAGR) of 6.2% for the period 2003-2007. However, while the industry has been expanding at a high speed, a ‘Back to the Tap’ movement against bottled water developed in Northern America, Europe and other developed countries in recent years. City governments, high-class restaurants, schools, and religious groups urge to ditch bottled water and encourage people to drink the public water from the faucet. Environmentalists condemn bottled water as wasteful and even immoral. Bottled water has been seen as an ‘Eco-sin’. This article aims to give an insight into this issue. The stands of the protests, consumer views and bottling companies are analyzed and commented. Measures to be taken are further discussed. Finally, the potential new markets that might emerge under the ‘anti-bottled water’ trend are explored.

Keywords: Bottled water industry, PET bottles, energy consumption, water management

Introduction

The global bottled water market has been expanding rapidly in the past decade (See Figure 1). In 2007, world consumption of bottled water stood at a total of 188 billion liters, more than double (80 billion) in 1997. The consumption volume has grown fast from 1997 to 2007, with an average annual growth rate of approximately 8.8%. Between 1998 and 2003, the average annual growth rate exceeded 10%. The total revenues of the global bottled water market equaled $US 66.6 billion in 2007, representing a compound annual growth rate (CAGR) of 6.2% for the period 2003-2007 (See Figure 2). The market has expanded in all regions. The United States is the world’s leading consumer of bottled water. In 2007, Americans drank almost 33 billion liters (See Figure 3).
Mexico has the second highest consumption with 22 billion liters. China exceeded Brazil in 2004 and has become the third biggest country for bottled water consumption since then, consuming 18 billion liters in 2007. Italy and Germany, following Brazil, rank as the fifth and sixth countries, respectively. In terms of per capita consumption, the world average amount was about 28.7 liters in 2007, jumping from 18 liters in 2000. The United Arab Emirates and Mexico, speeding up to exceed Italy in 2007, are the world’s top two countries in terms of per capita consumption. In the United Arab Emirates, consumers purchased an average of 260 liters of bottled water per person in 2007 (Beverage Marketing Corporation, 2008, in: IBWA). Generally speaking, Europe is the top region for bottled water consumption, accounting for 50.1% of the global market share in 2007 (Datamonitor, 2008).

North America, following Europe, represents the second biggest market. However, Asia has the highest annual growth rate (See Figure 4). Zenith International, a leading drinks consultancy company, predicted that global bottled water consumption would rise a further 32% to 272 billion liters in 2012 (Palmer, 2008).

While the global bottled water industry has been growing fast, a movement known as ‘Back to the Tap’ has risen in many countries to boycott bottled water products. On 18th August 2008, residents in London, Ontario, Canada, were informed through local media about a council vote to ban bottled water in municipal facilities. London became one of the first cities in Canada to stop selling bottled water in municipal buildings (CBC News, 2008). Two days later, on December 2nd, 2008 Toronto City Council voted to ban the sale of plastic water bottles on all municipal premises by 2011.
Furthermore, by the end of 2008, according to the Polaris Institute, 17 municipalities from five provinces in Canada had banned bottled water, and another 45 municipalities were planning to restrict bottled water (Canwest News Service, 2008). Thus, a backlash movement against bottled water became a trend among cities in the country.

In the United States, Chicago passed a 5-cent-per-bottle tax on bottled water sold within city limits in November, 2007. Chicago became the first city in the country to enforce a tax on bottled water. The new law was expected to raise $10.5 million for the city annually. The revenue was planned to be used for the maintenance of the city’s water infrastructure (Clair, 2007). The state of Washington, following the bottled water tax in Chicago, considered to impose a fine on the sale of petroleum-based water bottles “by any retail store, wholesale club or vending machine provider.” State agencies would be also prohibited to buy such products (Beverage Industry, 2008a). In addition, the San Francisco Mayor barred officials from using municipal funds to buy bottled water in the summer of 2007, while New York City launched a $1 million campaign to encourage citizens to drink the city’s clean municipal water. In Salt Lake City the mayor asked to stop serve bottled water at municipal events (Walsh, 2007). The backlash against bottled water also took place in Europe. Early in 2005, the Paris municipality distributed free designer carafes in a bid to obtain a majority of the population back to drinking tap water (BBC News, 2005a). In the United Kingdom in 2008, the Cabinet sent an order to the head of every government department to phase out bottled water in government offices (Politics.Co.UK., 2008). Schools, restaurants and religion groups also launched activities against drinking bottled water. Washington University banned the sale of bottled water on its campuses at the end of last year, and other universities, like University

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**Figure 5: Product life cycle of bottled water and controversies over bottled water industry.**

1. Bulk water from source
2. Water treatment
3. Filling & Packaging
4. Retailers
5. Consumers
6. Water bottle disposal

The controversies:
1. Depletion of fresh water resources
2. High energy consumption
3. Big carbon footprint
4. High product prices
5. The quality and safety issues
6. Plastic bottle disposal
of Leeds in England, were planning to follow the same approach (O’Neil, 2008; The National Student, 2009). Del Posto, a top restaurant in Manhattan, reported to stop selling bottled water and serve diners its kitchen’s purified tap water, sparkling and still (Walsh, 2007). On the list of the ‘Top 10 Food Trends of 2008’ conducted by Time Magazine, ‘the war on bottled water’ was ranked as number four (Time, 2009). The movement of ‘anti-bottled water’ has become a tide.

While the bottled water market has been emerging and prospering, the backlash against this product has been also growing worldwide. This paper aims to give an overview of this issue. The claims by protesters, consumers and bottlers will be examined. Certain suggestions about what could be done to solve the ‘bottled water conflict’ will be further discussed. Moreover, some potential new markets that might emerge under the ‘anti-bottled water’ trend will be explored.

Protests: arguments against bottled water

The arguments against bottled water are addressed along the product life cycle illustrated in Figure 5. Six key issues have been argued.

1. Depletion of fresh water resources

Bottling companies have been accused of depleting precious fresh water resources (Howard, 2003; Lohan, 2007; Polaris Institute, 2009) since groundwater is considered as a ‘non-renewable’ resource (Foster and Loucks, 2006). The depletion of groundwater could have severe impacts not only on local ecosystems but also on local communities and the economy (Foster and Loucks, 2006; Polaris Institute, 2009). For the manufacturing of bottled water, companies may pump up to more than 500 gallons of water per minute from every well, with operations in many cases going on 24 hours a day and 365 days a year (Howard, 2003). The permits to draw water normally last for decades. The huge amount of water extraction concentrated in communities often disturbs local water balances, and further impacts local residential, agricultural and fishery water uses and ecosystems. Thus, water pumping often draws public opposition and outrage in local communities (Howard, 2003; Lohan, 2007; Polaris Institute, 2009).

One example of protest concerns is the opposition against Nestlé Waters North America in McCloud, in the United States. McCloud is a small town with less than 1400 residents with an abundance of pristine spring water coming from the Shasta's glaciers (Lohan, 2007). In 2003, Nestlé signed a contract with the McCloud Community Service District (MCSD) to build a 1 million-square-foot water bottling facility. In the contract (see Box 1), Nestlé gained superior water rights for 100 years to pump 1,250 gallons of spring water per minute at a rate of 1,600 acre-feet a year. An additional unknown amount of well water could also be taken for production purposes. According to the contract, during the 100-year period, ‘regardless of drought or other shortage, Nestlé has the rights to take its maximum water draw. If the water draw is slowed or stopped for any reason, the District must make a restitution to Nestlé for its losses’ (McCloud Watershed Council, 2003). How much did Nestlé have to pay for this right? The company pays 0.000087 cents per gallon for the water.
it takes from McCloud’s springs. That is a rate of 22 times lower than what local residents pay for drinking water. Since the company can sell a 16-ounce bottle of the water at a price of around $1.29, or $10.32 per gallon, Nestlé can make $5,380,451,712 from the 1,600 acre-feet per year, by only selling the spring water from McCloud (Lohan, 2007). This deal angered the local community and a lawsuit against Nestlé went on for years. Finally, in August 2008, Nestlé withdrew from the contract (Food & Water Watch, 2008).

The depletion of groundwater by bottling companies has also been reported to have caused strong impacts on local communities. In Kerala, India, Coca Cola established Hindustan Coca-Cola Beverages Pvt. Ltd in 1998-99 in a 40-acre plot. From this plant, the company took away 15 million liters of groundwater every day free of cost (PUCL, 2002). This huge water extraction resulted in the depletion of water sources. Local farmers eventually had to dig deeper and deeper to search for water, sometimes under dangerous conditions.

Global Issues reported that some farmers were digging as deep as 450 feet without finding water (Global Issues, 2007). Furthermore, during the bottling process, the use of chemicals and effluents for bottle washing, released without treatment by the bottling company had contaminated the groundwater, creating a water crisis for the surrounding communities and farmers, and consequently, the local poverty situation worsened (PUCL, 2002). In 2000, violent protests by furious villagers forced the company to finally shut down the plant (Global Issues, 2007).

Moreover, not all water extracted is bottled for consumption. The Pacific Institute (2007) estimates that one liter of bottled water sold represents three liters of water used. In addition to the water sold in plastic bottles, twice that amount of water is needed in the production process. Generally, water bottlers typically do not pay or pay only very low rates for the right to use this precious public resource (Cormier, 2008; Saxe, 2008).

### 2. High energy consumption

Energy is required through the whole product life cycle of bottled water. Figure 5 illustrates the path of energy requirement during the bottled water product life cycle. Energy is required to capture and treat water at the water sources, send it to the bottling plant, fill and package it in the bottling plant, and transport the product to retailers and consumers. Energy is also needed to cool the bottled water and, after consumption, recycle or dispose the used containers (Pacific Institute, 2007).

Calculating the total energy consumption needed during the whole product life cycle is a complex task (Gleick and Cooley, 2009). It can vary by location and type of water source, location of consumers, types of materials and packaging, methods of transportation, and other factors. Gleick and Cooley (2009) conducted a study to calculate the quantity of energy required for bottled water consumption. Table 1 lists the energy requirement during production. Based on three different scenarios, the total energy needed to produce one liter of bottled water ranged from 5.6 MJ (th) to 10.2 MJ (th).

According to this study, the stage requiring most energy during the whole product life cycle of bottled water consists in the manufacturing of PET bottles. The total energy needed for that stage is approximately 100 MJ (th) per kilogram or 100,000 MJ (th) per ton of PET. Based on average weight-to-volume data, around 4.0 MJ of energy is needed to manufacture one typical 38-gram-weight PET bottle. Since global PET consumption for bottled water is estimated to be about three million tons, approximately 300 billion MJ (th) of energy is required to meet the global PET demand of

<table>
<thead>
<tr>
<th>Energy intensity (MJ/th) t⁻¹</th>
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<tbody>
<tr>
<td>Manufacture plastic bottle</td>
<td>4.0</td>
</tr>
<tr>
<td>Treatment at bottling plant</td>
<td>0.0001–0.02</td>
</tr>
<tr>
<td>Fill, label, and seal bottle</td>
<td>0.01</td>
</tr>
<tr>
<td>Transportation: range from three scenarios</td>
<td>1.4–5.8</td>
</tr>
<tr>
<td>Cooling</td>
<td>0.2–0.4</td>
</tr>
<tr>
<td>Total</td>
<td>5.6–10.2</td>
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Table 1: Total energy requirements for producing bottled water. Source: Gleick and Cooley, 2009
the bottled water industry. This is the energy equivalent of approximately 50 million barrels of oil per year (Gleick and Cooley, 2009).

The energy used for the transportation of bottled water can be also high, depending on two factors: the distance from the bottling plant to the market and the mode of transportation (Gleick and Cooley, 2009). After being filled, the bottles may be transported by boat, train, and truck. In the same study, three different scenarios for products shipped to Los Angeles, California, are assumed for the purpose of evaluation: (1) processed municipal water that is distributed locally by truck; (2) spring water produced in the South Pacific (such as Fiji SpringWater), transported by ship to Los Angeles, and distributed locally by truck, and (3) spring water packaged in France (such as Evian), shipped to the eastern United States, transported by freight railcars to Los Angeles, and distributed locally by truck. Based on the energy requirements of the three modes of transportation (See Table 2), the calculation results in a wide range of total energy requirements for the three scenarios: 1.4, 4.0 and 5.8 MJ per liter, respectively (Gleick and Cooley, 2009). To import bottled water from France requires four times more energy than to draw water from a local source in Los Angeles.

Nearly a quarter of all bottled water is transported across national borders to consumers (Owen, 2006). For instance, in 2004, a bottled water company in Helsinki, Finland, shipped 1.4 million bottles of Finnish tap water to Saudi Arabia. The distance from the water source is 2,700 miles (4,300 kilometers). Two large French bottled water brands, Evian and Volvic, are reported to export between 50 and 60 percent of their water to destinations across the globe (Owen, 2006). Moreover, bottled water is not just sold to water-scarce countries, like Saudi Arabia. In the United States, Americans import water shipped for about 9,000 kilometers from Fiji and other faraway places (Arnold and Larsen, 2006). In the United Kingdom, 500,000 bottles are imported annually, mostly from France (Smith, 2008). All these movements require substantial energy consumption.

### Table 2: Transportation energy costs.

<table>
<thead>
<tr>
<th>Cargo ship/ocean</th>
<th>Air cargo</th>
<th>Rail</th>
<th>Heavy truck</th>
<th>Medium truck</th>
</tr>
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<tbody>
<tr>
<td>(MJ t⁻¹ km⁻¹)</td>
<td>(MJ t⁻¹ km⁻¹)</td>
<td>(MJ t⁻¹ km⁻¹)</td>
<td>(MJ t⁻¹ km⁻¹)</td>
<td>(MJ t⁻¹ km⁻¹)</td>
</tr>
<tr>
<td>0.37</td>
<td>15.9</td>
<td>0.23</td>
<td>3.5</td>
<td>6.8</td>
</tr>
</tbody>
</table>

**Source:** Gleick and Cooley, 2009

### 3. Big carbon footprint

The bottled water industry has been blamed for its big carbon footprint. Poulter (2008) compared the carbon footprints of tap water and bottled water in the United Kingdom. The supply of bottled water in the United Kingdom is estimated to cause emissions of 0.172 kg CO₂eq per liter, i.e. 500 times higher than the provision of tap water (around 0.0003 kg CO₂eq per liter) in the same country (Poulter, 2008). Fiji Water published the carbon footprint data of its bottled water products on its company website (FijiGreen.com). Data show that Fiji’s products emitted between 230 to 801 grams of CO₂eq per bottle (See Table 3). In terms of an average carbon footprint per liter, the smaller is the product size, the higher is the CO₂ emission. Small bottles require a larger amount of packaging material. Clearly, more material also means more weight for transportation. The production of one 330 ml bottle can imply 30% larger emissions of CO₂ in comparison to one 1.5 l bottle.

According to Fiji Water, its overall carbon footprint was 85,396 tons CO₂eq for the entire 2006 – 2007

### Table 3: Carbon footprint of Fiji bottled water.

<table>
<thead>
<tr>
<th>Bottle size</th>
<th>Carbon Footprint (grams CO₂eq)</th>
<th>Carbon Footprint (grams CO₂eq/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>330 ml</td>
<td>230</td>
<td>697</td>
</tr>
<tr>
<td>500 ml</td>
<td>302</td>
<td>604</td>
</tr>
<tr>
<td>1 L</td>
<td>573</td>
<td>573</td>
</tr>
<tr>
<td>1.5 L</td>
<td>801</td>
<td>534</td>
</tr>
</tbody>
</table>

**Source:** Modified from Fiji Green.com
production period (See Figure 6). The manufacture of packaging materials and ocean freight lead to more than 50% of Fiji’s CO$_2$ emissions. This is compatible with the high energy consumption of PET bottle manufacturing and bottled water transportation, as indicated by Gleick and Cooley (2009).

The Pacific Institute (2008) estimated that every ton of PET production implies the emission of around 3 tons of CO$_2$. Based on this data, bottling water lead to CO$_2$ emissions of more than 2.5 million tons in the United States in 2006 (Pacific Institute, 2008). In the United Kingdom, the bottled water industry was responsible for 200,000 tons of CO$_2$eq emissions each year. In order to absorb an equivalent amount of CO$_2$ emissions, 57,140 trees would be needed to be planted annually (Smith, 2008).

4. Highly expensive prices

Bottled water is a highly expensive product compared to municipal water supply. Figure 7 shows the bottled water prices in different countries compared to the price of tap water in California, United States in 2003.

In California, the price of bottled water can be 1990 times higher than that of municipal tap water. The bottled water price is also generally high in other countries. Even in Nepal, the average price of bottled water was $US 206 per cubic meter, which was 412 times higher than the California’s municipal water price. In the United Kingdom, the average cost of tap water in England and Wales is about 0.1 pence per liter, while in the same regions bottled water costs 95 pence per liter, i.e. 950 times more than tap water (Smith, 2008). According to Gleick (2004), the bottled water price exceeded $US 1,500 per cubic meter in Switzerland in 1998. ‘It costs even more than gasoline’ (Owen, 2006).

5. The quality and safety of bottled water

The quality and safety of bottled water has been discussed in a controversial manner. The attention is drawn mainly on three aspects. Firstly, bottled water has been criticized because of generally loose regulations on safety and quality standards and inspections. In comparison with public tap water, the quality and safety of bottled water are not regulated through strict standards and regular inspections in many places, including the United States and Europe (Franklin, 2006). Generally speaking, bottled water is considered as a food product in most countries. Hence, it is often regulated by Food Administrations and not by Health Administrations. Municipal tap water is commonly regulated by Health Administrations or Environmental
In a survey, the Environmental Working Group (EWG), which is a US environmental NGO, examined 10 popular brands of bottled water purchased in 9 States and in the District of Columbia in 2008, and found a wide variety of chemical pollutants in every bottled water brand. Toxic by-products of chlorination were also detected in two big local brands, Walmart’s Sam’s Choice and Giant Supermarket’s Acadia brands. In total, 38 pollutants were found with an average of 8 pollutants in each brand (Naidenko, et al., 2008).

6. The disposal of plastic bottles

Bottled water is mostly sold in plastic containers ranging from small 8 ounce or half liter containers to multigallon bottles (Gleick and Cooley, 2009). Globally, the bottled water industry is estimated to use about 2.7 million tons of plastics each year (Arnold and Larsen, 2006), for the vast majority of water bottles in the shape of polyethylene terephthalate (PET) (Gleick and Cooley, 2009).

The disposal of single-serving PET bottles used for bottled water can cause a heavy burden on the environment. Although the PET bottles recycling rate is unknown at a global level, it is estimated to be very low. Data for the United States, the leading country of bottled water consumption in the world, might roughly reflect the global PET bottles recycling rate.

According to Franklin (2006), in 2004 about one in six plastics water bottles sold in the US was recycled (17%). Hence, the remaining 83% of used bottles (about 1.739 million kilograms) ended in landfills or incineration plants. Landfilled bottles may take 400 to 1,000 years to degrade (Arnold and Larsen, 2006; Owen, 2006).

Franklin (2006) estimates that only approximately 4% of PET bottles sold in the United States are recycled to make new plastic bottles. As a corollary, new water bottles are manufactured almost entirely from virgin petroleum resin. According to the Ecology Center (1996), manufacturing PET resin can generate toxic emissions (including nickel, ethylbenzene, ethylene oxide and benzene) to air and water 100 times higher than those of manufacturing the same size of glass bottles. Producing new PET bottles also requires of energy and resources (Franklin, 2006).

As a matter of fact, the substantial amount of plastics waste from bottled water consumption is often the key reason for governments to boycott this product. The plastics water bottle ban in Toronto City was estimated to imply a 70 % of Toronto’s waste by 2010 (Canwest...
News Service, 2008). The imposed 5 cent-per-bottle tax on bottled water in Chicago also aimed to cut the amount of plastics bottle waste in the city (Clair, 2007). Bottled water is also criticized as immoral. The commercialization of water has been questioned by some Christian groups. Phil Woolas, the Environment Minister in the United Kingdom, is quoted as saying that bottled water ‘borders on morally being unacceptable to spend hundreds of millions of pounds on bottled water when we have pure drinking water, when at the same time one of the crises that is facing the world is the supply of water’ (Smith, 2008).

People in countries with safe and cheap tap water spend huge amounts of money on bottled water, while people in countries where water is scarce have to struggle everyday to reach available water sources. Bottling water takes water resources away from the poor in developing countries. "The moral call for us is not to privatize water. Water should be free for all (Cho, 2007)."

**Bottling companies: their claims**

In order to respond to the environmental and media backlash, bottlers claim that bottled water should not be banned. The bottling companies stress that people use bottled water as a substitute for other unhealthy drinks; competing products of bottled water are other soft drinks, not tap water (Beverage Industry, 2008a; Deutsch, 2007; Owen, 2006).

‘About 70 percent of the beverages that people drink comes in packages. All our research shows that if bottled water weren’t available, people would buy Gatorade, or fruit juice, or other sugared or diet beverages. Some 16 percent say they would drink tap water -- but you can’t go into a deli and ask for a bottle of tap water,’ Statement by Kim E. Jeffery, an CEO of Nestlé Waters (Deutsch, 2007).

The International Bottled Water Association (IBWA) also argues that bottled water provides a convenient, healthy alternative to calorie-laden portable drinks or those containing caffeine and artificial additives. The Association claims that consumers choose bottled water because they want to avoid such so-called unhealthy drinks. People would turn to other drinks if governments ban bottled water (Beverage Industry, 2008a; Owen, 2006).

"People are making a substitution when they go to the fridge, so instead of getting a cola drink, they're getting a bottle of water" Statement by Patrick Racz, CEO of Icelandic Water (Walsh, 2007).

Referring to prices of bottled water, Jeffery mentioned that there is a whole range of prices. For instance, in supermarkets, prices are lower than in other points of sale. The CEO of Nestlé Waters added that bottled water is cheaper than other convenience drinks (Deutsch, 2007). Regarding to quality and safety of bottled water, he argued that some incidents were ‘problems with contamination that was introduced at the store, not at the point of manufacture (Deutsch, 2007)’. He claimed that the bottled water industry ‘adheres to a formal set of good manufacturing practices (Deutsch, 2007)’. Bottlers further argued that the industry was targeted unfairly. Moreover, the industry provides a large amount of job opportunities, which has a positive contribution to the society (Smith, 2008).

**Consumers: why bottled water?**

If bottled water is so expensive and environmentally costly, one question arises then: why do people drink bottled water? The answer to this question differs from country to country. Generally speaking, there are several reasons:

1. Dissatisfaction with tap water organoleptics
   Some people do not like the taste of tap water, as it is sometimes heavily chlorinated or contains minerals with unpleasant tastes. Bottled water often removes taste during processes. Doria (2006) conducted a study on the reasons why people turn to bottled water in the United States, Canada and France, and found that dissatisfaction with tap water organoleptics (especially taste) comes out to be particularly relevant (See Table 4). However, blind tests in many studies show that very few people can really distinguish the differences between public tap water and bottled water (Gleick, 2006; Doria, 2006).

2. Perception of ‘snob appeal’
   Drinking bottled water seems to be associated with social status (Howard, 2003; University of Arkansas, 2007)
Some studies suggest that people buy bottled water because they perceive it to be purer, safer and healthier than tap water (Doria, 2006; Reuters, 2007; University of Arkansas, 2007). Doria (2006) suggests that some consumers consider bottled water to be healthier and decide to switch to bottled water, in order to improve their health (Doria, 2006). It is found that the growth of the bottled water market appears to be closely relevant to sales of “healthy food”: 70% of organic food buyers ‘always’ drink bottled water, while 18% of non-organic food buyers do so (Hammit 1990, in Doria, 2006). Moreover, consumers’ perceptions of healthiness might be influenced by organoleptics (Doria, 2006).

(5) Effective marketing campaigns of bottled water
Another important factor that for the success of bottled water worldwide is the effective marketing campaigning by bottlers. Their marketing strategies influence the perception of consumers and they can be generally categorized into two parts: branding and marketing. Firstly, branding is used to differentiate markets. While there is no technological superiority between water companies, the brand becomes the only aspect to differentiate one bottled of water from another.

### Table 4: Reasons for drinking bottled water in USA, Canada, and France. Source: Doria, 2006.

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<tbody>
<tr>
<td>Organoleptics</td>
<td>7</td>
<td>71</td>
<td>54</td>
<td>43</td>
<td>47</td>
</tr>
<tr>
<td>Health and risk²</td>
<td>47</td>
<td>25</td>
<td>13</td>
<td>19</td>
<td>23</td>
</tr>
<tr>
<td>Prefers mineral or spring water</td>
<td>-</td>
<td>-</td>
<td>28</td>
<td>19</td>
<td>16</td>
</tr>
<tr>
<td>Substitute for other beverages</td>
<td>47</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Hardness</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>14</td>
<td>23</td>
</tr>
<tr>
<td>Other reasons (unspecified)</td>
<td>11</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Don’t know</td>
<td>-</td>
<td>1</td>
<td>-</td>
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</table>

A survey conducted by the University of Arkansas (2007) shows that income levels seem to be relevant to explain bottled water consumption. The finding suggests that Americans buy more bottled water when having a higher income, especially above $50,000 annually. In addition, it was found that young people (below an age of 40) consume more bottled water than people in other age groups. Hence, young and high-income people are more likely to purchase bottled water because of a perception of high quality.

(3) Convenience
In many countries, especially in western countries, it is generally agreed that convenience is one of the fundamental reasons why people consume bottled water. In those countries, bottled water is sold at supermarkets, convenience stores, sporting events, and hotels and more public locations (Gleick, 2006). Bottled water is portable, reliable, and widely accessible. Using bottled water can save time and energy for consumers to refill, wash and carry a bottle all the time.

(4) Perception of health, safety and purity

![Marketing claims of Aquafina, Canada. Source: company website (Retrieved February 18th, 2009)](image1)

![Marketing claims of Spiritual Water. Source: company website (Retrieved February 18th, 2009)](image2)
Secondly, bottlers use marketing claims and advertisements to build up the images of their brands. Very often the claims stress on the health benefits and purity of their brands (See Figure 9). However, in order to draw people’s attention and make a clear differentiation with other water brands, the marketing claims and advertisements tend to become more and more exaggerated (Datamonitor, 2007). Figure 10 shows the marketing claims of the Spiritual Water brand stating how it helps to purify the mind and body. Every bottle of this brand contains a Biblical text and images to inspire consumers. This may draw the attention of health-conscious Christians (Datamonitor, 2007) and does not longer relate to the statement that ‘after all, water is water’, as Karolefski (2002) notes in his report.

(6) Public water risks
In many developing countries, where tap water is either unavailable or unsafe to drink, bottled water is a better option to safe drinking water. China, ranking the third bottled water consumer country in the world, constitutes a typical example. People in this country are increasingly turning to bottled water because of severe water pollution. Water from more than half the mainstream rivers and lakes, and more than one-third of ground water sources, is too polluted to drink (Gleick, 2006; Owen, 2006; Lee, 2008). 700 million people, out of total China's 1.3 billion, drink water that is below the WHO minimum standards. Citizens with higher incomes turn to bottled water, while impoverished people can only boil tap or well water for daily drinking. However, boiling can only remove the microbes, but not chemical contaminants (Johnson, 2006).

Even in regions with generally good quality of tap water, scandals about tainted public water can influence the trust and confidence of people in the quality of municipal tap water (Doria, 2006; Poulter, 2008). Moreover, citizens tend to remember accidents for a long time (Doria, 2006). Doria (2006) provides the example of the Sydney Cryptosporidium and Giardia accident in 1998. The bottled water market saw a 40% increase and remained high for five years after the event.

(7) Basic drinking water source

<table>
<thead>
<tr>
<th>Country</th>
<th>Bottled water users (%)</th>
</tr>
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<tbody>
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<td>Dominican Republic</td>
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<td>Lao People’s Democratic Republic</td>
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<td>Haiti*</td>
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<td>Ghana**</td>
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Table 5: Countries in which more than 5 per cent of the urban population uses bottled water as their main drinking water source

* All or part of the water is sold from refilling stations that fill bottles with tap water.

** Data for Ghana only describe use of ‘sachet water’ (300 millilitre plastic bags of water).

In some developing regions, dwellers rely on bottled water as a significant source of their daily drinking water (See Table 5). Tap water is packaged in bottles and plastic sachets and sold by private enterprises (UNICEF and WHO, 2008). In general, urban areas have a much higher percentage of bottled water use than rural areas.

In most developed countries, the high-quality public tap water provides citizens with a fundamental supply and convenience when they come to the need for hydration, while in many developing regions people have to struggle for their own daily drinking water sources. The reasons why citizens in these regions drink bottled water can be thus different. Generally speaking, the reasons for dwellers in developed areas relate to factors (1) to (5) and partly (6) mentioned above. The reasons for people in developing countries relate to factors (3) to (7), depending on economic conditions.

In sum, among all these reasons, there is one central common idea for people in all areas to drink bottled water, i.e. the desire for ‘safe’ drinking water. Even if tap water is good but people do not perceive it to be good, they do not feel safe and turn to other sources. The dissatisfaction with tap water organoleptics can be
also interpreted as human’s natural resistance to
something not safe (irrespective of whether the ‘odd’
organoleptics with tap water are a reality or are seen
in one’s own perception). Since bottled water is
perceived to be safe (whatever this is true or not), it is
widely accepted and used. However, cultural factors,
like ‘perception of snob appeal’, ‘convenience’, and
‘bottling companies marketing campaigns’ further
enhance the consumption of bottled water.

What is the approach?

Bottling companies: go ‘greener’

In this global battle against bottled water, bottling
companies obviously have low ground over the
environmental impacts that the industry makes. Many
bottlers have started to react actively on the issue,
intending to improve their company images. Some
efforts have been done by bottling companies.

(1) Carbon neutral
Firstly, many companies work on the reduction of
company’s carbon footprint to be carbon neutral.
Icelandic Glacial is one good example. Icelandic
Glacial claims that the company was the first carbon
neutral company in the bottled water market. The
company pipes the water directly from the Ólfus
Spring and packages it at the company’s nearby
facility in Thorlakshöfn, Iceland, where the company
uses only geothermal and hydroelectric natural
energy. This allows Icelandic Glacial’s initial carbon
footprint to already be much lower than other
conventional bottled water. Box 2 lists the policies
that Icelandic Glacial takes to meet carbon balance
(Icelandic Glacial; Prepared Foods, 2008).

Icelandic Glacial also claims that it uses local energy
providers, uses low-energy lighting throughout its
manufacturing plants and other offices and recycles
where possible. The company further offsets the
remaining balance of CO₂ emissions via initiatives,
like reforestation, methane capture and wind energy
projects around the world (Icelandic Glacial).

Other big companies have been also putting in efforts
to become ‘greener’. In 2008, Fiji Water joined the
Carbon Disclosure Project Supply Chain Leadership
Collaboration, an investor coalition on climate
change, to disclose the environmental footprint of its
products for the further management of CO₂ emissions.
Fiji Water started to post the information on a new web
site along with progress reports on its pledge to become
“carbon neutral” (Beverage Industry, 2008b). Danone
Waters UK & Ireland, part of Groupe DANONE, joined
the Carbon Trust in the UK. Carbon Trust is an
organization which promotes the labelling of carbon
footprints on products (Carbon Trust, 2008).

(2) Increase of using recycled PET bottles
Bottling companies start to increase the use of recycled
PET bottles. On its web site, Pepsi-Cola announces that
the average Pepsi bottle contains 10% recycled plastics
and that more than 150 billions of Pepsi’s containers
have been recycled since 1990 (PepsiCo, company
website). In 2007, the Coca-Cola Company set the goal
to recycle or reuse 100% of the Company’s PET
(polyethylene terephthalate) plastics bottles in the
United States. The company also announced that more
than $60 million would be invested to build the world’s
largest plastic-bottle-to-bottle recycling plant to support
its goal for PET bottle recycling (The Coca-Cola

Box 2: Icelandic Glacial’s policies for carbon balance.
Source: Icelandic Glacial (Retrieved February 18th, 2009)

- **The water source**: Icelandic Glacial spring water is sourced exclusively from the Ólfus Spring in Southwest Iceland. The company captures the water that is forced out under natural pressure on its way to the ocean - with no effect whatsoever on the natural balance of this resource.
- **Green energy usage**: The bottling plant is powered entirely on hydro-electric power.
- **100% recyclable bottles**: The waters are packaged in 100% recyclable bottles. The outer case packaging is made from 75% recyclable packaging. The company also achieved a 10% reduction in PET by weights in 2008.
- **Low emission shipping policy**: As Iceland is a net-importer of goods, Icelandic Glacial utilises otherwise empty cargo slots on existing scheduled vessels for shipment of product to destination markets. The flights and travel are restricted wherever possible.
- **CarbonNeutral® certified**: Icelandic Glacial works with CarbonNeutral Company and was certified as CarbonNeutral in 2007. Being carbon neutral refers to neutral (meaning zero) total carbon release, brought about by balancing the amount of carbon released with the amount sequestered.
Evian introduced new 750-ml and 1-liter bottles that incorporate post-consumer recycled PET, and launched the Evian Water Protection Institute (EWPI) to “advance the sustainable management of natural water resources and to help the world’s populations preserve, maintain and restore their wetlands.” Evian, Coca-Cola and other bottlers cooperate with RecycleBank, a firm that offers incentives for consumers to participate in municipal curbside recycling programs (The Coca-Cola Company, 2007; Beverage Industry, 2008b).

(3) Bottle lightweight race

'Lightweighting’ the PET (polyethylene terephthalate) bottles and reducing the amount of packaging materials is another bottlers’ focus. Most water bottles which are made by standard machinery contain 18 grams of plastics. Now, the weight of some bottles is cut down to 12 grams or less (ElAmin, 2007; PepsiCo, 2009; Weaver, 2009). In March 2009, PepsiCo’s Aquafina brand, the best selling brand in the United States, launched a half-liter bottle, named Eco-Fina bottle, to the national market. The new bottle, weighting 10.9 grams, is made with 50% less plastic than the same size bottle from 2002. PepsiCo claims that this new bottle reduces the amount of required plastics by 75 million pounds every year (PepsiCo, 2009). PepsiCo’s Eco-Fina bottle is not the lightest one in the world. In 2007, France-based Sidel Inc. launched its ultra-lightweight NoBottle, weighting 9.9 grams per 500-ml bottle, while the average weight of 500-ml bottles at the time ranged between 13 and 16 grams. Hence, with NoBottle, a 25% to 40% percent reduction of plastics bottle could be achieved (ElAmin, 2007). Nestlé SA’s U.S. water unit cut the weight of its half-liter bottle to about 12.4 grams for some regional brands such as Poland Springs in 2007, and further to less than 11 grams for other brands, like Pure Life. The company claims that a 9.8-gram half-liter bottle is to be introduced to the market by 2011 (Bauerlein, 2009). Lightweighting the PET bottles becomes a technology competition between bottlers.

(4) Increase water efficiency

Some bottled water companies also invest to reuse and recycle their water use in order to improve their efficiency. Nestlé announces that it has cut its water use by 30% since 2002 (See Figure 11), which is equivalent to 8 billion liters of water saved. In 2006, the amount of water needed by Nestlé for the production of 1 liter water was equal to 0.86 liter (Nestlé S.A., 2007). The Coca-Cola Company reports similar results. In 2007, the company used 1.77 liters of water to produce 1 liter of its beverage products. By 2010 this amount is to be reduced by 10% (Coca-Cola Enterprises, 2008).

Role of governments: legislation and inspection

To respond to citizens’ needs with respect to access to safe and healthy water and to a protected environment, governments can play an important role.

(1) Improve water facilities and expand the public water system

Water is essential to our life and safe drinking water is a basic need for human beings. Governments can contribute substantially to improve water systems and provide safe drinking water to citizens. According to a progress report conducted by the United Nations Children’s Fund (UNICEF) and the World Health Organization (WHO) (2008), in 2006, 13% of the world’s population, i.e., approximately 884 million people, did not have access to improved drinking water3 (See Figure 12). The majority of the population without improved drinking water is located in developing regions with about half of it in Asia (See Figure 13).
In some of these regions, bottled water is the major source for drinking water (See Table 5). In addition, improved drinking water coverage is significantly lower in rural areas than in urban areas worldwide. According to UNICEF and the WHO (2008), approximately 746 million rural residents do not have improved drinking water supplies, compared to 137 million urban inhabitants. Governments can design policies and initiate infrastructure works to improve that situation.

(2) Improve the quality of public water
In some regions, although municipal water with pipe systems connecting to the households is provided, it is not safe for daily drinking. Polluted water sources, lack of a good quality management of the municipal water systems and old pipe systems are often the problems.

The water system in China is an example (Johnson, 2006). Governments can help to improve facilities of public water systems (hardware) and adopt stringent legislation about standards and the inspection of public water quality (software).

(3) Make data about public water quality transparent and accessible
In regions where the public water quality is good, residents do not always trust the safety of public water and turn to bottled water. One Expert on the European Commission’s water policy suggests the five-year time lag between EU reports water quality may be a main reason why the EU citizens ignore the high quality of public water (Gray, 2008). A proposal is that the Water Information System for Europe should contain comprehensive reports to the Commission publicly available on the internet.

(4) Maintain a stringent legislation on standards and an inspection of bottled water quality
Bottled water may not always be of good quality, especially in countries without stringent legislation and inspection of bottled water quality. The conflict over contaminated bottled water in India in 2003 provides one example. In India, in 2003, the Center for Science and Environment (CSE), an environmental group, found massive doses of pesticides and other chemical contaminants in many local brands of bottled water. On average, every sample of bottled water tested contained 36 times more pesticides than the maximum permissible concentrations in Europe. Even so, the water companies
stated that they met the standards of the government. Hence, CSE blamed Central Government for lax legislation on bottled water and weak enforcement (Devraj, 2003). Evidently, adopting legislation and ensuring its enforcing through inspection constitute key tasks for governments.

(5) Improve the recycling rate of plastic bottles
Some governments have taken initiatives to ban bottled water or impose a tax on plastic bottles to encourage citizens drinking tap water. (See above for London and Toronto in Canada and Chicago, U.S.A.) In Member States of the European Union legislation on the recovery and recycling of packaging waste is in place.

Lastly, however the ultimate choice option is with consumers. On average, the carbon footprint of tap water is lower than the one of bottled water. Bottled water which is produced and consumed locally has a lower carbon footprint than imported brands. In areas where safe drinking water refers to a variety of options, making a choice for a lower carbon footprint may be a good action for consumers to take. Interestingly, options with lower carbon footprints often are less costly.

Future perspective
Given the situation of a global campaign against bottled water and the response by the bottlers, one might ask: what could be the future of the industry? Many analysts remain optimistic with respect to the bottling industry. A report by Datamonitor, at the end of 2008, predicts that the market’s volume of bottled water might rise to 165.5 billion liters, a value of $94.2 billion, by the end of 2012, representing a compound average growth rate (CAGR) of 6.7% for 2007-2012 (Figures 14 and 15). In the Asia-Pacific region, the average annual growth rate of revenue is predicted to reach 13.7%. Even in the North-American and European markets, despite the ‘Back to the tap’ opposition, CAGRs of 7.3% and 4.1%, respectively, are predicted for the same period. The markets may be able to reach values of $ 31 billion (America) and $ 40.8 billion (Europe) by 2012 (Datamonitor, 2008). Although the average annual growth rates of the bottled water industry might flatten or decrease, the numbers are still predicted to be positive in all regions.

In that line, Beverage Marketing (2009) published its new annual report, estimating that the growth rate of bottled water in 2008 was only 2.3%, a sharp decline from 8-12% in the decade before. It was suggested that the global backlash against the bottled water industry might contribute to this decrease of growth. Nevertheless, the global faltering economy might also be the culprit.

Generally speaking, drinking bottled water is considered as a habit with a growing trend worldwide in the next few years. Beverage Marketing Corp. (2008) predicted that bottled water may surpass carbonated soft drinks to become the largest beverage category by volume in the next five to seven years (Palmeri and Byrnes, 2009).

New developments and markets
The global ‘anti-bottled water’ movement has lead to innovations and the development of new markets. One market is the one for biodegradable packaging. In 2006, UK based Belu Natural Mineral Water launched biodegradable water bottles from NatureWork for its production. The bottle, made of

![Figure 14: Global bottled water market value forecast: $US billion, 2007-2012. Source: Datamonitor, 2008](image)

![Figure 15: Global bottled water market volume forecast: liters billion, 2007-2012. Source: Datamonitor, 2008](image)
corn-derived plastics, can be commercially composted back to soil in 12 weeks (Food Productiondaily.com, 2006). In March 2009, PurBlu Beverages, Inc., U.S.A., switched to a biodegradable polyethylene terephthalate (PET) bottle made by Planet Green Bottle Corporation. This oxo-degradable PET bottle is claimed to be degraded biologically in five to 15 years but not to impact the PET recycling process (Packexpo.com, 2009). Biodegradable packaging products seem to have a growing market with annual increase rates of 20% (Food Productiondaily.com, 2006; Merrett, 2008).

A second market is the one for refillable bottles made by companies such as KOR Ideas, Sigg, CamelBak, and Kleen Kanteen (Palmeri and Byrnes, 2009). These refillable bottle products are often claimed to be free of bisphenol-A (BPA), the leaching toxin found in polycarbonate bottles. Moreover, refillable and reusable bottle are often claimed to be environmentally friendly (Wheeler, 2009).

In 2005, the Paris municipality distributed free refillable carafes in order to encourage the citizens to support drinking tap water (BBC News, 2005a). In general, however, it is not clear how a market with refillable containers can be sustainably established without strong incentives, preferably set by government regulations, as in the case of Germany with its obligatory deposit fee on one-way drinks containers.

A third market which may also benefit from the anti-bottled water movement is the market for home carbonation systems. A home carbonation system contains a carbonation machine, a carbon dioxide canister and a reusable bottle (Soda Club). With this system, a variety of sparkling water and soda drinks can be easily made at home. However, this system is not newly invented. In fact, the first business can be traced back to the very beginning of last century (Wikipedia). Currently, Soda Club, a company based in Israel, has the biggest market share worldwide. The company claims that its home carbonation products are earth friendly, as its products use tap water, do not need the use of plastics for bottle and avoid transportation of water and soft drinks (Soda Club). Other firms making filtration systems may also benefit from the global bottled water campaign.

The ‘Back to the tap’ movement has been heating up in many countries. The major argument against bottled water industry is the heavy, additional impact that the industry could cause on the environment. Some protests, thus, criticized that the bottled water industry is unnecessary. For people in certain regions where there is no access to safe daily drinking water, this claim may not be true. However, when consumers do have various options for their safe drinking water, making a choice to reduce the burden that the human population places on the environment can be a good option.

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Notes
1. The amount of carbon footprint may vary due to different factors applied for calculation. Thus, one cannot compare the data of Fiji Water with that of Poulter (2008) directly.
2. Consumers’ perception of health and the fear of public water risks are not distinguished as two factors in this study.
3. An improved drinking water source is defined by UNICEF and WHO (2008) as a drinking water source or delivery point that, by nature of its construction and design, is likely to protect the water source from outside contamination, in particular from faecal matter. It includes piped water into dwelling, plot or yard, public tap/stand pipe, tube well/borehole, protected dug well, protected spring, rainwater collection.

References


