

## 2019 HiMCM Problem B: Bottle Battles

A number of communities (campuses, towns, cities, etc.) around the world have proposed and enacted plastic water bottle bans in some form.

In 2013 the small town of Concord, Massachusetts (population approximately 19,000) became the first town or city in the United States to ban the sale of single-serving **Polyethylene terephthalate (PET)** bottles less than or equal to 1 liter (34 ounces) containing water which is non-sparkling and non-flavored (in other words, plain water)<sup>[1]</sup>. The sale of water in bottles of any size made of other types of plastic or other materials, as well as PET bottles of **flavored** or **sparkling** water, soda, tea, juices, and other non-plain water beverages, regardless of size, is allowed<sup>[2]</sup>. [See attached FAQ document.](#)

Concord citizens supporting this action stated various reasons including: concerns of plastic garbage and litter, use of fossil fuels in the production of plastic, product transportation emissions, damage to water-providing **aquifers**, and beliefs that businesses shouldn't profit on the sale of a free resource.

Since enactment of Concord's ban, a handful of other communities in the United States have enacted single-serving water bottle bans, the largest being the city of San Francisco (population approximately 885,000) who banned the sale of single-serving water bottles on city property in 2014<sup>[3]</sup>. Just recently, the San Francisco Airport decided to comply with its city's law and banned the sale of single-serving water bottles, making it the first airport to do so<sup>[4]</sup>.

Not everyone is in favor of these bans, nor does everyone think that these bans will have any impact on the issues they are trying to address. Opponents include the International Bottled Water Association (IBWA) who, after the San Francisco ban, stated that there are unintended consequences to these bans as they may lead to "more packaging, more additives (e.g., sugar, caffeine), and greater environmental impacts than bottled water<sup>[5]</sup>." Additionally, as we have seen in recent world news, in some areas (e.g. unavailability/ inaccessibility of fresh water) and under some circumstances (e.g. natural disasters, compromises in water delivery) bottled water is a necessary and critical resource.

1. Model the impacts of a ban on the sale of single-serving water bottles in a town or city. Use your model to discuss the impacts of the bans in the Town of Concord and the City of San Francisco.

- a. Identify the possible impacts (positive and negative) of a ban on the sale of single-serving water bottles within a town or city.
- b. What information and data do you need to model and measure these impacts? How would you collect this information and these data? (Note: You do not need to actually collect information and data, but need to identify what you need and how you might obtain it.)
- c. Develop a model or set of models to measure water bottle ban impacts.
- d. Discuss the application of your model to Concord and San Francisco.

2. Address the impacts of a ban on the sale of single-serving water bottles within an airport. How are the impacts similar to and different from a ban in a town or city? How would your initial model for a town or city change, if at all, to model bottle ban impacts within an airport?

3. Discuss and recommend possible changes to Concord's water bottle ban, or other related community measures, that would enhance beneficial impacts and reduce adverse impacts. Use your suggested changes to adjust your impact model. Address whether or not your new model is generalizable to larger communities (e.g. large cities, regions, states, countries).

4. Write a one-page article for your local newspaper reporting your findings and recommendations.

Your submission should consist of:

- One-page Summary Sheet.
- Table of Contents.
- One-page Article.
- Your solution of no more than 20 pages, for a maximum of 23 pages with your summary, table of contents, and article.

Note: Reference List and any appendices do not count toward the page limit and should appear after your completed solution.

**Attachment:**

Town of Concord, Massachusetts. Town Bylaws. (Updated January 9, 2013). [\*Frequently asked questions about interpretation and enforcement of the drinking water in single-serve PET bottles bylaw.\*](#)

**References:**

[1] NBC News, US News. (2012, September 7). *Concord, Mass., the first US city to ban sale of plastic water bottles.*

[2] Town of Concord, Massachusetts. Town Bylaws. *Sale of drinking water in single-serve PET bottles bylaw.*

[3] Levin, Sam T. The Guardian, US Edition. (2017, June 28). *How San Francisco is leading the way out of bottled water culture.*

[4] CBS News, CBS This Morning. (2019, August 20). *San Francisco International Airport rolls out ban on water bottles.*

[5] International Bottled Water Association. (2013, December 18). *Proposed bottled water ban not in the best interest of San Franciscans.*

**Glossary:**

**Aquifers** – geological formations containing or conducting ground water.

**Flavored (water)** – having been given a taste by an additive (e.g. sweetener, fruit juice, etc.).

**Sparkling (water)** – effervescent beverage consisting of water charged with carbon dioxide (also known as seltzer water, fizzy water, water with gas).

**Polyethylene terephthalate (PET) bottles** – bottles made from PET, a plastic form of polyester and a type of thermoplastic polymer resin.

**Frequently Asked Questions about Interpretation and Enforcement of the *Drinking Water in Single-Serve PET Bottles Bylaw*. Updated January 9, 2013**

**1. What is the effective date of the bylaw?**

The bylaw becomes effective January 1, 2013.

**2. How do I know which bottles are made of PET?**

Almost all clear plastic bottles in which beverages are sold are made of polyethylene terephthalate, also called PET or PETE. Bottles made of PET will have the number 1 and/or PETE with the recycling symbol on the bottle. Recently, some beverages are starting to be sold in clear bottles made of other plastics; these bottles do not have the number 1 and PETE included in their recycling symbol.

**3. What types of bottles are prohibited from sale under the bylaw?**

The bylaw prohibits the sale of non-sparkling, unflavored drinking water in PET bottles of 1 liter (34 ounces) in size or less.

Only bottles made from PET are prohibited from being sold. The sale of water in bottles made from other types of plastics is allowed.

Only the sale of non-sparkling, unflavored drinking water in bottles of 1 liter or less in size is prohibited. The sale of juice beverages, flavored waters, and sparkling water, in bottles of any size, is allowed. Examples of these types of beverages include flavored waters such as Vitaminwater®; sports drinks such as Gatorade®; energy drinks; seltzers and other sparkling drinks; soda; juice; juice-flavored and artificially-flavored beverages; and bottled teas.

**4. May unflavored water with added electrolytes or minerals be sold?**

There are several brands of bottled non-sparkling water to which electrolytes and/or minerals, but no flavoring, have been added. These brands include, but are not limited to, OWater and SmartWater. If the water is unflavored, non-sparkling, and in bottles of 34 oz or less, it may not be sold.

OWater and SmartWater (and possibly other brands) also produce electrolyte-added or mineral-added water that is flavored. Bottles of flavored water products may be sold, regardless of size.

**5. May cases of bottled water (for example, cases of 12 1-liter bottles or 24 12 oz. bottles) be sold?**

No. The sale of cases of small (<34 oz.) bottles of water is still a sale of “water in single serving [PET] bottles ...” regardless of how the bottles are packaged and labeled. If the individual

bottles in the case are 1 liter or less, and the product being sold is non-sparkling, unflavored drinking water, the sale is prohibited, even though the bottles are packaged in case quantities.

**6. May bottled water be offered for sale in vending machines?**

No, not if the bottles are 1 liter in size or less and the product being sold is plain, non-sparkling, unflavored drinking water in PET bottles.

**7. May bottled water be offered for sale at civic events such as sports events, road races, festivals, theater performances, catered events, and similar situations?**

No, not if the bottles are 1 liter in size or less and the product being sold is plain, non-sparkling, unflavored drinking water in PET bottles.

**8. May bottles of water or cups of water be offered for free to patrons?**

Yes. Only the sale of bottled drinking water is prohibited. Water may be provided for free in any form.

**9. May businesses to give away bottles of water but post a sign or put out a container asking customers if they would like to make a voluntary donation?**

No. By soliciting donations, a business is essentially asking for payment for the water, regardless of whether the transaction is characterized as a sale or a donation.

**10. How will the bylaw be enforced?**

The Town Manager has designated the Health Division as the primary town agency who will ensure compliance with the bylaw. Early in January 2013, Health Division staff will begin inspections of retail stores, restaurants, and other venues that are likely to be selling bottled beverages. Health Division staff will determine whether bottled water of 1 liter or less is being offered for sale. If so, upon first inspection the business will be issued a written warning. Re-inspection of businesses violating the bylaw will occur within one week. If bottled water is being sold at the time of the second inspection, a Non-Criminal Citation with a fine of \$25 will be issued to the business. On the third and subsequent inspections, a Non-Criminal Citation with a fine of \$50 will be issued to the business if bottled water is being sold in violation of the bylaw.

**11. What is the appeal process if I believe a Non-Criminal Citation has been issued to my business in error?**

The Town's *Bylaw Providing For Non-Criminal Disposition Of Violations Of Town Bylaws*, and Massachusetts General Laws Chapter 40, section 21D outlines the appeal process. Any person who wishes to contest a Non-Criminal Citation may, within 21 days of receiving such citation, file a written request for a hearing at District Court.