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Going with the flow: bottled natural mineral water and drinking water in Malaysia

The demand for bottled water is growing. People buy bottled water for the convenience, taste, as a substitute for sugary drinks or simply because they distrust municipal tap water.

By Casey Ng

Figure 1. Bottling Spritzer mineral water.

This article examines the intricacies of the bottled water industry and explores the growing popularity of bottled water. As a high-rainfall tropical country, Malaysia is not short of rainfall and most households are supplied with cheap municipal water on tap. Yet many consumers are willing to pay for bottled water of various brands and sources. This is an interesting subject that warrants enquiry.

Who are the consumers of bottled water?

In Malaysia there are two categories of bottled water, namely Natural Mineral Water (NMW) and Drinking Water (DW). Mineral water is classified (following the U.S. Food and Drug Administration) as water containing at least 250 parts per million total dissolved solids, originating from a geologically and physically protected underground water source. No minerals may be

added to this water. For a product to be legally advertised as 'mineral water', it must maintain its original physicochemical profile and no other substance can be added. Most importantly, it must also be microbiologically safe to consume without any treatment. However, removal of particulate matters and iron is allowed by filtration and deaeration processes. For DW, the label is required to specify the treatment process used, for example, if the water is filtered only, the label must state 'Filtration Process'. Other processes include 'Reverse Osmosis Process' and 'Distillation Process'. Most DW originates as municipal tap water. Currently, there are 29 brands of NMW and 28 brands of DW sold in Malaysia (Azlan *et al.*, 2012).

It has been observed that the consumers of bottled water are typically well-educated, middle-class adults with high awareness of health and wellness in matters of food and drink. Mineral water and purified bottled water are perceived to be natural, untouched, pure, and free from water-borne pollutants and microbes.

In an interview-based study participated by 123 females and 102 males in the Klang Valley (Azlan *et al.*, 2012), 14.8% and 11.9% of subjects consumed bottled mineral water and purified water respectively. It turned out that 85% of the respondents were college and university graduates. This suggests that those with higher education are more likely to spend more on what is perceived to be a healthier choice. The study also indicated that respondents of the 30-40 years age group are more likely to consume bottled mineral water.

In another study in Seremban, 70% of urban respondents gave a 'poor' rating for the quality of municipal tap water while 16% of respondents gave a 'very poor' rating (Aini *et al.*, 2007). A very high percentage, 85% of the subjects, had installed water filters at home and 17% consumed bottled water. This tells us that whenever a community is dissatisfied with tap water, its demand for bottled water will rise even though the International Bottled Water Association forbids bottled water companies from discrediting tap water in advertisements. Municipal tap water is governed by different standards as it has to be produced in immense quantities, for all kinds of uses, industrial as well as domestic.

The water resources trend doesn't look good

It is already general knowledge that our water resources are degrading. In 1983, the Department of Environment (DOE) launched a National Drinking Water Quality Surveillance Programme (NDWQSP) in response to increasing pollution of surface waters which had resulted in high occurrence of waterborne diseases (Aini *et. al.*, 2007). However, the situation has not improved.

All land in watershed areas come under the jurisdiction of the state government agencies via their forestry departments and land offices. However, river quality is monitored by the federal government agency DOE which has very little influence on how the states manage their forests and water catchment areas. The newspapers frequently carry major stories describing how uncontrolled logging has soiled the rivers.

Figure 2. Siltation is common in the rivers due to improper land-use management.

DOE also has no authority over local municipal authorities which typically govern commercial, industrial, household and waste landfill zones. These areas are commonly known to generate considerable organic and inorganic pollutants that finally make their ways to the rivers via the vast urban drainage network.

In 2005, there were 302 clean rivers, but by 2014, clean rivers had been drastically reduced to only two (Figure 3). Adding more coagulants, usually polyaluminium-based coagulants, to remove suspended solids for clarifying tap water is not a good long-term solution. A population of about 20,000 in Camelford, United Kingdom, that was accidentally exposed to more than five days of increased levels of aluminium in tap water developed symptoms such as vomiting, nausea, diarrhoea, mouth ulcers, skin ulcers, skin rashes, and arthritic pain (Clayton, 1989; WHO, 2003; Kawahara & Kato-Negishi, 2011). Adding more chlorine to destroy bacteria gives tap water an unpleasant taste. Simply put, using more chemicals to treat a water source that is dirty and contaminated is not a healthy long term solution.

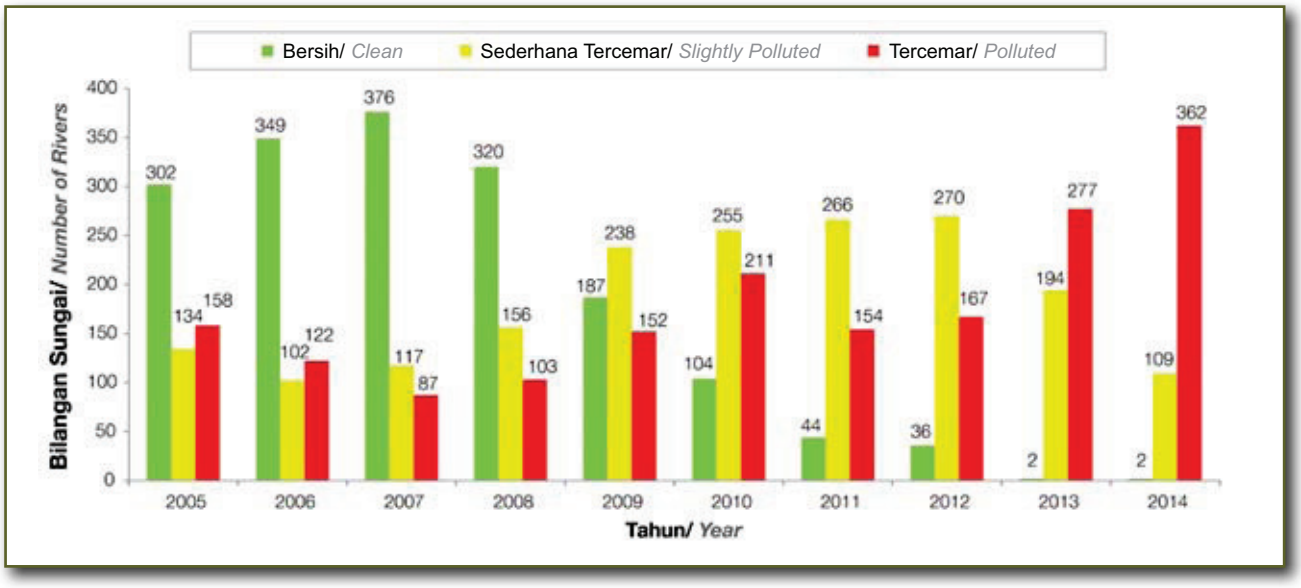

Figure 3: The state of rivers in Malaysia from 2005 to 2014 based on Biochemical Oxygen Demand (BOD5) parameter tested. Source: DOE, 2014.

As surface water becomes more polluted, the unsightly rivers give rise to public perceptions that water resources are not managed properly by the authorities, and that it may not be safe to consume water supplied by state-run water treatment plants.

Bottling takes off

The commercialization of mineral waters began in Europe in the mid-16th century and the first packaged water to reach Malaysia was imported from Belgium in earthen jars in the 1700s (Denny, 1996). In the infancy years of packaged water, waters were mainly sourced from Apollinaris in Germany, Malvern in England, Ferrarelle in Italy, Vichy in France and Spa in Belgium. In America, packaged water was first sold by Jackson's Spa in Boston in 1767. Back then, mineral waters were mainly sold as medicinal products by pharmacies.

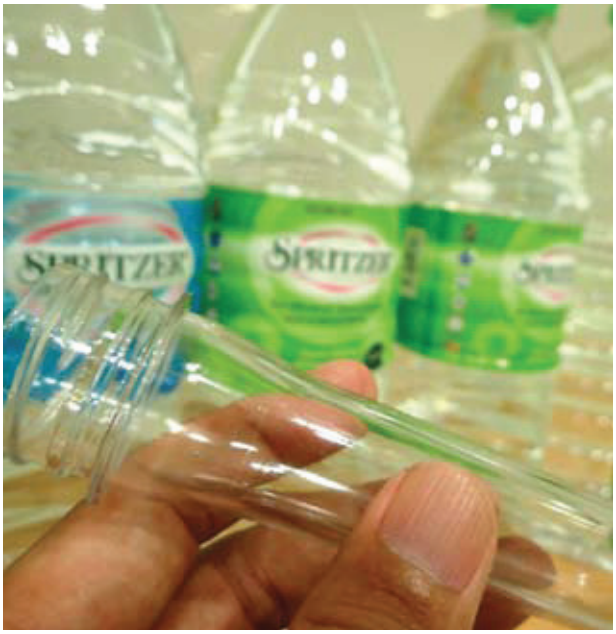

Figure 4. A PET preform looks similar to laboratory test tubes but it has preformed threads. It is placed into a blow moulding machine and the tube part is "blown" to the shape a bottle. The process produces PET bottles that are thin, light-weight and durable. Fully formed PET bottles are shown in the background.

Later, water commercialization got a boost from technological innovation. The mechanical corking machine was invented in France in 1840 and glass bottles making was industrialized. Bottled water production grew in tandem with the capacities of the factories.

In 1973, DuPont introduced polyethylene terephthalate (PET) bottles and the water bottling industry made another quantum leap (Figure 4). PET bottles are superior to glass bottles because they are resistant to breaking, extremely light-weight and can be moulded to any shape at low cost. PET plastic bottles can also be recycled to a certain extent and this development suits the ideals of the people who are more environment-conscious. In the context of Malaysia, all mineral water and purified brands use PET to bottle their waters.

Not all mineral waters are created equal

It is said that between the earth and atmosphere, the total volume of water is fixed. The hydrologic cycle never stops and water is either up in the air or on and in the ground. While purified water is generally a straight-forward matter of treating and filtering tap water with the reverse-osmosis and other processes before bottling, mineral water is more complex and a compelling subject by itself.

Mineral water is found deep beneath the land surface, often below the local river beds in natural geological pockets known as aquifers (Figure 5). Academically, the study of aquifers is covered by *hydrogeology*. When it rains in the

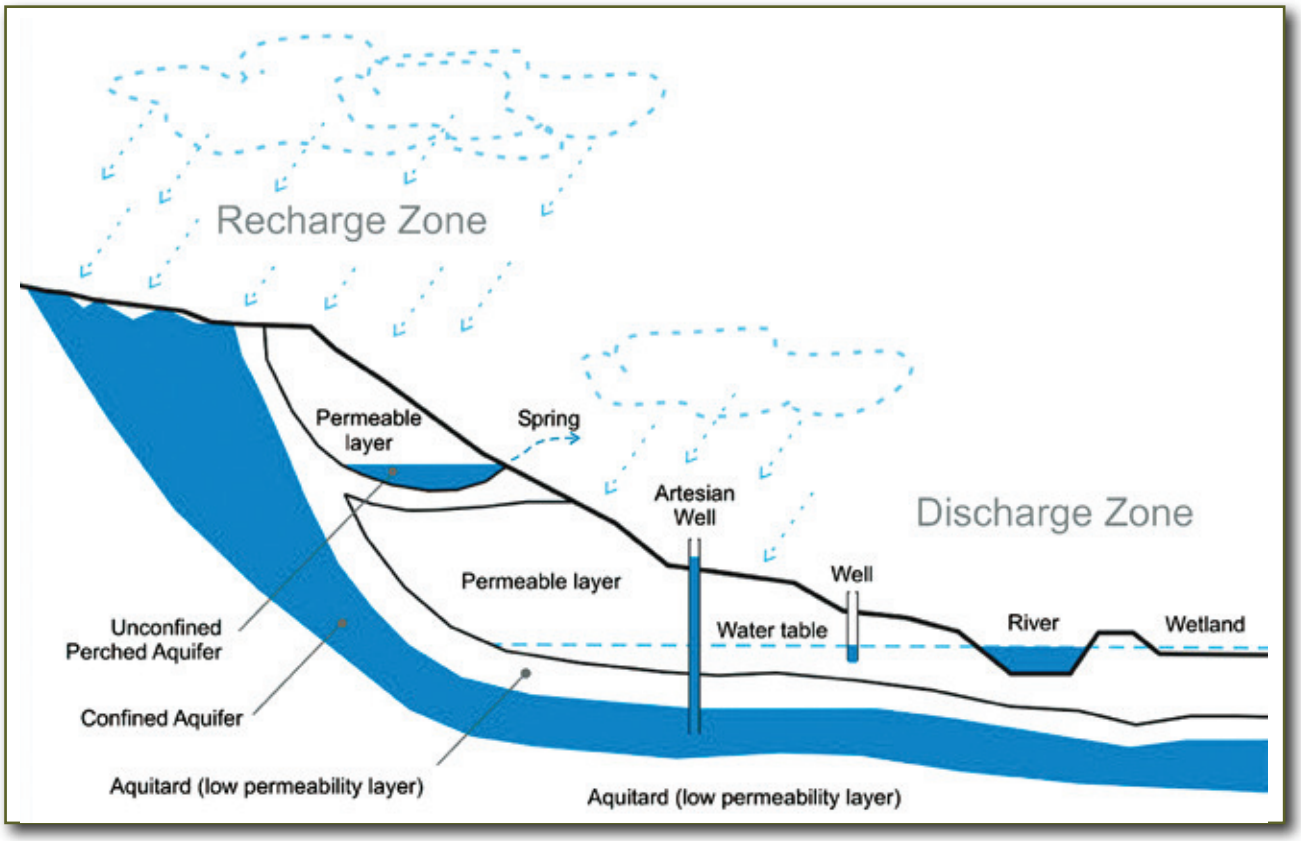

Figure 5. Cross sectional view of a simple confined and unconfined aquifer system.

tropics, water percolates through soils, gravel, sand and other permeable geological strata until it reaches an underlying impermeable rock layer which may be deep underground. In the process the water is thoroughly filtered and clarified. In an aquifer, water cannot seep down any further and is accumulated and stored over millennia. Its physicochemical composition varies in accordance with chemicals found on the land around it. And here is the interesting part.

Currently there are six aquifer locations approved by the Ministry of Health in Peninsula Malaysia where mineral water is extracted for bottling. The locations are Pendang (Kedah), Air Kuning (Perak), Lenggeng (Negeri Sembilan), Bentong (Pahang), Kota Tinggi (Johor) and Batu Pahat (Johor) (Aris *et al.*, 2012). The location of a mineral water source determines the water quality and claimed pharmaceutical properties of each brand. In a comprehensive study, Azlan *et al.* (2012) found that microminerals, heavy metals, and other inorganic elements in the mineral water of all brands were found to be within national and international standards. However they caution that the characteristics of aquifers may be affected by changes in the surroundings over time, and continuous monitoring is imperative.

The Spritzer story

Spritzer started as a small set-up in 1989 when it stumbled upon an aquifer 400 feet under a lush rainforest in Air Kuning, an area near the town of

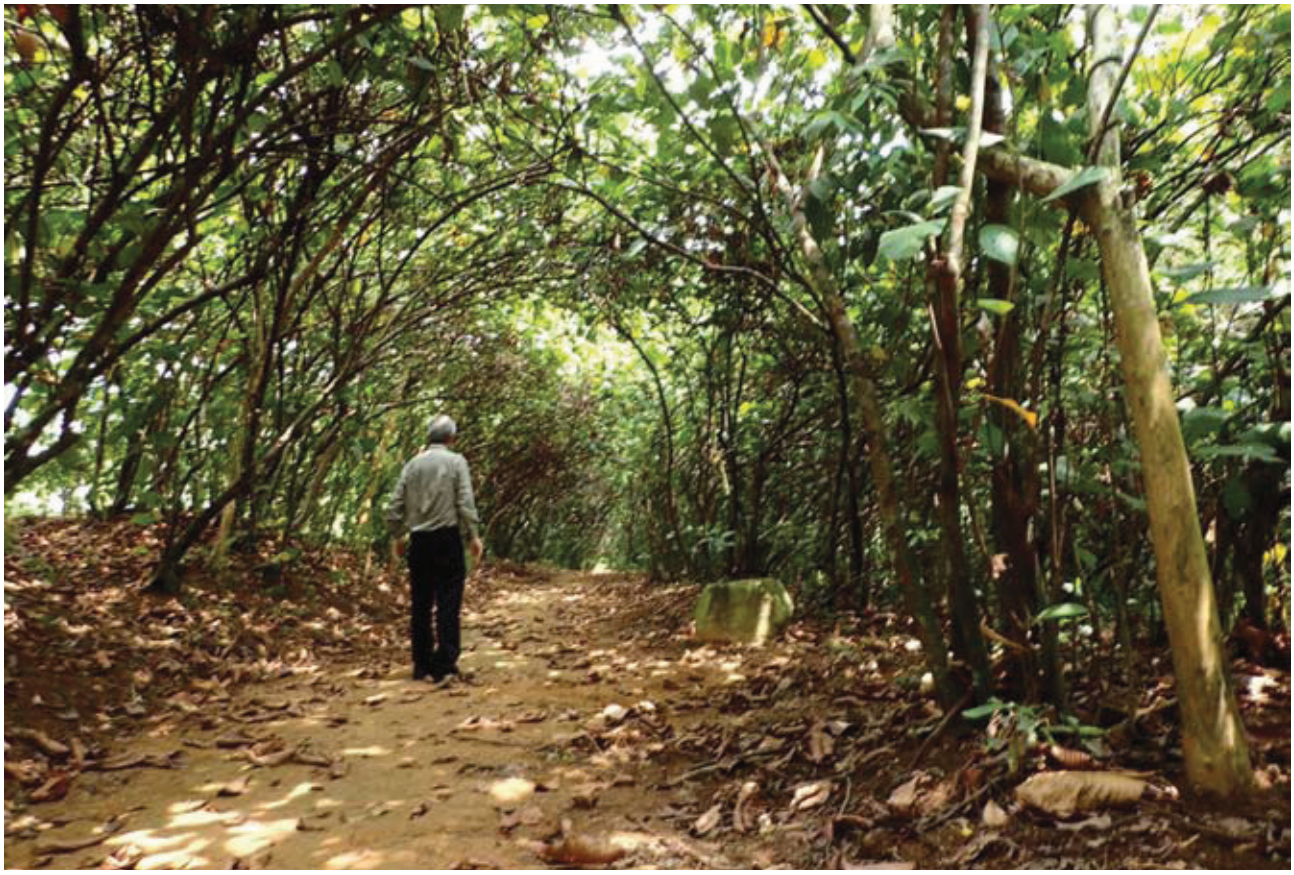

Figure 6. Spritzer's 172 hectares forested land is closely conserved to safeguard its underground aquifer.

Figure 7. Spritzer's fully automated bottling plant ensures no human comes into contact with the purified water and mineral water. Such stringent system is required to ensure compliance to national and international health standards.

Taiping, which is well known for its high annual rainfall. Spritzer received permission from the local authorities and the Ministry of Health, in compliance with the Malaysian Food Act and Regulation, to commercialise the mineral water of the aquifer. To safeguard the aquifer since then, company has acquired more land to expand the protected area of the aquifer and has so far accumulated 172 hectares.

Figure 8. Water quality testing laboratory in Spritzer

Besides its forested areas, the Spritzer site also houses a state-of-the-art bottling plant, PET plastic bottle blow-moulding plant, warehouse, water quality and microbiology laboratory, offices and a new public park named Spritzer Ecopark. The company also has subsidiaries to produce and distribute a diverse range of products apart from mineral water, such as sparkling natural mineral water, distilled drinking water, carbonated fruit-flavoured drink and non-carbonated fruit-flavoured drink. Spritzer has become a household name by its best-seller bottled mineral water which is distinctively labelled green.

As mentioned earlier, the physico-chemical composition of mineral water in each location is unique. Spritzer claims that its aquifer's mineral water has been tested and found to have natural high content of silicon in the form of orthosilicic acid (OSA). The company sees this as its key selling proposition to promote good health, and the OSA content is clearly highlighted on the product label. According to Iler (1979), OSA is a stable and monomeric form of silica dissolved from weathering of rocks and soil minerals into water by hydrolysis at different rates. This means the concentration of OSA is influenced by the surrounding geology. The typical concentration of OSA in European mineral water is 4 – 16 mg/L (Jugdaohsingh, 2007) but Spritzer's claims that its mineral water has higher level up to 43 mg/L.

Studies have shown that silicon influences bone formation and the stabilization of collagen in humans. Higher amounts of silicon are often found in connective tissues such as cartilage, tendons and arteries (Jugdaohsingh, 2007).

Quite recently, in a small study in the United Kingdom involving some who had Alzheimer's disease, the researchers concluded that drinking Spritzer – the silicon-rich mineral water – daily for 12 weeks accelerated the removal of aluminium via urine in the patients (Davenward *et al.*, 2013). With less aluminium in the body system, researchers found that 8 out of 15 patients with Alzheimer's disease showed no deterioration in their cognitive abilities. Three of these 8 actually showed clinically relevant improvement in their cognitive performance over the period of the study. Since it was first reported by Spofforth *et al.* (1921), evidence has been growing to implicate aluminium accumulation in the brain as a likely contributor to neurodegenerative diseases, chiefly Alzheimer's disease (Foster,

2000; Rondeau *et al*., 2000; Campbell, 2002; Kawahara, 2005; Tomljenovic, 2011; Walton, 2014; Exley, 2014).

Future prospects

If we take Spritzer's business performance as an indicator, the future looks bright for the bottled mineral water and purified water industry. According to its annual report, Spritzer's basic earnings per share was 6.2 sen in 2011. In just four years, it jumped to 16.6 sen in 2015. It has been reported that Spritzer commands 45% of market share in the bottled water segment in Malaysia and 75% of earnings is derived from bottled mineral water (Focus Malaysia, 2015).

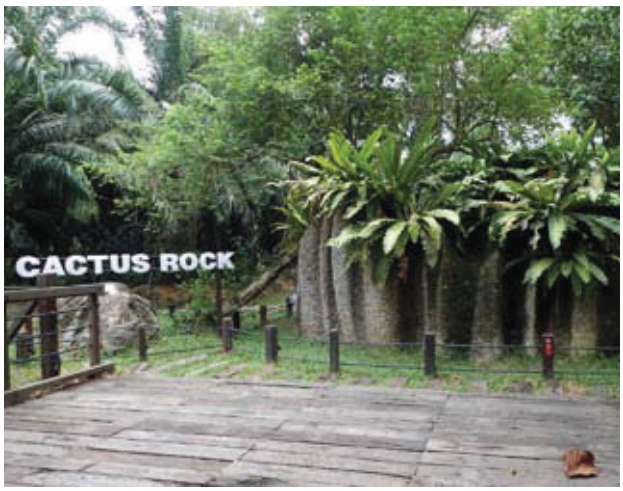

Figure 9. In 2014, the Spritzer Ecopark was opened to public and the curious looking "cactus rock" is one if the main attractions.

The company expects an annual growth of 6 - 7% and this may increase if dry or hazy weather conditions become more frequent as in the past few years. The bottled water industry may be set for double-digit growth in the coming years. All it has to do is to go with the flow.

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