

Water, Water Everywhere, but Not a Drop to Drink

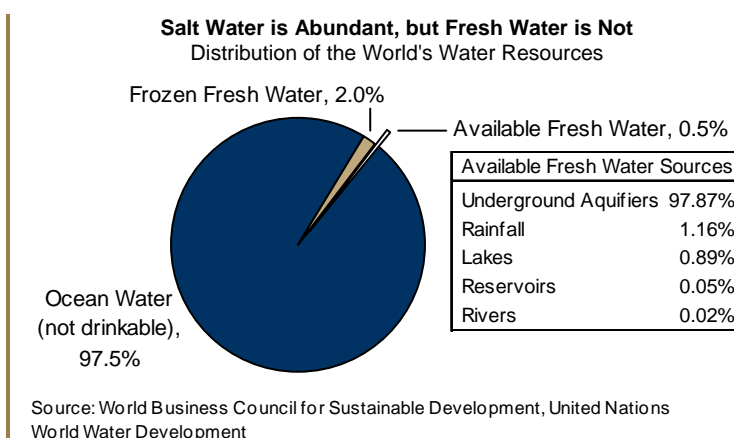
by RBC Wealth Management's Investment Committee

What the Ancient Mariner expressed in frustration certainly has relevance today: "Water, water, everywhere, Nor any drop to drink." Variations of that old adage, which have been passed down for generations, illustrate the dangerous paradox of water. It's everywhere, yet most of it is inaccessible.

The fictional characters of Samuel Taylor Coleridge's famous 18th century English poem, *The Rime of the Ancient Mariner*, recognized what so many explorers have lamented as they began to run out of water. They were surrounded by a vast ocean of seawater, but they couldn't drink any of it.

More than 200 years later, the world is still rich in seawater but by comparison has barely a drop of fresh water. Roughly 70% of the earth is covered with water; however, 97.5% of it is saltwater. Only 2.5% of the earth's water is fresh, and much of that is frozen. Just 0.5% of the world's water is accessible fresh water.

Water scarcity doesn't discriminate. It can impact developed and developing nations. Water shortages already afflict roughly 700 million people in 43 countries. The World Bank forecasts by 2035, more than one-third of the world's population will be at risk of living in severely water-stressed areas. Water usage is rising at twice the rate of global population growth.



For investors, we believe the Ancient Mariner's lament and the distressed state of fresh water resources brings opportunity. As water shortages become more common, and as water infrastructure needs grow, more resources will likely be spent to solve the world's pressing water problems, in our assessment.

The water industry is already the third-largest industry in the world—behind oil and electricity. Our correspondent research firm forecasts global water infrastructure spending could grow 6.7% per year until 2025. However, investing in the water industry is not a cut-and-dried exercise.

This report describes the distressed state of the world's fresh-water resources and examines some of the investment opportunities in the industry. Furthermore, it explains why RBC is so committed to fostering water stewardship and preserving the world's water resources from environmental and humanitarian standpoints.



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The Problem: Water Scarcity is at Risk of Worsening

Agriculture Needs It

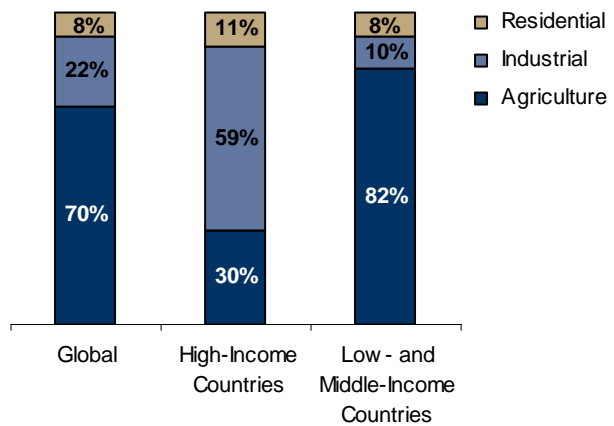
The agriculture industry uses a tremendous share of fresh water resources on a global basis. It takes a lot of water—between 2,000 and 5,000 liters—to produce the food that an average person eats each day, according to a United Nations study. That far exceeds the amount of water the average person drinks daily, which is 2 to 4 liters.

Agriculture requires 70% of the world's fresh water resources compared to 22% for industrial use and 8% for residential use.

However, agriculture usage rates vary quite dramatically depending on the prosperity level of the country, as this chart illustrates.

High-income nations (such as the United States and Canada) tend to use only 30% of their fresh water resources for agriculture, on average, due partly to farming efficiencies. Low- and middle-income nations (such as China, India, and Mexico) tend to use 82% of their fresh water resources for agriculture, on average.

Agriculture Uses Most of the World's Fresh Water Resources
Water Use Per Consumption Category



Source: United Nations World Water Development Report, 2003

As low- and middle-income nations (developing nations) become more prosperous, demand for food typically rises. That can put even more stress and strain on water resources because some of the crops that are used as staples in many parts of the world, such as grains, require significant amounts of water to produce. For example, it takes 1,300 cubic meters of water to produce one metric ton of wheat. Meat, which is rising in demand in the developing world, is even more water intensive to produce. It requires 15,500 cubic meters of water to produce one metric ton of beef. In China, demand for beef rose 21% on a per capita basis from 2001 to 2004 and is expected to rise further as the economy grows and as its citizens become more prosperous.

It Takes a lot of Water to Produce Basic Products
Water Used Per Product (in liters)

1 tomato	13
1 apple	70
1 slice of bread with cheese	90
1 glass of wine	120
1 egg	135
1 cup of coffee	140
1 glass of orange juice	170
1 glass of milk	200
1 hamburger	2,400
1 medium cotton T-shirt	4,100
1 pair of leather shoes	8,000

Source: UNESCO-IHE, *Water Footprints of Nations*, Arjen Hoekstra, 2004

Rather than consider statistics based on cubic meters of water and metric tons of crops, the more simplified examples in this table can provide an even better real-world comparison of just how much water it takes to produce our food requirements and basic products. Whether it's a glass of wine or a hamburger, a stunning amount of water is used to satisfy our daily desires.

The shift toward biofuels raises another significant water-related challenge. It can take between 1,000 and 4,000 liters of water to produce just one liter of biofuel, the International Water Management Institute estimates. (One liter is equivalent to 1.0567 U.S. liquid quarts.) The precise amount depends on the type of feedstock used and the conversion method. If biofuel production continues to rise, there is a risk that agricultural water use could double by 2030 from the 2005 level, according to Stockholm International Water Institute.¹

Industry Wants It

Large multinational corporations are in pursuit of water resources around the world. A number of industries are highly water intensive—some because they use water as a key component of their final products, others because they use water in the manufacturing process. Food and beverage, power generation, semiconductor, textile, paper and pulp processing, oil drilling, steel, aluminum, and other metals companies are all highly affected by the supply and cost of water.

When water access is threatened, it can disrupt supply chains, reduce profit margins, or threaten production capabilities. If water access becomes more stressed over time, economic growth could be threatened, in our analysis.

Water demand for these and other industries is rising, particularly in developing nations where manufacturing capacity is expanding. Unfortunately, that is also where manufacturing processes are least efficient. For example, to produce one ton of steel, a manufacturer based in India would use between 10 and 80 cubic meters of water. In the United States, a steel manufacturer would use no more than 10 cubic meters of water.² U.S. steel production is less water intensive because 95% of the water used in the production process is recycled.

The struggle for water resources can put companies at odds with local communities when access to groundwater is limited or regulatory issues arise:

- The city of Beijing has limited the development of water-intensive businesses due to water scarcity.³ Northern China has 40% of the nation's population but has only 15% of the nation's water resources.
- Coca-Cola and PepsiCo lost their licenses to use groundwater in Kerala, India, when a drought hit and community officials sought to conserve water.⁴
- One of India's largest technology centers, Bangalore, is at risk of losing technology firms due to concerns about water reliability and scarcity.⁵

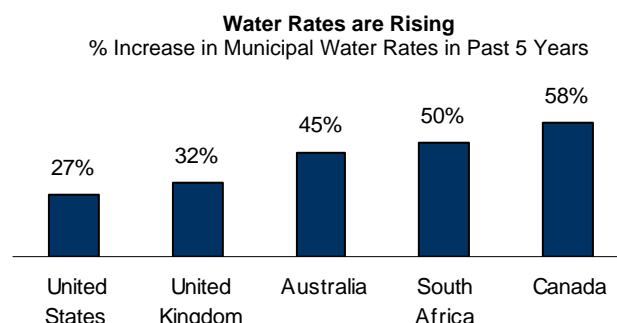
We believe conflicts between multinational corporations and local communities—particularly in developing nations—will continue to increase in the years ahead as water shortages occur.

Individuals Have to Have It

Humans don't need much water to survive—just a couple liters per day—but we certainly do *have* to have it. And we sometimes use what we don't even need. On average, Americans and Canadians use more than 200 cubic meters of water per year for residential purposes compared to 38 cubic meters by British citizens and 26 cubic meters by Chinese citizens, according to the U.N.-sponsored water institute UNESCO-IHE.

Individuals in developed nations pay very little out-of-pocket cash for residential water supplies, especially compared to other commodities. The Earth Policy Institute found that prices per cubic meter range from \$0.66 in the United States to \$2.25 in Germany. In the United States, the cost of water delivery is often subsidized by local governments with taxpayer dollars. Even so, prices are on the rise, as the graph below illustrates.

We anticipate residential water rates will drift higher as water shortages occur and water infrastructure requires more resources. T. Boone Pickens, one of America's biggest oil and natural gas investors and alternative energy crusader, is also anticipating U.S. water prices will rise. Pickens has acquired underground water resources in the Texas Panhandle. His company, Mesa Water, claims it can supply water to more than 1.5 million people per year.



Source: Earth Policy Institute, Waterinfo.org, First Trust, 2008

Asia and the Middle East are Particularly Vulnerable

While the entire world is dependent on fresh water, certain regions are particularly vulnerable to disruptions in supply and dwindling water resources. Asia and the Middle East are at greatest risk, in our assessment.

Asia has 60% of the world's population but only 36% of the world's water resources. In China and India, water availability is expected to fall by 60% and 72% per capita, respectively, from 1955 to 2025.

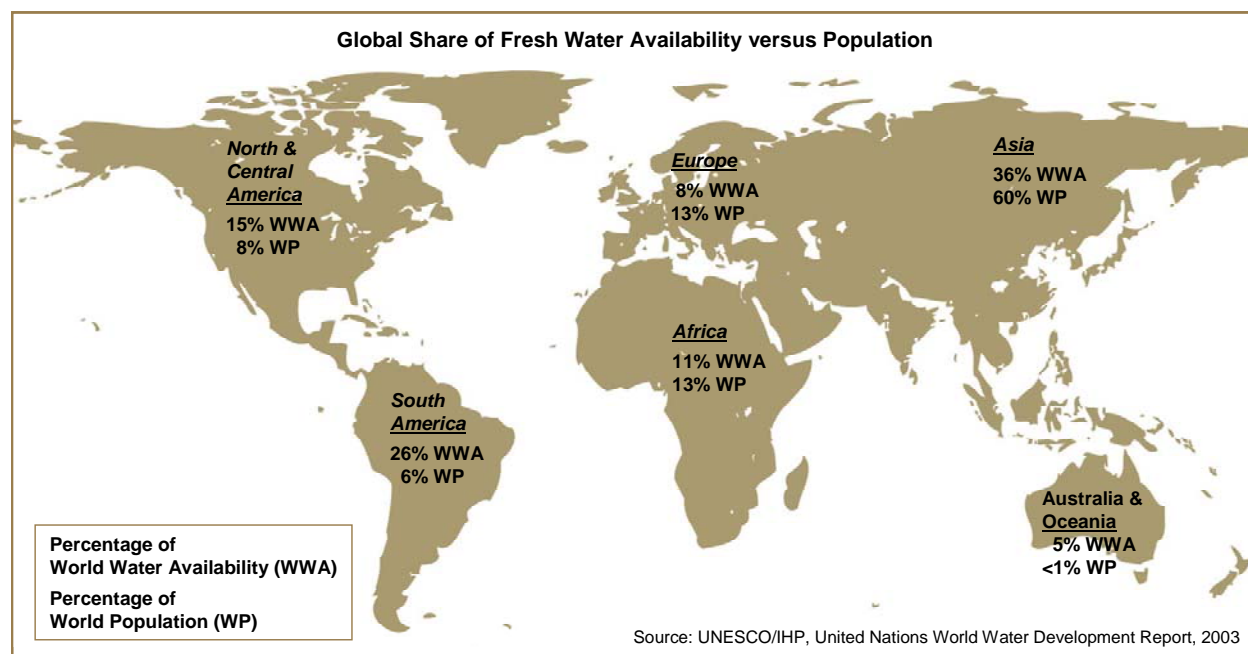
Water stress is not just a water resource problem; it's also a water pollution problem. Only half of China's industrial and municipal waste is currently being treated. The untreated waste is released directly into water bodies. As a result, thousands of rivers and water bodies could be toxic. More specifically, five of China's seven major river systems are severely polluted, according to the Pacific Institute.

Water depletion is a serious problem in the arid land of the Middle East. The population growth rate is far outpacing the supply of water. In Saudi Arabia, some analysts estimate water reserves have dwindled to less than 10 years of supply. As a result, the Saudi government plans to cut agriculture water use drastically. It now has a goal to import 100% of its food by 2016.⁶ But that will make it highly dependent on other nations, including on nations outside of the region.

Europe isn't free to fritter away its water supplies. It has 13% of the world's population but only 8% of the world's water resources.

North America's water supplies are abundant relative to its share of worldwide population. Canada has among the richest supplies of fresh water resources in the world. More than 9% of the nation is covered by fresh water. However, the United States and Canada are among the nations that consume the most water on per capita basis, according to UNESCO-IHE. Certain regions of North America are at risk of becoming water-stressed areas. For example, water supplies in the U.S. desert southwest are stretched thin.

Climate change creates additional risks for water supplies in many parts of the world. If the earth's temperature continues to warm, access to water could deteriorate further in regions already experiencing water stress. Changing weather patterns could create droughts in some areas and create humanitarian catastrophes. Finally, geopolitical risks exist. If sufficient conservation measures, water pollution control, and technological breakthroughs don't come fast enough, water shortages could lead to conflicts between nations.



Investment Opportunities in the Water Industry

From our vantage point, investing in the water industry is not a cut-and-dried exercise. There simply aren't many pure-play, publicly traded water companies. Over the years, a number of pure-play companies have been acquired by large corporations, often by industrial conglomerates. Also, some companies with emerging water-related technologies are still in the incubator, so-to-speak, and may come public in the years ahead. To navigate potential investments in the industry, we suggest examining the following three areas:

Water Utilities: Attractive Opportunities Come Only at the Right Price

Even though 90% of water utilities in the world are owned by government entities, there are some privately owned, publicly traded water utility companies in the United States and Europe. The vast majority of them operate plants in Europe where 45% are privately owned. Only 10% of water utility companies in the United States are privately owned. The U.S. system is quite fragmented, with roughly 50,000 public and private water agencies, but most households receive water from large utilities. Roughly 8% of the 50,000 water agencies provide water for 82% of the U.S. population, according to the Environmental Protection Agency (EPA).

Historically, investing in U.S. water utilities has been an attractive option and has provided a stable source of dividends. In recent years, valuations of U.S. water utilities have become stretched relative to historical norms. That is why we believe investors need to be particularly valuation conscious regarding not only the slower-growing water utilities, but also when considering the faster-growing water utilities.

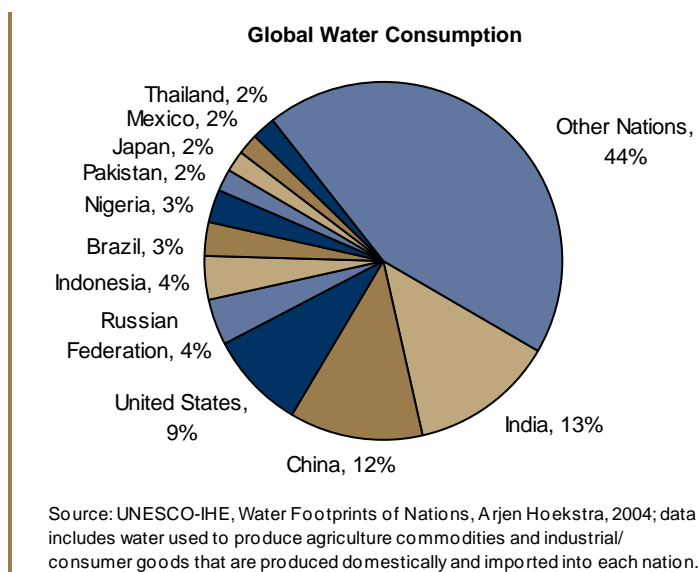
Infrastructure: It's Desperately Needed in Developing and Developed Nations

One of the most attractive investment segments of the water industry is the infrastructure sector, in our opinion. Our correspondent research firm, Credit Suisse, forecasts global water infrastructure capital spending could grow 6.7% per year until 2025.

In developing nations, the need for infrastructure spending is great and obvious. Consider that the world's largest consumers of water resources are India and China on a national basis, as this graph illustrates. Many major cities in these countries have too few or severely sub-standard water systems. As their populations continue to grow and migrate from rural to urban areas, the need for increased water infrastructure spending is likely to become even more acute than it already is.

By 2010, the Chinese government intends to spend the equivalent of up to \$241 billion on waste-water treatment plants, on the upgrade of existing water distribution systems, and on the creation of new distribution systems and water facilities. Dam capacity is another important component of the region's water infrastructure requirements. It would cost roughly \$400 billion for Asia to bring its dam capacity up to U.S. levels.

In developed nations, the need to upgrade existing water infrastructure systems is becoming more pressing by the year because water facilities and water distribution systems are old, deteriorating, and in disrepair. In the United States, many water infrastructure systems were built after World War II, during the great suburban boom. The water systems in many large cities are even older—some are more than 100 years old.



The problems are already coming to the surface. New York City and Chicago recently experienced breaks in 80-year-old water or steam pipes that resulted in water and mud gushing onto the streets.⁷ Even cities with relatively newer water infrastructure systems, such as Denver, have experienced breaks in major water pipelines that have caused large sinkholes.

The EPA recommends roughly \$1 trillion should be spent during the next 20 years upgrading existing U.S. water infrastructure. Of that, more than \$277 billion should be spent on repairing and improving drinking water systems, the EPA estimates. However, some water engineers believe that amount won't even come close to fixing the drinking water infrastructure problems. They believe it would take roughly \$480 billion to repair the system.⁸

Among publicly traded companies, the key providers of water infrastructure systems are typically units of conglomerate industrial companies. They produce the pumps, pipes, and water-control devices that enable public and private utilities to bring water to and from residences and businesses. In effect, these companies sell into the water utility supply chain and provide utilities with products to run water facilities more efficiently.

Companies that manufacture water conservation products for residential, industrial, and agriculture purposes will be an increasingly important part of the infrastructure category in the future, in our opinion. For example, there are already technological innovations that enable agriculture irrigation systems to reduce water runoff.

For years budgetary constraints have provided government officials with reasons—and excuses—to defer necessary water infrastructure upgrades or to postpone construction of new water systems. Each year they delay, the system becomes more vulnerable to breakages and service disruptions, and the price tag to fix it rises. At some point the excuses will run their course, in our assessment, because the public health and safety risks are too great and the costs are too high if the delays were to persist. Ultimately, we believe major upgrade projects will be funded by a combination of higher water rates, higher tax rates, and possibly bond measures.

Desalination: It's a Viable Option

One of the most clear-cut means to overcoming the world's limited fresh-water resources is to tap into the vast water resources of the ocean. The process of desalination can do just that by turning salt water into drinking water. Approximately 15,000 desalination plants are scattered around the world, most of them outside of North America. More than 40% of the desalination capacity is provided by 100 plants.

While most Middle Eastern nations are petroleum rich today, they are at risk of being water poor in the decades ahead. Desalination is one solution to the region's serious water problems. That is why roughly 65% of the world's desalination capacity is located in the Middle East where groundwater is very scarce.

One key drawback of the desalination process is that it requires a lot of energy to separate the salt from the water. Not surprisingly, many Middle Eastern desalination plants use oil as the energy source. The plants are dual-purpose, producing water and electricity. Nuclear power is also a viable energy source for desalination power.

Volume of Desalinated Water Produced
Ranked by 2007 Production

Country	Cubic Meters Produced (in millions)		
	2002	2007	% Growth
Kazakhstan	1,330	1,330	0%
Saudi Arabia	863	1,030	19%
United Arab Emirates	385	950	147%
United States*	580	580	0%
Kuwait	420	420	0%
Iran	3	200	6567%
Qatar	99	180	82%
Israel	26	140	447%
Oman	34	109	221%
Bahrain	44	102	131%
Egypt	100	100	0%
Spain*	100	100	0%

* U.S. and Spain desalination production hasn't grown since at least 1992.
Source: Food and Agriculture Organization of the United Nations (FAO) Aquastat Database, <http://www.fao.org/nr/water/aquastat/main/index.stm>

Reverse osmosis (membrane desalination), a technology that has been around for decades, is becoming more viable because capital costs to build the plants have fallen. There is currently a reverse-osmosis plant under construction in the London borough of Newham. It will treat brackish water (a mix of fresh and sea water) from the Thames River. The plant will be powered by bio-diesel fuel and will have the ability to meet the daily water needs of one million people.

Conceptually, desalination could be an attractive area in which to invest. Unfortunately, many of the companies that construct desalination plants are privately owned but are not publicly traded. Also, among some of the largest publicly traded conglomerates with water divisions, the percentage of revenue from desalination and water infrastructure projects are so low they are not attractive as water-related investments. That being said, some publicly-traded companies involved in desalination do have a meaningful share of revenue from the water industry.

For specific investment ideas in the water industry, contact an RBC Wealth Management Financial Consultant.

RBC is Committed to Fostering Water Stewardship

The RBC Blue Water Project™ is a Multi-Year Effort

RBC is not only interested in the water industry from an investment standpoint, the firm is also committed to fostering water stewardship and preserving the world's fresh-water resources from environmental and humanitarian standpoints.

In late 2007, RBC announced a C\$50 million grant program to fund charities and non-profit research organizations that protect watersheds and provide access to safe and clean drinking water, particularly in rural communities. While grants will be dispersed during the next 10 years to organizations primarily in countries and regions in which the firm is most active (Canada, the United States, the Caribbean, and the United Kingdom), organizations in all 38 developed and developing countries in which RBC is located will be eligible. This grant program is the first phase of RBC's Blue Water Project.™

Grants have already been awarded to charities and institutes across Canada and the United States, including to the following U.S. organizations: North Carolina State Engineering Foundation, World Wildlife Fund (watershed project on the Little Tennessee River), the Institute for Public Health and Water Research at Texas A&M University, Friends of the Mississippi River, and Alabama Coastal Foundation.

For many years RBC has sought to advance environmental and social causes. The firm has been named to the Dow Jones Sustainability World Index for nine consecutive years. The Index recognizes the world's financial, social, and environmental corporate leaders. Recently, RBC chose to focus its environmental efforts on water stewardship and fresh water sustainability primarily for the following reasons:

“Lack of access to clean fresh water is considered to be one of the major threats to human health and economic development around the world. The demands on this limited resource continue to grow, even in Canada, where we have one of the world's largest supplies of freshwater. This is an urgent global humanitarian crisis, and is becoming an economic crisis, in both developed and developing nations, if industries that need fresh water for their operations can't find it.”

— *Gordon Nixon, president and CEO of RBC*
October 2007

Footnotes

- ¹ “At the Crest of a Wave: A Proactive Approach to Corporate Water Strategy,” Business for Social Responsibility and the Pacific Institute, September 2007; reports cites research from Stockholm International Water Institute, 2005
- ² “To use or to misuse,” CSE India, Down to Earth Supplement on Water Use in Industry, 2004
- ³ “Business Risks of Water Fact Sheet,” Pacific Institute, August 15, 2004
- ⁴ Jason Morrison and Peter Gleick, “Freshwater Resources: Managing the Risks Facing the Private Sector,” Pacific Institute, August 2004
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- ⁶ Niels Jensen, “The Absolute Return Letter,” Absolute Return Partners, May 2008. Letter courtesy of John Maudlin’s “Outside the Box” newsletter
- ⁷ Colleen Long, “US Water Pipelines Are Breaking,” Associated Press, April 8, 2008
- ⁸ “US Water Pipelines Are Breaking”

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ADDITIONAL INFORMATION AVAILABLE ON REQUEST.

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