Water – an increasingly hot 'commodity'

"If the wars of the 20th century were fought over oil, the wars of the 21st will be fought over water." Ismail Serageldin, ex-VP, World Bank

AT A GLANCE

- Freshwater is a fragile, unequally distributed, and increasingly polluted resource that is difficult to transport and easy to waste.
- Demand for water is intensifying as global, and particularly emerging, populations grow, produce more and become wealthier.
- Developed economies are water-intensive, via demands from agriculture and protein-rich diets, as well as heavy industrial and domestic use.
- Inefficiencies are high in both the developed and emerging world.
- Desalination and water recycling are areas where significant progress is expected to be made.
- Water ownership rights, infrastructure and technology offer significant investment potential.
- Water will provide a growing number of stock opportunities, going forward. Indeed, it has the potential to become one of the biggest themes of the 21st century.

"All the water that will ever be is, right now."

National Geographic, October 1993

Water is seen as a basic human right. In some parts of the world it is taken for granted, in others access to clean water has always been a challenge. Now, as populations grow and water use intensifies around the world, water is becoming an increasingly hot 'commodity' that is set to dominate the economic, social and investing landscape of the 21st century.

BLUE GOLD

Water is something many of us take for granted. After all, two thirds of the Earth's surface is covered in the stuff. Unfortunately, 97.5% of the world's water is saltwater. And, of the 2.5% that is freshwater, 68.9% of that is locked in glaciers, 30.8% is in the groundwater table (or underground aquifers) and only 0.3% is to be found in lakes and rivers.[1] Add to this the fact that the Earth's river systems are unevenly distributed geographically and much of the water we use is wasted or polluted by man's efforts in urbanisation and industry, and our growing dependence on this fragile resource, used ubiquitously in agriculture, industry and households, becomes painfully clear.

'PEAK' WATER OR A RENEWABLE RESOURCE?

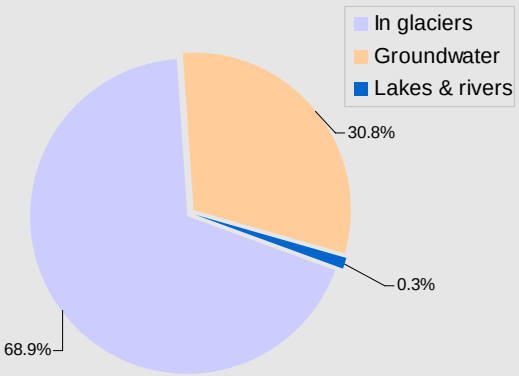
Water has traditionally been thought of as a renewable resource and in many areas of the world that is true. However, ground water stores and lakes and river basins can become depleted, and polluted, through intensive use, urbanisation and mismanagement.

The 'Ogallala' aquifer in the US is one of the world's largest, stretching from Texas to South Dakota. However, it is being rapidly depleted through municipal and agricultural use. The aquifer primarily contains fossil water from the time of the last ice age. It supports 200,000 wells, withdrawing millions of gallons a minute, a rate that is many times faster than its natural replenishment rate. Depleted aquifers can become polluted or permanently damaged through subsidence. Coastal aquifers, such as Biscayne, have problems with saltwater intrusion as a result of over-pumping.

The over-pumping of ground water supplies has led some economists to suggest that Hubbert's 'peak' theory of resource use applies to much of our water resources (particularly fossil water aquifers) and has led to a broadening debate over 'peak water' that is similar to concerns over 'peak oil'. Its proponents believe rapidly growing populations in the developing world and increasing demands for water will inevitably lead to non-renewable use of water resources. The terms 'peak renewable' (where entire renewable flows are used) and 'peak ecological' (where environmental issues outweigh economic benefits) have also been put forward.

FRESHWATER IS A SCARCE COMMODITY...

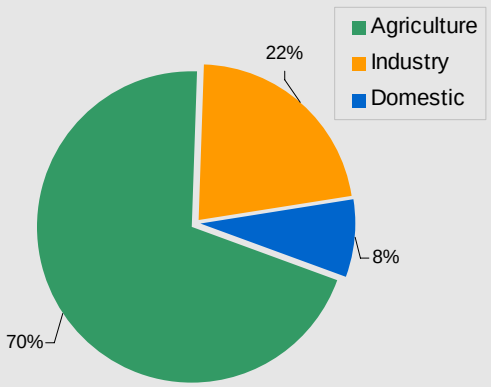
97.5% of the world's water is saltwater. The 2.5% that is freshwater can be broken down as follows:



Source: United Nations Environment Programme (UNEP)

...THAT IS USED INTENSIVELY ACROSS THE WORLD

Agriculture is by far the most intensive user of fresh water. We should bear in mind that a lot of the water withdrawn from the system is wasted.



Source: United Nations Environment Programme (UNEP)

"When the well is dry, we know the worth of water."

Benjamin Franklin

A HIGHLY REGIONAL BUSINESS

Some areas of the world have plenty freshwater. In the southern hemisphere, Brazil is the standout in terms of volumes (if not quality and access), while, taken together, the Arctic rim countries of Canada, Greenland, Scandinavia, and Russia form a formidable bloc of water surplus economies in the northern hemisphere. At the other end of the scale, there is a large and growing list of countries that have water supply problems either in terms of outright shortages or access to clean water. Let's consider some of the major problem areas:

India

India has around 17% of the Earth's population, but only 4% of its water.[2] Water tables are dropping fast in some of the main agricultural areas. India has the greatest rate of water withdrawal in the world; the Indus and Ganges rivers are tapped so heavily that, except in rare wet years, they no longer reach the sea. The majority of water supports agriculture, in the form of irrigation for rice paddies, but inefficiency is widespread. Some studies suggest that Indian rice farmers achieve less than half the yield they do in China, despite using ten times more water.

China

China, like India, also has low per capita supplies of water (19% of the world's people, yet only 7% of its water supplies)[2] and the second-largest rate of water withdrawal. The country's intensive use of water, combined with multi-year drought conditions in some areas, is nearing crisis levels. Water resources are over-allocated, inefficiently used, and polluted by human and industrial waste. Indeed, five of the seven main river systems in China are classified as 'severely polluted'.[3] Hundreds of lakes have disappeared over the last 20 years as water table levels have fallen and aquifers have been over pumped. This is a particularly serious problem for the drought prone, wheat-growing Hebei Province, which surrounds Beijing.

United States

The US has about 5% of the world's population, yet it uses almost as much water as India or China.[2] As mentioned above, many aquifers in the US are being depleted at an unsustainable rate.

Middle East

Many economists estimate that 'peak water' conditions have already occurred in some middle eastern countries, such as Saudi Arabia and Yemen. Water sustainability is no longer attainable according to the Yemeni government. The focus of efforts in many of these countries has moved to desalination, agriculture has shifted away from water intensive crops, and most food is typically imported. After being desalinised at Jubail on the coast of Saudi Arabia, water is pumped 200 miles inland though a pipeline to the capital city of Riyadh.

Africa

Only a small part of Africa is actually irrigated (7% of farmland in Africa is irrigated versus 38% in Asia),[4] therefore much of the harvested cropland is reliant on rainfall, which is unpredictable and mostly insufficient. Egypt, Morocco, Sudan and South Africa are the exceptions, with large irrigated areas; here the problem tends to be unsustainable irrigation practices.

"Over the past few decades, use of water has increased, and in many places water availability is falling to crisis levels. More than eighty countries, with forty percent of the world's population, are already facing water shortages, while by the year 2020 the world's population will double. The quality of water in rivers and underground has deteriorated, due to pollution by waste and contaminants from cities, industry and agriculture. Ecosystems are being destroyed, sometimes permanently. Over one billion people lack safe water, and three billion lack sanitation."

World Bank, Water Policy Reform Program, 1999

GROWING POPULATIONS, CHANGING DIETS = INTENSIFYING WATER USE

Since 1950, global water use is estimated to have trebled - and it is only going to get worse. The biggest reason for that is the growing global population, which is being driven by increases in water-poor emerging economies.

In 2000, scientists predicted that a third of the world's population would suffer from a shortage of water by 2025, but they have been dismayed to find that this threshold may have already been breached. Indeed, a recent report in the journal Nature puts 3.4 billion people into the most severe category of water insecurity, right now.[5] Due to population growth, scientists at the International Water Management Institute (IWMI) predict that by 2025, 36 countries in the world will fall into the category of being 'freshwater scarce'. Climate change and desertification will only serve to exacerbate the issue.

"Feeding everyone in 2050 will require twice as much as water as agriculture requires today."

Colin Chartres, Director, International Water Management Institute

Given that agriculture accounts for around two thirds of all water use, the availability of food and water are intimately related. Rapid population growth means more food production which, in turn, means significantly more water use.

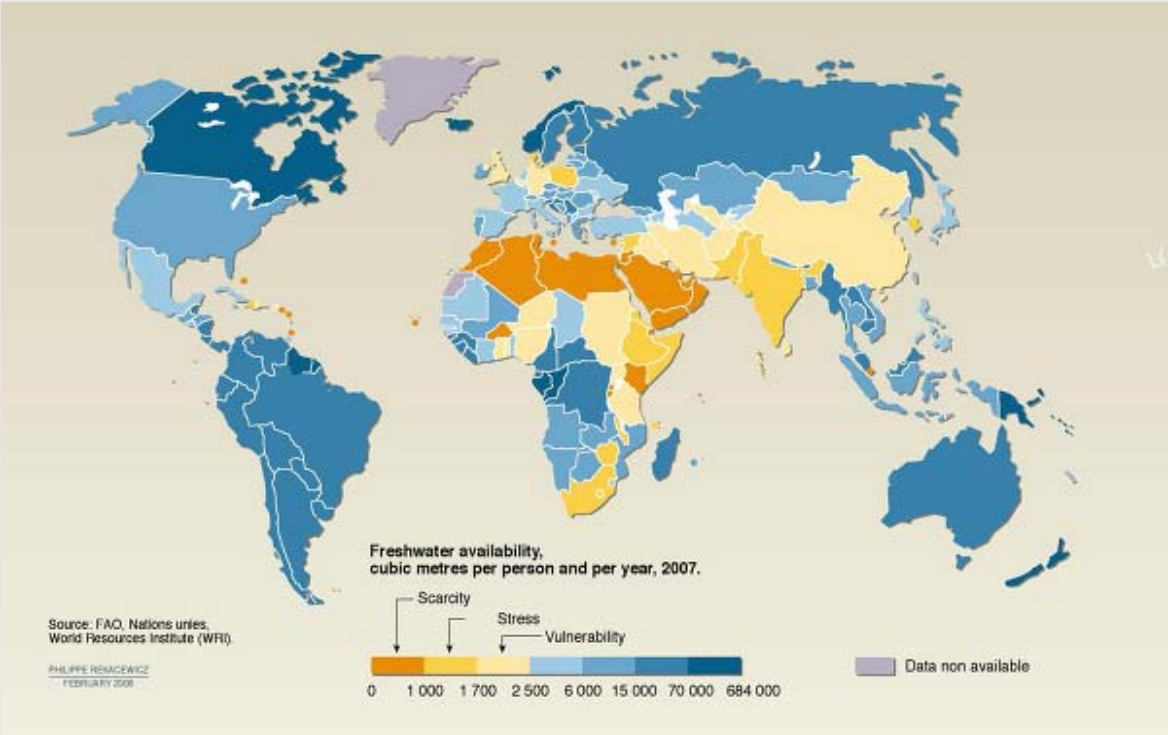
Modern agriculture is also using more water than ever before. The 'Green Revolution' introduced higher-yielding cereal seeds into developing countries to replace (often fairly drought resistant) indigenous crops. The problem is that these 'water-hungry' strains are highly dependent on irrigation, so this 'leap forward' in food production has had very bad repercussions for water.

DEVELOPING NATIONS' USE OF WATER WILL GROW

On average, it takes one litre of water to produce one calorie of food. Multiply that by the 2,000 calories an average human needs on a daily basis, then multiply that by the world's population (6 billion and rising) and you have a very big water requirement number.

As developed populations grow richer, the problems intensify. According to UNESCO, people in developed countries consume around 10 times more water daily than those in developing nations.[6] The problem is exacerbated by a shift to higher protein diets in developing countries, where we are seeing steadily growing demand for meat. This is because livestock farming is particularly water intensive, much more so than crops. To produce one kilogram of corn takes 1.5 cubic metres of water. However, one kilogram of chicken takes 6 cubic metres and one kilogram of beef requires 15 cubic metres. (1 cubic metre = 242 gallons).[7]

FRESHWATER IS ALREADY SCARCE IN MANY PARTS OF THE WORLD



Source: United Nations FAO, World Resources Institute, 2007.

UPSTREAM TRUMPS DOWNSTREAM

There are several regional flashpoints when it comes to water. Over 260 river basins are shared by two or more countries and 13 are shared by five or more countries. Generally, the further upstream a country is situated, the more it has the upper hand in the use of water flows.

For example, in the Middle East, Turkey holds a dominant position since the Tigris and Euphrates rise in its eastern mountains. Both rivers flow through Syria and Iraq, which are dependent on Turkish cooperation for the amount of water they receive. The situation has been made more fragile by Turkey's decision to build a US$32 billion water scheme, which involves the construction of several dams, for irrigation and hydro electric power. This will have a negative impact on the downstream states of Syria and Iraq, which oppose Turkey's plans.

This issue is mirrored in several areas across the globe – for example, dam building in China negatively impacts water flows in Bangladesh, Laos, Vietnam, Burma and Cambodia.

WATER INFRASTRUCTURE

When it comes to the need for water infrastructure, the most acute requirement is clearly in the developing world. China recently committed $20 billion to water infrastructure in its post credit-crunch stimulus plans. However, in the developed world too, the need to upgrade and enhance outdated and inefficient infrastructure is also pressing. The EPA, the government agency in the US responsible for water safety, estimates that $138 billion is required by 2016 to get US water infrastructure compliant with safety standards mandated by the Safe Drinking Water Act.[7] Much of the water infrastructure in the US (for instance in New York) is around 100 years old.

THE KEY 'ALTERNATIVE' SUPPLIES

Seawater desalination

Given that more than the half of the world's population live less than 60km from the coast, seawater is set to become one of the main alternative sources of water in the next few decades. Desalination is the removal of salt and other dissolved minerals from seawater and brackish water (a mixture of fresh water and ocean water). It is expected to become one of the primary long-term solutions to water shortages. In the Middle East, largely in Saudi Arabia, desalination plants already satisfy over 70% of the region's freshwater needs from over 30 plants, many of which are run by private contractors.

There are two main types of procedure for desalinating seawater, which contains almost 100 times more than the WHO-recommended amount of salt in water for human consumption.

- **Thermal desalination -** converting water to steam in distillation facilities
- **Reverse osmosis membrane desalination -** water is pumped through a membrane, which lets the water through but traps the salt.

World-wide, desalination plants produce more than 12 billion gallons of water a day, according to the International Desalination Association, but it still makes up less than 5% of freshwater use. The efforts have been led by Middle Eastern countries such as Israel, Saudi Arabia and the UAE, as well as Singapore and the US. Notably, however, India and China have also begun desalination programmes in recent years.

There are a few factors that currently keep desalination from being a panacea for the world's water problems. First, there are the high capital costs in building desalination plants, combined with the still relatively high cost of the water produced, and the energy required during production. There are also environmental issues with the disposal of the resulting brine and the high cost of transporting the water to the areas where it is required.

However, Goldman Sachs estimates that water desalination costs are three to four times lower than they were thirty years ago. Israel and Singapore are just two of the countries desalinising water at a cost of less than US$0.60 per cubic metre.

Water recycling and reuse

The re-use of treated wastewater has grown sharply in the last few years, especially in arid countries such as Australia and Israel. More than 40 million cubic metres of municipal wastewater is now recycled daily worldwide, but this still represents only a fraction of total water use.[8]

Treatment solutions include advanced clarification, bio-treatment, filtration, membrane techniques (microfiltration, ultrafiltration, nanofiltration, and reverse osmosis), ultraviolet disinfection, activated carbon treatment using sand or gravel, ozone disinfection and industrial wastewater recovery installations. Ultraviolet light disinfection, in particular, is a significant growth area. Goldman Sachs predicts that this $500 million subsector will grow 15-20% annually in the US alone.[7]

Recycled water is principally used in irrigation and industry. However, if the infrastructure continues to improve, and consumers can overcome the psychological 'yuck' factor, there is no reason why recycled water could not be used in sanitation and even as drinking water. If these barriers to its wider use can be broken down, it could form a significant part of the solution.

"The Latin American economy is rich in natural resources, including freshwater. In fact, Brazil has the most plentiful supplies of freshwater of any country in the world, and delivers over 80% of its electricity via hydroelectric power. Water quality, pollution, and sanitation in poor and rural areas remain key policy areas. We should continue to see heavy investment in water infrastructure with certain private companies being potentially significant beneficiaries."

Angel Ortiz, Portfolio Manager, Latin American equities, Fidelity

InPerspective:

"Water is a big theme in emerging markets and one that is set to get an awful lot bigger still. ***RusHydro*** *is one of the lowest-cost generators of power in Russia and stands to benefit greatly from the deregulation of the Russian electricity market."* Nick Price, Portfolio Manager, Emerging Market equities, Fidelity

*"****Doosan Heavy Industries*** *is a company with a wealth of experience in the construction and engineering sector, particularly in the field of desalination. It is well placed to take advantage of growing interest in desalination in its Asian and Middle Eastern markets."* Allan Liu, Portfolio Manager, South East Asian equities, Fidelity

"I like ***Jain Irrigation*** *due to its strong market position in a country where penetration of irrigation is low and dependence on rainfall is high. The company's revenue from micro irrigation systems has expanded at a CAGR of 61% during 2005-2010. It should continue to benefit as land under micro irrigation in India is expected to rise from 3.4m hectares to 15m hectares over the next 7 years."*
Teera Chanponsang, Portfolio Manager, Indian equities, Fidelity

*"****General Electric*** *is a leading multinational with a water division that is a proven expert in desalination technologies. Given the increasingly acute need for more efficient water technology and infrastructure, the firm is well positioned to be a prime beneficiary of anticipated growth in the seawater desalination market. I also like* ***Halosource*** *which has ambitious plans to expand its water purification business in emerging markets."*
Amit Lodha, Portfolio Manager, Global equities, Fidelity

A RANGE OF BENEFICIARIES, BUT STOCK SELECTION IS KEY

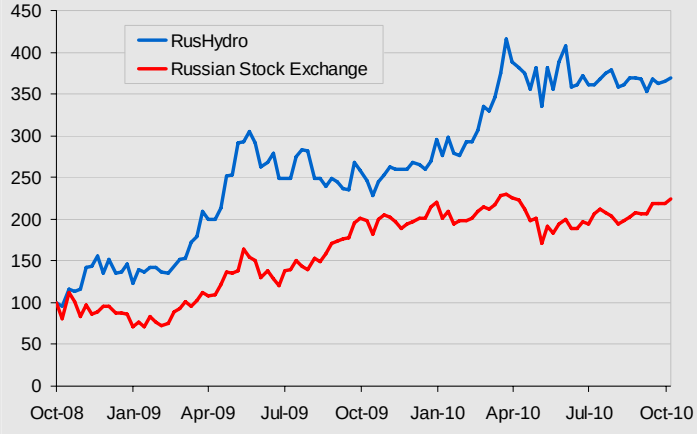
Goldman Sachs predicts long-term growth of up to 6% in the $425 billion global water industry. However, in developing markets like China and India, the build out of new infrastructure should mean we see double digit growth over the next decade.

There are a multitude of interesting stocks involved in water-related activities and we can expect to see many more opportunities emerge as the water theme attracts further investment. Here are just a few of the opportunities.

- **RusHydro** is Russia's largest hydro-generating company and the second largest in the world in terms of installed capacity. The company is a leader in the production of clean power, with over 50 renewable power facilities which harness water flows, wind and geothermal energy. These include the 'Sayano-Shushenskaya' hydroelectric plant - the largest in Europe.
- **Doosan Heavy Industries** is a diversified construction and engineering company based in South Korea, which has become a global leader in the desalination field. The company has completed major desalination projects in the likes of Saudi Arabia, the UAE, and Kuwait. The company recently won the $1.46 billion contract to build the world's largest seawater desalination plant at 'Ras Az Zawr' in Saudi Arabia, due for completion in 2014.
- **Jain Irrigation Systems** is an Indian company with a sales presence in over 110 countries, which manufactures drip and sprinkler irrigation systems. The company has grown strongly, making a number of strategic acquisitions (including Chapin Watermatic, a US irrigation pioneer, in 2006) which have allowed it to become the second-largest drip irrigation company in the world. Goldman Sachs expects 20%+ growth in drip irrigation systems, which are between 30%-70% more efficient than conventional ditch or sprinkler systems.
- **Hyflux** designs, builds and operates desalination plants in Singapore, China and the Middle East. Landmark projects include the 'SingSpring' plant in Singapore and the 'Tianjin' plant in China.
- **Veolia Environnement** is the giant of global water services. The company provides drinking water for more than 78m people and wastewater services for more than 54m. It is involved in all aspects of water distribution, treatment, desalination, recycling and aquifer recharge.
- **General Electric** is another heavyweight company with a large footprint in energy, and water in particular. GE was a pioneering force in desalination and remains a world leader in the supply of seawater membrane desalination systems, including such projects as the 200,000 cubic meter/day Hamma Desalination Plant in Algeria, the largest of its kind in Africa.
- **HaloSource** is a water purification company, whose products kill disease-causing bacteria and viruses to provide safe drinking water at the point-of-use. The company, which has manufacturing facilities in Bangalore and Shanghai, plans to focus heavily on emerging markets as the basis of its future growth strategy.

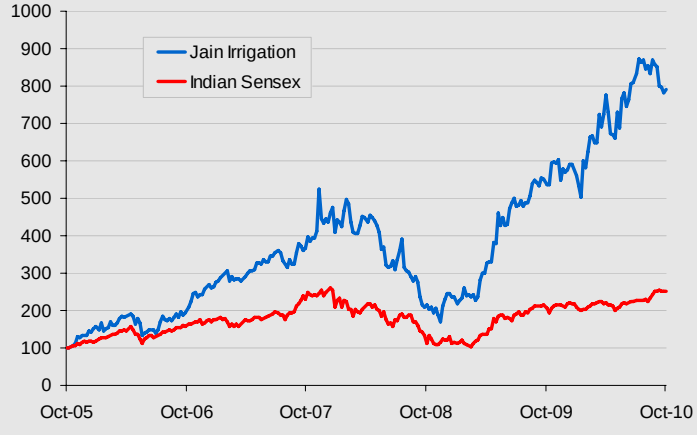
There are a host of other companies that have the ability to take advantage of the water themes that our analysts are monitoring. And, of course, there are a large number of indirect plays, particularly in the agricultural and fertiliser area since the food chain is inextricably linked to water.

WATER FOR POWER: RUSHYDRO



Source: DataStream, as at 27.10.10

WATER FOR AGRICULTURE: JAIN IRRIGATION SYSTEMS



Source: DataStream, as at 27.10.10

THE FUTURE IS NOT WRITTEN

In his book, 'The World in 2050', Laurence Smith considers population growth, resource demand and climate change to paint a stark future, where a batch of countries he calls the NORCs (Northern Rim countries) emerge as clear winners, based in large part on their freshwater supplies and land rights in the Arctic Circle. The NORCs are Canada, the US, Russia, Sweden, Finland, Denmark (Greenland), Norway and Iceland. In Smith's view, these countries will be the beneficiaries of an Arctic warming that will create a more hospitable and economically fruitful climate that will allow more drilling and extraction and trigger northward migration. Climate change will boost agricultural productivity in these fertile post-glacial areas. Lack of freshwater in other areas could precipitate a surge in displaced 'climate migrants', who are forced to move north both for better access to water and better economic opportunities.

The counter- argument to what may seem like an entirely rational hypothesis is that humans thankfully have a knack, and a pretty decent track record, of inventing and innovating their way out of trouble. In fact, the actual track record of forecasts like this, which are effectively linear extrapolations, is very poor. Many environmental economists believe the world's water issues *can* be tacked, if we take a holistic approach, with appropriate local solutions for local problems. Taken together, dramatically cheaper desalination, nanotech water purification systems, more efficient irrigation systems, (and, at the margin, technological developments like the ones mentioned below) offer the prospect of a holistic solution to water shortages.

SOME INTERESTING NEW TECHNOLOGIES

Nanotechnology water purification – Nanotechnology can improve water quality through the use of advanced filtration materials that enable greater water reuse, recycling, and desalination. Nanomaterials such as carbon *nanotubes*, *nanoparticles*, and *dendrimers* are contributing to the development of more efficient, cost-effective water filtration processes. A recent entrant to this field is Indian company, **Tata Chemicals**. In much the same way that Tata Autos shook up the automobile market with its affordable car, Tata Chemicals is finding plenty of buyers for its affordable water purifier, called *Swach* ('clean' in Hindi), which costs less than 1000 rupees ($22).

The *Swach* was developed using nanotechnology, but the purifying cartridge is made from cheap, naturally-occurring sources, principally rice husk ash – of which there is plenty in India. Crucially, it does not require electricity or running water, giving it mass appeal to the largely poor and rural populations of the Indian sub-continent and, in time, other parts of Asia and Africa. The product, which has won independent innovation awards, has been selling so well that the firm recently announced it is planning to build a second plant with the aim of boosting annual sales to 1m units.

Water filters are by no means solely for the developing world. The water produced by tap filters claims to be as good as bottled water and many commentators predict that we will see a backlash against bottled water in coming years as consumers realise the benefits of advanced filters. A US study showed that half litre of bottled water (which also brings plastic/landfill issues) costs a ridiculous 4000 times as much as the same volume of municipal tap water (despite little-to-no difference in quality).[7]

Condensation windmills - An innovative windmill, created by Max Whisson, can harness wind power to collect water out of the atmosphere. It offers the prospect of an environmentally-friendly solution; water vapour makes up a large part of the bottom kilometre of air around the world and this vapour is replaced every few hours as part of the natural water cycle. The windmill uses refrigerant to cool the blades, so that when air meets them, water vapour forms condensation, which is collected and stored. Its maker claims the windmill can collect as much as 2,600 gallons of water from the air each day. While it has green credentials, the technology has yet to receive the significant capital backing and testing on which its wider diffusion would be based.

Cloud seeding - Cloud seeding is a form of weather manipulation that works by firing silver iodide into storm clouds. It has been used by both the US and Chinese governments in order to bring rain to agricultural lands. However, it is has produced mixed and unpredictable results. For instance, Chinese scientists recently seeded clouds in the wheat-producing area near Beijing, which was suffering from a drought. The operation went as planned until temperatures dropped sharply and the precipitation fell as heavy snow. It was the earliest snow in Beijing for ten years and caused traffic chaos. Cloud seeding could only ever form one part of a wider solution to the world's growing water needs. The wider impact of manipulating local weather patterns is still poorly understood; there are concerns that it has worrying implications for neighbouring areas.

THE VALUE OF WATER

"Water is a human right rather than a commercial good." While everyone feels this should be the case, in practice, such distinctions are become increasingly blurred. Water may well be a human right, but *providing* water is a *business* that costs money and merits a return on investment.

In fact, this disconnect is in many ways part of the problem. The provision of clean water is a business with high infrastructure costs that has traditionally been heavily subsidised. Yet, it is water's perception among most consumers as a cheap and abundant resource that contributes to inefficiencies in its use.

Many economists argue that in order to reduce water shortages and water waste, we need to create a proper sense of value in water use. Australia is ahead of the game, having faced acute water issues in their economy. Under their 'National Water Initiative', water rights can be transferred between parties, such as irrigators or infrastructure operators. It is effectively a sophisticated water trading system that creates a value around water based on what a user is prepared to pay. Going forward, it is a model that may become increasingly widespread if the planet's water issues are to be resolved.

CONCLUSION

We do not need oil or gold just to survive, which is why water is like no other resource. It is a vital ingredient in life, as well as virtually every economic sphere. While the world's water problems are challenging and multi-faceted, many believe that they are ultimately manageable if we begin to invest in sustainable alternatives, such as water recycling and desalinated seawater. And, while water may be a human right, increasingly users will be prepared to or forced to assign a value to its use.

Water seems sure to become a mega-trend of the 21st century – perhaps the defining trend. From an investment point of view, there will be many winners as this broad dynamic plays out over time. As ever, rigorous fundamental research and bottom up stock selection will be critical in identifying them.

Footnotes

1. United Nations Environment Programme (UNEP).
2. US Census Bureau International Database, as at 2010. Wikipeida.
3. World Resource Institute 2008, 'Watering Scarcity'.
4. United Nations Food and Agriculture Organisation (FAO), March 2009.
5. Nature 467, Vorosmarty et al, 'Global threats to human water security and river biodiversity'.
6. UNESCO, 2000
7. Goldman Sachs, 'The essentials of investing in the water sector', March 2008
8. Global Water Intelligence, Municipal Water Reuse Market 2010