

Research Note

Aqua: Invest in The Source of Life

Water was, is and will be key for the development of human kind. We have just started the International Decade of 'Water for Life', and it is becoming increasingly evident that the development of the global economy throughout the 21st century will be dependant on the sustainability of the Earth's resources, and in particular that of water. Because we think water will become increasingly scarce, it offers interesting investment opportunities, especially amongst the socially-responsible companies which put sustainability of water at the core of their business decisions. This report offers a detailed analysis on the issues of water and offers an easy to way to play the investment theme of water.

The vision

An important fact that encompasses the trends in the water industry in the last few years is that in December 2003, the United Nations proclaimed the decade between 2005 and 2015 as the "International Decade for Action, Water for Life". This is finely expressed in the following quote by the World Health Organisation: "Access to water supply and sanitation is a fundamental need and a human right. It is vital for the dignity and health of all people."

This highlights the increasing importance that water availability and quality will have in the coming decades as well as throughout the 21st century. It also proves the increasing importance that sustainability policies will have in the economic and social arenas.

In this report, the reader will find a detailed analysis of the situation of worldwide water, as well as the trends and challenges we will be facing in the coming decades. We also give a selection of stocks with which an investor can play the theme of water. As we will see on page 4 "I. Sustainability at the core of the investment philosophy", the stocks have been selected through our 3-layer investment approach:

1. these stocks are all exposed to water and will benefit from the trends we envisage for the coming years and decades
2. all these companies put sustainability as an important parameter in their business decisions. This makes the list a socially-responsible list of stocks.
3. Finally, out of those stocks we select only those which we think will appreciate in the coming 2 to 3 years. This is done through traditional, fundamental investment analysis.

The selected stocks

Based on the above, the selected list of stocks is shown in Figure 1. Figures 2 and 3 give further details on these companies.

We acknowledge that some of the stocks selected in our strategy have a very small exposure to water. For example, General Electric's water exposure is only 2% of sales (see Figure 3). However, it is also important to realise that General Electric is a leading player in many water technology segments, its exposure to water is rapidly increasing and water will become

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Figure 1: The Aqua strategy: stock selection

Stock	Sector	Currency	Rating
Coca-Cola	Cons. Staples	USD	OP
Danone	Cons. Staples	EUR	MP
Nestlé	Cons. Staples	CHF	OP
Geberit	Industrials	CHF	OP
General Electric	Industrials	USD	OP
Siemens	Industrials	EUR	OP
SGS	Industrials	CHF	MP
Tyco International	Industrials	USD	MP
Severn Trent	Utilities	GBP	OP
Veolia	Utilities	EUR	MP

Note: OP = Outperform; MP = Marketperform
Source: UBS WMR

more important in the coming 2 to 3 years. A similar statement could be made on Tyco International and Siemens. Hence, we feel comfortable having these stocks in our stock selection.

The investment horizon

Although our stock selection is valid for a period of 2-3 years, the underlying theme of water provides you with a long-lasting investment case. We think the theme of water should be part of any long-term portfolio of equities.

Investment opportunities

Based on our research, here is a compressed list of the investment opportunities we see in the several different water sub-sectors.

Water and waste-water treatment and technology

- Water treatment technologies are becoming more and more important as pollution remains widespread and news on environmental incidents travels fast.
- Decentralised systems for waste-water treatment and drinking water disinfection will become more and more attractive, as the currently centralised systems can hardly keep pace with the rapid growth of cities.
- New, emerging water pollutants require new treatment technologies. Demand for state-of-the-art treatment technologies is on the increase, as older treatment plants are often not capable of guaranteeing safe drinking water.
- Desalination represents the highest growth market, as it is currently the most obvious way to overcome the potential scarcity of water: not only do desalination technologies turn seawater and brackish water into drinking water, but they also represent a necessary component of waste-water treatment.
- New equipment is needed to measure the effectiveness of the new, improved treatment technologies. Companies able to provide such equipment will experience increasing demand.

Infrastructure

- The so-called "inlining" systems will become increasingly popular. These are new, competitively-priced technologies designed to extend the working life of water pipes. The process involves inserting new pipes made of high-quality, flexible material into existing pipes. The advantage is that large areas of street do not have to be dug up.
- In general, companies which offer innovative methods for extending the useful life of the infrastructure will experience demand growth.

Irrigation, food and bottled water

- Demand for efficient irrigation systems, water-efficient food sources and water management technologies will grow.
- Growing health awareness is stimulating demand for organic produce as well as mineral and bottled water.

Demand side efficiency and safety

- Rising water tariffs will lead to an increasing incentive to cut water consumption: demand for water-efficient appliances, such as high-efficiency showers or flushing devices will grow.
- Water management systems in the building premises will also gain in importance: demand for drinking water filtration and purification technologies will grow.

Figure 2: The Aqua strategy: stock selection

Stock	Valor	ISIN
Coca-Cola	919390	US1912161007
Danone	487663	FR0000120644
Nestlé	1205604	CH0012056047
Geberit	803822	CH0008038223
General Electric	933071	US3696041033
Siemens	827766	DE0007236101
SGS	249745	CH0002497458
Tyco International	674698	BM9021241064
Severn Trent	676845	GB0000546324
Veolia	1098758	FR0000124141

Source: UBS WMR

Figure 3: The Aqua strategy: stock details

	Water as % of Sales	Water exposure comment
Coca-Cola	7%	Bottled water manufacturer
Danone	100%	Bottled water and food production (1).
Nestlé	100%	Bottled water and Food production (1)
Geberit	100%	Bathroom devices; Water saving devices.
General Electric	2%	Desalination, Industrial water treatment, wastewater treatment and filtration
Siemens	2%	Wastewater treatment and industrial water treatment
SGS	15%	Water inspection and agriculture inspection
Tyco International	2%	Valves, engineering and consulting, and industrial water treatment
Severn Trent	65%	Water Utility and Waste water treatment
Veolia	40%	Water Utility

(1) Food production demands almost 70% of total water consumption worldwide. Danone, Unilever, Nestle and Kraft Foods have signed the [Agriculture Initiative agreement](#). This means that the food production process is water efficient and meets all the relevant sustainability criteria. This is the reason why, in the case of these four companies, we consider that food production is part of their water exposure.

Source: UBS WMR

Water metering

- Rising water tariffs will create an incentive to pay and bill on a per-usage basis. Demand for equipment to meter individual water usage will increase.

China

- China's growing urbanization and industrialisation are putting an enormous strain to the country's inadequate water infrastructure. The Chinese government changed its legislation in 2002 and allowed foreign investment in the water business. There are huge opportunities in China on all the points mentioned above, as explained further ahead in this document.

Water is unique

Without going into too much detail, it is, however, interesting to highlight some unique features of water as a commodity as well as the economics of water investing:

- Water is the only output from a utility that is ingested: this exacerbates the need of responsible health policies related to water.
- Demand is extremely inelastic as it is unaffected by inflation, recession, interest rates, changing preferences or inventory loss.
- The raw material is "free" at the moment: despite the inherent costs of cleaning and distributing water, it can be obtained at no cost at the source. This may change in the future as water scarcity increases. Although, we may find it unethical, we think there is a chance that, in the future, the land upon which water sources lie could be privately owned. This would further support our view that water price will go up.
- Water is not subject to technological change: despite the emergence of mineral water, natural water, if properly treated, is as healthy as ever, and in many cases healthier than mineral bottled water.

I. Sustainability at the core of our 3-layer investment philosophy

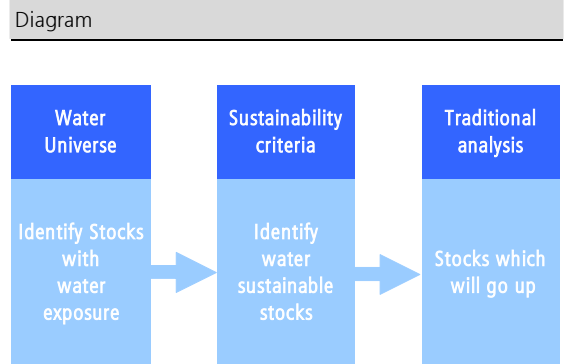
As we will see in Section "II Global Trends", given the strain that we are likely to experience in the coming decades, water sustainability will play a pivotal role in the development of the global economy and our lives throughout the 21st century. The stability of the global economy is dependent on how human beings maintain the resources that our planet harbours.

Our 3-layer investment philosophy for this strategy revolves around the concept of water sustainability.

4. Firstly, we identify the stocks that have exposure to water and should benefit from the 6 factors affecting the demand of water (see "3. Factors affecting the demand of water" on page 6).
5. Secondly, we select only those companies which, in some way, put sustainability as an important parameter in their operations. It is virtually impossible to make a comprehensive list of actions which would be deemed as "sustainable", and inclusion or not of a company in this category has been decided on a discretionary basis. In addition, we would like this list to be open as the changing nature of businesses, demand, supply, technologies, and operations require enough flexibility to take into account all these future changes. Hence, the list of sustainable criteria shown in Figure 5 will allow changes and additions in the future.
6. Finally, our third layer relies upon the traditional pillars of investing in Equities. We must ensure that the stocks selected in the first two layers provide a sound investment case for you. Hence, we apply the traditional investment concepts such as valuation analysis, earnings growth prospects, competition analysis, strategic analysis and management quality amongst others in order to select those most likely to appreciate.

The next section describes the global trends of water: supply, demand, pricing and the factors that will make demand grow throughout the next decades. Sections III and IV will give you further details on the several different markets and businesses of water where growth will lead to attractive investment opportunities.

Figure 4: Our 3-layer investment approach



Source: UBS WMR

Figure 5: Sustainability criteria

Water sustainable activities
Use of water efficient processes, methods, technologies (information systems, irrigation etc...)
Use of water saving technologies, procedures, methods
Use of water treatment technologies and processes (disinfection, desalination etc...)
Investment in water distribution infrastructure
Production of bottled water to non-industrialised countries
Use of water metering technologies
Abiding by the Agriculture Initiative Agreement
Monitoring the quality of water

Source: UBS WMR

II. Global Trends

1. Supply

a) The big picture

Our planet holds water everywhere but only a tiny proportion of that water can be used for consumption currently. As much as three quarters of the world is covered by water. It is estimated that the world contains about 1,400 million km³ of water. However, more than 97% of it is in oceans and only about 2.5% of it (about 35 million km³) is fresh water. Of that amount, almost 70% is permanently frozen in glaciers and 30% is stored in underground aquifers, so the water that is available for use is, indeed, a tiny proportion of the world's water reserves.

Fresh water that can be used stems essentially from rainfall over land, generated through the hydrological cycle. Water is continuously recycled as a result of evaporation driven by solar energy. The average annual rainfall over land amounts to 119,000 km³, of which, some 74,000 km³ evaporate back into the atmosphere. The remaining 45,000 km³ flow into lakes, reservoirs and streams or infiltrate into the ground to replenish the aquifers. This represents what is conventionally called "water resources". However, not even all of these 45,000 km³ are accessible for use because part of the water flows into remote rivers during seasonal floods. The Food and Agriculture Organisation (FAO) of the United Nations estimates that between 9,000 km³ and 14,000 km³ is all that are economically available for human use. Indeed, a "drop in the ocean".

b) The unequal distribution of that supply

As we will see in the next section, water supply may be tightening in the coming decades. However, what is clear is that, today, water supply is enough to cater for the total amount of the world's population. Yet, according to the World Health Organisation (WHO) and Unicef, 1.1 billion people have currently no access to improved water supply (as defined by WHO). In addition, 2.4 billion people have no access to improved sanitation. Not surprisingly, most of these people are in Asia and Africa, the lion share being located in rural areas.

c) The Hydrological cycle: Where water comes from

Here is a quick summary of the water cycle, taken from the US Geological Survey (USGS). The water cycle has no starting point. But, we will begin in the oceans, since that is where most of Earth's water exists. The sun, which drives the water cycle, heats water in the oceans. Some of it evaporates as vapour into the air. Ice and snow can sublimate directly into water vapour. Rising air currents take the vapour up into the atmosphere, along with water from evapotranspiration, which is water transpired from plants and evaporated from the soil. The vapour rises into the air where cooler temperatures cause it to condense into clouds. Air currents move clouds around the globe, cloud particles collide, grow, and fall out of the sky as precipitation. Some precipitation falls as snow and can accumulate as ice caps and glaciers, which can store frozen water for thousands of years. Snowpacks in warmer climates often thaw and melt when spring arrives, and the melted water flows overland as snowmelt. Most precipitation falls back into the oceans or onto land, where, due to gravity, the precipitation flows over the ground as surface runoff. A portion of runoff enters rivers in valleys in the landscape, with stream-flow moving water towards the oceans. Runoff, and ground-water seepage, accumulate and are stored as fresh water in

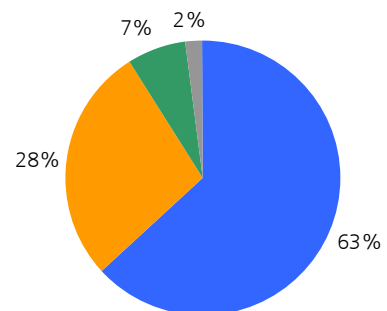
Figure 6: World water distribution

	Water volume (million Km ³)	Percent of fresh water	Percent of total water
Total water	1'386		100%
Fresh water	35	100%	2.53%
Glaciers and ice caps	24.4	69.70%	1.76%
Groundwater	10.5	30%	0.76%
Lakes, rivers, atmosphere	0.1	0.30%	0.01%
Saline water	1'351		97.47%

Source: Food and Agriculture Organisation (FAO), Crops and Drops, 2002

Figure 7: Distribution of the global population not served with improved water supply

by region, Total unserved: 1.1 billion

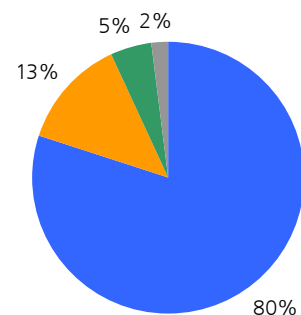


Legend: Asia (blue), Africa (orange), Latin America & Caribbean (green), Europe (grey)

Source: World Health Organisation (WHO)

Figure 8: Distribution of the global population not served with improved sanitation

By region



Legend: Asia (blue), Africa (orange), Latin America & Caribbean (green), Europe (grey)

Source: World Health Organisation (WHO) and Unicef

lakes. Not all runoff flows into rivers, though. Much of it soaks into the ground as infiltration. Some water infiltrates deep into the ground and replenishes aquifers (saturated subsurface rock), which store huge amounts of freshwater for long periods of time. Some infiltration stays close to the land surface and can seep back into surface-water bodies (and the ocean) as ground-water discharge, and some ground water finds openings in the land surface and emerges as freshwater springs. Over time, though, all of this water keeps moving, some to reenter the ocean, where the water cycle "ends" ... and "begins".

2. Demand

The available water

Annual withdrawals of water for human use amount to about 3,600 km³, or 580 m³ per capita per year. Part of the available surface water must be left to follow its natural course to ensure effluent dilution and safeguard conservation of the aquatic ecosystem. The FAO estimates this amount to be about 2,400 km³ per year. Adding this amount to the amount withdrawn for human use, results in 6,000 km³ per year. This means that there are only between 3,000 and 8,000 km³ per year of spare water. Taking into account the demographic and water demand projections, we could see a global tightening of water availability in the coming decades.

Indeed, according to Zehnder A.J.B, a prestigious researcher in the field of water, if the growth of water consumption continues at the same pace as in the last century, water consumption could be tight by 2025. Experts estimate that, by 2050, 18% of the world population will suffer from water scarcity, compared with 3% in 1995.

Other sources also point at the increasing usage of water. According to the US Geological Survey (USGS), withdrawals of fresh water in the US have more than doubled from 1950 to 2000 (see Figure 11).

The uses of water: agriculture is the main part

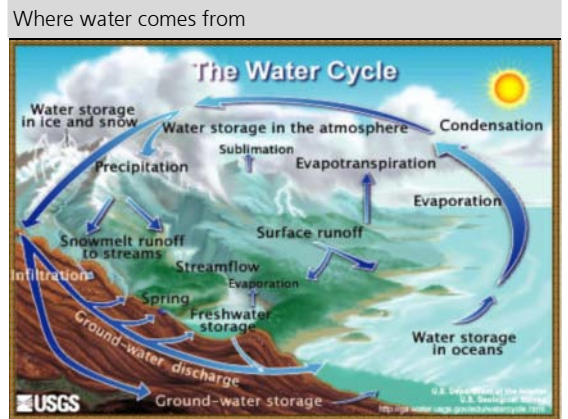
Agriculture is, by far, the biggest user of water and accounts for almost 70% of all withdrawals. Industrial use of water comes second at 21%, while domestic (municipal) use amounts to 10% (see Figure 12).

- **Agriculture irrigation:** This is the most important use of water besides drinking it. Throughout the world, irrigation is used by large-scale farming as the means to provide food to the world's population. Not all crops are grown through irrigation but it is absolutely necessary because precipitation (rain) is subject to great seasonal and regional variability. Hence, without irrigation, we would not be able to feed the growing food demands of the world population.
- **Industrial and Commercial:** Almost every manufactured product uses water during some part of the production process. Industrial water use includes purposes such as fabricating, processing, washing, diluting, cooling or transporting a product and for sanitation needs within the manufacturing facility. The industries that use the largest amount of water produce primary metals, wood and paper products, chemicals, gasoline and oils.
- **Domestic:** This use of water includes several purposes, mainly lavatory, laundry, shower, faucet, bath, leaks and dishwasher.

Factors affecting demand of water

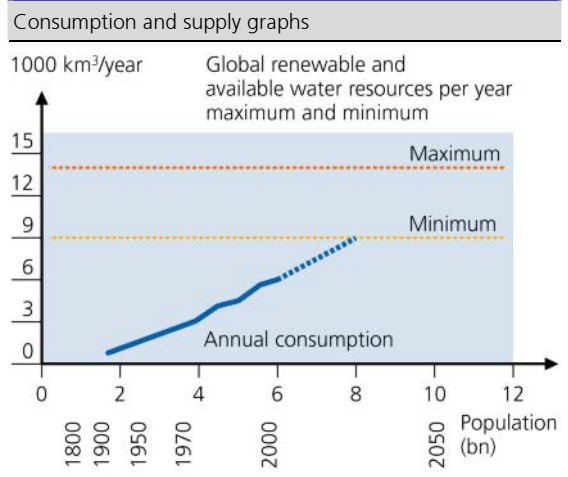
The question is whether there will be enough fresh water to satisfy the growing needs of agriculture and other water uses. The factors that mostly

Figure 9: The Hydrological cycle



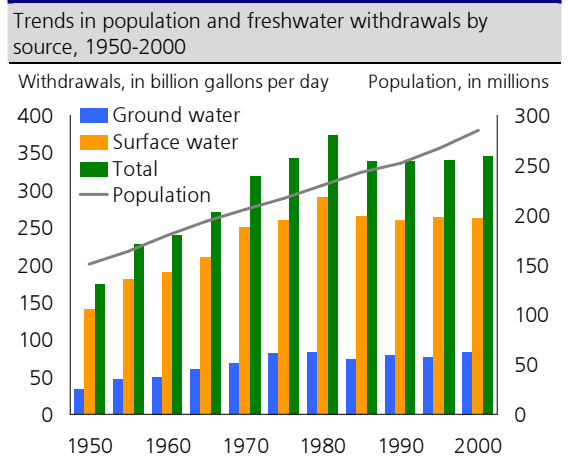
Source: US Department of the Interior, US Geological Survey

Figure 10: Water supply bottleneck in the foreseeable future



Source: Sustainable Asset Management, Zehnder, 1997

Figure 11: Ground water use in the US



Source: US Department of the Interior, US Geological Survey

affect water demand are the following:

a) Population growth

Despite the fact that the world population growth rate has declined from 2% p.a. to 1.2% p.a. in the last 30 years, human presence is expected to grow to c.a. 8 billion people by 2025. It is clear, that despite the expected increase in irrigation efficiency, water needs for agriculture purposes and, ultimately, food production will increase over time. The predictions are not that discouraging, overall. An FAO analysis of 93 developing countries estimates that in the period to 2030, irrigation water withdrawal in these countries is expected to grow by a total of only about 14%.

However, the 93 countries belong to widely different regions and climates. This means that some countries may be reaching water shortages while others may be far from that. In order to determine how tight the water resources of a country or region are, we look at the percentage of water that is used for irrigation. The higher the percentage, the more stretched resources are.

Going down to the regional level, the Near East/North Africa region uses as much as 53% of its water resources in irrigation, while the figure for Latin America is only 1%. We consider a figure of 40% or higher as a situation that can be considered as critical. In the case of South Asia, the situation is also close to critical, as the above-mentioned figure lies close to 40%. In the case of China, water scarcity is severe in the north, although the south still benefits from abundant resources.

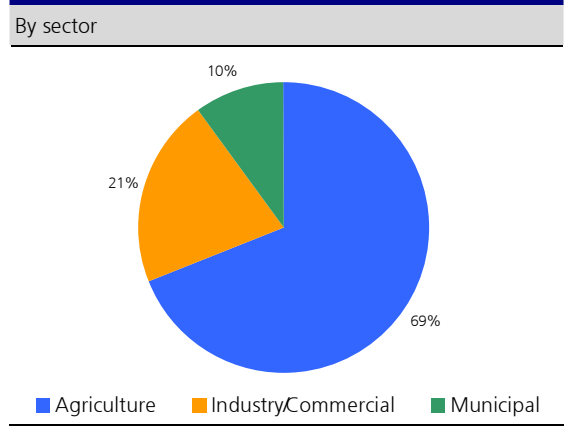
b) Increasing urbanisation and industrialisation

An increasing population is not the only driver for water usage. We observe that, on a per capita basis, water usage is also increasing. Indeed, the increase in water usage has outpaced the population growth. Water withdrawals are currently growing at 2.5% per annum. This is partly due to the increasing urbanisation of the world's population. Rural unemployment is leading to increased urbanisation. According to the WHO and Unicef, in 2000, 47% of the world's population were urban dwellers, as opposed to 43.5% in 1990. This trend towards urbanisation is set to continue and most urban population growth is predicted to take place in Africa, Asia, Latin America and the Caribbean. In particular, the African urban population is expected to more than double over the next 25 years, while that of Asia will almost double. In Latin America and The Caribbean, the increase will be of 50% in the same period.

As urbanisation continues and incomes rise, so will the consumption of water. First, there will be a shift from maize and coarse grains to rice, and then from rice to wheat. At the same time, there will be a shift in preference from cereals to meat and fish, with increasing demand for maize and other coarse grains as animal feed. According to Zehnder A.J.B, including a 20% meat in a person's diet will double the water consumption due to the huge amount of plant crop needed in the production of meat.

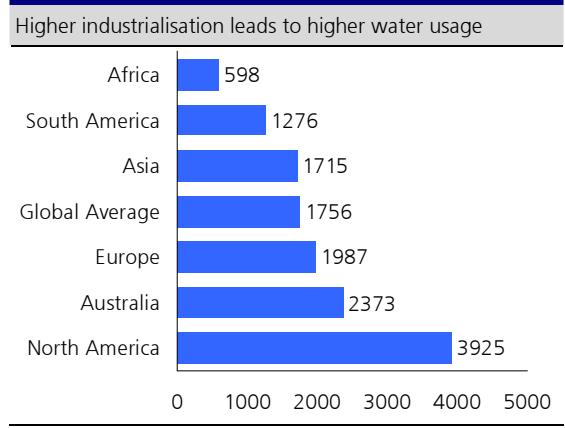
The growing urban population and changes in food preferences will result in a strong demand for additional food production, though the types of cereals demanded for food and feed, and the mix of cereals and animal products in the diet, will change. According to FAO predictions, over the next 30 years, overall crop production will increase considerably more than that required simply by population growth. Goldman Sachs Research states that US water demand has tripled in 30 years, while the population has grown only by 50%.

Figure 12: Global water withdrawal for the 3 main use sectors



Source: Food and Agriculture Organisation (FAO), Crops and Drops, 2002

Figure 13: Aggregate daily water usage per capita in selected regions, in litres



Source: Goldman Sachs Research

c) Need for water infrastructure

The growing urbanisation in developing countries is also leading to an increasing need for water services infrastructure, especially on the water drainage and treatment side, where minimum standards of hygiene must be ensured. Urban services will face great challenges over the coming decades in order to meet the needs of the fast-growing urban population. Utility, waste-water management and water management technology companies will be in high demand.

The data are certainly compelling. In Africa, only 24% of the population has access to piped water through household connections. In Asia, although the figure is higher, it does not even reach half of the population (see Figure 14). The access to sanitation services shows even a darker picture, as only 18% of the Asian population has access to a sewerage connection (see Figure 15).

One of the UN Millenium Development Goals is to reduce by half the proportion of people without access to drinking water by 2015 and to stop unsustainable exploitation of water resources. In that respect, China has been identified by the UN as one of the 13 countries with the lowest figure of water per capita in the world.

China is a particular case as the uneven distribution of water will necessitate an increasing amount of infrastructure investment. The north of China has two thirds of the country's cropland, but only one fifth of its water. According to UBS Global Asset Management, China's sewage discharge has more than doubled from the early 1980s to an annual total of nearly 60 billion tonnes. Nowadays, water treatment facilities are notoriously inadequate, only 40% of the waste-water is treated and 75% of China's lakes are polluted. China represents the clearest example of opportunities in the infrastructure arena coming from both increasing urbanisation and industrialisation. For more details on China's opportunities, see next section.

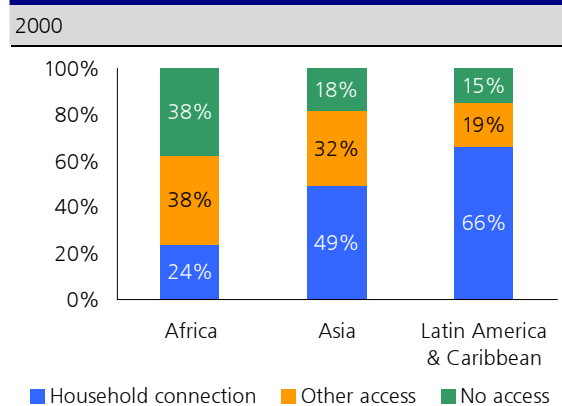
Even in developed countries like the United States, the ageing infrastructure will need to be renewed. According to the US Environmental protection Agency (EPA), in order to continue to ensure safe drinking water, the US water utilities will need to make an estimated USD277 billion in investments over the next 20 years. Drinking water pipes can be expected to last between 50 to 100 years depending on their quality. As most of the US infrastructure was constructed 50 to 100 years ago and renovation has been, in many cases, neglected, US utilities are expected to address the backlog in the next 20 years.

d) The opportunities in China

China's water shortages results from a large population and water pollution caused by rapid expansion with little regard for environmental impacts. Accelerated urbanisation and high-speed economic growth are exacerbating the water shortage problem. The official municipal waste-water treatment rate is just under 40% at the end of 2002, clearly insufficient given the above. According to China's latest five-year plan, the municipal waste-water treatment rate must increase to 60% at the end of 2005. We expect the rate to continue in the coming 5 years, and that will open up opportunities for foreign enterprises.

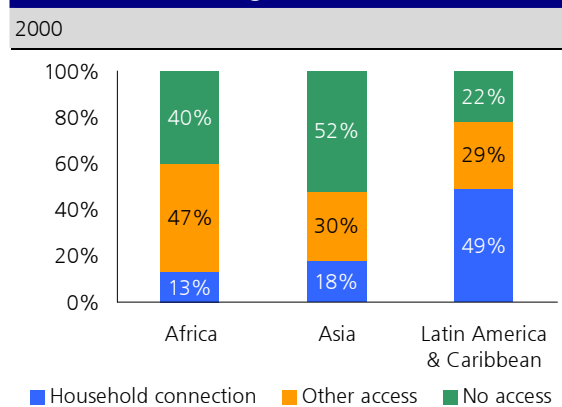
Another very important problem in China is the fact that, until recently, the Chinese population did not pay for the provision of water. This led to a chronic underinvestment in the country's water infrastructure. Fortunately, the Chinese government realised its mistake and revised its legislation

Figure 14: Water supply coverage by category of service in selected regions



Source: World Health Organisation (WHO) and Unicef

Figure 15: Sanitation coverage by category of service in selected regions



Source: World Health Organisation (WHO) and Unicef

through the Water Resource Law in 2002. As a result, water tariffs and waste-water treatment fees are rising to rational levels. At the same time, the Chinese government opened up the water industry to foreign investment, with the consequent investment opportunities. These encompass a wide array of markets, including: distribution infrastructure, desalination technologies (membrane technology, phosphorus removal technologies etc...), purification (through biological agents, for example), waste-water treatment (organic and inorganic), waste-water reclaiming, water-saving technologies and monitoring instruments.

e) Increasing health awareness among the population

A fourth trend that is impacting the water sector is people's growing health awareness. Issues such as genetically modified organisms (GMOs), BSE (mad cow disease) are also increasing people's awareness of the food they eat.

The World Health Organisation issued recently a revised and newly ratified single code of practices to prevent disease spread: the International Health Regulations.

Given the broader access to information in developing countries, coupled with the rising industrialisation and standards of living, we expect the health awareness in these countries to become more and more prominent in the coming years.

f) Pricing

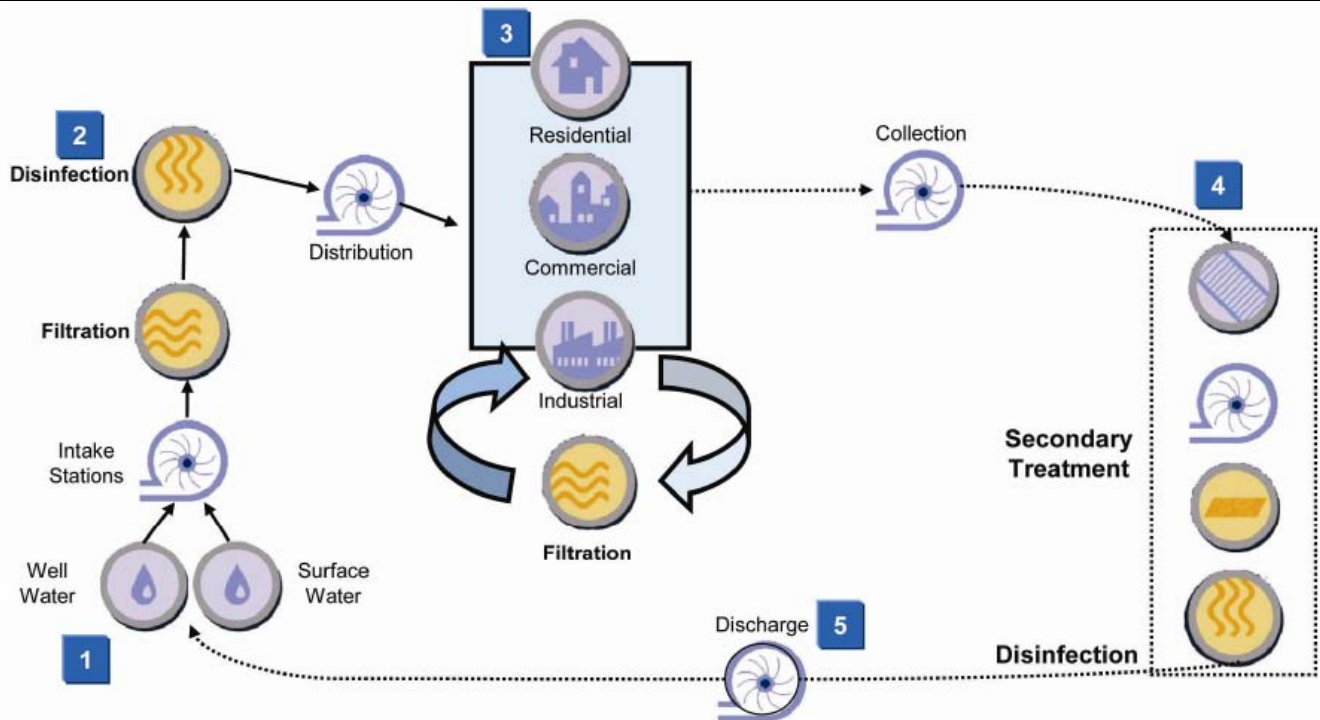
It is difficult to estimate exactly how water prices will evolve in the coming years, although looking at the above-mentioned trends, we are convinced that water prices must increase in the mid term. Given that there is no substitute for water, the demand is extremely inelastic and will continue to increase. If supply is finite or declines, prices must come up, especially taking into account that water prices are the lowest of all utility prices. Indeed, in the US, water represents less than 1.5% of household income. Experts consider 2% as an affordable level.

In the UK, where the sector is privatised and pricing responds to a specific formula (RPI plus k), we estimate that k, the real increase in prices will be set at 4.5% p.a. in the next 5 years. In other countries where municipalities own the infrastructure, it is more difficult to assess the evolution of prices for end customers, as these can more easily be subsidised by the state.

III. The Inner Water cycle and its opportunities

Figure 16: Water cycle overview

Subtitel



Source: Goldman Sachs Research, ITT Industries

The Inner water cycle overview: 4 stages for the water you use

A subset of the hydrological cycle is what we call the 'inner water cycle', and is shown on Figure 16. This encompasses the stages which water goes through from being collected on the surface or in a well, till it is flushed as waste-water.

The inner water cycle provides us with an easy way to understand the opportunities and challenges for companies in the water technology arena.

- Stage 1. Fresh water is collected either from wells or from surface water (dams, lakes etc...)
- Stage 2: The water is then filtered and disinfected, typically by Utility companies. This is necessary if the water is to be used for residential, commercial or industrial purposes.
- Stage 3: The water is consumed and waste-water is discharged.
- Stage 4: Waste-water goes through the necessary treatment (typically done by Utility companies) so that it can be re-used.

Stages 2 and 4 are the ones where water technology companies can profit the most. The main treatments water must go through are the following:

Desalination

This is the process which removes dissolved materials (salts) from seawater, brackish water and treated waste-water. Desalination is considered the

most viable solution to the decreasing supply and increasing global demand for fresh water and, as such, has the highest growth of all water sub-sectors. This market is forecast to grow at a 23% CAGR in the next 15 years. General Electric is the largest manufacturer of desalination systems, following the Ionics acquisition in 2005. There are 3 main types of desalination processes: reverse osmosis, distillation and deionisation.

- Reverse osmosis is considered the future of desalination. Although it is not the most widely extended method, its market share of 22% is rapidly increasing. This method employs semi-permeable membranes that reject contaminants while they allow purified fluids to pass through.
- Distillation (thermal method) is becoming less common, although it still represents the lion share of all desalination volume with some 74% share. This method consists of boiling and evaporating salt water and then condensing the vapour to produce fresh water.
- Deionisation is also becoming less common as it requires high amounts of chemicals which could give water some undesirable side effects. This process removes impurities at the ionic level by chemically treating small beads of synthetic resin.

Water treatment processes

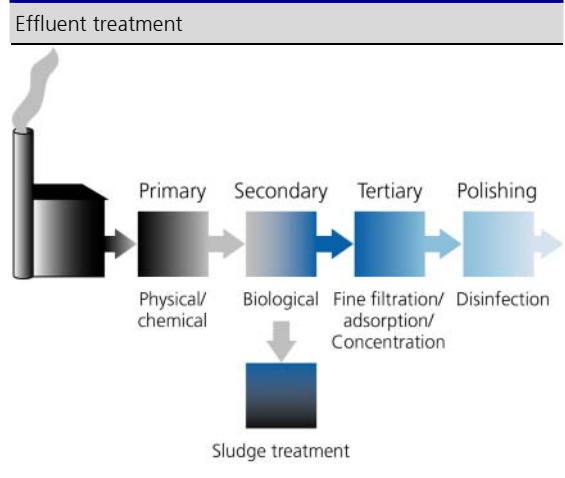
These are processes which take place mainly in stage 4 and involve the removal of solids, bacteria, algae, plants, as well as inorganic and organic compounds. Contaminants such as metals and toxins place greater burdens on treatment systems, because they are difficult to process. Below we highlight the basic municipal, residential, industrial and waste-water treatment processes:

- Municipal drinking water treatment: These systems typically take in, treat, monitor and distribute water to households and other customers. This is mainly done by Utility companies.
- Residential water treatment: This type of treatment enhances the quality of drinking water, softens water by changing calcium ions into sodium ions and protects assets by reducing sediment and rust that can damage plumbing, appliances and clothes. These water systems are typically installed on the basement of a building for the benefit of all the families in the premises. General Electric has recently launched the so-called Smart-Water system in Q4'05. Other market leaders in this field are Cuno, Culligan, EcoWater Systems and Pentair.
- Industrial water treatment: These systems include the chemicals, equipment and services that are used to prevent corrosion, deposits, microbial growth and other problems in equipment and pipes where water is circulated. This is an important part of the industrial manufacturing process, as badly treated water can jeopardise the reliability and quality of the production process for many industrial products. Also, this process reduces pollution when water is discharged. Pre-treatment of industrial waste removes many pollutants at the beginning of the process and makes waste-water treatment cheaper.

Waste-water treatment

These processes handle water at the end of the cycle and they usually involve collecting, treating and discharging waste-water after it is used. These processes reduce the amount of chemicals and biological impurities, remove grease, oil, minerals and pesticides. The primary treatment systems, which remove about 60% of suspended solids in waste-water, use a sedimentation tank with the purpose of separating solids and liquids. It includes the process of aerating (stirring up), which adds oxygen in order to stimulate living micro-organisms such as bacteria. The secondary treatment processes remove more than 90% of suspended solids and they involve further

Figure 17: Waste-water treatment diagram



Source: Lenntech Waste Water Treatment

biological treatment: the bacteria consume the dissolved organic material in waste-water. The tertiary processes include the fine filtration of water, as well as adsorption of smaller impurities. The process finishes when the effluent coming from the sedimentation tank is disinfected with chlorine, before being discharged to its source. Alternatives to chlorine are treatment with ultraviolet light and ozonation. Finally, advanced treatment systems such as filtration, carbon adsorption, distillation and reverse osmosis can achieve most levels of pollution control. Effluents treated this way can be used for industrial, agricultural, recreational or drinking water.

Membrane micro-filtration technologies such as those used by Ionics and Biotreat offer an alternative to the tertiary and the chemical disinfection processes. This new technology combines two processes into one, generates less sludge than the conventional processes and produces the same amount of clean water in a footprint size smaller than in the conventional process.

Reclaimed Waste-water

Using treated water for other purposes: With the scarcity of water and with water conservation being so important nowadays, the reuse of treated waste-water is becoming increasingly important. In California, the East Bay Municipal Utility District is pioneering a project which saves enough water to provide drinking water for 83'000 households. Treated waste-water can be used for many purposes including the cooling of industrial plants or irrigation of agricultural land and golf courses. This way we can save higher-quality water for other purposes, such as drinking.

IV. Sectors in the water business: investment opportunities will arise

We have identified 5 sectors or investment clusters in the water business.

1. Water and Waste-water Utilities

This is, by far, the largest segment in the water business, and we find companies like Veolia, RWE, Suez and Severn Trent amongst many others. The annual turnover for this segment is estimated at USD600 billion, of which USD400 billion is municipal, according to Veolia. The main target market of this segment is composed mainly by cities and municipalities.

Two trends: liberalisation and stronger regulation

We have identified two major trends which could be seen contradictory. Firstly, liberalisation of water services started in the early 1990s and is continuing. This implies that the regional monopolies enjoyed by state-owned utilities are slowly being abolished and, hence, private companies are increasingly becoming responsible for providing water services. Secondly, and paradoxically, the trend continues towards increased state regulation in water, in order to ensure water from the mains is safe and complies with the necessary quality standards.

In fact, there is no such paradox. Since private companies are now increasingly responsible for the water being served to consumers, it is necessary to put in place the appropriate regulatory framework to ensure the satisfactory quality and service standards.

Concerning the first point, in Europe, we find mainly three types of industry structures for the water utility sector. The UK has a fully privatised system. France and Spain have a concession-type of model, while Germany, Switzerland and Italy have a municipality-owned system.

The UK water utility sector: the private system

In the UK, the regulator allows a 5.1% post-tax real return, which corresponds to 7.1% or 7.6% depending on the differing assumptions for inflation (2% or 2.5% respectively). Pricing is determined by an RPI plus k formula. Although UK water utilities do not have pricing power, the "k" figure can be changed (increased) depending on the amount of capital expenditures. This way, UK water utilities have an incentive to improve and maintain the quality standards of water. In terms of investment perspectives, the UK water utilities offer high dividend yields (average is 4.8%) and that limits the downside potential.

France and Spain: the concession system

In France and Spain, water utilities operate based on concession schemes. The assets are owned by the municipalities but operated by private companies. These bid for concessions which last between 5 and 20 years, but they never actually own the infrastructure. Companies' income is in the form of a management fee, and as said, companies do not assume ownership of the infrastructure, but they operate, maintain and develop it.

The municipality system: Germany, Switzerland and Italy

Germany, Switzerland and Italy use a state-owned system. The infrastructure is owned by the state through a myriad (several thousands) of municipalities, which operate the infrastructure and deliver water to end customers.

The US: very fragmented and moving towards a private system

The US is moving from the municipality-owned system to a privatised one. Currently, about 86% of the assets are state-owned while 14% are owned by private water utilities such as Aqua America. This latter percentage is increasing by the year, although we are still looking at a very fragmented sector with more than 50'000 municipalities in the field. This leads to too many inefficiencies in the provision of water, as indicated by the fact that less than 1% of the water systems serve more than 100'000 people. This highlights the lack of economies of scale exploitation and the continuing trend towards consolidation, and probably, privatisation, despite the high capital intensity of the business.

As far as the water quality levels are concerned, in the US, water suppliers must comply with the law. The Environmental Protection Agency (EPA) is the government agency in the US responsible for protecting consumers from getting unhealthy water. This is done through The Safe-Drinking Water Act which sets the water standards across a whole range of possible contaminants. In addition, the Clean Water Act sets the standards for waste-water treatment and protects the surface water resources from pollutant discharges.

2. Water infrastructure and engineering

This is a USD40 billion global market that includes pipes, sewers, fittings, hydrants, valves, as well as service and repair equipment across commercial, residential and industrial markets. Market leaders include Mueller (hydrants), Tyco (valves), Watts (drains), Institutform, Northwest pipe and Gormann Rupp. The key end markets are publicly funded municipalities, as well as contractors (both privately and publicly funded). According to EPA, the current rate of capital investment is insufficient and EPA recommends to invest, at least USD150 billion in water system improvements. As mentioned previously in this report, many drinking water and sewage pipes in the US were installed between 50 and 100 years ago and are nearing the end of their useful life.

The so-called "inlining" systems will become increasingly popular. These are new, competitively-priced technologies designed to extend the working life of water pipes. The process involves inserting new pipes made of high-quality, flexible material into existing pipes. The advantage is that large areas of street do not have to be dug up. In general, companies which offer innovative methods for extending the useful life of the infrastructure will experience demand growth.

a) Water distribution and sewers

Most drinking water pipes and sewers are laid by traditional construction companies (e.g. Bouygues, FCC etc...). The segment is mature, fragmented and has some cyclical exposure to residential and commercial construction. However, rising standards, the emergence of alternative technologies for laying pipes and sewers, as well as the reach of more remote locations are leading to increasing specialisation by companies.

b) Water management and engineering

Decreasing water resources have to be intelligently managed. In the future, terrestrial and satellite information systems will be increasingly used to optimise withdrawals and distribution amounts. Leading companies in this field include Stantec and Tetra Tech.

3. Water and waste-water treatment

Water and waste-water treatment is a USD140 billion global market that grows in the mid-single digits and consists of treating water at the beginning and the end of the 'inner water cycle'. This process involves collecting and treating water so that it becomes environmentally acceptable, even potable (drinking) water, in some cases. End markets are typically municipalities.

a) Desalination

With drinking water being scarce in Asia, Latin America and Africa, desalination has become very important and will become even more so. Not only is desalination used as a means to turn seawater and brackish water into potable (drinking) water. It is also an increasingly necessary component of waste-water treatment.

According to Sustainable Asset Management, there are currently over 13,000 desalination plants in operation in some 120 countries, removing salt from 30 million m³ of water every day. The desalination market is currently worth USD2.5 billion, and is forecast to grow to USD70 billion by 2020. This is a 23% compounded average growth rate (CAGR). Top companies in the desalination market include General Electric (Ionics), Fisia (Italy), Sidem (France), US Filter, Hydranautics (US) and Emco (US). Some of the top membrane producers are Dow Chemical (Filmtec), GE (Ionics), Koch Membrane Systems (private) and TriSep (private).

Cost is the main reason why desalination is not more widely adopted. Indeed, production costs lie between USD0.7 and USD1.5 per m³ compared with USD0.1 to 0.25 per m³ for conventional water treatment. According to the International Desalination Association, desalination costs have fallen by about 10% per year and experts think there is potential for further savings. We expect to see a substantial increase in investment in desalination and so does the management team of General Electric, as indicated by the acquisition of Ionics.

Water treatment technologies are becoming more and more important as pollution remains widespread and news on environmental incidents travels faster. We are convinced that demand for these products will keep growing. New, emerging water pollutants require new treatment technologies. Demand for state-of-the-art treatment technologies is on the increase, as older treatment plants are often not capable of guaranteeing safe drinking water.

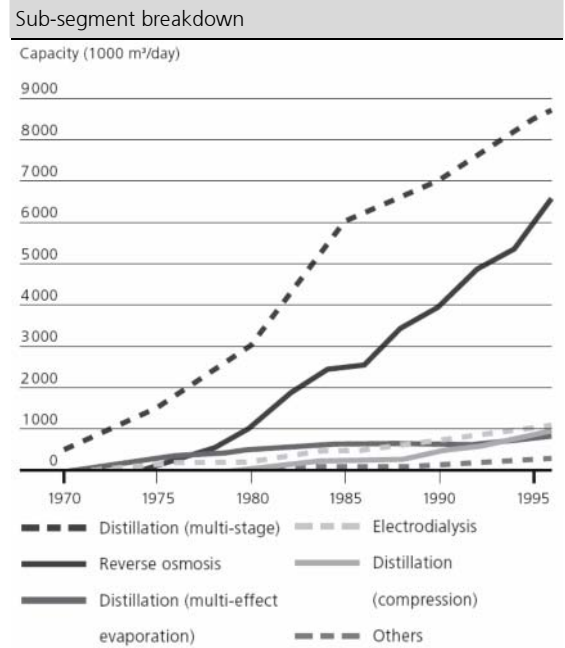
b) Disinfection

Disinfection of drinking water is the most common treatment method used by water utilities. Water disinfection consists of the removal, deactivation or killing of pathogenic micro-organisms. Micro-organisms are destroyed or deactivated, resulting in termination of growth and reproduction. Despite the great advances in this field in the last 30 years, according to the WHO, almost 70% of all infectious diseases in the world are still spread by non-disinfected water. We estimate that the disinfection business is growing at c.a.12% per annum. So far, chlorination has been the predominant disinfection method, although irradiation with ultraviolet light (UV) is gaining popularity. Adsorption techniques and membrane-based processes are additional alternatives. However, newer techniques have the disadvantage of not preventing the water from getting re-infected in the future. The largest UV water treatment companies are Danaher (Trojan) and ITT Industries (Wedeco).

c) Waste-water treatment

This sub-segment is estimated to grow at 10%-15% annually. While the

Figure 18: Growth of the desalination business



Source: Sustainable Asset Management, International Desalination Association

main aim of waste-water treatment used to be preventing the pollution of waterways, nowadays the emphasis is increasingly on enabling waste-water to be reused, typically for flushing toilets, irrigation or groundwater recharge. Enhanced treatment technologies are constantly emerging as developments progress. Biological techniques are being optimised, and physical processes such as membranes are becoming increasingly viable from an economic point of view. Companies working in the field of membranes include General Electric, Sinomem, Bio-Treat, Pall and Zenon.

Opportunities in this field will abound. Decentralised systems for waste-water treatment and drinking water disinfection (see next paragraph) will become more and more attractive, as the currently centralised systems can hardly keep pace with the rapid growth of cities.

d) Monitoring and water test

This is a USD4 billion global market, estimated to grow in the mid-single digit. This segment captures a wide range of analytical systems, instrumentation and reagents that are used to analyse water quality and safety, either continuously or through random checks. Reagents are chemical testing compounds used to test for items such as chlorine, pH, alkalinity, turbidity (clarity) and calcium hardness.

With the introduction of tougher legislation, especially in the EU, technologies for monitoring the quality of water are becoming increasingly important. In the US, the EPA (Environmental Protection Agency) administers the 2 main Federal safety laws: "The Safe Drinking Water Act" and the "Clean Water Act". Key end markets are Municipal water facilities, industrial companies (e.g. beverage, electronics) and environmental agencies.

New equipment is needed to measure the effectiveness of the new, improved treatment technologies. Companies able to provide such equipment will experience increasing demand. Market leaders in the field include Danaher, Thermo Electron, Emerson, Veolia and Honeywell.

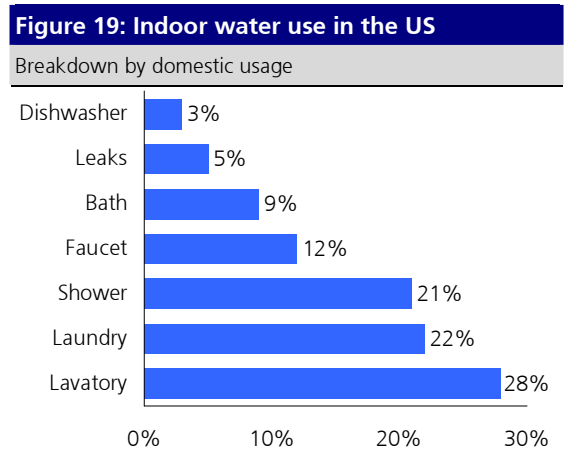
4. Demand-side efficiency

Raising demand-side efficiency is the quickest and cheapest way of ensuring water savings. The objective is to provide the same service, using less water without sacrificing convenience.

According to EPA each US citizen uses about 100 gallons of water per day or 138.2 m³ per year for indoor use (lavatory, laundry, shower etc...). The figure for Europeans stands at 102.2 m³ per year. Some 20% of this is used for showering. Using a high-efficiency shower head reduces the consumption of showering water by half. This means that, only by using high-efficiency shower heads in each household in the EU and the US, the potential savings of water could amount to more than 7 billion m³ per year.

In the future, services for which we use water will be carried out without the use of water. For example, we will eventually flush the toilet with high pressure air. At the end of the day, it does not matter whether faeces are disposed of with or without water, as long as they are disposed of.

Given rising water tariffs, there are strong incentives for consumers to use efficient household fittings, provided that each household's water usage can be billed fairly and transparently. Demand for water-efficient appliances, such as high-efficiency showers or flushing devices will grow. Water management systems in the building premises will also gain in importance: demand for drinking water filtration and purification technologies will



Source: Environmental Protection Agency, Goldman Sachs Research

grow.

a) Graywater recycling

Graywater recycling means the reuse of water that has already been used for one purpose. Depending on the new use, this water will need minimal purification. This, together with the expected rise in water prices, explains the expected 20% growth in decentralised waste-water treatments. End markets include industrial companies, households (flushing water) and the public sector.

b) Water metering

In order to pass on the costs of water to the consumer in line with the "consumer uses, consumer pays" principle, there must be a reliable way to meter water consumption. This requires water metres which can measure the consumption of individual dwelling and not only for whole buildings. Automatic reading technology is readily available and prominent companies in this field include Techem and Badger Meter.

Additionally, rising water tariffs will also create an incentive to pay and bill on a per-usage basis. Demand for equipment to meter individual water usage will increase.

5. Water and food

Food is certainly a huge sector of our overall economy. Global sales in the food industry (processed food) stand at USD 1'100 billion per year, according to Euromonitor. Food production is 100% reliant on safe water resources. As a matter of fact, almost 70% of the world's water consumption is used in the food production industry. Water efficiency in the food production field is especially important in order to maintain or even increase production in areas with low rainfall.

Demand for efficient irrigation systems, water-efficient food sources and water management technologies will grow. Growing health awareness is stimulating demand for organic produce as well as mineral and bottled water.

a) Irrigation

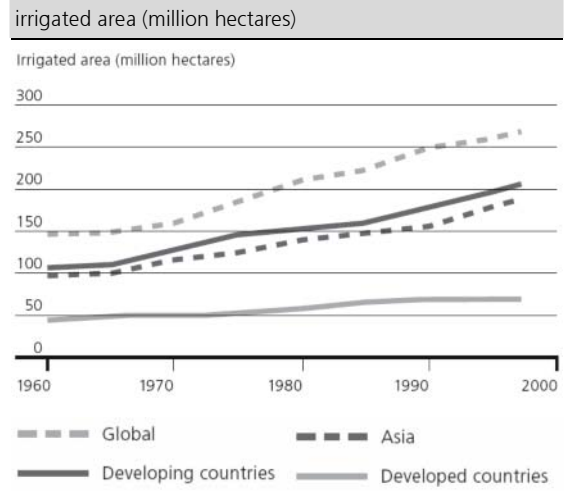
Precipitation is subject to great seasonal and regional variability. Hence, irrigation is often used in agriculture. Currently, only 20% of agricultural land worldwide is irrigated. According to Postel, Sandra, a highly world-wide recognized scientist in the field of irrigation, the irrigated area is likely to increase sharply in the coming years.

As such, investment in agricultural irrigation is expected to increase in coming years. Nowadays, the most common way of irrigating land is by flooding (ditch irrigation), which is inefficient (wastes a great amount of it) and carries the risk of increased soil salinity. Drip irrigation (micro irrigation) is much more efficient as it uses 30% to 70% less water and boosts agricultural yields by 20% and 90% (Postel,S. 1999 "Can the irrigation miracle last?"). Drip irrigation has a mere 1% market share of all irrigation methods and is expected to increase its presence.

b) Food production

Being 100% reliant on water, food production is threatened by water pollution. Excessive use of fertilisers and pesticides has an impact on ground and surface water. For this reason, organic and natural farming are experiencing great amounts of popularity in western countries, as they help preserve the quality of water resources. The market for organic and natural

Figure 20: Net irrigated area on the increase



Source: Sustainable Asset Management, WHO, 1996

produce is currently growing at a 20% rate.

c) Bottled water

The global market for bottled water is worth USD20 billion and has been growing at 9% per year in the last 5 years. We expect volume of bottled water to grow by 7% p.a. in the next 3 years. This is, indeed, surprising, as in industrialised countries, bottled water is much more expensive than tap water, but it is not necessarily better quality. In fact, the main reason for consumers to drink bottled water is the fear of impurities in tap water, a common misconception amongst the population in the industrialised world. The growth of this market is attracting large players like Nestlé, Danone, PepsiCo and Coca-Cola, which are becoming the main global players through acquisitions. This market adds real value to society in countries where tap water is unsafe, like India, where the growth rate of bottled water is just under 50%.

V. Our water universe and our stock selection

Given all the analysis in the previous pages, it is hence, important to understand how we can invest in stocks which will benefit from the described trends, while, at the same time, making sure that we invest in "water sustainable, socially-responsible stocks".

In our universe of stocks, there is a long list of companies with exposure to water. We have screened all these companies and selected those that fit our sustainability criteria. The list on Figure 21 shows our "Sustainable Water Universe", a subset of the almost 700 stocks in the WMR universe. We will monitor the companies which did not meet our sustainability criteria, and if this changes in the future, they will be included in our "Sustainable Water Universe" of possible investments.

As said at the beginning of this document, out of this list of stocks in the "Sustainable Water Universe", we have selected those which, we believe, are best positioned at the moment to appreciate in the coming two years. These are shown in Figures 22 and 23, as well as in Figures 1,2 and 3, at the beginning of this document.

In this list we have an interesting and balanced mixture of stocks which will benefit from the trends and opportunities on all the several different water sub-sectors:

- growth in the bottled water industry: Coca-Cola, Danone and Nestlé
- increasing need for clean water in the food production industry: Danone and Nestlé
- increasing use of water saving appliances segment: Geberit
- growing demand in the several different water technologies: General Electric, Siemens, SGS and Tyco International
- increasing need for suitable water infrastructure, especially in developing countries: Severn Trent and Veolia.

Figure 23: The Aqua strategy: stock details

	Water as % of Sales	Water exposure comment
Coca-Cola	7%	Bottled water manufacturer
Danone	100%	Bottled water and food production (1).
Nestlé	100%	Bottled water and Food production (1)
Geberit	100%	Bathroom devices; Water saving devices.
General Electric	2%	Desalination, Industrial water treatment, wastewater treatment and filtration
Siemens	2%	Wastewater treatment and industrial water treatment
SGS	15%	Water inspection and agriculture inspection
Tyco International	2%	Valves, engineering and consulting, and industrial water treatment
Severn Trent	65%	Water Utility and Waste water treatment
Veolia	40%	Water Utility

(1) Food production demands almost 70% of total water consumption worldwide. Danone, Unilever, Nestle and Kraft Foods have signed the [Agriculture Initiative agreement](#). This means that the food production process is water efficient and meets all the relevant sustainability criteria. This is the reason why, in the case of these four companies, we consider that food production is part of their water exposure.

Source: UBS WMR

Figure 21: Our "Sustainable Water Universe"

List of stocks	Sectors
Coca-Cola	Consumer Staples
Danone	Consumer Staples
Kraft Food	Consumer Staples
Nestle	Consumer Staples
Unilever	Consumer Staples
3M	Industrials
Emerson	Industrials
Geberit	Industrials
General Electric	Industrials
Honeywell	Industrials
Illinois Tool Works	Industrials
Siemens	Industrials
SGS	Industrials
Tyco International	Industrials
Dow Chemical	Materials
RWE	Utilities
Severn Trent	Utilities
Suez	Utilities
United Utilities	Utilities
Veolia Environment	Utilities

Source: UBS WMR

Figure 22: The Aqua strategy: stock selection

Stock	Valor	ISIN
Coca-Cola	919390	US1912161007
Danone	487663	FR0000120644
Nestlé	1205604	CH0012056047
Geberit	803822	CH0008038223
General Electric	933071	US3696041033
Siemens	827766	DE0007236101
SGS	249745	CH0002497458
Tyco International	674698	BM9021241064
Severn Trent	676845	GB0000546324
Veolia	1098758	FR0000124141

Source: UBS WMR

VI. Conclusion

Water was key for the development of human life and will continue to be key for the development of the world. Water has always been a precious resource and a look into the future reveals that it will become even more so. If growth of water consumption continues at the pace we have seen in the 20th century, by 2050, half of the world population may suffer due to lack of clean water.

Both individuals and companies must behave in a socially responsible manner in order to maintain the availability of this precious resource. Sustainability is the key word and one of our stock selection criteria. We are convinced that making sustainability a key agenda item will help the performance of firms. Involving the several different stakeholders along the value chain in order to support the idea of sustainability will become an increasingly important success factor. With this report, we are contributing our grain of sand to a world of sustainable water policies. By investing in socially responsible water companies, so will you.

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Appendix

Terms and abbreviations			
Abbreviation	Description	Abbreviation	Description
BVPS	Book Value Per Share	FFO	Funds From Operations
Disc. to NAV	Discount to Net Asset Value	NAV	Net Asset Value
Div.	Dividend	P/BV	Price to Book Value
Div. Yield	Dividend Yield	P/E	Price Earnings Ratio
EV/DACF	Enterprise Value / Debt Adjusted Cash Flow	P/E rel.	Price per Earnings relative to index, to peer, etc.
EV/EBITDA	Enterprise Value / Earnings Before Interest, Tax, Depreciation and Amortisation	P/EV	Price to Embedded Value
EV/EBITDAR	Enterprise Value / Earnings Before Interest, Tax, Depreciation, Amortisation and Rentals	P/FFO	Price to Fund From Operations
EV/Sales	Enterprise Value / Sales	ROE (%)	Return On Equity
EPS	Earnings Per Share	IBES	Institutional Brokers Earnings System

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