SAM Study

Precious Blue

Investment Opportunities in the Water Sector

sam sustainable asset management

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The average person uses around a million liters of water each year – or 2700 liters a day. This is the water we use in industry and to cover basic needs such as drinking, eating and sanitation. Globally, the lion's share of water goes to agricultural food production. Yet water is becoming increasingly scarce. Food already accounts for up to 35% of imports in some countries which do not have enough water to produce food for their own population. Groundwater reserves are also diminishing in 60% of European countries. Not only this, but the quality and the infrastructure needed to transport water are also presenting a growing challenge.

These three issues – water quantity, water quality and infrastructure – are being shaped by global trends:

- Demographic changes
- Ageing infrastructure
- Increasing health awareness
- Controversy over the liberalization of the water market

These trends are changing the demands on those responsible for managing water and redefining the markets. Their impact is being felt by all companies which provide services related to the supply or use of water.

By evaluating the market demand emerging from the current situation and the influence of these global trends, SAM has identified four promising investment clusters. These are clusters with attractive upside potential where investors can also make a contribution to the sustainable use of precious water.

- Distribution and management. In addition to companies which focus on building and maintaining the mains and sewer infrastructure, pumping systems and managing water resources, this cluster also includes politically well-situated water and wastewater utilities.
- Advanced water treatment. This cluster includes companies which play a key role in the treatment of wastewater, the disinfection of drinking water and the desalination of sea water.
- Demand-side efficiency. This cluster includes companies offering products for water metering, graywater recycling and boosting the efficiency of water use.
- Water and food. This cluster covers companies offering products related to food production, irrigated agriculture, and the production of bottled water.

As the social, economic and political climate changes, people have higher and higher expectations of water and wastewater utilities when it comes to issues like quality, price and stakeholder involvement. Increasingly, successful companies will be those that manage to integrate sustainability into their strategy. In particular, this involves:

- Enhancing the water-efficiency of products to provide the desired service using as little water as possible,
- Involving and managing the various stakeholders in response to greater public expectations,
- Charging realistic prices for water which cover costs and allow for reasonable margins. This is the only way of financing badly-needed infrastructure renovation and providing an incentive for consumers to save water.

This new study from SAM lays the foundation for an attractive, all-inclusive investment strategy geared to the sustainable development of water use.

1. New Opportunities in the Water Sector

1.1 Water: a key factor in our future

Water, more than just about any other resource, has influenced the development of all the world's cultures. Not least, it has enabled us to produce food and prevent diseases. Yet water is not just a life-preserver; it can destroy life as well. In the ten years from 1988 to 1997, floods killed around 400 000 people and caused approximately USD 700 billion worth of damage (World Water Council, 2000, p. 19). Water also harbors grave dangers through the unseen transmission of diseases. Every year some 5 million people die of water-borne infectious diseases. This high fatality rate is partly due to the fact that about 2 billion people do not have access to adequate sanitation, and the trend is rising. It is in the interest not only of developing countries but also the industrialized countries to find a solution to this problem.

The sale of water and water treatment equipment is now a business with turnover of USD 300–400 billion per year. Of this amount, roughly USD 80 billion is invested worldwide in equipment alone. It is estimated that in future annual investment of up to USD 180 billion will be necessary to build and maintain the infrastructure. In the EU alone it will take investment of some EUR 170 to 230 billion in the next ten years to ensure that current wastewater guidelines are met. The US is predicted to require equally substantial investments, to the tune of USD 21 billion. This figure will remain high, as water plays a vital role in efforts to attain and maintain prosperity (World Water Council, 2000, p.64; US EPA, 2005).

Water of life

Water is a key component of prosperity, health, stability and development. It is important to achieve the correct combination of water quantity and water quality. The infrastructure which carries the water to the people is also vital. Before long, though, we will have to change our relatively wasteful attitude to water so as to become a water-efficient society. Not only will companies which face the challenges of the water sector help mold a sustainable future for water. By offering innovative products and solutions they will ensure themselves a strong position in a market with great future potential.

1.2 Challenges along three value chains

Viewing the water sector as a whole, three value chains in particular stand out: urban water management, agriculture, and industry (e. g. cooling water, process water and energy production, Figure 1).

Worldwide, 10% of water flows into domestic use, 70% to agriculture and 20% to industrial production. But there are large regional differences: in Europe the lion's share of water is used for industrial purposes, while in Asia agriculture dominates (Figure 2).

Water and urban water management

Today, a European consumes on average about 50 to 60 m^3 of water per day just for his personal (domestic) needs. Americans consume twice as much, while people in developing countries consume only a fraction of that amount. Around 90% of all people are supplied with this water by state-owned utilities. Less than 10% of all people get their water from privatized or part-privatized businesses.

In the twentieth century, Switzerland invested around 18 000 euros per person in urban water management (water supply systems, drainage and wastewater treatment). This corresponds to more than 50% of per-capita investment in many municipalities. Given the ageing infrastructure, in many places in desperate need of renovation, the same amount will have to be invested again in the next 20 or 30 years (Lehmann, 1994).

Figure 1

Investment opportunities, along three value chains.

Source: SAM

Figure 1

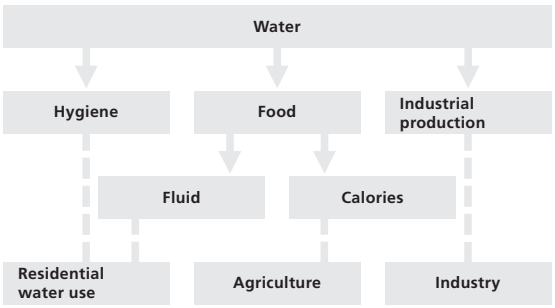


Figure 2

70% of global water consumption is used in agriculture.

- Urban water management
- Agriculture
- Industry

Source: FAO, 2000

Figure 2

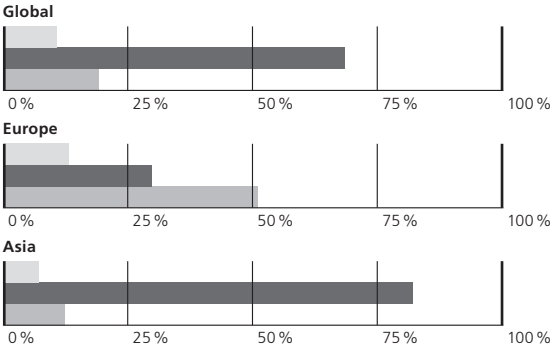


Table 1

	Algeria	Spain	USA
Available fresh water per capita (m^3/year) 1)	471	2753	9985
Own corn production 2001 [1000t] 2)	2659 (86 kg/P)	17658 (432 kg/P)	322141 (1118 kg/P)
Net corn imports 2001 [1000t] 2)	6747 (219 kg/P)	5843 (143 kg/P)	–78556 (–273 kg/P)
Share of agricultural imports in total imports 3)	35%	12%	6%
Share of agricultural exports in total exports 3)	1%	16%	10%

Some countries spend up to 35% of the value of all imports on food.

Sources: 1) World Bank, 2003; 2) FAOSTAT, 2001; 3) WTO, 2001

Water and agriculture

The largest share of the global water supply is used in the production of food. It takes around 2500 kcal per day to meet one person's energy requirements. One kilogram of bread contains around 3,500 kcal. Based on this rule of thumb (1000 liters of water for 1 kilogram of bread), it takes around 260m^3 of water to feed one person with a vegetarian diet for one year. Factoring in losses due to crop failures (40% per year) and irrigation (50%) gives average water requirements of approximately 1.5m^3 per person per day, or around 550m^3 per person per year. If we include around 20% meat in the diet, water consumption doubles, because of the huge amount of plant crop needed in the production of meat (Zehnder, 1997).

But because many countries do not have enough water to be able to produce enough food for their own population, they have to import food instead. By importing food, these countries are effectively importing water they do not have. In some countries, where local water resources are insufficient to provide food for the population, food accounts for up to 35% (in monetary terms) of all imports. The availability of water can thus play a dominant role in state finances (Table 1).

Water and industry

Industrial production – from paper to automobile tires to electricity – is impossible without consuming vast amounts of water. Around 15–30 m^3 of water are needed per ton of paper, 200 m^3 per tire and 60 m^3 per MWh of electricity. Water is used for cooling, cleaning, transport and lubrication. Even mineral oil can only be raised from the ground through the injection of water.

1.3 Sustainability as the basis for successful corporate management

The new awareness of water's importance and the fact that is has become such a highly sensitive public issue mean that companies have to emphasize sustainable management. To ensure the long-term success of all their stakeholders, companies must systematically make sociocultural, environmental and economic considerations an integral part of their strategy. This means, for example, not overusing renewable resources much as groundwater, and making sure that depreciation is written down in good time to ensure the long-term availability of cash for renewing pipe systems. At the same time, companies must nurture constant dialog with stakeholders so that their products, services and strategies are accepted.

2. Global Trends

2. Global Trends impacting the Water Market

The challenges confronting the water sector fall into three groups (Figure 3):

- To supply a sufficient quantity of water to provide the service required.
- To assure adequate water quality for the service in question.
- To set up an appropriate infrastructure to transport water (e. g. pipe networks).

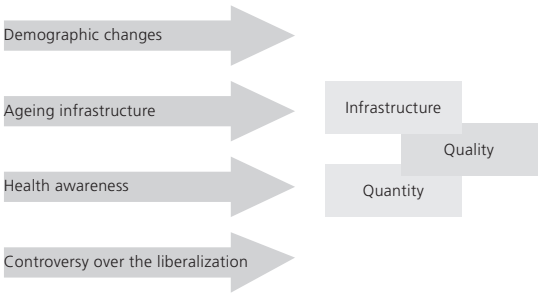
Four global trends are accentuating these challenges, and will shape the future development of the water sector:

- Demographic changes
- Ageing infrastructure
- Increasing health awareness
- Controversy over the liberalization of the water market

Figure 3

Global trends impacting the water market

Source: SAM



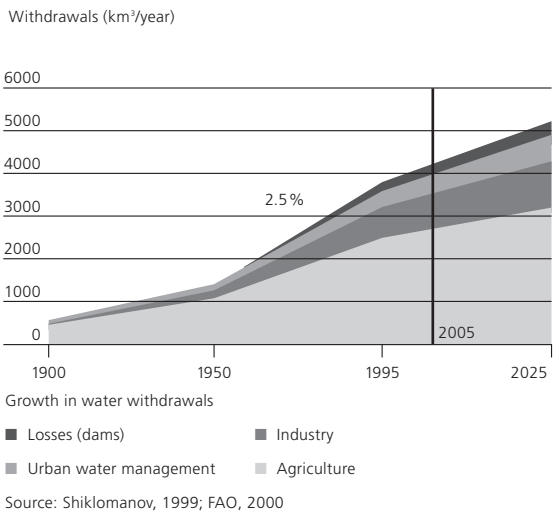
2.1 Demographic changes

Demographic changes include both population growth and increasing urbanization. Both these factors are resulting in greater demand for drinking water, sanitation and effective water supply and sewer networks.

Population growth and water consumption

Between 1970 and 2000, the population growth rate declined from 2% to 1.5% per annum. Even so, the world population is forecast to grow to around 8 billion by 2025. By contrast, the increase in water withdrawals has steadily outpaced population growth. Water withdrawals are growing at 2.5% per annum, and there is no sign of a reversal in this trend (Figure 4).

Figure 4



Source: Shiklomanov, 1999; FAO, 2000

Increasing urbanization

The way the population is developing is also leading to increased urbanization. One of the reasons is rural unemployment. A clear indicator of this trend is the burgeoning number of megacities with a population of more than 8 million. In 1950 there were only two – New York and London – but now there are already 22. This figure will have risen to around 36 by 2015, and many of these cities will have populations way in excess of 8 million. Of these 36 megacities, 23 will be in Asia (Figure 5).

Bottleneck in food production

There are signs that this development is leading to water stress. Up to 14 000km³ of renewable, useable water are available annually. Total global water consumption (water withdrawals incl. water for agricultural irrigation and water for diluting wastewater) is currently running at around 6000km³. In terms of water supply and demand, overall

Figure 5

Proliferation of megacities.

The number will increase to 36.

■ Industrialized countries

■ Developing countries

Source: Brinkhoff 2004

Figure 5

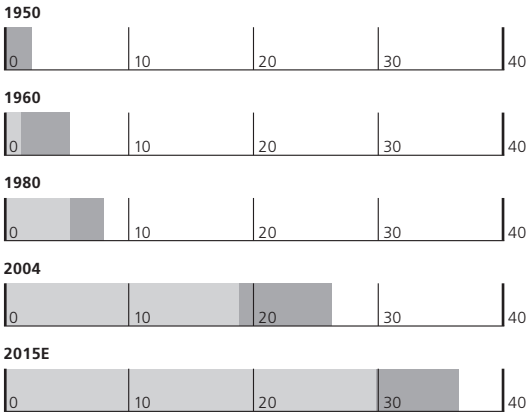


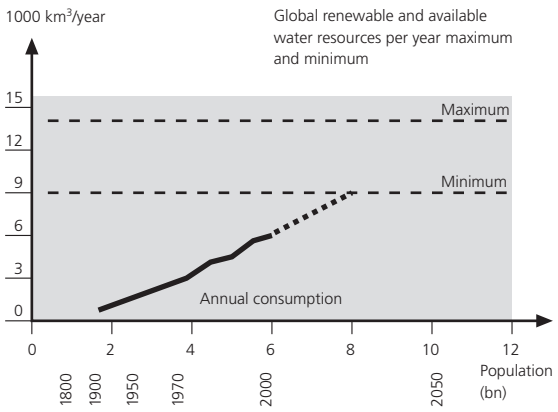
Figure 6

Bottleneck predicted in water supply.

Source: Postel et al., 1996

Zehnder, 1997

Figure 6



there is no scarcity of water on a worldwide basis. But in the next few years the gap between supply and demand will shrink on a global basis (Figure 6). Even so, an analysis of the water problem must also take account of regional differences.

Falkenmark has come up with the following rule of thumb for assessing the water situation: if, in a given region, less than 1700m³ of renewable water resources are available per person per year, this is the first indication of water stress; at volumes of less than 1000m³ per year, the situation becomes serious. However, these figures do not take account of the fact that precipitation varies over time. For example, heavy rainfall (leading to floods) often cannot be used. This means that even countries with around 2000m³ per person per year can suffer serious water stress (Table 1).

On the basis of this massive water demand it is possible to assess which countries already lack sufficient water to produce food for their own population (Figure 7).

Lack of infrastructure

Growing urbanization is also increasing the need for water services infrastructure, especially on the water drainage and treatment side, where minimum standards of hygiene must be assured. The real challenge lies in rapidly setting up, maintaining and funding the infrastructure – here there are attractive markets emerging for companies providing pipe networks as well as those involved in decentralized water treatment.

Depletion of resources

Water resources are already massively overused in urban areas. For example, Jakarta's water and wastewater infrastructure was designed to cater for 500 000 people. In 1999, though, the city had around 15 million inhabitants, leading to depletion of groundwater resources – even though only 25% of the population has access to water. Added to this, because the groundwater table now lies 30 meters below sea level, the city's water is oversalinated. At this depth it is very difficult to dig wells deep enough to reach the groundwater (Sundblad, 1999). Drops in groundwater tables have also become a fact of life in 60% of EU urban areas. And in the United States, depletion means that the Colorado River sometimes does not even reach the Mexican border.

Growing risk of catastrophe

As the population grows and population density increases, the risk posed by natural catastrophes also increases. Floods, droughts, storms and earthquakes have always been a feature of human life. But natural disasters in recent years have affected even greater numbers of people because of higher population density (Figure 8).

This greater susceptibility to catastrophes also has an impact on the water sector. Not only are backup systems needed to provide drinking water in emergencies, but the costs of repairing damage are generally very high, and often not covered by insurance.

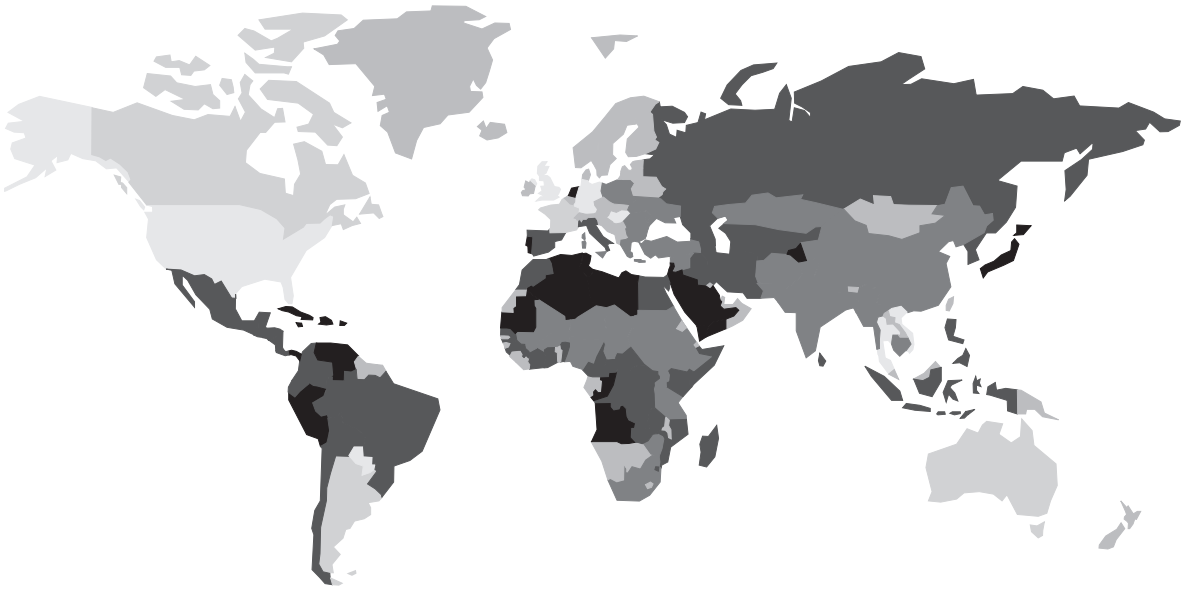
Figure 7

Availability of water and land to grow food for own population (1995)

- Big shortfall
- Small shortfall
- Exactly enough
- Small surplus
- Big surplus
- Not analyzed

Source: IWMI, 2000

Figure 7



Implications for investors

- Demand for efficient irrigation systems, water management technologies and water-efficient food sources will grow.
- The gap between water supply and demand can only be bridged using extremely water-efficient (economical) technologies. There is great potential for com panies offering products which can do the same job (e. g. toilet flushing) with less water.
- A key aspect of water use is to assure infrastructure in urban areas, and demand will increase for companies operating in this field. However, efforts to set up the necessary infrastructure can hardly keep pace with the rapid growth of cities, meaning that decentralized treatment systems will become an important feature of the market.

2.2 Ageing infrastructure

The second global trend is the increasing ageing of the infrastructure. Drinking water pipes and sewers are the lifeline of water provision and disposal of wastewater. They account for around 80% of the costs of the entire water infrastructure.

Desperate need for infrastructure renovation

Drinking water pipes can be expected to last between 50 and 100 years depending on their quality, the type of ground they are laid in and various other factors. This means that 1 to 2% of the network must be replaced every year. Even 10 years ago, the renewal rates in many cities were not high enough to ensure the renovation of a network with an average age structure (Table 2). Since most pipe networks were laid at the beginning of the twentieth century, but replacement work has been neglected in recent years, many pipes are in very bad shape indeed. In future, more work will be required to address the years of neglect. It is hardly surprising therefore to see local and national authorities publishing new reports every year on the urgent need for major investments to upgrade existing water supply and drainage networks.

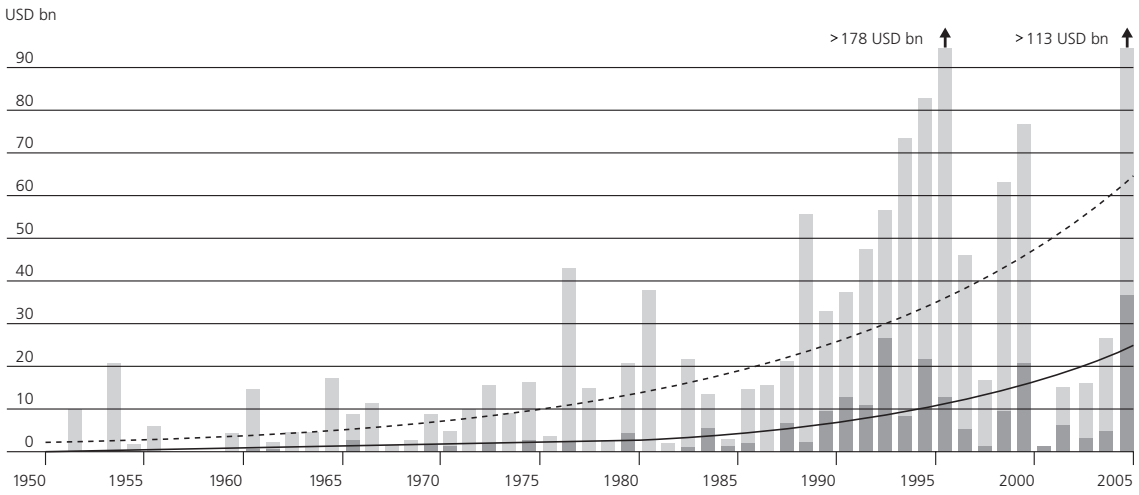
Figure 8

The rising costs of natural catastrophes.

- Economic losses (in 2004 values)
- of which, insured losses (in 2004 values)
- Trend for economic losses
- Trend for insured losses

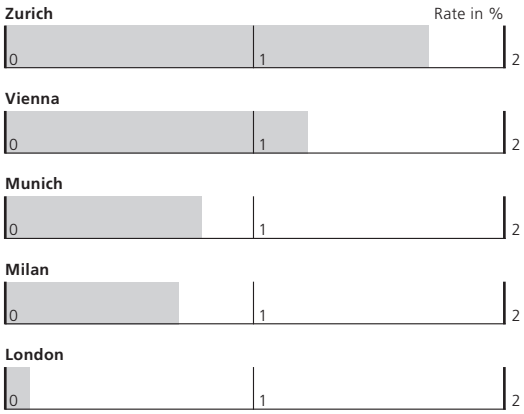
Source: Munich Re, 2004

Figure 8



One result of this is increased water loss. In the United States alone, leaks in the pipe network mean that around 15 to 20% of drinking water is lost during transportation; in other words, around USD 800 million worth of water goes to waste every year. In less highly developed industrialized nations the losses are even higher at 20 to 40%, although here illegal withdrawals from pipe networks are common practice, in addition to losses through leaks.

Table 2



Water infrastructure renewal rates per year in selected cities. They are almost all too low. Source: Skarda, 1998

New technologies

This state of affairs has spurred the emergence of so-called inlining systems – 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.

To fund the replacement of pipe systems, water prices have to reflect the costs, which means charging for water on a "user pays" basis. This requires water metering systems which measure the water use of individual households.

Implications for investors

- Companies which offer innovative methods for extending the useful life of the infrastructure will be in increasing demand.
- Decentralized systems for wastewater treatment and drinking water disinfection will become more and more attractive.
- Demand for equipment for metering water usage will increase. Water management systems will also gain in importance.

2.3 Increasing health awareness among the population

A third global trend which is impacting the water sector is people's growing health awareness. One symptom of this trend is the rapidly growing demand for natural and organic produce, which has also been fuelled by issues such as the marketing of genetically modified organisms (GMOs), or illnesses such as BSE (mad cow disease) or foot and mouth disease (Figure 9). Increasing health awareness is also boosting sales of bottled water.

Water pollution

Water pollution – in industrialized western nations at any rate – is no longer the high-profile issue it was a few decades ago. Even so, this topic still poses substantial challenges, not only because people expect higher standards, but also because new sources of pollution are constantly emerging. It typically takes around 50 years from the moment a particular source of pollution is identified until it has been eliminated across the board (Figure 10).

An example is the discovery, in the mid-twentieth century, that nutrients in wastewater, especially phosphorous, were overfertilizing lakes and leading to huge amounts of algae. Thanks to the development of adequate technologies and a successful ban on phosphates, 50 years later this problem has been largely solved. Nowadays, measures to reduce the nitrogen content of treated wastewater are necessitating major investment. Recently there have been large questionmarks over the impact of endocrine active substances – substances which act on the hormone system – which up till now have not been completely eliminated by sewage plants.

As far as drinking water is concerned, the current focus is on new species of parasites (e. g. cryptosporidia and giardia). The legionella bacterium, which causes legionnaires' disease, is a growing problem too. Carcinogenic organic chemicals are also posing water technicians a major challenge.

Media reporting on environmental issues

Nowadays the media ensure that news of new risks and sources of pollution travels very quickly (Figure 10). While in the past, news of environmental or health scares was restricted to a local level, global media and the Internet today mean that practically the entire population of industrialized countries are immediately informed and warned about potential health hazards. Global reporting

Figure 9

Rocketing demand for organic products. Figures for the USA (in USD billion).

Source: Wal-Mart, Hartman Group, Knight Ridder, HSBC, 2005

Figure 9

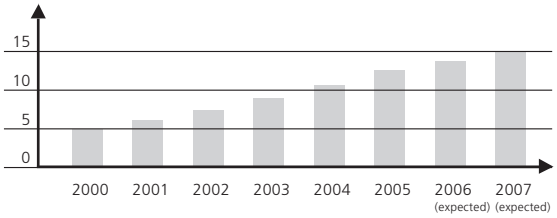
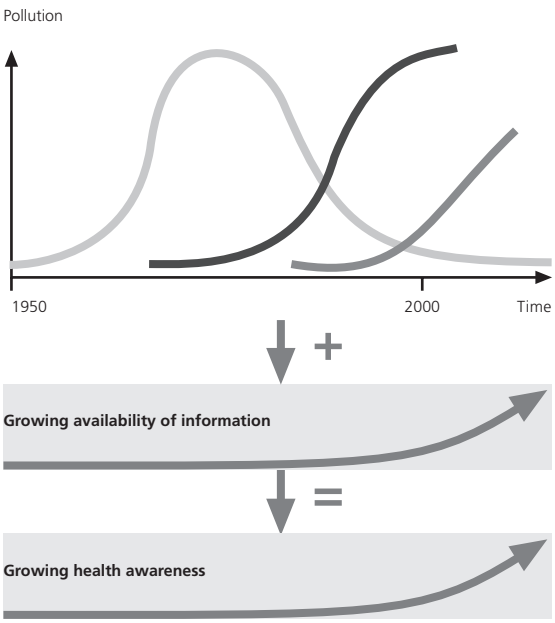


Figure 10



New pollutants are repeatedly causing new problems.

Pollution cycles last roughly 50 years.

e. g. Phosphates

e. g. Legionella

e.g. Endocrine disruptors

Source: SAM

on environmental catastrophes increases public awareness of these issues and also ensures that risk containment and prevention measures are implemented more swiftly.

Implications for investors

- Water treatment technologies are becoming more and more important as pollution remains widespread and news on environmental incidents travels faster.
- Newly emerging water pollutants require new treatment technologies. Older treatment plants are often not capable of guaranteeing safe drinking water. Demand for state-of-the-art treatment technologies is on the increase.
- Growing health awareness is stimulating demand for organic produce and mineral and bottled water.
- New equipment is needed to measure the effectiveness of the new, improved treatment technologies.

2.4 Controversy over the liberalization of the water market

The liberalization of water services – in other words, the abolition of the regional monopolies enjoyed by local, state-owned utilities, thereby opening the door to competition – quickly gathered pace in the 1990s. In most cases liberalization also means privatization or part-privatization (under a Public Private Partnership). This means that private companies have now assumed responsibility for water services. Figure 11 shows the number of projects with private-sector involvement co-financed by the World Bank in developing countries. However, only a small minority of the world's population (about 10%) is supplied by private water companies.

Privatization is one of the important – and controversial – developments of the last few years. This trend was started in 1992 at the International Water Conference in Dublin, where it was argued that water should be regarded as an economic commodity, in the hope of putting a stop to the persistent water crisis and wasteful handling of water. The World Bank subsequently issued development credits which were conditional on the privatization of various government-run activities, such as water and wastewater services.

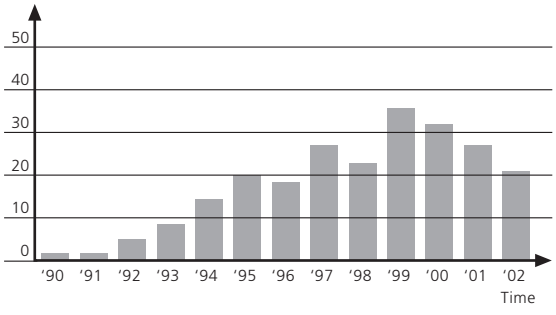
In recent years, though, the privatization boom has abated due to strong resistance from non-governmental organizations and also because of the rather mixed experiences which private water groups have had of privatization projects. Opponents' main arguments are based on fears that companies will try to maximize their profits at the expense of poorer sections of the population (through price rises) combined with the risk that companies will neglect to maintain the infrastructure over the long term.

Opportunities and risks

Privatization activities in the last few years have undoubtedly had a beneficial effect on the water sector as a whole. After all, the competitive pressure exerted by the wave of privatizations on established, state-owned and sometimes lethargic organizations forced them to pay more attention to the issues of efficiency, fair pricing and customer focus. In Britain, where the state utility was privatized in 1989, the positive aspects of privatization are shown, for example, by the number of water meters that have been installed (Figure 12). In the drive towards fairer pricing and greater transparency, the rate of installed water meters rose from 1% in 1989 to around 23% in 2003.

Figure 11

Number of projects with private-sector interests being co-financed by the World Bank in developing countries.

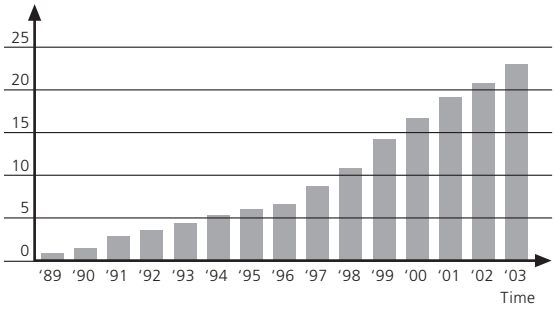


Source: Worldbank, 2004

To counterbalance the risks of privatization, a strong regulatory authority is needed to lay down strict guidelines within which the private companies may operate. On the one hand this means keeping the price below a socially acceptable upper limit (Figure 13); on the other hand, it means guaranteeing safety and maintaining the pipe network. Within these limits, companies may explore the potential both for raising prices and for cutting costs. However, privatization will result in higher water prices because public sector cross-subsidies will cease. Fair price hikes are justifiable from the point of view of sustainability, though, as they encourage consumers to be more economical with water and enable the industry to fund desperately-needed investments in the infrastructure.

Figure 12

Clients with water meters

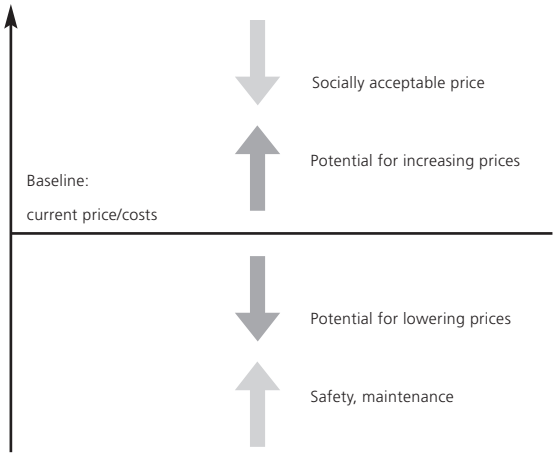


Source: Metering International Magazine, 2/2003

Whether water and wastewater utilities are in public or private hands, for a system that will work in the future it is essential to create incentive structures for the organizations that will produce a lean system. In other words: maximum performance with minimal infrastructure.

Figure 13

Water price/costs



Incentive structures for private water utilities.

- Limitations imposed by politics and technology
- Network operator incentives

Source: SAM

Implications for investors

- Corporate governance, i. e. the degree to which a company actually implements management guidelines putting the philosophy of sustainability into practice, is a key criterion when picking water utility stocks.
- Liberalization at any price is not the best strategy for the water sector. It is important to bear in mind that this is an extremely sensitive issue. To successfully take over a supply area, a utility must be well positioned in all three dimensions of sustainability (economic, environmental and social).
- When selecting water and wastewater utilities, one should consider the extent to which political concessions and the age and quality of the available infrastructure may limit the scope of management.
- Because utilities are guided very much by political as well as economic considerations, investment in these companies demands particularly careful scrutiny.

3. An Investment Strategy geared to Sustainability

A successful investment strategy will take account of all the trends shaping the water sector (Figure 3). Ideally it will be able to identify companies which have managed to adapt to all four trends (demographic changes, ageing infrastructure, health awareness and controversy over liberalization).

At the same time, it has to take account of sustainability, consider the entire value chain, and adhere to a set of general investment principles (Figure 14). These three factors combine to create good investment opportunities.

3.1 Sustainability

The way water is managed today is not sustainable. For example, little is being done to preserve the value of the infrastructure, the use of water is often anything but efficient, the groundwater table is sinking in most places, and water quality is often insufficient. Not only this, but in many industrialized nations people have failed to realize just how precious a commodity water is. Such awareness is vital in order for a resource to be used sustainably.

Shifting the focus from water to services

Although the technologies used up till now in the water sector have partly solved certain problems (enhancing water quality and the infrastructure), they have also created new problems (e. g. there are new funding difficulties, and some technologies require massive consumption of water). In future, the industry will therefore have to stop focusing primarily on water itself, and start thinking in terms of the sustainable provision of services (Figure 15). This means, for example, no longer thinking in terms of supplying water to a flushing toilet, but rather focusing on providing a specific service – "feces disposal" – regardless of whether this is done with water or by other means (e. g. vacuum technology).

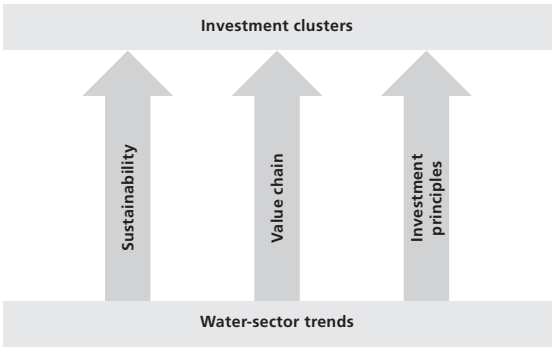
Concentrating on the service rather than water itself opens up new ways of looking at and solving problems concerning efficient water use, financing and water quality. It is no longer a matter of being able to supply water at all times, but of providing a service to customers.

Figure 14

Three factors to consider for investment strategy.

Source: SAM

Figure 14



In the water sector, sustainability may involve adopting the following objectives among others:

Economic sustainability objectives

– Creating and maintaining investment incentives which help protect water resources. Assuring water and wastewater services has to be possible for private companies at reasonable profit margins.
– The service must be provided economically. In order to use as little water as possible, any solution must also include measures to manage demand (minimizing water losses, encouraging the use of water-efficient home installations, and smoothing out peaks in demand. Tillman et al., 2002).

Environmental sustainability objectives

– The quality and quantity of available resources must be maintained in both the short and long term.
– The negative side-effects of water usage (e. g. disease and increased soil salinity) must be avoided as far as possible.
– Pollution should be tackled at source. The more the pollutant is diluted, the more inefficient treatment is (because it is harder to clean water with lower concentrations of pollutants).

Social sustainability criteria

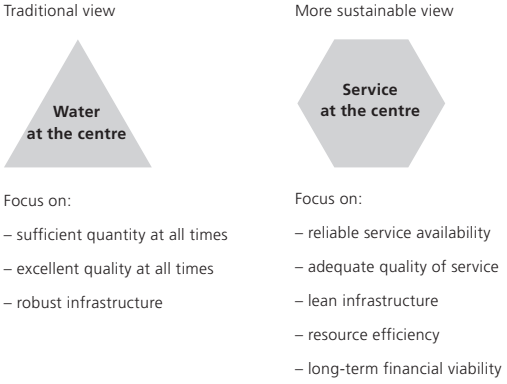
– Minimum standards must be set governing the availability and quality of water-related services for all population groups (e. g. access to drinking water and sanitation).
– Care must be taken to ensure that all social classes can afford minimum basic water services. This means, for example, charging lower prices for basic water consumption and higher prices for luxury consumption.
– Stakeholders should be sufficiently involved in the decisionmaking process.

Figure 15

Shifting the focus from water to services.

Source: SAM

Figure 15



3.2 Investments along the value chain

Promising investments are often to be found not only at the level of the core product (e. g. clean water), but also up and downstream on the value chain (e. g. household fittings, sanitary equipment and pipes, Table 3).

So-called enabling technologies, products and technologies which allow the break-through of a particular core product, are often particularly attractive. These technologies may be used to enable a broad range of different applications (e. g. membrane materials, UV lamps).

3.3 Investment principles

Adhering to certain investment principles is a good way of minimizing investment risks. This includes diversifying investments by size (market capitalization), region and sector.

Regardless of the quality of a company, it is important to assess the overall value of the stock. This has a significant bearing on the timing of the investment.

Implications for investors

- Integrating sustainability criteria helps reduce investment risks and enhance the risk/return profile of the investment.
- Looking at the whole value chain expands the universe of potential investments. Companies may emerge as potential investments which at first sight do not seem to have any connection with water, but which subsequently turn out to be indirectly related to the water sector.
- A company should generate the lion's share of its sales in the water sector. This is the only way of profiting from the trends impacting the water sector.
- Thorough financial analysis is required to ensure that investments are only channeled into undervalued stocks.

Table 3

One important criterion for investment is a consideration of the entire value chain.

Source: SAM

Table 3

	Residential water use	Agriculture	Industry
Key input	Untreated water	Untreated water, fertilizer, land	Untreated water
Enabling technology	Treatment, e.g. membranes	Irrigation	Pre-treatment
Primary product	Drinking water	Crop	Process water
Distribution	Pipes, bottles	Crop transport	Pipes
Transformation	Sanitary installations	E.g. food processing	E.g. cooling elements
Service	Health, Hygiene	Food (preventing hunger)	Flushing
Wastewater treatment	Recycling, sewers, treatment	Sewers, treatment	Industrial treatment

4. Attractive Investment Clusters

Based on the trends and sustainability criteria described above we can identify four investment clusters within the water sector which have great potential. The total annual turnover of the water market is estimated to be USD 300–400 billion.

4.1 Distribution and management

Water and wastewater utilities

Up to now, the different local and municipal authorities have sought to operate largely autonomous utilities. In Switzerland, for example, there are still around 3000 water utilities and 1000 organizations operating treatment plants, and in Germany there are 6000 water utilities and 10 000 wastewater utilities. Nowadays the emphasis is more on increased efficiency, cost savings and flexibility. One expression of this is endeavors to compare (benchmark) the efficiency of different utilities. Another symptomatic trend is regional concentration, in some cases pronounced, on a smaller number of utilities. Networks are also extending internationally to an increasing extent, with a small number of multinational utilities in a constant process of merging and re-merging.

Market volume, measured in terms of water sales revenue, stands at over USD 100 billion per year (Table 4). This figure is based on an estimated average water price of approximately USD 0.5/m³ multiplied by around 1 billion paying customers with an annual consumption of 200 m³ (including industry's share).

Water distribution and sewers

Most drinking water pipes and sewers are laid by traditional construction companies (e. g. Bouygues and FCC). In industrialized countries this involves investment of at least USD 100 billion every year. Rising standards, the emergence of alternative technologies for laying pipes and sewers, and increasingly complex locations are prompting more and more companies to specialize in a particular field. One example is Insituform, which focuses on pipe rehabilitation using sliplining.

A number of different techniques are used for laying water pipes: repairing and replacing pipes by excavating or using trenchless technology, cement mortar linings, sliplining and long pipe relinings. New methods for identi-

Table 4: Distribution and management

Sub-cluster	Technologies	Target market	Market volume USD/year	Annual growth rate	Examples of companies*)
Water and wastewater utilities		Cities/municipalities Industrial companies	> 100 bn 2)	5% 2)	AWG, Severn Trent Plc, Suez
Distribution	Open/closed, various materials, sliplining/long pipe	Water mains and sewer networks	> 100 bn 1)	5% 1)	Insituform, Northwest Pipe Co., Gorman Rupp
Management & engineering		Public sector, agriculture, companies	20 bn 2)	10% 2)	Stantec, Tetra Tech

*) The companies are listed for illustration purposes only. This does not imply that SAM necessarily invests in these companies or recommends them as investments.

Sources: 1) SAM, Water Infrastructure Network, 2001 2) SAM

fying damage (for example endoscopic inspections and repairs) play an important role in this. Discovering and repairing damage in good time helps avoid major damage resulting from burst pipes.

Water management and engineering

Ever-scarcer water resources have to be intelligently managed. In the future terrestrial information and satellite systems will increasingly be used to optimize withdrawals and distribution. Consultancy firms focusing on the management of large river catchment areas or ecosystems have reported very good sales in these areas in recent years.

4.2 Advanced water treatment

Wastewater treatment

The volume of the worldwide wastewater treatment business is estimated at USD 10 billion a year, growing at 10 to 15% annually (Table 5). Even so, only 5% of wastewater is currently treated. While the main aim of wastewater treatment used to be preventing the pollution of waterways, nowadays the emphasis is increasingly on enabling wastewater to be reused (e. g. for flushing toilets, irrigation or groundwater recharge).

Enhanced treatment technologies are constantly emerging as developments progress. Biological techniques are being optimized, and physical processes (e.g. membranes) are becoming increasingly viable from an economic point of view. Companies working with membranes include Pall and Zenon. Not only this, but new problem substances (such as endocrine active substances) are constantly being discovered which today's treatment plants cannot deal with.

Disinfection

Disinfection of drinking water is the most common treatment method used by water utilities. Of all water used in residential areas, 80% is disinfected. Even so, 80% of all infectious diseases are still spread by undisinfected water. The disinfection business, worth around USD 5 billion, is growing at an annual 10 to 15%. So far chlorination has been predominant, with approximately 85% of the

Table 5: Advanced water treatment

Sub-cluster	Technologies	Target market	Market volume USD/year	Annual growth rate	Examples of companies*)
Treatment	Physical/biological/ Chemical/chemicals	Drinking/wastewater	50 bn 2)	10% 3)	Zenon, Kemira, GE, ITT
Disinfection	Chlorine/ozone/ peroxide/chlorine dioxide/ membranes/UV/ adsorption/ distillation/filtration	Drinking/wastewater	5 bn 2)	10% 3)	Wedeco, BWT, Calgon Carbon, Danaher
Desalination	Distillation/ reverse osmosis/ nanofiltration/ electrodialysis/ ion exchange	Sea water/ wastewater	5 bn 1)	15% 1)	GE, Kurita
Monitoring		Quality/quantity	3 bn 2)	10 to 15 % 3)	Danaher, Waters Corp

*) The companies are listed for illustration purposes only. This does not imply that SAM necessarily invests in these companies or recommends them as investments.
Sources: 1) Helmut Kaiser Consultancy, 2005 2) Environmental Business Int., 2005 3) SAM

Figure 16

Growth of the desalination business.

- Distillation (multi-stage)
- Reverse osmosis
- Distillation (multi-effect evaporation)
- Electrodialysis
- Distillation (compression)
- Others

Quelle: International Desalination Association

Figure 16

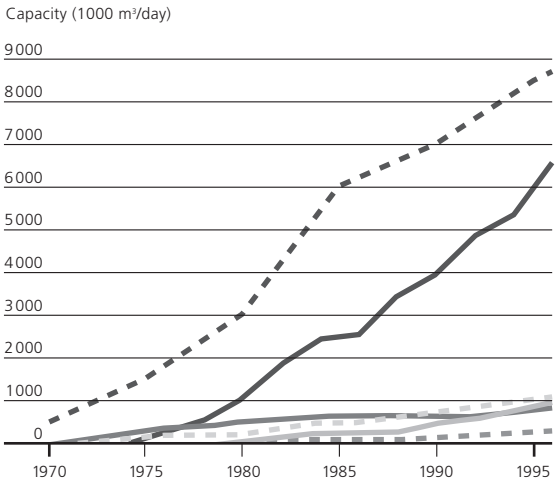


Table 6

	Efficacy (disinfection)	Practical experience	Sustainability
Chlorination	++	++	–
Ozone treatment	+	+	–
Membrane filtration	++	–	++
UV treatment	+	++	+

Comparison of different disinfection process.

Source: ATV, Merkblatt M205, 1998

market (Table 6). Recently, however, this process has hit the headlines, with new research forging a link between the use of chlorine gas and the formation of undesirable by-products such as trihalomethane, which are suspected of being carcinogenic.

Given the potential risks, the market share of disinfection by chlorine is likely to fall to around 50% in the next five or ten years. An efficient and recognized alternative is irradiation with ultraviolet light, a technique offered by for example Trojan Technologies (Danaher). Adsorption techniques (such as the one offered by Calgon Carbon Corporation) and membrane-based processes are additional alternatives. However, newer methods have the disadvantage that they do not guarantee permanent disinfection (preventing water in the mains from being reinfected). For this reason, combined methods, for example using chlorine dioxide, will become popular as a means of protecting water i[n the mains network. There will also be increasing calls for the disinfection of wastewater, which is already commonplace in the United States.

Desalination

With water scarce in many southern countries, desalination has become very important. Not only is desalination used as a means of making drinking water from seawater and brackish water (a mixture of salt and fresh water [Figure 16]). Desalination is also increasingly a necessary component of wastewater treatment. There are currently over 13 000 smaller and larger desalination plants in operation in 120 countries, removing salt from 30 million cubic meters of water every day. The market, currently worth approximately USD 5 billion, is forecast to grow to USD 70 billion by 2020.

As things stand at present, thermal desalination methods (distillation) have a 74% market share, while reverse osmosis accounts for 22% of the business, in terms of the volume of water treated. However, reverse osmosis is clearly gaining ground.

Even though desalination has long been possible from a technological point of view, it is not yet in widespread use. The main reasons for this are high energy consumption and considerable production costs of between USD 0.5 to 1.5 per m^3 (compared with USD 0.1 to 0.25 per m^3 for conventional water treatment). In recent years the production costs have fallen 10% a year, and experts reckon the potential for further savings has not yet been exhausted. In future we can therefore expect to see a substantial increase in investment in desalination. Companies involved in this field include Kurita Water and GE Ionics.

Monitoring

The main aim here is to monitor the quality of water

either permanently or by means of random samples. With the introduction of tougher legislation, especially in the EU, technologies for monitoring the quality of water are becoming increasingly important. Methods for identifying water losses are also steadily gaining in importance.

4.3 Demand-side Efficiency

Raising demand-side efficiency is the quickest and cheapest way of ensuring that water resources are used more sparingly. Demand-side efficiency means providing the same service using less water without sacrificing convenience.

Sanitary installations

The average person in Switzerland uses 60 m^3 of potable water a year, 20% of which for showering. While a normal shower head uses around 20 liters of water a minute, a high-efficiency shower head mixes air with the water to halve the water consumption without any noticeable reduction in effect. In this way around 6 m^3 of water per person per year can be saved. Extrapolating this example to the 450 million people in the EU gives potential savings of some 2.7 billion cubic meters of potable water a year. Assuming an average water price of EUR 2.2 per cubic meter (including wastewater treatment) and factoring in savings on hot water (EUR 2.2 per cubic meter), no less than EUR 11 billion could be saved every year.

Given rising water tariffs, there are huge incentives for consumers to use efficient household fittings – provided that each household's water use can be billed fairly and transparently. However, with these savings lowering the consumption of water while infrastructure costs remain the same, the price of water would rise again in the medium term.

Decentralized treatment

The market for decentralized wastewater treatment systems is growing rapidly at around 20% per year. The reason is clear: as the price of water rises, it makes much more economic sense for industry to invest in recycling gray water (water that has been used for one purpose but can be reused for another purpose without, or with minimal, purification). These systems are also becoming increasingly attractive for household use, where they can also bring economic benefits.

Water utilities, on the other hand, are often skeptical when it comes to water-saving technologies. Their main argument is the high overheads of pipe networks, which have to

Table 7: Demand-side efficiency

Sub-cluster	Technologies	Target market	Market volume USD/year	Annual growth rate	Examples of companies*)
Sanitary installations		Industry/households/ public sector	10 bn 2)	<10% 2)	Geberit, Aqua Art AG
Decentralized treatment	Use of rainwater/ biological treatment/ chemical/physical treatment/disinfection	Industry/ households/ public sector	6 bn 1)	15 to 20 % 1)	Purecycle
Metering	Water meters/reading instruments/evaluation	Owner-occupied & rental accommodation/ industry	1 bn 1)	5 to 10 % 1)	Techem, Badger Meter

*) The companies are listed for illustration purposes only. This does not imply that SAM necessarily invests in these companies or recommends them as investments.
Sources: 1) SAM 2) Geberit AG

be in place in any case. If efforts to save water result in lower water sales, utilities have to charge higher prices for water, which is not politically attractive. On the other hand, there will be no increase in the overall annual costs paid by consumers for water. If actively communicated, water-saving can thus be a sensible move for utility companies.

Water meters

To pass on the costs of water to the consumer in line with the "user pays" principle, there must be a reliable way of metering water consumption. This requires water meters which can not only measure water consumption for a whole apartment block, but can break water usage down into individual households. Nowadays the technology exists to read meters automatically. The whole process is similar to billing central heating costs on an individual household basis.

4.4 Water and food

Irrigation

Precipitation is subject to great seasonal and regional variation. For this reason, irrigation is often used in agriculture. Currently around 18% of agricultural land worldwide – producing some 40% of the world's food – is irrigated (Figure 17). The irrigated area is likely to increase sharply in the coming years (Postel, 2001). Investment related to agricultural irrigation currently runs to around USD 35 billion a year.

The most common way of irrigating land is by flooding (ditch irrigation). However, this wastes a large amount of water and carries the risk of increased soil salinity. Much more efficient are technologies such as micro irrigation (drip irrigation), which uses 30 to 70% less water, minimizes the risk of increased soil salination, and boosts agricultural yields by between 20 and 90% (Postel, 2001). Other alternatives include sprinkler equipment: high-pressure sprinklers, which spray water inefficiently over plants and allow a large amount of it to evaporate, and low-pressure sprinklers, which are much more targeted and efficient by comparison.

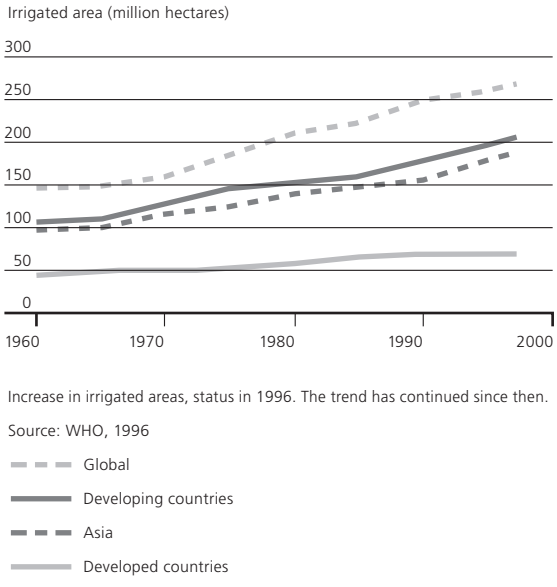
Even though sprinklers currently account for only 10 or 15% of the market, and micro irrigation a mere 1%, the market share of these technologies should grow substantially. In this area innovative startup companies are developing new techniques, for example for measuring soil moisture content exactly and managing the amount of water used for irrigation in line with this.

Food production

Food is a multi-billion-dollar industry, with global sales of around USD 3000 billion a year. The business is 100%-reliant on safe water resources. Especially important is the efficient use of water in crop production. Only if ways are found of growing crops with a minimum of water will it also be possible to maintain or increase production in areas with low rainfall.

A large part of water pollution stems from agriculture. Excessive use of fertilizers and pesticides has an impact on ground and surface water. One advantage of organic and natural farming methods is that they help preserve the quality of water resources. Organic and natural produce is becoming more and more popular in industria-

Figure 17



Increase in irrigated areas, status in 1996. The trend has continued since then.

Source: WHO, 1996

lized western countries – this market is growing at an annual 20%, compared with only 2% for the food market as a whole.

Genetically modified plants are also becoming increasingly important and offer the opportunity of reducing certain health problems, such as the lack of vitamin A in certain countries. Here it is vital that the risks associated with such production are fully recognized and effectively managed through transparency of information and suitable measures.

Bottled water

The global market for bottled water is worth USD 20 billion, and is growing at 5 to 25% a year (around 80% in India!). These figures may come as a surprise, as in some industrialized countries bottled water is between 100 and 1,000 times more expensive – but not necessarily better quality – than mains water. Not only this, but the price of tap water includes delivery to the home via the mains network.

Now some major food companies have also decided to enter the market for bottled water. By acquiring Vittel, San Pellegrino and Perrier, Nestlé has managed to grow its market share to around 25%. Other large players in the water market include Danone (which owns Evian and Volvic) and Coca-Cola.

Fears of impurities in tap water prompt 35% of the world's population to drink bottled water (NRDC, 1999), even though the same study shows that the quality of bottled water is often worse than water from the mains. With consumers becoming increasingly aware of food labeling, manufacturers of bottled water have to take growing care to ensure that what they deliver actually corresponds to what is written on the label.

In terms of sustainable development, bottled water adds real social value in many countries as an alternative to unsafe mains water or water offered by local suppliers who do not adhere to quality standards. In industrialized countries where tap water is germ-free, bottled water can add value in terms of taste or mineral content. In any case, it is important to analyze the way manufacturers and distributors of bottled water behave in local markets in terms of social sustainability.

Table 8: Water and nutrition

Sub-cluster	Technologies	Target market	Market volume USD/year	Annual growth rate	Examples of companies*)
Food production	Conventional/organic/ natural/functional	Food distributors	3000 bn/yr 1)	2 to 20% 1) (according to segment)	Unilever, Hain Foods
Bottled water		Developing countries Industrial countries	22 bn 3)	10 to 25% 2)	Danone, Vermont Pure
Irrigation	Microirrigation/ low-pressure sprinklers	Agriculture	30 bn 5)	10% 4)	Eurodrip SA, Lindsay

*) The companies are listed for illustration purposes only. This does not imply that SAM necessarily invests in these companies or recommends them as investments.
Sources: 1) SAM, 2) NRDC, 1999, 3) SAM, based on company reports, 4) SAM, 5) World Water Council, 2000

5. Conclusion

5. New investment opportunities in the water sector

In future, water will play a key role in the development of the entire economy. Our use of resources, up till now anything but sustainable, must be changed so that it is tenable in the long term. This is the only way of ensuring global economic stability.

Global trends will increase the pressure on efficient use of water resources. But the technologies needed for this have already been extensively developed and could alleviate the situation. Companies that commercialize these technologies will therefore play a key role in the future development of the industry, and in mastering the challenges described. And because these companies can expect increasing demand as a result of prevalent trends, investors would also do well to focus on them.

Changes in the water sector have raised people's expectations of utilities (especially when it comes to issues like quality, prices and stakeholder representation), and increased its environmental impact (in the form of pollution, salination and water stress). Successful companies will be those that are able to manage and involve their stakeholders and ensure the efficient use of resources. The concept of corporate sustainability, which involves taking all these interests into account in the decisionmaking process, will therefore become an increasingly important key success factor, helping companies add value in environmental and social as well as economic terms.

In so many different ways, water is already a uniquely precious resource, and a look into the future reveals that it will become even more precious. Water is a mass market which will grow rapidly in the coming years. On the basis of the situation described in this report, we cannot expect to see a decline in demand. Taking into consideration and evaluation of these companies, forward-looking investors will find numerous attractive investment opportunities.

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What is Sustainability?

Corporate sustainability means creating long-term shareholder value by embracing opportunities and managing risks deriving from economic, environmental and social developments. Companies which integrate this forward-looking business approach in their strategy can generate substantial competitive advantage.

Short Profile

SAM Sustainable Asset Management (SAM) is an independent asset management company based in Zurich, Switzerland. Its core business is managing assets on behalf of institutional and private clients in line with the principles of sustainability. SAM can draw on the know-how of its own research team and a worldwide network of sustainability experts. Its clients include leading financial services companies, global insurers, and institutional and private investors. SAM was established in 1995 and now employees about 50 people.

SAM Asset Management

SAM's objective is to invest in companies which lead the world and generate competitive advantage by adding economic, environmental and social value. SAM acts as advisor to the investment company Sustainable Performance Group (SPG), supporting the company in investment decisions. In addition, SAM manages a number of SICAV funds, including SAM Sustainable Leaders Fund and SAM Smart Materials Fund.

Your Benefits

Sustainable investments

Personal advice

Focus on growth markets

Early investment opportunities

Broad diversification

SAM Network

Global

Renowned partners

Research institutions

Sustainability experts

SAM Sustainability Research

SAM has a large team of sustainability analysts. SAM Research bases its evaluation of sustainability on the SAM Sustainability Rating™. This rating system also serves as the basis for the Dow Jones Sustainability Group Index, the world's first sustainability share index, which was developed by SAM in cooperation with leading index company Dow Jones Indexes. In addition, SAM works with a global network of experts to analyze trends and develop concrete strategies for translating sustainability into successful investments.

SAM Private Equity

In the private equity segment, SAM invests in young, rapidly-growing companies offering high-potential products and services. The investment vehicle SAM Sustainability Private Equity LP focuses on growth financing for companies involved in energy technologies, resource productivity and sustainable nutrition, while the sector fund SAM Private Equity Energy Fund LP focuses on the emerging energy component of the overall portfolio.

Investment Companies

– Sustainable Performance Group (SPG)

SICAV Funds

– SAM Sustainable Water Fund
– SAM Smart Energy Fund
– SAM Smart Materials Fund
– SAM Sustainable Leaders Fund
– SAM Sustainable Global Equity Fund
– SAM Sustainable European Equity Fund

Private Equity Funds

– SAM Sustainability Private Equity LP
– SAM Private Equity Energy Fund LP
– SAM Private Equity Sustainability Fund II LP

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