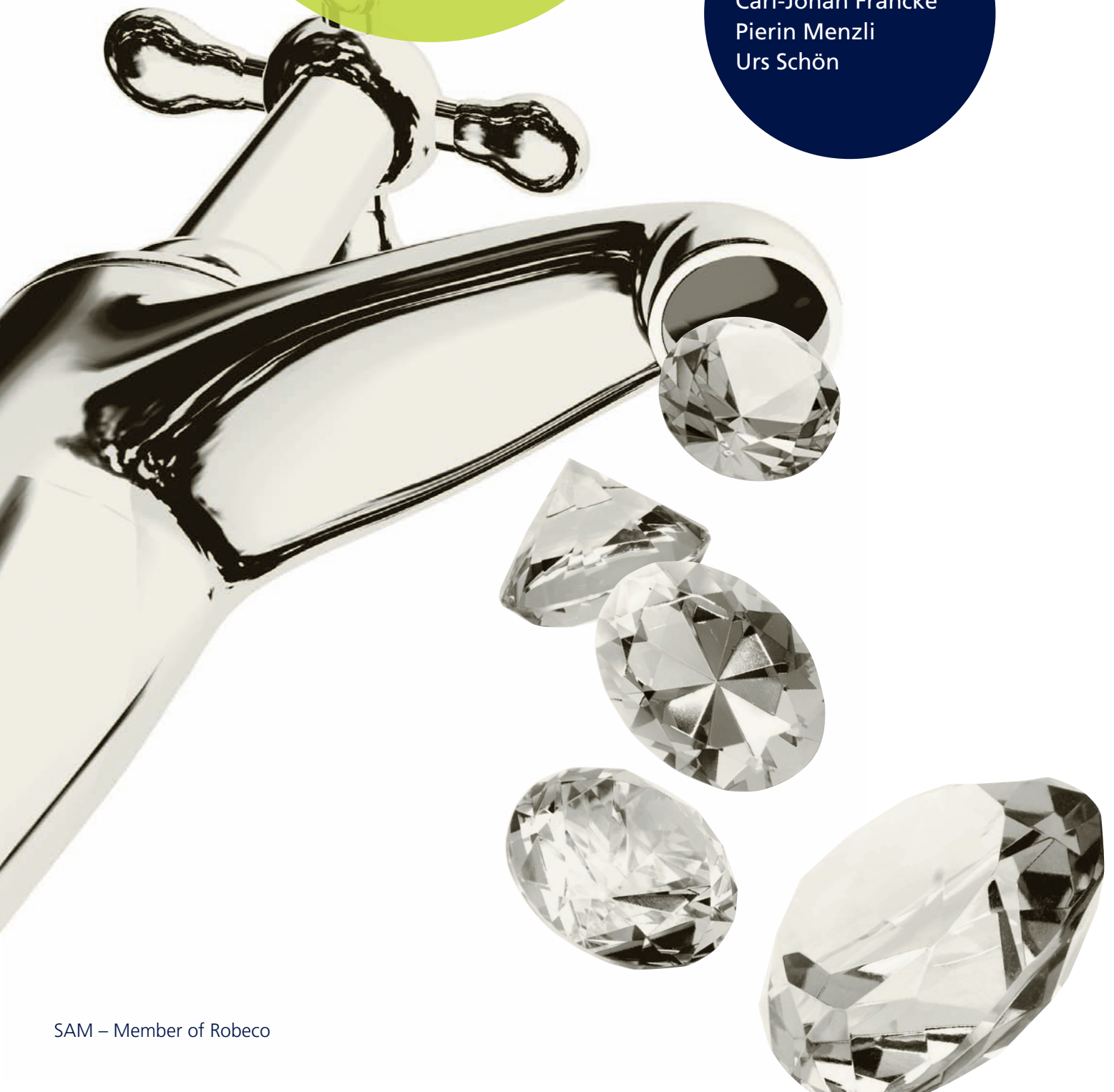


SAM Study

Water: a market of the future

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Executive Summary

Supplying water of adequate quality and in sufficient quantities is one of the major challenges facing modern society. In many countries the available water reserves are now being overexploited to such an extent that the negative consequences can no longer be ignored. Countries located in arid regions are finding it particularly difficult to irrigate the crops they need to feed their population. At the same time many people still do not have access to safe drinking water, because water resources are limited or polluted by domestic and industrial wastewater.

The situation will become even more critical in the years ahead. The development of the water market is being shaped by four megatrends:

- Explosive global population growth. Demand for water is soaring, and not just to cater for the personal needs of individuals. In the coming years even more water will be needed to produce food for the world's burgeoning population.
- In many countries the infrastructure for supplying the population with drinking water and wastewater treatment is badly run down. Major investments will therefore be required in the short term to upgrade ageing water mains and sewer systems in particular.
- Higher standards for water quality. One major priority is to ensure that people living in developing and newly industrialized countries have access to clean drinking water. Added to this, solutions also need to be found to meet the fresh challenges arising from new micro pollutants that are becoming a problem in industrialized countries especially.
- Climate change will cause significant variations in the hydrological regime in many regions, culminating in a water crisis in some areas.

These megatrends will intensify the pressure to manage existing water resources far more efficiently in the years ahead.

These megatrends will intensify the pressure to manage existing water resources far more efficiently in the years ahead. The associated investments will inevitably have an impact on the markets in question. This situation opens up attractive opportunities to all businesses offering products and services for the treatment, supply or use of water. Those companies that are capable of offering sustainable solutions stand to benefit the most. Based on an analysis of the current situation and an assessment of future market demand, SAM has identified four investment clusters that promise attractive upside potential:

- **Distribution and management:** Companies active in this cluster offer solutions for upgrading water mains and sewer infrastructure, develop systems for supplying fresh water and removing wastewater, act as utilities, or are involved in the management of water resources.
- **Advanced water treatment:** This cluster includes companies which play a key role in the disinfection of drinking water, the treatment of wastewater or the desalination of sea water, or which provide the necessary control systems and analytical instruments.
- **Demand-side efficiency:** This cluster includes companies offering products and services that boost the efficiency of water use in households or industry.
- **Water and food:** Companies in this group develop products that improve water efficiency and reduce pollution in crop irrigation and food production, or are involved in the production of bottled water.

As the overall social, economic and environmental climate changes, corporate sustainability has become an increasingly crucial success factor. This study from SAM lays the foundation for an attractive and all-inclusive investment strategy which at the same time is geared to the sustainable development of the water industry.

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1. Water – A Global Challenge

1.1. A KEY ROLE IN OUR FUTURE

Water is essential for life. We need water for everything: for our personal use, in order to grow food, and to produce virtually all the goods required for our daily existence. It is impossible to imagine our lives without an adequate water supply.

Yet water is not just a life-preserver: it can destroy life as well. It can spread water-borne infectious diseases for example. Millions of people worldwide suffer from serious diseases because they do not have access to clean drinking water.

Water is also vital for economic prosperity. The sale of water-related equipment and services is now a business with an annual turnover of USD 400-500 billion. Although water has become a precious commodity in many areas of the world, the price charged to consumers of water in most countries is still too low to accurately reflect its value.

ECONOMIC IMPORTANCE STEADILY GROWING

Over the coming years the economic importance of water will continue to increase for a number of reasons:

- Global demand for water is soaring. To meet this demand, a whole range of water services need to be expanded and made to operate more efficiently.

- To meet the current challenges, enormous investments are required to upgrade and expand the water infrastructure.
- For poorer and rapidly growing nations in particular, new technologies need to be developed for treating, distributing and using water.
- It is unlikely that water can in future be made available for all applications at the same low cost as it is today. If the price of water does increase due to supply bottlenecks, this will have dramatic consequences for all areas of our lives that essentially depend on water. These areas include virtually all of society's commercial activities, from agriculture through to the production of everyday consumer goods.
- Companies that identify these changes at an early stage and consequently respond with appropriate measures in order to exploit the resulting opportunities will be better positioned in the market and will achieve greater commercial success.

1.2. SUPPLY AND DEMAND

There are two dominant features in current global water consumption patterns:

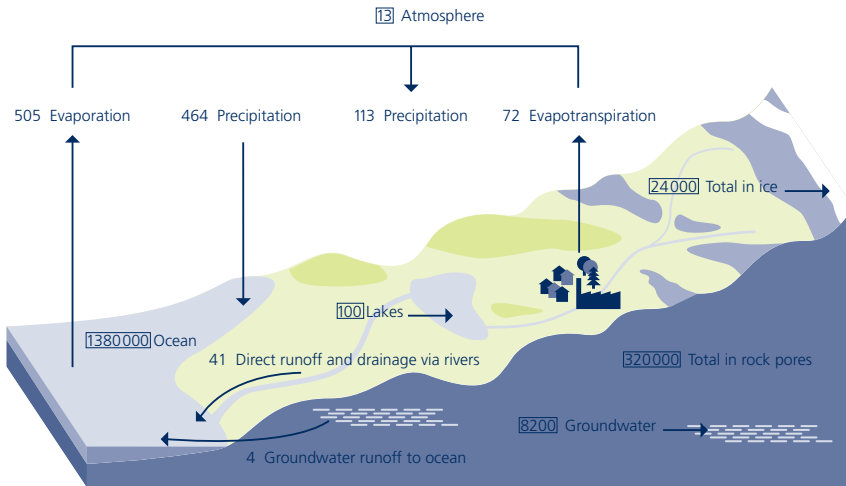
- The supply of fresh water is limited, but demand is growing steadily.

Aerial view of a river delta on the Kamchatka Peninsula (Russia).



Figure 1: Global water cycle.

The figures in boxes represent the reservoirs of water, while the others show the water volumes involved. All data are expressed in 1000 km³ per year. Source: 1



– Many countries are failing to satisfy the basic need to provide sufficient quantities of water of acceptable quality.

LIMITED WATER RESERVES

Every year around 90,000-120,000 km³ of precipitation falls on the world's continents and islands. About two thirds of this precipitation reverts directly to the atmosphere through evaporation. Of the remaining 35%, two thirds flows into water-courses, and is not therefore fit for human use. A total of some 9000-12,000 km³ of water is therefore available for drinking, agricultural irrigation and industrial use.¹

However, there are significant regional differences in the distribution of the effectively useable water.² In countries with ample rainfall, such as Switzerland, more than 7000 m³ of water are available per person per annum. In arid regions however, sometimes only a few hundred cubic meters are available per person per annum. One worrying trend is the

sharp decline in recent years in the quantity of water available to each person in many countries. The situation is especially critical in low rainfall countries.

DEMAND CONTINUES TO RISE

Water use can be roughly divided into three areas: urban water management, agriculture, and industrial production. Worldwide, 10% of water flows into domestic use, 70% to agriculture and 20% to industrial production.³ There are however major regional differences in water use: in developed countries around half the water consumption is destined for industrial uses, whereas in developing countries, agriculture is the biggest consumer of water, at around 80%.

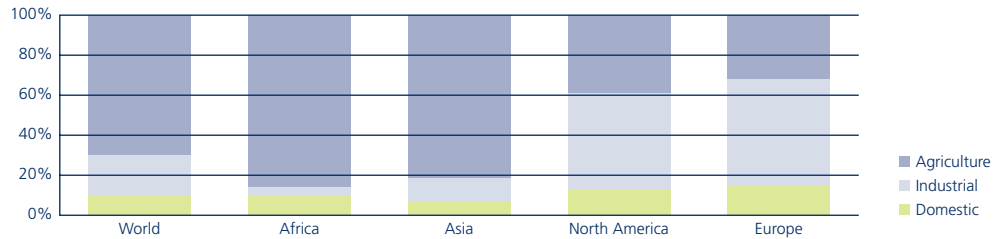
Overall, water consumption has risen sharply in recent decades. In 1900 annual water extraction volumes totaled approximately 770 km³. This figure had doubled by the middle of the century, to 1480 km³. Thereafter consumption soared to 3840 km³ in 2000.

Conversion Table

1 km ²	= 1 bn m ²
1 m ³	= 1000 liters
1 ha	= 10 000 m ²

Figure 2: Water use in different regions.

Source: 3



Individual countries such as Yemen, Uzbekistan and Israel are currently consuming more water than can be replenished by natural means. China and India – the two countries with the largest populations – are also heavily exploiting their available water resources.

This trend is likely to continue in the coming years, with consumption surpassing 5000 km³ in 2025.³ The extra demand can be explained on the one hand by relentless population growth and on the other by higher per capita consumption due to improved living standards.

Water shortage is already a serious problem in many regions of the world. These include southern Spain, the Maghreb, the Middle East, Central Asia, Pakistan, southern India and northern China. In the Americas, the US Mid-West, Mexico and the Andes are the worst-hit areas. Eastern Australia is also badly affected by drought.

Individual countries such as Yemen, Uzbekistan and Israel are currently consuming more water than can be replenished by natural means. China and India – the two countries with the largest populations – are also heavily exploiting their available water resources.

The availability of water in individual countries is measured by the Water Exploitation Index (WEI). This records water consumption as a percentage of annually renewable water reserves. A WEI of 20% is a critical value that signals the beginnings of a water shortfall. Countries with a WEI of over 40% suffer from extreme water shortages and no longer use their available reserves in a sustainable way. Seven European countries – Germany, England & Wales, Italy, Malta, Spain, Bulgaria and Cyprus – have a WEI of more than 20%. Around 35% of the European population live in these seven countries.⁴

But there are also some regions where the situation has improved. This is particularly the case in Eastern Europe, where water consumption has dropped significantly since 1990, mainly thanks to infrastructure improvements and more efficient use of water.

Figure 3: Water exploitation in selected European countries.

The Water Exploitation Index (WEI) specifies the percentage of renewable water resources consumed. If it moves above the 20% threshold, this is an alarm signal. Countries with a WEI of over 40% suffer from extreme water shortage. Source: 16

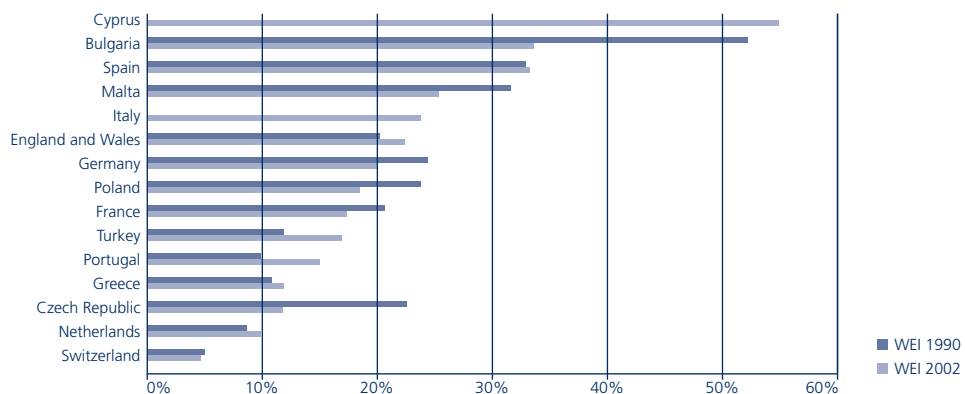
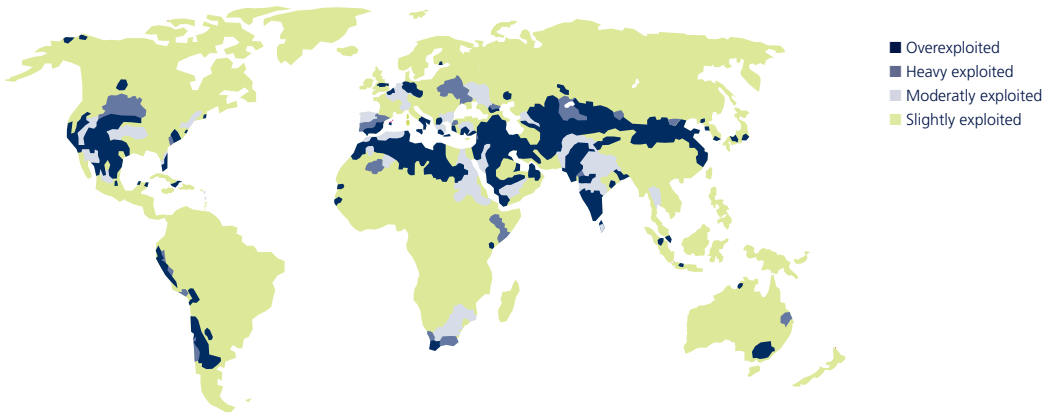


Figure 4: Use of water reserves in different regions of the world.

The map shows the river basin areas where the available water reserves are being overexploited by humans. In these regions the long-term survival of the ecosystems is under threat. Source: 5



PRIVATE CONSUMPTION: WATER BRINGS PROSPERITY

An average European uses between 150 and 400 liters of water every day for his personal requirements. Consumption in the US is almost twice as high, at 580 liters/day per person. In China, by contrast, the figure is only 90 liters per day on average. In many developing countries, individual consumption is well below the limit of 50 liters per day specified as the critical threshold by the Food and Agriculture Organization (FAO).⁵

In many countries, wastewater is not adequately treated (or not treated at all) before being channeled back into the water cycle. These countries

therefore have to cope with undesirable impacts on human health and the environment. Around 2.4 billion people worldwide have no access to adequate sanitation. The situation is particularly critical in Africa, South East/Central Asia and parts of South America.⁵

Countries with an efficiently run urban water management system have invested large sums in their infrastructure in recent decades. In Switzerland, the specific repurchase value of the entire public and private sewer system, along with all the wastewater treatment facilities, comes to almost CHF 100 billion. This works out at CHF 13,600 per head of population.⁶ Many of these installations are now de-

Figure 5: Water use and global population 1900-2025.

A comparison of global water consumption since 1900 and predicted water consumption up to 2025 against global population trends demonstrates that water consumption has increased more rapidly than the overall population. Sources: 3, 7

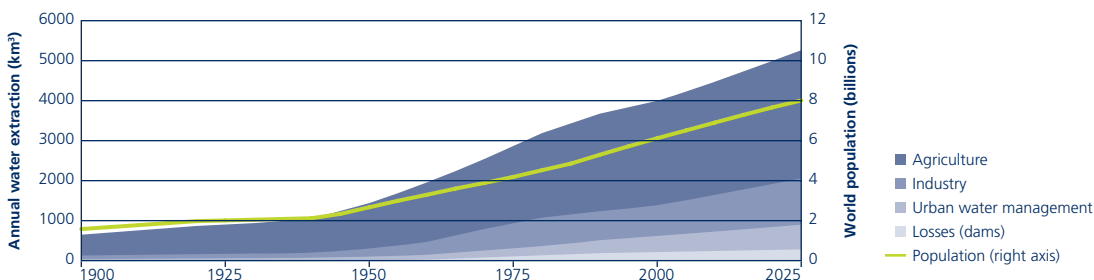
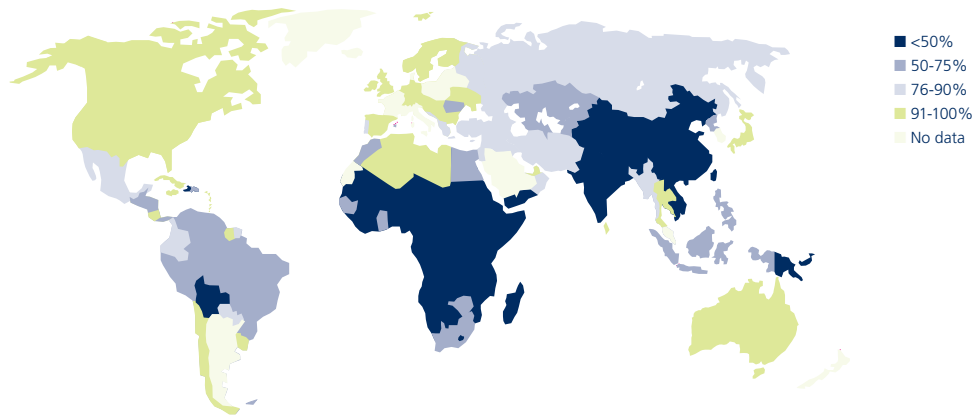


Figure 6: Percentage of the population with access to sanitation.

Source: 5



Because rainfall is distributed so unevenly, not all countries are able to produce enough food for their own population. Many governments therefore have to resort to importing food, which in some cases accounts for up to 35% of all imports.

credit, however, and need to be replaced within the next few years.

AGRICULTURE: THE MAJOR CONSUMER

Agriculture is easily the world's heaviest consumer of water, most of which is used for irrigation. It takes around 2500 kcal per day to meet one adult's energy requirements. One kilogram of bread contains around 3500 kcal, and it takes roughly 1000 liters of water to produce one kilogram of bread under optimum growing conditions. Based on this assumption, it takes around 260 m³ of water to feed one person for one year with a vegetarian diet.

The more meat contained in a person's diet, the higher the associated water consumption. When meat accounts for 20% of a person's diet, twice as

much water is consumed for its production.¹ This calculation does not take into account the fact that conditions for food production are seldom ideal. Much of the water used is wasted due to crop failures and losses in irrigation. If production losses are factored in as well, 550 m³ of water are required to feed one person a purely vegetarian diet for one year.

Because rainfall is distributed so unevenly, not all countries are able to produce enough food for their own population. Many governments therefore have to resort to importing food, which in some cases accounts for up to 35% of all imports. The situation becomes even more critical for these countries if food prices are forced higher by adverse weather conditions or competition from biodiesel production. It is perhaps surprising to find that arable

Every year over 1000 m³ of water per person are used in food production.



Table 1: Water quantities used in food production.

Volume of water (in liters) needed to produce one kilogram of the food specified. Source: 27

	Liter
Beef	15,500
Lamb	6100
Pork	4800
Goat	4000
Rice	3400
Soya beans	1800
Wheat	1300
Maize	900

farmland registered only an insignificant increase worldwide in the period 1960-2000. As a consequence, the area of cropland required per person has fallen from around 0.45-0.25 hectares during this period.

This reduction has been achieved through massive intensification of farming methods. This has included not just the use of fertilizers and crop protection agents, but also crop irrigation. A total of 227 million hectares of land is now under irrigation, equivalent to 18% of the total area under cultivation.²

INDUSTRY: CONSUMPTION STABILIZED AT A HIGH LEVEL

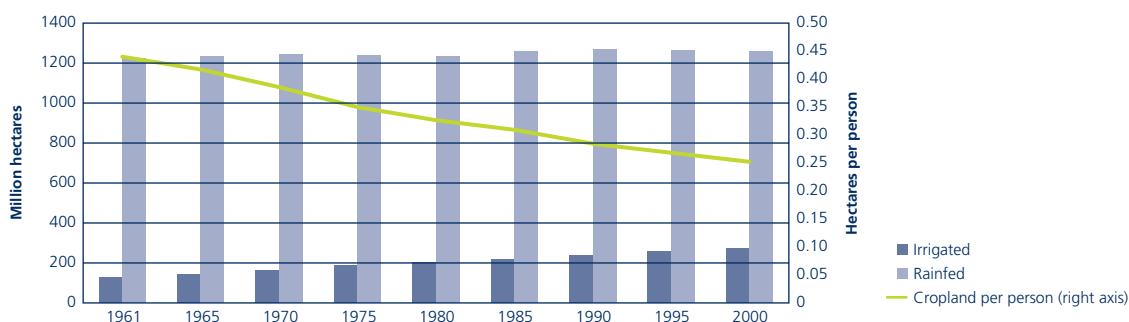
Water also plays a crucial role in industrial production, whether it be for paper production, tire manufacture, electricity generation, mining or oil

exploitation. In Europe, industry accounts for just over half of water consumption, while in the US the figure is just below 50%.

In contrast to agriculture and urban water management, where consumption is steadily rising, the situation is slightly more positive for industrial water use. Global water consumption by industry rocketed during the period 1950-1990, from around 150 km³ to over 800 km³ per year.² Since then, industrial water consumption has continued to rise worldwide, but at a much slower pace than in previous decades. The figure came to roughly 950 km³ in 2000. At the same time there are significant regional differences. In Europe and North America, industrial water consumption after 1980 settled at around 200 km³ p.a. (Europe) and 300 km³ p.a. (North America). The annual increase in industrial water consumption has also been much more gradual in Asia.

Figure 7: Cropland per person trends.

It is interesting to note that the cropland per person figure has dropped sharply. Source: 2



2. Global Trends Impacting on the Water Market

The global crisis threatening the management of water resources is likely to get worse in the coming years. Four trends will shape the future development of the water sector:

1. Demand for water is increasing further as a result of demographic changes.
2. In many cases the ageing water infrastructure needs to be replaced.
3. Water quality improvements are necessary in many places.
4. Climate change is altering the availability of water resources.

2.1. DEMOGRAPHIC CHANGES

There are three ways in which demographics will affect water consumption:

- The world's population will continue to grow in future decades.
- More and more people are moving from the countryside into towns.
- General living standards are improving, especially in the two countries with the largest populations: China and India.

CONTINUING BOOM IN GLOBAL POPULATION

The world's current population of approximately 6.6 billion people will continue to swell over the coming decades. The UN predicts a global pop-

ulation of 9.2 billion people by the year 2050. Demand for water will of course escalate purely in response to this population growth. Experiences in recent decades even show that water consumption has grown at a faster rate than the general population. This trend is mainly attributable to continuous improvements in living standards. In 1950, for example, per capita annual water consumption averaged 580 m³. This figure had already risen to 625 m³ by the year 2000. Given the population boom in regions such as Asia especially, this underlying trend is unlikely to be reversed for some time.

INCREASING URBANIZATION

Rapid population growth is occurring in tandem with increasing urbanization. More and more people are moving from the country into the city, usually because of a real or perceived lack of employment opportunities in rural regions. The urbanization trend is clearly reflected in the number of megacities. In 1950 there were only 86 cities with a population of over a million, but this figure had already risen to 387 by 2000.

The number of megacities is increasing rapidly in Asia, Africa and Latin America especially. The cities are growing not just in number, but in size: in the

The population of Shanghai, a major port, is 18.4 million.



Table 2: Demographic trends and urbanization of global population.

Sources: 2, 7

No. of cities with >1m inhabitants	1950	2000	2025
World	86	387	
Africa	2	35	
Asia	31	194	
Europe	30	62	
Latin America	7	49	
North America	14	41	
Oceania	2	6	
Average size of world's 100 largest cities (1000 inhabitants)	2200	6300	
% of population in urban areas	29%	47%	58%
World population (million inhabitants)	2530	6125	8010

year 2000 the world's 100 largest cities had an average population of more than 6 million people.²

UN forecasts indicate that almost 60% of the world's population will be living in urban areas by 2030. The proportion is roughly 50% at present, compared with 29% in 1950.⁷ Rapid growth of cities presents a huge challenge to the water sector. Demand for water services, especially for wastewater treatment, is booming. Extending basic sanitation will require huge investments in the coming years. According to UN estimates, over the next eight years some 900 million people will need to be connected to a safe supply of drinking water, and over a billion connected to proper sewage treatment facilities, in order to achieve the millennium target of halving the number of people with inadequate access to a safe water supply by 2015.²

SOARING DEMAND FOR FOOD

The rise in the world's population and the improvement in living standards are also having an impact on food production. The FAO expects demand for food to be 55% higher in 2030 than in 1998. Food production must increase by 1.4% p.a. in order to meet this demand. The surge in demand will be driven mainly by developing countries. Intensifying the farming methods used in these countries should help to meet most of the increased demand for food. The FAO expects the overall area under cul-

tivation to expand. At the same time, the amount of cropland under irrigation is likely to increase by 20%. This will in turn push up water consumption by 14%, potentially causing local bottlenecks in areas such as the Middle East and North Africa, where there is likely to be less water available for agricultural use. These countries will therefore be forced to import even more food than at present.

OVEREXPLOITATION OF RESOURCES

The consequences of overexploiting water resources are already manifesting themselves in different parts of the planet. Once mighty rivers now carry only a fraction of their former water volume, and the groundwater table is steadily falling. 11 countries accommodating almost half the world's population – China, India, Pakistan, the US, Israel, Egypt, Libya and Algeria – currently have a negative groundwater balance.⁸

Overexploitation of water has dramatic consequences at local level:

- In the region around the Spanish city of Huelva the water table has been steadily falling for some years because many farmers had been illegally siphoning off groundwater to irrigate their fruit crops. This overexploitation is posing a threat to the Doñana national reserve in particular, which contains one of the most important marshlands in Europe.⁹

UN forecasts indicate that almost 60% of the world's population will be living in urban areas by 2030.

- On occasions China's second largest water course, the Yellow River, does not even reach the sea, or peters out into no more than a stream.¹⁰
- In the southern Indian state of Tamil Nadu, the expansion of agriculture has led to a situation where the Kaveri river, once 300 meters wide, dries up on occasion. In some places the water table has fallen by 300-400 meters.⁸
- Farmers in the southwest of the US are feeling the effects of the overexploitation of groundwater: the level of the Ogallala aquifer, the Earth's third largest underground water table, has fallen several meters in recent years. This has caused many fertile regions to dry out. Many farmers have had to revert to more basic crops, which generate less income. Although the size of the irrigated area has shrunk again, it will only take another 20-30 years before the Ogallala aquifer dries up completely.⁸

In view of these problems, some countries have plans for large-scale canal systems to divert water and alleviate the shortage in arid regions. India, for example, has launched a river-linking project to combine 14 rivers flowing from the Himalayas with rivers from the south. China has started work on a huge project to divert water away from the Yangtze into the arid regions of the north. And Spain too also has plans for channeling water from the north to the south. One common thread of these numerous projects is that they are often a source of pub-

lic controversy and are bound to have serious consequences for the environment.

TAPPING INTO NEW WATER SOURCES

Although the water supply infrastructure is in a very dilapidated state in many countries, with large volumes of water being wasted through leakage, countries where water is scarce are increasingly trying to expand freshwater supplies through the use of desalination plants. The installed capacity of these plants has increased enormously in recent decades.

Back in 1970 it was only possible to desalinate 770,000 m³ of water per day globally, but this figure has now been increased to well over 40 million m³ daily. There is no sign of this trend letting up for a while, given that annual newly installed capacity is constantly rising. New capacity of over 3 million m³ per day was installed in 2004 alone.¹¹ At the start of 2005 Saudi Arabia had large-scale desalination plants with a combined capacity of more than 4.5 million m³ per day in either the planning or construction phase. The United Arab Emirates are backing this technology as well: in January 2005 they planned to commission facilities with a daily capacity of around 4 million m³. The US is also a big player in this market. At the start of 2005 it was planning large-scale plants with a daily capacity of almost 3 million m³. In California alone there are currently 15 new plants under construction or in the planning stage.¹²

Years of low rainfall and high volumes siphoned off from Lake Powell, a reservoir straddling the border between Utah and Arizona, have caused a steady drop in the water level in recent years.



One reason for the boom in desalination plants is that their production cost has dropped dramatically in recent years. Especially in the case of plants using reverse osmosis technology, operating costs are now three to four times lower than they were 30 years ago. With production costs of less than one dollar per cubic meter of water, these plants are achieving a price level which (depending on the region) is on a par with conventional tapping water sources.¹²

Apart from facilities to desalinate sea water and brackish water, plants are also being built that are capable of treating wastewater for reuse in other applications. The City of Madrid, for example, plans to invest roughly EUR 100 million over the next few years to expand its water purification facilities and to install a 1200 km-long pipe network for reuse of treated wastewater.

2.2. AGEING INFRASTRUCTURE

In contrast with many developing countries, where many people still do not have adequate access to safe drinking water, industrialized nations originally built their water mains back in the early 20th century. In many areas huge investments are now required in order to repair and upgrade the ageing infrastructure. Water supply and sewer systems have a service life of roughly 60-80 years and in many cases have reached the end of their useful lives. Furthermore, the water mains are not being adequately maintained in some countries:

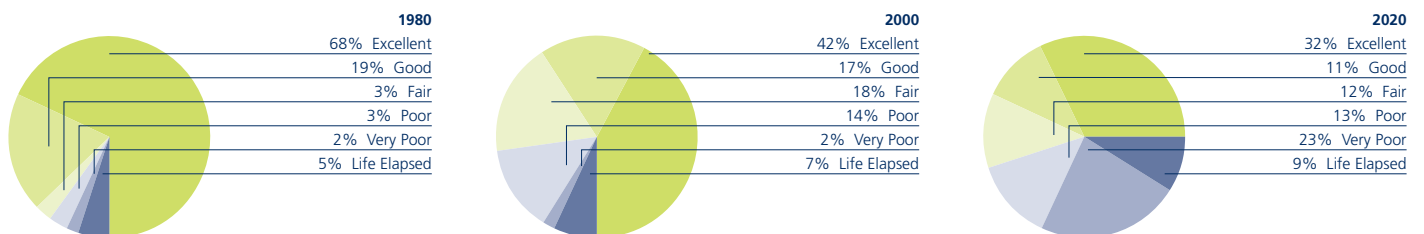
- The standard of maintenance for the US water mains and sewer system – like many other areas of the infrastructure – is far too low. Leaking pipes mean that large volumes of precious drinking water are wasted. The City of San Diego, for example, buys in 300 million m³ of water every year. 25 million m³ are never actually used, which costs the city approximately USD 22 million.¹³ The total water loss nationwide is probably in the region of 23 million m³ per day, which is equivalent to the combined water consumption of America’s ten biggest cities.
- The US environmental protection agency EPA has identified a huge financing gap for the maintenance of drinking water and wastewater treatment facilities over the next 20 years: if spending continues at the current level, the total gap by the end of that period will amount to some USD 540 billion. Even if investments rise by 3% p.a. in real terms, the shortfall would still come to USD 76 billion.¹⁴
- In London over 800 million liters of water a day are lost because the decrepit water main has so many leaks.¹⁵ Under pressure from the industry regulator, the network operator Thames Water has now agreed to replace over 1500 km of the ageing supply network over the next five years. A desalination plant is also to be built at a cost of GBP 200 million and will eventually supply 15% of the fresh water currently lost through leaking pipes.²⁸

One reason for the boom in desalination plants is that their production cost has dropped dramatically in recent years.

Figure 8: State of the US water supply system.

If the standard of maintenance of the water supply system continues at its current level, more than half of the pipework will be in a poor condition or worse by 2020.

Source: 14



Even in extremely arid countries, very little care is taken in using this precious resource.

- In France and Spain water is also being used inefficiently: around 30% of water is lost before it even reaches the end consumer.¹⁶
- Even in extremely arid countries, very little care is taken in using this precious resource. In Riyadh, the capital of Saudi Arabia, 21% of the water is lost due to technical faults. In addition, another 36% of water consumption is never billed for various reasons. Even so, the inhabitants of Riyadh pay one of the world's lowest tariffs for their water consumption.²⁹
- There is also an urgent need to renovate the sewer system in Switzerland, most of which was constructed in the second half of the 20th century and needs to be renewed over the next few decades.¹⁷ Around 23% of the sewer network currently has significant or serious defects and needs to be renovated in the mid-term.⁶ The situation is even more critical in the residential property sector, where up to 85% of the pipework is sub-standard.¹⁸

2.3. HIGHER WATER QUALITY STANDARDS

In many countries the population is suffering not only from a shortage of water, but also from the poor quality of the water that is available. Over 1 billion people worldwide have no access to safe drinking water.

This situation is mainly caused by three factors:

- In developing countries many people living in urban areas are not connected to a proper sewer system. The wastewater from these households is released into the environment without any form of treatment, polluting groundwater and surface waters in the process. Solid waste is also frequently dumped into water courses.
- In many countries, industrial effluent is inadequately treated. This is a critical problem in China, for example.
- The fact that farmers have managed to increase their food production so significantly in recent decades is mainly due to the increased use of crop protection agents and fertilizers. In many regions, these substances are now contaminating the water and polluting the groundwater.

The range of potential pollutants is enormous: organic matter decomposing in the water removes the oxygen that is vital for sustaining life; feces contaminate the water with bacteria and microorganisms that spread disease; the runoff from over-fertilized fields floods rivers and lakes with harmful nutrients; overwatering and excessive groundwater extraction increases soil salinity; acid rain changes the pH value; heavy metals and toxic compounds from industrial processes are contaminating drinking wa-

Figure 9: Renewal of sewer network in Switzerland.

The sewer network in the canton of Berne is a good example to illustrate the need for renovation of the sewer infrastructure in Switzerland. Most of the existing network was constructed in the second half of the 20th century and needs to be renewed over the next few decades. Source: 17

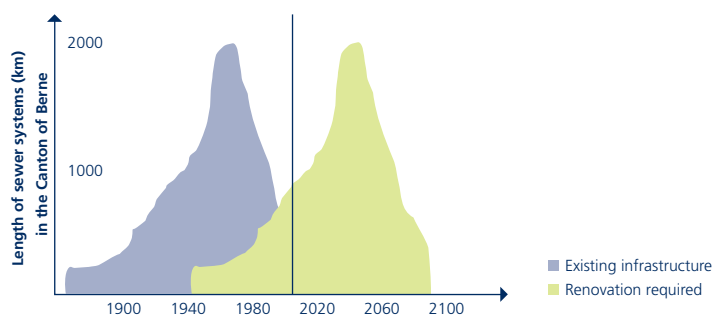
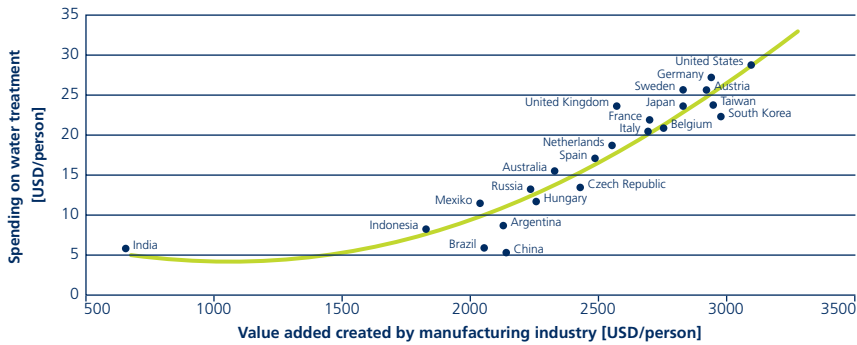


Figure 10: Water treatment and the creation of industrial value added.

The higher the value created by manufacturing industry, the higher the level of spending on water treatment tends to be.
 Source: 19



ter; and inappropriate cultivation methods are releasing large quantities of fine particulates into the water which is also causing the water quality to deteriorate.

The lack of adequate sanitation facilities in countries with poor infrastructure is one of the major causes of widespread gastrointestinal disorders. For children especially, this can have deadly consequences. The number of deaths caused every year by contaminated water is estimated at up to 5 million worldwide. Setting up a comprehensive sanitation system as typically found in industrialized nations is not feasible within a reasonable time frame, mainly because cities in these countries are growing so rapidly. Because of this, simpler solutions to the sanitation problem in these countries are being sought.

One point worth raising in this context is that a correlation has been found to exist between water treatment and economic prosperity. A comparison of different countries shows that those with a high

level of value added spend more money per capita on water treatment than less prosperous countries.

It is interesting to note from this comparison that China spends comparatively little on wastewater treatment.¹⁹ It is less surprising to encounter increasing numbers of reports about severely polluted watercourses in the world's most populous country. Many rivers in China are so badly polluted that not even industry can use the water. According to official statistics, the drinking water of 300 million Chinese people is classed as contaminated, and in nine out of 10 cities it is unfit to drink.¹⁰

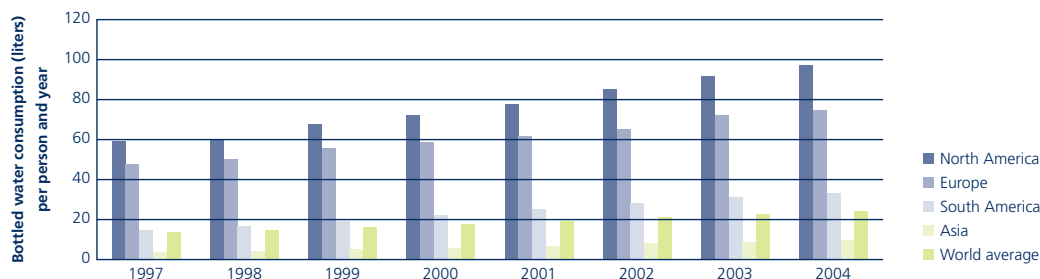
NEW POLLUTANTS IN THE WATER

In industrialized countries, decent water quality is more or less guaranteed nowadays thanks to the provision of advanced water and wastewater treatment. But these countries are increasingly facing new challenges. Investigations in Switzerland have shown that despite the construction of new sewage treatment plants, hazardous chemicals are still entering the watercourses. Especially in times of heavy

Many rivers in China are so badly polluted that not even industry can use the water. According to official statistics, the drinking water of 300 million Chinese people is classed as contaminated, and in nine out of 10 cities it is unfit to drink.

Figure 11: Bottled water consumption in different regions.

Source: 11



rainfall, acute concentrations of toxic nitrogen compounds, such as nitrite and ammonium, are being detected at sewer overflows, and large quantities of pesticides and nitrate find their way into the groundwater when they are used in farming.²⁰

Another problem is the constant stream of new substances and compounds entering the water cycle which wastewater treatment systems are unable to remove entirely. The trickiest are endocrine-active substances, which can have a negative impact on any living organisms in the water. Another problematic aspect as far as wastewater treatment is concerned is that many of these substances are excreted in human urine. The water used for flushing heavily dilutes these substances, however, thereby making it more difficult to remove them, despite using the latest technologies in sewage treatment systems.¹⁶

GREATER HEALTH AWARENESS

For increasing numbers of people in developed countries, water is not only a basic commodity, but also of a lifestyle product. In Germany, for example, today's consumer can choose from around 500 different domestic water brands, all of them different in terms of taste and origin. And these are complemented by many other types of mineral water imported from abroad.²¹

This trend is also reflected in the sales figures. Global sales of bottled water have rocketed in recent years.

In North America and Europe, per capita consumption of bottled water rose by roughly 60% in the period 1997-2004, and more than doubled in South America and Asia.¹¹ In developing countries, however, there is likely to be less emphasis on the lifestyle aspect. Many people in these regions only drink bottled water because they do not trust the quality of normal tap water.

2.4. CLIMATE CHANGE

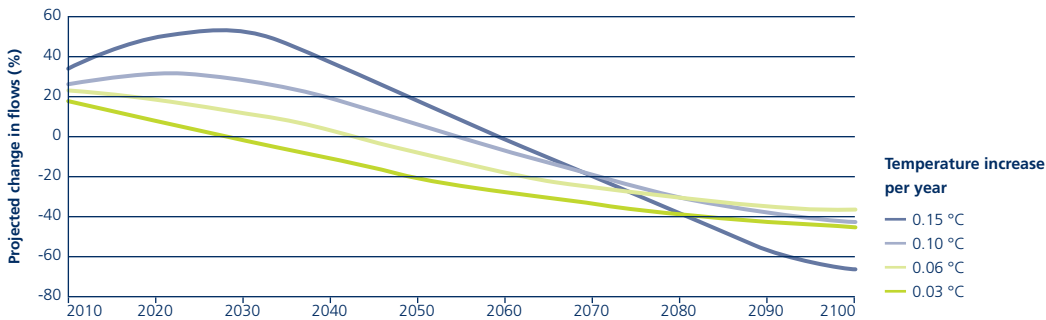
In many regions of the world, climate change will have a significant impact on global water resources in the coming decades. In its latest report, the Intergovernmental Panel on Climate Change (IPCC)²² anticipates the following trends:

- In the high latitudes and in some tropical regions, the average annual runoff will increase by 10-40% by the middle of this century.
- It is likely that even more areas will be affected by drought, and water shortages will be more common.
- An overall increase in the frequency of heavy downpours is predicted. This also makes it more likely that human settlements will experience severe damage.

In many regions of the world, climate change will have a significant impact on global water resources in the coming decades.

Figure 12: Runoff volume from the River Indus under changing climate conditions.

The runoff pattern could vary widely, depending on how quickly the average global temperature changes in the coming years. Even if drastic measures are taken to combat climate change, the runoff volume will still drop significantly over the course of this century. Source: 5



– The volumes of water stored in glaciers and the snow pack will decline over the course of the next century. This means that after a phase of increased discharge there will be less water available in regions supplied by meltwater running off from major mountain chains. This is an ominous development, because over a sixth of the world’s population currently lives in these regions.

IMPACT WILL VARY FROM ONE REGION TO THE NEXT

In addition to these general statements, the IPCC also provides forecasts on the effects of global warming on specific regions:

– In Europe, Mediterranean countries will be most heavily affected by climate change. The IPCC predicts that Southern Europe will generally have to cope with far more difficult conditions, including

high temperatures, extreme drought, poor water availability and subsequently limited potential for exploiting water as an energy source.

– In Central and Eastern Europe, IPCC predicts less rainfall in the summer. This could spell trouble, since some parts of this region already experience relatively low rainfall throughout the summer.

– In Central, Southern, Eastern and South East Asia the volume of fresh water available in the large river basins is predicted to fall.

– The water supply problems in Southern and Eastern Australia, as well as in New Zealand, are likely to deteriorate up to 2030 due to evaporation and less rainfall.

– In North America, it will mainly be the west of the country that is affected by the impacts of climate change on the hydrological regime. Rising temperatures in the western mountains will



Severe glacial erosion illustrated by the photo of the Grinnell glacier in the Glacier National Park in Montana (USA).
 Source: 33

Image 1: 1938
 Image 2: 1981
 Image 3: 1998
 Image 4: 2006

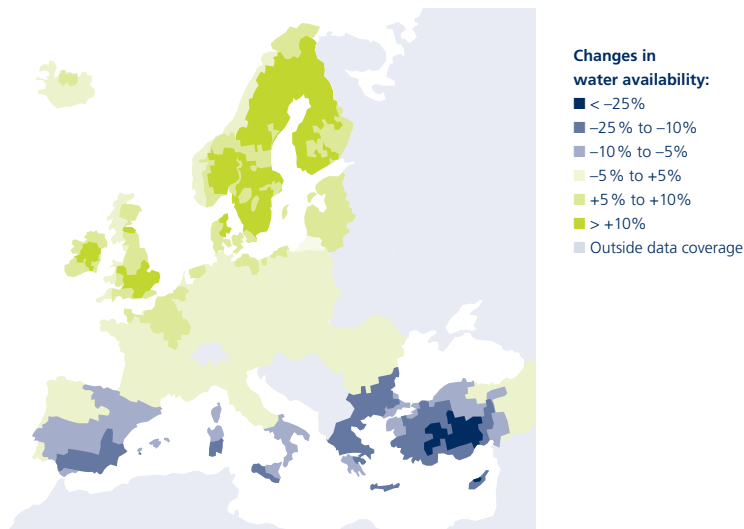
make the snow pack shrink, increase flooding in winter, and will result in lower runoff volumes in the summer. This is likely to intensify competition for the overexploited water resources in that region.

– Even countries that do not directly experience water shortages as a result of changing weather

conditions will feel the ripple effects of climate change. In Switzerland, for example, low-lying areas can expect to experience more frequent and in some cases more devastating flooding in winter and spring as a result of climate change. At the same time, unusually dry spells in the summer are likely to increase significantly.^{23, 24}

Figure 13: Changes in water availability in Europe.

The map shows which regions will have more or less water available in 2020 than at present as a result of climate change. Source: 4



3. Investment Opportunities

The many different challenges surrounding the use of water resources actually present a number of attractive opportunities for investors. Based on the global trends that will shape the water sector in the coming years, we can identify four investment clusters that offer great potential:

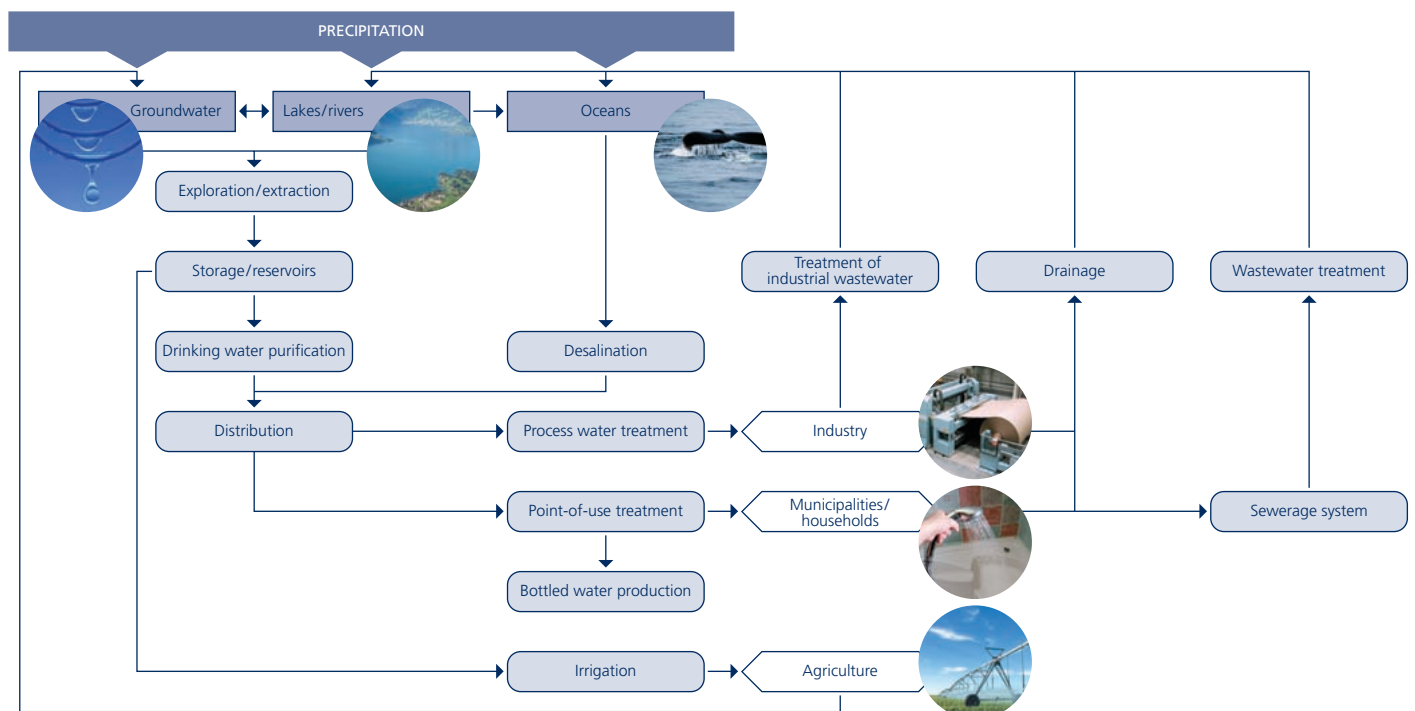
1. Distribution and management
2. Advanced water treatment
3. Demand-side efficiency
4. Water and food

A successful investment strategy is based on three key principles: it complies with the basic principles of sustainability, it adheres to a set of general investment principles, and it takes the entire value chain into consideration. In the case of domestic water

supply, for example, this includes a whole series of elements: forecasting natural disasters and providing protection against them; exploring, extracting and transporting water reserves; treating and disinfecting drinking water; distributing water to end consumers; measuring the volume of water sold; domestic water use; drainage into the sewer system; treating the wastewater in sewage plants; reusing the graywater for other purposes or channeling it back into natural watercourses.

If we look at the entire value chain, the spectrum of investment opportunities is actually very broad and encompasses companies which at first sight appear to have little direct connection with the theme of water, but are closely linked indirectly to the sector: food production, for example.

Figure 14: The water value chain.
 Water value chain (simplified). Attractive investment opportunities exist along the entire chain. Source: SAM



OVERVIEW OF THE GLOBAL MARKET

Measured in terms of water-related revenues, the global water market is worth between USD 400 and USD 500 billion, depending on the parameters and definition used. The bulk of this is concentrated in the areas of water supply and wastewater services. Global spending in this area amounted to around USD 325 billion in 2007. Sales of bottled water have also continued to soar, generating revenues of USD 91 billion in 2007.²⁵

Certain segments of the water market can look forward to growth rates of 5-10% over the next 10 years, although there will be major differences between the regions and sectors.

REGIONAL DIFFERENCES

The biggest markets are currently to be found in Asia (especially China and Japan), Europe and North America. The North American water market will only experience modest growth rates in the coming years, heavily influenced by public budgets and water-related policies. Growth is likely to be sluggish in a number of European markets as well. Some countries will however enjoy higher than average growth, especially Eastern Europe, Spain and Turkey. There are big regional differences within

Asia as well: while the Japanese market will only expand slightly, growth rates in China and India will surpass 10%. Performance in the Middle East should be even more dynamic, with growth rates in certain countries of well over 10%.

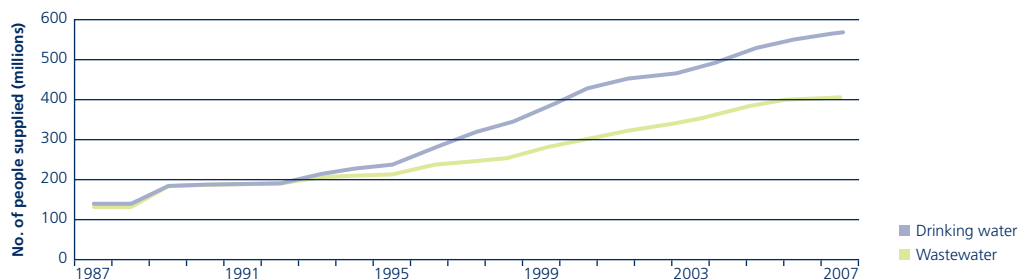
CONSOLIDATION OF THE WATER INDUSTRY

The water industry is heavily fragmented at the moment. In Switzerland, for example, there are still around 3000 water utilities and 1000 organizations operating sewage treatment plants, while in Germany there are 6000 water utilities and 10,000 wastewater utilities. Globally there are an estimated 250,000 plants in service, all of them operating under very different economic and legal conditions.²⁵ The supplier industry is also heavily fragmented. This is because no individual technology dominates the market and local providers often have to be catered for. Nevertheless, a number of global players have established themselves by building up their water business in the last 10 years, especially through the acquisition of smaller, specialized companies.

Bigger companies are now trying to generate additional growth by developing a global distribution network. This will inevitably speed up the consolidation of the market. This trend will be further

Figure 15: Water supply and wastewater treatment by private companies.

In the last 20 years there has been steady growth in the number of people whose drinking water and wastewater services are supplied by private companies. Source: 25



encouraged by the fact that local authorities are increasingly opting for integrated solutions along the lines of Public-Private Partnership (PPP) models. Looking at the different options available for establishing water purification and wastewater treatment plants, the picture that emerges is quite varied: market growth rates are lowest for those projects where the local authorities commission specialist firms to handle only the planning aspects. By contrast, the Build-Operate-Transfer segment (BOT) of the market is enjoying more than double the rate of annual growth, at 13.6%.²⁵ With the BOT model, local authorities commission all-inclusive solutions, i.e. a single contractor handles the financing, planning, construction and operation of the plant. Companies able to offer the entire range of services therefore enjoy a competitive advantage here.

NEW OPENINGS FOR PRIVATE PROVIDERS

In most countries, public authorities or state-owned organizations are responsible for the drinking water supply and wastewater treatment. Only in a few countries have these sensitive areas been privatized or organized as PPPs. In recent years, however, the number of people whose drinking water and wastewater services are provided by private companies has increased significantly: 570 million in the

case of drinking water, and 400 million for wastewater. Growth is being fuelled mainly by dynamic trends in Asia.

Globally active private operators currently account for roughly 19% of all investments in facilities for drinking water supply and wastewater treatment. The remaining 81% are invested by public authorities or state-owned organizations. The same percentage applies when it comes to running costs. The proportion of private companies is expected to rise to almost 30% by 2016.²⁵ In many countries, however, there is an underlying skepticism towards private water utilities, for a whole variety of reasons. Both positive and negative examples can be produced to support or challenge their case. The international community offers comprehensive support in the preparation and definition of agreements with private operators, in order to avoid subsequent conflicts. These include, for example, the World Bank's Public Private Infrastructure Advisory Facility (PPIAF).

Opportunities do exist for companies to establish themselves as private operators in the Middle East and East Asia especially. The strongest growth in private investment is therefore expected in these regions.²⁵



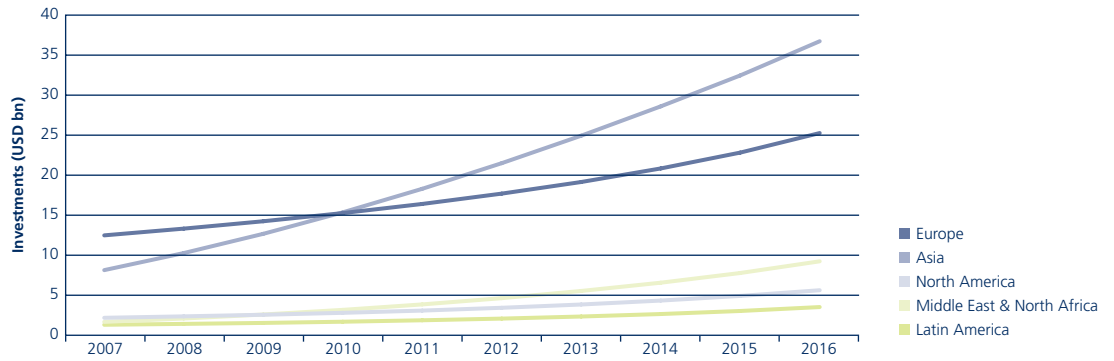
Table 3: Business climate for private companies in the water sector.

This table summarizes the attitude of the general population in different areas of the world towards private companies that are active in the supply of drinking water and wastewater treatment. Source: 25

Africa	Very little interest in private investors.
China	Private investors are welcome, even though certain restrictions apply.
CIS	Difficult market, because tariffs are low and there is a huge investment requirement.
Far East	Basically open to private investors.
Latin America	Basically negative towards private investors, especially Argentina and Bolivia. Interest is growing in Colombia and Peru, however. Brazil has a flourishing market.
Middle East and North Africa	Numerous investment opportunities. Libya expected to open up soon for private investors.
New EU member states	Governments want to retain control, at least as long as the EU makes contributions.
North America	There is very little support for private companies in the US. In Canada they are basically unwelcome.
South Asia/India	Private companies are not welcome, except in Tamil Nadu and Gujarat.
Spain	Has benefited from EU financing in the past, but is now increasingly looking for private investors for the wastewater segment.
Western Europe	Very few growth opportunities for private companies.

Figure 16: Growth of private investments.

The chart shows the expected annual investments made by private water and wastewater suppliers in different market regions.
 Source: 25



3.1. DISTRIBUTION AND MANAGEMENT EXPLORATION

To meet soaring demand for drinking water, the ability to locate and exploit new water reserves is becoming far more important. In some cases this means tapping into aquifers where the geological conditions are very challenging. A number of modern drilling technologies capable of reaching very low depths are used for this task.

The very highest quality standards must be adhered to, particularly when tapping into new sources of mineral water. To ensure that a new source is capable of delivering water of high enough quality over the long term, boreholes are now equipped with modern measuring devices capable of providing operators with information about the hydrological situation beneath the ground. Specialist companies

are now able to use state-of-the-art monitoring techniques to inspect existing water sources and related infrastructure, and carry out the required maintenance work where necessary.

EXPANSION OF DISTRIBUTION NETWORKS

Worldwide, more than USD 65 billion is spent every year on maintaining and expanding the water mains. In addition, the operating costs amount to over USD 100 billion. Investment costs are expected to almost double by 2016. Strong growth is also forecast in wastewater treatment. Current annual investments of approximately USD 75 billion will climb to roughly USD 140 billion by 2016. In the case of both drinking water and wastewater, almost two thirds of the investments will be directed to water distribution networks and sewer systems.²⁵ Providers of services and equipment such as pipes,

Around USD 150 billion a year is currently being spent on wastewater treatment worldwide.



Table 4: Distribution and management.

Overview of selected segments of the global market. Sources: 25, SAM

	Market volume 2007	Expected annual growth
Distribution networks		
Water mains: new pipework	USD 33 bn	7.2%
Water mains: renovation	USD 10 bn	4.3%
Sewers: new pipework	USD 35 bn	7.4%
Sewers: renovation	USD 14 bn	5.5%
Plant & equipment		
Pipes	USD 42 bn	3.4%
of which: Plastic pipes		4.4%
Valves	USD 4.5 bn	6.7%
Pumps	USD 8 bn	4.3%
Management	USD 20 bn	10%

pumps, valves and building materials, as well as engineering and construction firms specializing in the water business, all stand to benefit from this trend.

The bulk of this growth is attributable to the burgeoning global population. Since the population is growing fastest in developing countries, economical but also efficient technologies are needed to cater for these countries' requirements. Decentralized systems for water supply and wastewater treatment also play an important role here, since the provision of new infrastructure cannot keep pace with the rapid growth of urbanization in booming cities.

Nowadays a number of different techniques are used for constructing and maintaining pipework: these include laying pipes by excavation or using trenchless technology, cement mortar linings, slip-linings and long pipe relining. Particularly in built-up areas, where most of the systems in need of renovation are located, alternative pipelaying technologies are in greater demand so as to minimize the disruption on the surface. New approaches are

also being developed for maintaining pipework. In particular, these include monitoring and early detection of damage using remote-controlled cameras.

MANAGEMENT

In a number of regions there has recently been a move towards an integrated approach to the management of limited water resources. The European Union has adopted common guidelines for this, in the form of the EU Water Framework Directive. Intelligent approaches are required, which promote sustainable management of water resources. Individual companies have specialized in the management of entire river basin areas and ecosystems. To this end they use sophisticated remote control and geoinformation systems, besides more traditional assessment methods. Management services of this type will become increasingly important, as climate change will have a dramatic impact on the water supply in many regions. Because of this, it is likely that the distribution of water in various river basins will need to be reviewed, as part of a proactive risk management policy.

3.2. ADVANCED WATER TREATMENT WASTEWATER TREATMENT

Demand for wastewater treatment is set to rise sharply in the coming years. This is particularly true for Asia: in India and China, untreated industrial and communal effluents are posing a serious threat to the population's health. In these two countries especially, enormous investments are required to bring wastewater treatment up to a standard that is commensurate with these countries' economic standing.

Every year around USD 150 billion is spent worldwide on wastewater treatment, and this figure is set to exceed USD 240 billion by 2016. The challenge is not simply to channel the water back into the waterways once it has been treated, but to process it so that it can be reused for other applications (e.g. for watering golf courses). Graywater recycling facilities with a daily capacity of 15 million m³ were installed in 2006, and total capacity is set to rise to 59 million m³ by 2016.

A number of different technologies are also used for graywater reuse. Membrane systems offer particularly promising growth potential: sales are expected to rise by around 20% p.a.²⁵

At the same time, new challenges are constantly arising. For example, the contamination of wastewater with endocrine-active substances presents a serious problem that urgently needs to be solved in the near future, as conventional sewage treatment plants are generally not up to the task. The entire chain – from the polluter through to release into the waterways – needs to be rethought. If attempts to remove the problematic substances at source are unsuccessful, more sophisticated wastewater treatment techniques, such as ozone purification, will be necessary in industrialized countries at least.

DRINKING WATER DISINFECTION

Providing clean drinking water is one of the main missions of the water industry. The task here is to provide water not simply in sufficient quantity, but also of sufficient purity. There are a number of ways for treating water to make it fit to drink: including disinfection with ozone, chlorine or chlorine dioxide, ultraviolet radiation or purification using membrane filters. Ozone and UV treatment both have significant growth potential. The market for membrane technology is particularly attractive, with sales in the drinking water segment expected to be roughly eight times higher in ten years' time than they are today.²⁵

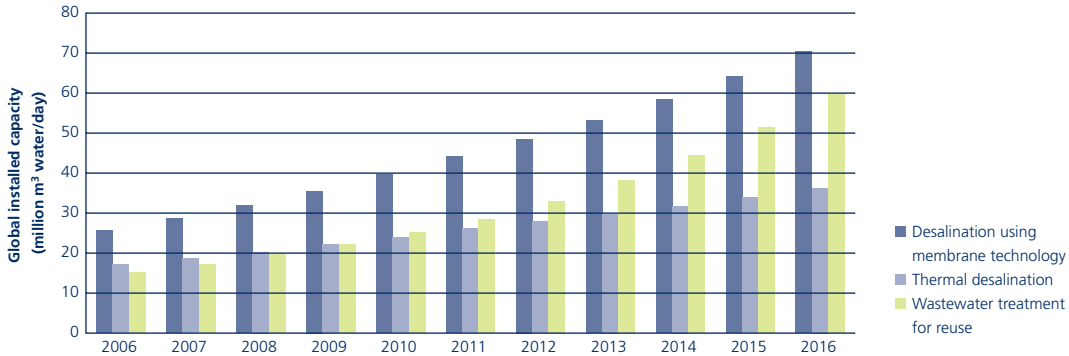
Table 5: Advanced water treatment.

Overview of selected segments of the global market. Source: 25

	Market volume 2007	Expected annual growth
Wastewater		
Sewage treatment	USD 104 bn	4%
Equipment for wastewater treatment	USD 12 bn	6%
Chemicals and services for the industry	USD 13 bn	4%
Membrane systems for wastewater treatment	USD 4.2 bn	19%
Drinking water		
Drinking water purification	USD 129 bn	4%
Ozone treatment	USD 0.3 bn	10%
UV treatment	USD 0.5 bn	14%
Treatment using membrane systems	USD 1.9 bn	20%
Desalination		
Thermal desalination plants	USD 2.5 bn	4%
Desalination plants with membrane systems	USD 2.4 bn	8%
Desalination plant running operation	USD 7.3 bn	9%

Figure 17: Desalination and wastewater reuse.

The graph shows the expected installed capacity for desalination plants and graywater recycling facilities. Source: 25



DESALINATION

In recent years desalination has become far more popular as an alternative for meeting mounting demand for water. At the end of 2006 desalination plants with a global capacity of roughly 42 million m³ of water per day were in service. This capacity is predicted to pass the 100 million m³/day mark by the end of 2016. Desalination using membrane technology (reverse osmosis) is gaining ground over thermal desalination techniques: in 2006 around USD 1.8 billion was invested in thermal technologies, compared with USD 1.4 billion in membrane systems, but these figures are expected to reach USD 3.5 billion and 4.5 billion respectively by the year 2016.

3.3. DEMAND-SIDE EFFICIENCY

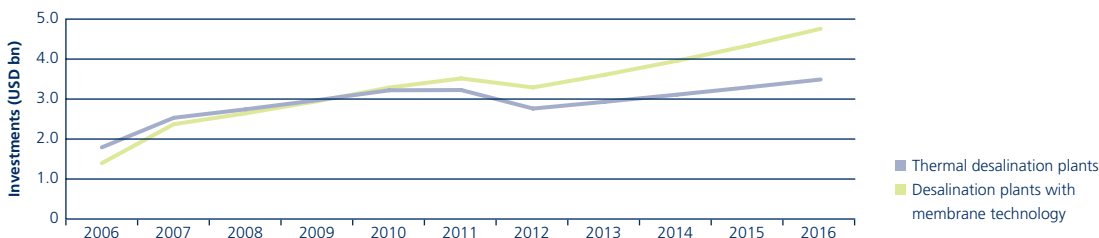
In many regions of the world, water has now become a precious good. The most efficient way to prevent overexploitation of available water resources is to invest in technologies that promote more efficient water usage. The aim here is to achieve the same level of service with less water, without compromising on convenience and performance.

INDUSTRY

Industrial water consumption has stabilized in industrialized nations over the past 20 years. This proves that efficient water use is compatible with solid economic growth. Despite massive efforts, industry is still the biggest consumer of water in

Figure 18: Investments in desalination plants.

Source: 25



Europe and North America. As water reserves continue to dwindle, additional initiatives will be necessary in industry to reduce water consumption even further.

The situation is particularly critical in Asia: industrial water consumption is continuing to rise in this region. In addition, in countries such as China many companies discharge their industrial effluent into rivers without prior treatment. This has led to a massive deterioration in water quality in many cities. A comparison with other countries illustrates exactly how far developing countries are lagging behind in the area of water treatment: China spends significantly less money on the treatment of water than other countries that generate a similar amount of value added through industry.¹⁹

Today the market for industrial water treatment is worth USD 24 billion and is forecast to grow to around USD 37 billion by 2016.²⁵ This market also includes the manufacture of technical equipment, the provision of chemicals and additives for water treatment, and the development of integrated solutions.

DOMESTIC CONSUMPTION

Compared with the industrial sector, where water consumption has stabilized in Europe and North America at least, domestic water consumption continues to rise in most countries. Household water consumption varies enormously from one country to the next. This implies that large quantities of water could possibly be saved if appropriate technology were installed.

Switzerland is a good example to illustrate how much potential there is: in the last 25 years, per capita consumption has steadily declined. Today each Swiss resident consumes 160 liters of water a day on average to cover their personal requirements – roughly 20 liters less than 20 years ago. Almost 70% of the water consumed goes on flushing toilets, taking baths and showers and washing clothes – a similar pattern to the rest of Europe.

In this area especially, major efforts have been made in recent years to reduce water consumption.¹⁶ For improvements to be made, consumers need to be billed on the basis of water use, which is good

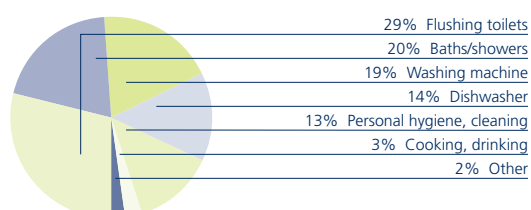
Table 6: Demand-side efficiency.

Overview of selected segments of the global market. Sources: 25, 32

	Market volume 2007	Expected annual growth
Industrial wastewater treatment	USD 24 bn	4-5%
Domestic installations	USD 10 bn	< 10%
Installation for wastewater reuse	USD 1.3 bn	17%
Water meters	USD 2.4 bn	12%

Figure 19: Breakdown of water use in Swiss households.

Source: 16



news for companies that manufacture water meters. Modern water meters now have components to automatically record and/or transmit electronic data on water use.

3.4. WATER AND FOOD

IRRIGATION

Agriculture is by far the biggest consumer of water worldwide, accounting for around 70% of water use. Approximately 18% of cropland is now under irrigation, with half of this located in Asia.⁵ Many countries are starting to experience severe water shortages. There will be mounting pressure in these regions for fields to be irrigated more efficiently.

Nowadays most fields are irrigated using a system of ditches or sprinkler equipment. Although both these methods are relatively economical, they are also highly inefficient, because most of the water is wasted. Modern micro-irrigation systems could cut water consumption by as much as 30-70%. One of the positive side-effects of this technology is that it helps to prevent soil salination.

These new irrigation technologies are very promising and obviously make good business sense. The speed at which they actually establish themselves ultimately depends to a large extent on the available financing. It is usually the farmers themselves who have to make the investments in irrigation systems, and the amount available for investment depends largely on the farmer's income. One of the decisive factors is still the price that farmers have to pay for the water and the extent to which the authorities are prepared to clamp down on illegal water extraction. One interesting point worth noting in this context is that the amount invested globally each year in irrigation systems only amounts to between USD 9 billion and USD 30 billion (depending on the literature source), which is a surprisingly low figure given the importance of the agricultural sector for water consumption.^{25, 26}

SUSTAINABLE AGRICULTURE

The production of organic or sustainably produced foods is not only becoming increasingly popular with consumers, but also has a very positive impact

Table 7: Water and food.

Overview of selected segments of the global market. Sources: 11, 25, 26, 30

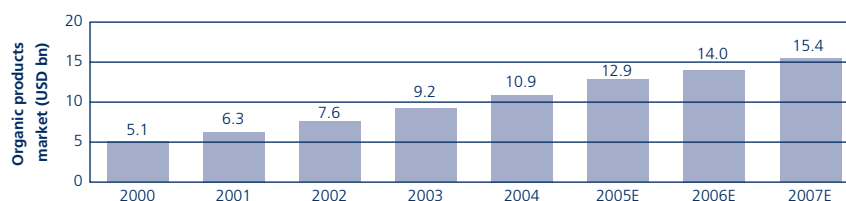
	Market volume 2007	Expected annual growth
Bottled water	USD 91 bn	10%
Organic food	USD 33 bn	10-12%
Irrigation	USD 9-30 bn	10%



Agriculture is the world's biggest consumer of water. In future there will be far more pressure to install more efficient crop irrigation systems.

Figure 20: Growth of the US organic products market.

The spread of sustainable agriculture has a particularly positive impact on water resources, as it helps to reduce water consumption and the chemical contamination of groundwater and surface water. Source: 30



on water resources. The use of more environmentally friendly fertilizers and crop protection agents also protects the groundwater and reduces topsoil runoff. Slow-release fertilizers act more selectively and losses are lower. From the water perspective, they are therefore vitally important for sustainable agriculture practices, particularly in developing nations with burgeoning populations. Fortunately, specialist firms now exist (even in countries like China), which stand to benefit from dynamic growth in this area.

BOTTLED WATER

The consumption of bottled water has skyrocketed in recent years and shows no sign of stopping in the immediate future. Today the beverages market

generates global revenues totaling USD 91 billion, and is set to grow another 5-25% in the foreseeable future.²⁵ Although bottled water is significantly more expensive than tap water, more and more consumers are choosing it because they do not trust the quality of water from the mains. The outlook for emerging markets is particularly bright, as a more affluent and health-aware middle class recognizes the importance of drinking water of better quality. In the US, however, more and more pundits are arguing that the quality of bottled water is not actually any better than tap water. How to dispose of the mountain of plastic bottles is another environmental stumbling block, and this could well entice consumers back to drinking tap water, possibly with additional filtering at the point of consumption.

4. Conclusion: New investment Opportunities in the Water Sector

The importance of water as a life-sustaining resource will steadily increase over the next few years. As the global population continues to boom, pressure will mount on water resources which are already under enormous strain, and in many regions the traditionally careless use of water will have visible negative consequences.

- Consumers are therefore becoming increasingly aware that water is a precious resource, which needs to be managed in a sustainable way. Technologies that promote more efficient use of water are already available: water-saving domestic appliances, efficient industrial plants or low-cost methods for repairing pipes are just some of the practical ways of reducing water consumption. Enormous efforts are also being made in agriculture, to try and improve on the frequently wasteful way that water is currently being used.
- These major challenges open up interesting opportunities for investors: companies that see the increasing need for sustainable solutions as an opportunity – and respond by offering innovative solutions – can look forward to a sharp increase in demand in the years ahead.
- If we are to ensure sustainable management of water resources and avert a global water crisis, water must be given a price tag that accurately reflects its vital role in our lives. It is therefore the duty of politicians and lawmakers to lay down the relevant rules and to push through measures that promote more sustainable use of water. This change of mindset has already occurred in those countries confronted with urgent water problems, whether in terms of quality or quantity, encouraging them to adopt the necessary laws, ordinances or budget allocations. But action is still needed at the political level, combined with a greater awareness by the general public of the importance of using water resources efficiently.
- To make successful investments in the water sector, investors therefore not only need to be informed about the latest technical advances and industry solutions, but must also closely follow developments and decisions on the political and legislative front. The introduction of new environmental standards, tougher demands on water quality, more public spending on infrastructure construction and maintenance as well as the fixing of tariffs and fees, will have a significant impact on the growth of individual segments of the water market and, consequently, on the attractiveness of companies doing business in these segments.
- In the years to come, water will develop into a dynamic market of the future. Given the global trends that are shaping the water market, demand is unlikely to drop off in the long term. While due account needs to be taken of company valuations, investors with a long-term horizon can therefore expect to find numerous worthwhile and attractive investment opportunities.

5. References

- ¹ Zehnder, A.J.B., Schertenleib, R., Jaeger, C.: Herausforderung Wasser. EAWAG Jahresbericht 1997
- ² UNESCO: Water – a shared responsibility. The United Nations World Water Development Report 2, 2006. www.unesco.org/water/wwap (5.10.2007)
- ³ FAO: Aquastat. www.fao.org/nr/water/aquastat (5.10.2007)
- ⁴ The European environment – State and outlook 2005. <http://dataservice.eea.europa.eu/atlas/viewdata/viewpub.asp?id=1114> (5.10.2007)
- ⁵ UNDP: Human Development Report 2006
- ⁶ Herlyn, A.: Status quo der Schweizer Abwasserentsorgung. Gas Wasser Abwasser 3, 171-176, 2007.
- ⁷ United Nations Secretariat: The World Population Prospects 2006. <http://esa.un.org/unpp/p2k0data.asp> (5.10.2007)
- ⁸ Lanz, K.: Wem gehört das Wasser? Lars Müller Publishers, 2006
- ⁹ Reye, B.: Knallrote Früchte mit üblem Beigeschmack. Tages-Anzeiger, 2007. www.tagi.ch (5.10.2007)
- ¹⁰ Den Flüssen den Weg weisen. Neue Zürcher Zeitung, 2006. www.nzz.ch (5.10.2007)
- ¹¹ Pacific Institute: The World's Water: 2006-2007. 2007 <http://www.worldwater.org/books.html> (5.10.2007)
- ¹² Pacific Institute: Desalination, With a Grain of Salt – A California Perspective. 2006
- ¹³ Davis, R.: The case of San Diego's vanishing water, 2007: <http://www.awwa.org/publications/MainStreamArticle.cfm?itemnumber=29525> (5.10.2007)
- ¹⁴ US EPA: Clean Water and Drinking Water Infrastructure Gap Analysis Report, 2002
- ¹⁵ Milner, M.: Thames Water fails to plug leaks but profits rise 31%. The Guardian, 2006: <http://business.guardian.co.uk/story/0,,1802686,00.html> (5.10.2007)
- ¹⁶ European Environment Agency: <http://www.eea.europa.eu/themes/climate/> (5.10.2007)
- ¹⁷ Lehmann, M.: Volkswirtschaftliche Bedeutung der Siedlungswasserwirtschaft. Gas, Wasser, Abwasser 6/94, 1994
- ¹⁸ Gränicher, H. U.: Die neue VSA-Richtlinie – Baulicher Unterhalt von Abwasseranlagen. Kanalisationsforum, Bern, 2006
- ¹⁹ Nalco Freedomia, 2006
- ²⁰ EAWAG, Dübendorf, BUWAL, Bern: Fischnetz – Dem Fischrückgang auf der Spur. Schlussbericht des Projekts Netzwerk Fischrückgang Schweiz, 2004
- ²¹ Informationszentrale Deutsches Mineralwasser: <http://www.mineralwasser.com/> (5.10.2007)
- ²² IPCC, WMO/UNEP: Climate Change 2007: Summary for Policymakers, 2007
- ²³ OcCC / ProClim: Klimaänderung und die Schweiz 2050 – Erwartete Auswirkungen auf Umwelt, Gesellschaft und Wirtschaft. 2007
- ²⁴ Bundesamt für Umwelt (BAFU): Klimaänderung in der Schweiz – Indikatoren zu Ursachen, Auswirkungen, Massnahmen. 2007
- ²⁵ Global Water Intelligence: Global Water Market 2008. 2007
- ²⁶ World Water Council: World Water Vision. Making Water Everybody's Business. 2000
- ²⁷ UNESCO – IHE: <http://www.waterfootprint.org> (5.10.2007)
- ²⁸ Telegraph.co.uk (24.07.2007)
- ²⁹ Global Water Intelligence, Volume 8/Issue 2, February 2007
- ³⁰ Organic Monitor, www.organicmonitor.com
- ³¹ HSBC, December 2005
- ³² Geberit AG, www.geberit.com
- ³³ Northern Rocky Mountain Science Center



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In Brief

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The Group offers a comprehensive range of theme-related products in the area of new energy sources, water and innovative materials. In addition, it provides large institutional investors with a broad palette of mandate-based, client-oriented services (including enhanced, active and unrestricted strategies). For investors, SAM ensures a high degree of social responsibility and transparency with respect to their investments.

SAM seeks out and identifies companies that stand out in terms of corporate sustainability criteria. The integration of these forward-looking factors into corporate valuation and the investment process represents the basis for SAM's philosophy. The company's expertise is based on its own independent research and an active worldwide network focused on sustainability investments. To that purpose, SAM has compiled the world's largest sustainability database.

Together with Dow Jones Indexes and STOXX, SAM has launched a family of sustainability indexes to track the performance of companies that are industry leaders in terms of sustainability. In fulfilling that goal, SAM analyses over 1,000 companies a year. Headquartered in Zurich (Switzerland) SAM maintains operations in Europe, Australia and North America.