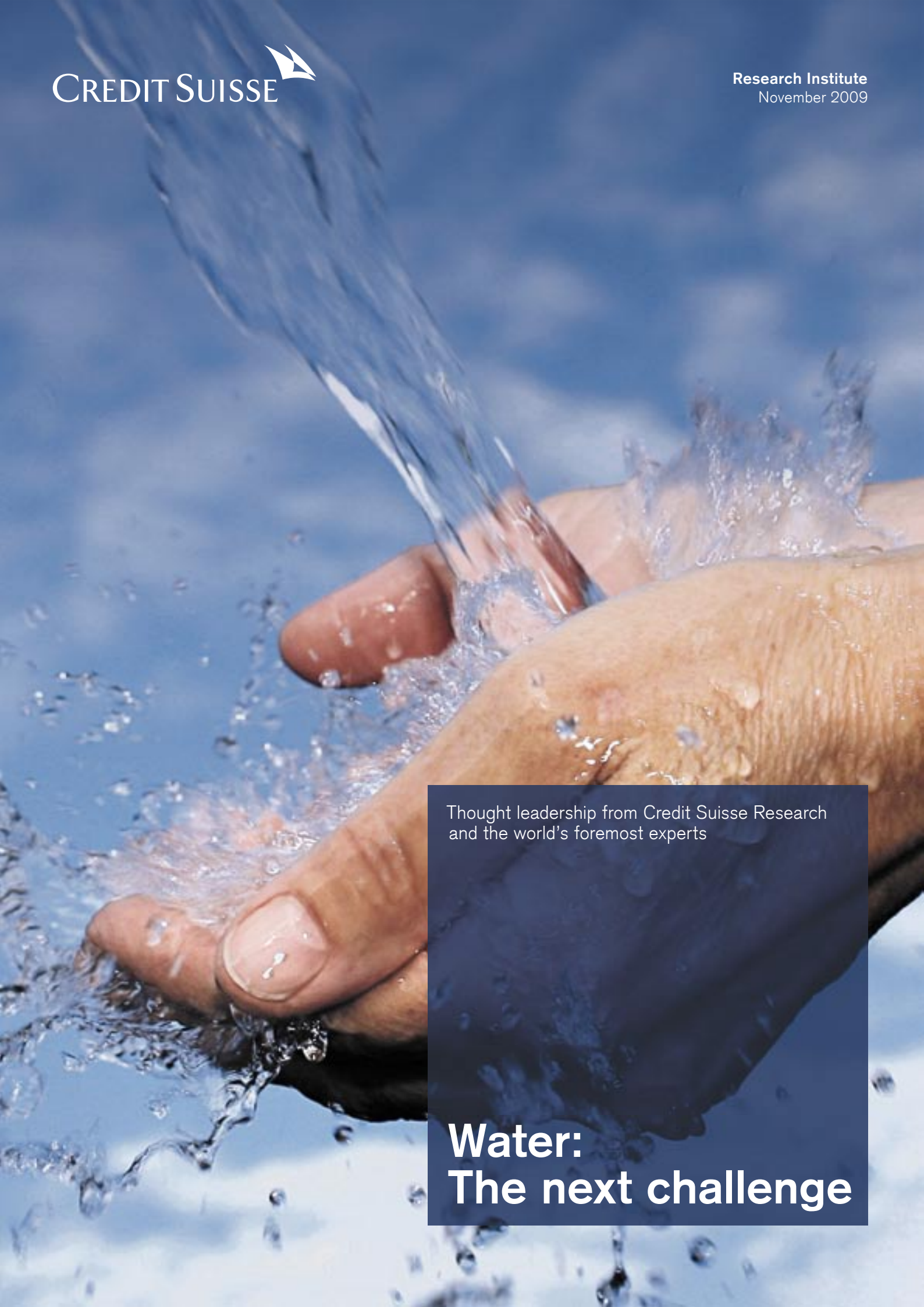


CREDIT SUISSE

Research Institute
November 2009

Thought leadership from Credit Suisse Research and the world's foremost experts

Water: The next challenge

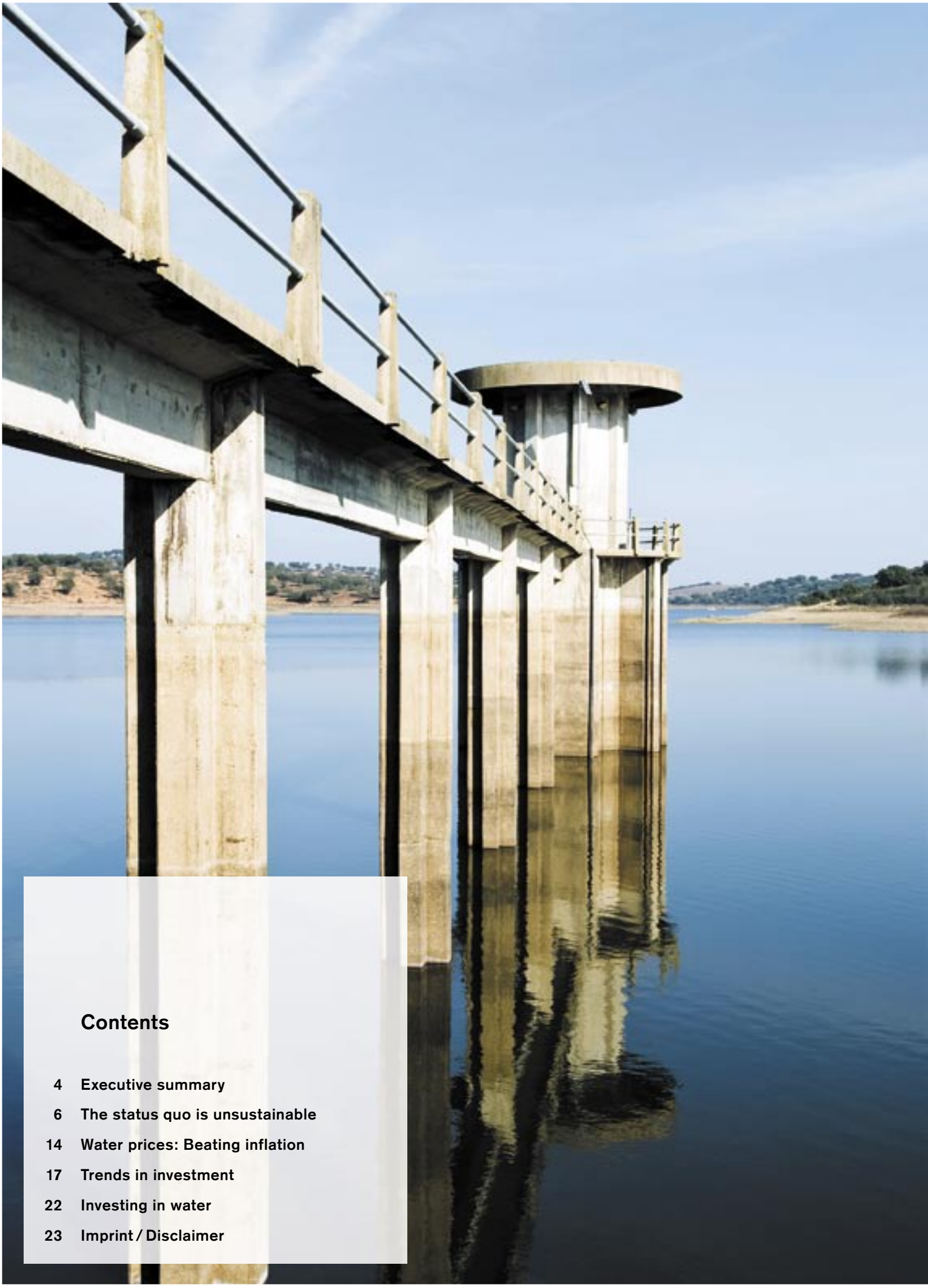


Photo: istockphoto.com

Contents

The scarcity of water will be one of the most difficult social and political problems that the world is going to face in the next twenty years, not to mention one of the more complex economic issues.

Credit Suisse has been researching this topic for a number of years now and the key forces that point toward more scarce supplies of water – sharp falls in ground water levels, overconsumption, inefficiency of transportation and climate change – have if anything intensified.

From a larger perspective, the scarcity of water is part of a much greater theme of sustainability. Together with demographics and the trend toward a multi-polar world (see the Research Institute publication "World Post the Credit Crisis," September 2009), sustainability is one of three interdependent pillars in what we term "Global Megatrends."

Global megatrends are not new to mankind. In the past, many megatrends appeared, most of them stemming from the irruption of a major change, such as technological breakthrough or a change in the geopolitical balance. Megatrends have been developments from the invention of the wheel, to the development of money, codified law and central governments (see the Research Institute "Intangible Infrastructure" Report, November 2008). Computing, mobile phones and the Internet are more recent examples.

In particular today, sustainability is thus becoming increasingly important for the future of the world population. Demand for resources is growing rapidly on the back of population growth and enrichment. In the coming years, this trend is expected to further accelerate on the back of the rapid economic growth and demographic expansion we see in emerging markets.

Rising demand and depleting resources are leading to imbalances in an increasing number of areas. A recent UN study, for instance, estimates that at current consumption levels, two thirds of the world's population will suffer from water scarcity by 2025. One key solution to restore the balance between supply and demand is sustainable generation of drinkable water as well as more efficient use of the existing resource. This interacts with the development of new industries (cleantech, nanomaterials etc…).

In this report, we examine in detail the underlying issues and trends that are leading to the scarcity of water – a resource that many people see as a public good – and outline where we feel innovation and industrial change will occur as a natural response. This can stimulate growth for many companies and even bring about the emergence of new ones, which might provide attractive investment opportunities over the next several years.

Water is a vital geo-economic and social issue, and with this report we hope to contribute to the broader global debate on this key topic of the next few decades.

Giles Keating
Head of Research for Private Banking and Asset Management
giles.keating@credit-suisse.com

Lars Kalbreier
Head of Global Equity & Alternatives Research
lars.kalbreier@credit-suisse.com

Stefano Natella
Head of Global Equity Research Investment Banking
stefano.natella@credit-suisse.com

For more information, please contact:

Richard Kersley, Investment Banking Equity Research,
richard.kersley@credit-suisse.com

Michael O'Sullivan, Private Banking Equity Research,
michael.o'sullivan@credit-suisse.com

Executive summary

We need to build a new water infrastructure to tackle imbalances in water supply and demand.

Growing imbalances in global water supply and demand are well documented. Credit Suisse (both in the Private and Investment Banks) has been researching this issue since 2007. Since then, relatively little has changed in terms of the scale of the overall problem and the susceptibility of certain geographic regions. Sharp falls in groundwater levels (in India, Australia, China and parts of the USA, in particular) and natural reservoirs (for example, the Aral Sea) illustrate the unsustainable nature of water consumption patterns. The bottom line is that demand is outstripping supply. We estimate that by 2020, based on UN population projections (and assuming current levels of supply prevail), that 37% of the global population (or 2.8 billion people) will face absolute water stress (a UN definition where supply is less than 1,700 cubic meters per annum per capita).

Problems get worse if IPCC forecasts on climate change are correct. This would have a significant negative impact on water supply. For example, in its 2007 report, the IPCC controversially reiterated the forecast from the WWF that the Himalayan glaciers could have all but disappeared by 2035. Roughly 1.3 billion people live along the drainage basins of the seven major rivers fed by the Himalayan glaciers. During the dry season, the glaciers are the main source of river flow (70% in the case of the Ganga).

There are signs that the market is responding to the issue: water prices have continued to outstrip headline inflation in the majority of developed countries. However investment levels in general have been surprisingly weak. This is clearly illustrated by World Bank data for the emerging markets. Indeed, we find that public sector investment in key markets (such as the USA) is probably a considerable way behind "required" investment.

In our view, greater levels of investment (in the form of pipelines, desalination plants, recycling systems and other supply-side solutions) will be crucial in alleviating shortages and, as such, look likely to rise in importance. In other words, while investment growth in many regions may have been disappointing so far, we expect it to pick up substantially over the next 5–10 years. However, we have three caveats to accompany this forecast:

- Investment growth is likely to be stronger, in our opinion, in those markets where water shortages are relatively acute, financing is at least partly available from the federal or national budget (as opposed to the private sector or local municipalities) and the administration is sufficiently organized to deliver on targets. To us, this implies greater relative growth in water-related investment in Australia, China, the Middle East and North Africa (MENA), Mediterranean markets and Russia (where ageing infrastructure requires substantial upgrades). Investment should continue to pick up in the USA and India but relative to requirements, may well continue to disappoint.
- Returns in water management can be high where infrastructure is well established and pricing is appropriate (for example, France or the UK). In less mature markets however, where water is seen as more of an "entitlement" than a "service," it may make more sense to invest in the building, but not the owning and operating.
- Given the inherent corporate risks in providing water services, the trend towards smaller private sector contracts looks likely to persist. To some extent, this may improve the chances of smaller, local players to compete for water-related contracts as opposed to the big multi-national companies that have traditionally dominated the industry.

We also note that greater efficiency in water usage appears to be rising in importance. To the extent that consumers (or governments through subsidy schemes) are faced with rising costs and/or supply interruptions, the onus is shifting towards reducing overall demand for water. This puts added emphasis on the importance of the contribution from companies proficient in demand-side efficiencies (ranging from drought-resistant crops, less water intense crops and more efficient irrigation systems, to low-use shower heads and water-efficient toilets).

Investment implications

(1) Increasing water supply. There are two obvious ways to augment the water supply: either through water recycling (re-use) or desalination. Growth in both has been strong over the past 5–10 years and we expect this trend to continue. Global Water Intelligence (GWI) forecasts a CAGR of 11% in water recycling to 2015 (taking re-use levels to just under 25% of global supply, up from 10% as of 2005) and a CAGR of 9.3% in desalination to 2016. Since much of the recycled water will not be clean enough to drink, it is much cheaper to produce than desalinated water: re-used water can be used for agricultural purposes with relatively little purification compared with desalinated water (where the salt has to be extracted), which

Photo: istockphoto.com

requires extensive purification. However, this cost of treatment (if it is not up to potable standards) has to be weighed against the cost of building a secondary "non-potable" network.

(2) Water infrastructure. We look at those sectors that are essentially concerned with storing and transferring water, be it on a large scale (in dams and pumped through pipelines) or on a small scale (and transported in a bottle). We consider four areas: (a) dams and reservoirs, (b) pipelines, (c) leaks and (d) packaged water.

- Dams: Declining growth in the 1990s has been replaced with a resurgence in dam building since the turn of the twenty-first century.
- Pipelines are in demand to replace ageing infrastructure, connect desalination and water recycling schemes to the end users and to pump water into areas of scarce resources.
- Leakages are less acceptable as the economic costs of water supply have risen.
- Demand for bottled water is on the wane in developed markets, but is growing quickly in developing markets.

(3) Reducing water demand. Much can be done to cut down on water demand. We consider ways to reduce water demand for the three main user groups: agricultural demand (which accounts for some 70% of total water demand), domestic demand (8%) and industrial demand (22%).

- There are two main methods to cut agricultural demand for water: (a) drought-resistant crops (some of which are scheduled for commercial release by 2012) and (b) more efficient irrigation techniques.
- There is a multitude of ways to cut domestic demand for water. We consider metering, tiered tariffs and better plumbing.
- Industrial water demand has been relatively stable for some time, despite much higher output levels.

(4) The listed water management sector. This is a classically defensive sector reflecting the inelastic nature of water demand and the regulatory environment faced by most water utilities. Dividend yields are typically higher than the market average, as long-term growth potential is perceived to be lower. Underperformance YTD of 20% has meant the relative gap in the trailing dividend yield of water utilities (4.5%) versus global equities (2.6%) has opened up again.

Photo: istockphoto.com

The status quo is unsustainable

Water supply is typically fairly static but water demand is up six-fold over the last century, more than double the rate of population growth. Continued strong demand growth looks inevitable on the back of a growing world population, rising relative incomes in the emerging markets and the trend towards urbanization. Potentially acute supply-side problems are presented by global warming (given the significant impact registered on inland glaciers) and pollution.

The impact of strong demand growth against relatively static supply is well illustrated by the rate of decline in ground water levels. Just over 20% of water used globally is from groundwater. Ground water (stored in aquifers) has typically taken tens of thousands of years to accumulate. Over-use of groundwater in some areas has meant reserves have plummeted regardless of prevailing rainfall patterns.

Even without further growth in demand for water, continued reliance on groundwater (at prevailing extraction rates) looks unsustainable as these reserves dry up:

- According to the US Geological Survey (USGS), North America's largest aquifer, the Ogallala, is being depleted at a rate of 26 billion cubic meters (bcm) a year. Total depletion to date amounts to some 312 bcm, or 9% of total water storage since substantial ground-water irrigation development began in the 1950s.
- Data from the Geological Environmental Monitoring Institute (GEMI) in Beijing shows that the ground water under the north China plain (an area that produces over half of the country's wheat and a third of its corn) has been falling by as much as three meters a year. According to the World Bank, wells around Beijing now have to reach as much as 1,000 meters in order to extract water, escalating the cost of supply.
- In a survey of India's water situation, the New Scientist (July 2007) reported that the 21 million wells are lowering water tables in most of the country and that in North Gujarat, the water table was falling by six meters a year. According to a study published in Nature (August 2009), NASA scientists estimated that between 2002 and 2008, 109 cubic kilometers of water had been depleted from the aquifer covering North West India. This is equivalent to double the capacity of India's largest reservoir. Rainfall over the study period

Figure 1

US ground-water levels

Source: US Geological Survey

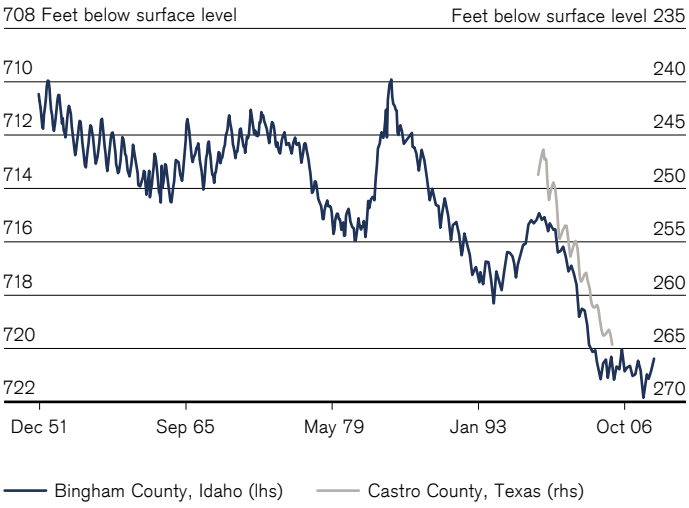
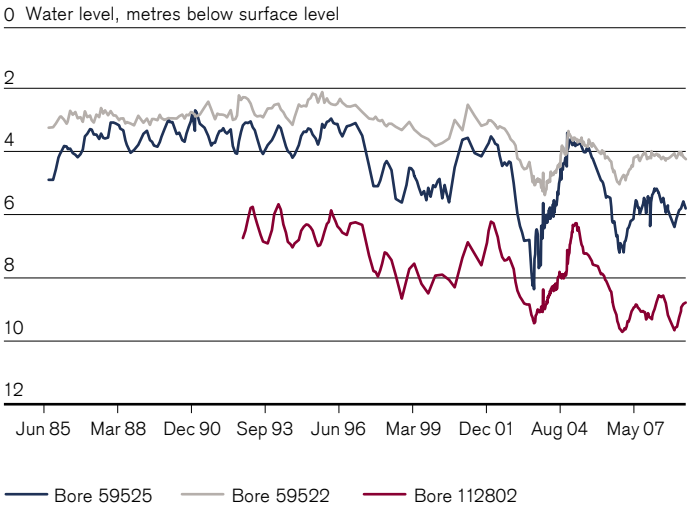


Figure 2

Victoria, Australia: Ground-water levels

Source: Victorian water resources



had been reasonably consistent, emphasizing that the fall in ground water was a result of over-extraction rather than any drought conditions.

- In Pakistan, the drop in water tables appears similar to that in India. Observation wells near the cities of Islamabad and Rawalpindi show a fall in the water table between 1982 and 2000 of one to two meters a year.

Of the total amount of water used globally, 65% is from surface water (rivers, streams and lakes). Again, demand has outstripped the rate of replenishment. The most vivid illustration of this is the decline in the Aral Sea. At one stage, the Aral Sea was the world's fourth biggest inland seas, and one of the world's most fertile regions, but overuse has meant that, by 2007, the Aral Sea had lost 90% of its original volume and had split into three separate lakes, two of which are too saline to support most aquatic life.

Water supply is relatively static

In aggregate, there is sufficient fresh water to meet global demand. 10.5 million cubic kilometers of fresh water is more than enough to supply the current 6.5 billion global population. As the UN put it (United Nations World Water Development Report, 2007), providing universal access to the basic minimum of 50 liters a day per person would mean redistributing just 1% of the amount of water used currently. The problem is essentially a question of distribution of the fresh water resource, given spatial and time variations in its natural delivery.

Water demand has seen substantial growth

Annual world water use is up six-fold over the last century, more than double the rate of population growth, according to the Food and Agriculture Organization (FAO).

Growth in water usage has significantly outstripped population growth for three broad reasons:

1. Rising real incomes have increased the demand for more food and more water-intensive food groups (agriculture accounts for 70% of water demand, according to the FAO).
2. Advances in technology (water networks, pipelines) have brought water and sanitation into the home, making it more convenient to use in greater quantity (domestic water use accounts for 8% of water demand). Urbanization has added to this factor.
3. Growth in industrial processes has added to greater demand for water.

Trouble brewing: Continued strong demand growth…

There are two measures of water deficiency as defined by the UN:

1. The absolute standard. The UN defines countries (or areas) as "water stressed" on an absolute basis when annual water supplies drop below 1,700 cubic meters per person. When supplies drop below 1,000 cubic meters per person, the UN defines the country as "water scarce."
2. The relative standard. This is determined by the ratio of water demand relative to supply. The UN defines a country as suffering high relative water stress if demand is greater than 40% of the renewable water supply. Medium-high water stress is defined as demand of between 20% and 40% of supply. On this measure, the USA (as an example) is ranked

as suffering "medium-high water stress" since annual water demand equated to 24% of supply in 2005. This may not sound particularly egregious but, given significant variations in water supply across any one country throughout the year, anywhere with demand running at greater than 20% of supply, on average, faces problems with water supply.

Using population data from the UN and the latest numbers available on water supply and demand from the World Resources Institute, we estimate that 30% of the global population will be suffering absolute water stress or scarcity by 2010. By 2020, based on UN population projections (and assuming current levels of supply prevail), we estimate this will have increased to 37% (or 2.8 billion people) with various ramifications for political stability, health and economic growth.

On the UN's relative measure, we estimate that 63% of the global population in 2010 will live in countries where water demand is greater than 20% of their water supply and 10% of the global population will live in countries where water demand is greater than 40% of their water supply. With continued growth in global population (plus increasing levels of water consumption as average real incomes across developing markets improve) these numbers are set to worsen. By 2020, we estimate 65% of the global population will live in countries where water demand is greater than 20% of their water supply, but 29% will live in countries where water demand is greater than 40% of water supply.

Of the most populous countries, China, India and Pakistan are probably facing the most egregious problems on both absolute and relative measures of water stress. By next year, India and Pakistan are both expected (on the basis of UN forecasts) to be below the absolute stress level of 1,700 cubic meters per inhabitant per annum. China is also approaching this point. Demand relative to supply is likely to be running at 40% in India by 2010 and close to 100% in Pakistan. The USA is water-rich in absolute terms but, given consumption per head that is nearly three times that of Japan, for example, it is classified by the UN as moderately water-stressed on a relative basis. In absolute and relative terms, Brazil and Canada are the two most water-rich countries.

...plus urbanization, global warming and pollution

Three factors are exerting further stress on the global water supply and demand balance:

1. Rural/urban migration

Rural/urban migration is increasing the stress on the supply/demand balance for most utilities and particularly water for two reasons: (1) a greater proportion of urban dwellers are directly connected to the water network (which naturally facilitates increased domestic water use and adds to overall demand); and (2) a greater concentration of consumers in a smaller geographical area typically places increased pressure on neighboring water resources (i.e., local water tables).

The average population size of the world's 100 largest cities grew from around 0.2 million in 1800, to 0.7 million in 1900, to 6.2 million in 2000. Currently, about half the world's population lives in urban centers, compared with less than 15% in 1900. By 2030, the UN forecasts that 60% of the world's population will live in urban areas.

Figure 3

Global distribution of the world's water

Source: Shiklomanov and Rodda, 2003

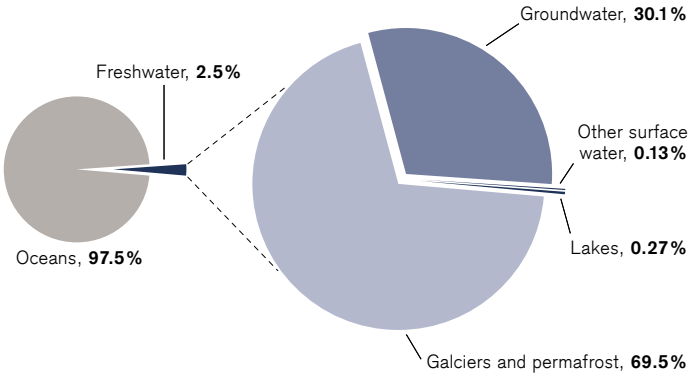


Figure 4

Global water use and population

Source: FAO Aquastat, UN

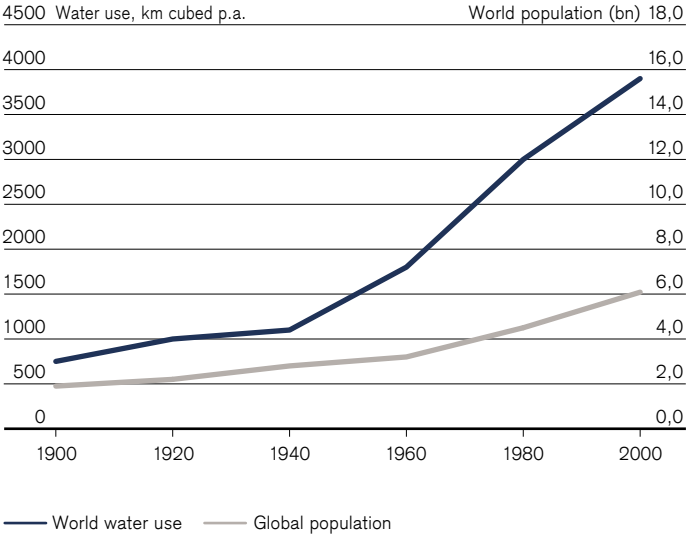


Figure 5

Percentage of the global population suffering relative water stress, 2010E vs. 2020E

Source: World Resources Institute, UN, Credit Suisse estimates

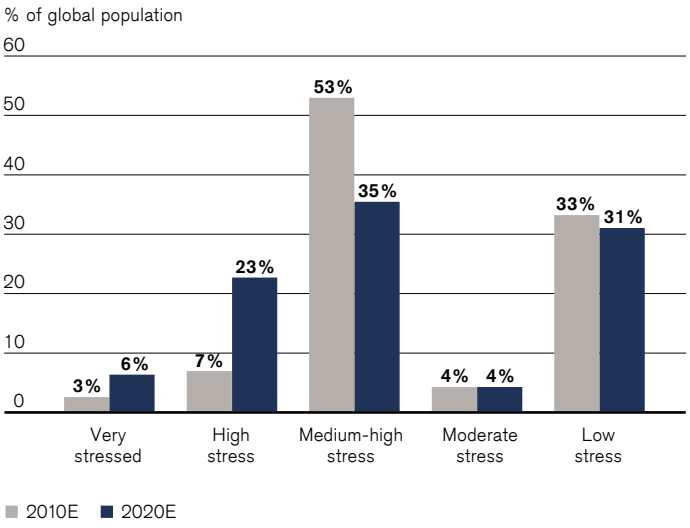


Photo: istockphoto.com

In order for the Millennium Development Goal on water (a UN target to reduce the proportion of people without access to safe drinking water and basic sanitation by half relative to 2000) to be met by 2015, 961 million urban dwellers would have to gain access to an improved water supply.

2. Global warming

The Intergovernmental Panel on Climate Change (IPCC) points out that in different regions, climate change will affect where, when, how much and how water falls, increase the vulnerability of water supplies, increase the severity of droughts and flooding events and threaten coastal aquifers.

One of the main impacts of global warming is on glacial river flow. If the glacier disappears then so does the river (at least in the dry season). The World Glacier Monitoring Service shows an acceleration in the rate of glacier melt across the world. According to its most recent study of global glaciers (published in March 2008), glacier thickness declined by an average of 0.3 meters a year between 1980 and 1999, but since 2000 the average annual ice loss has increased to about 0.5 meters.

The Himalayan glaciers are the origin of seven of the world's largest rivers – the Ganges in India, the Yangtze and Yellow Rivers of China, the Brahmaputra that flows through Bangladesh, the Mekong that descends through Southeast Asia, the Irrawaddy in Burma and the Indus that flows through Pakistan – and are the main source of flow during the dry season. The combined drainage basin of these rivers is home to approximately 1.3 billion people. China and India recently announced (August 2009) that they would co-operate in scientific research to monitor the state of the Himalayan glaciers since they are of such clear strategic importance to both countries.

The Gangotri glacier supplies 70% of the Ganga flow during the dry season. A study carried out by India's Department of Science and Technology has found the Gangotri glacier is

Figure 6

Water supply and demand for the six most populous countries, 2010E

Source: World Resources Institute, UN, Credit Suisse estimates

	Population (m) 2010E	Population (m) 2020E	Water supply per inhabitant m³/pa, 2010E	Water supply per inhabitant m³/pa, 2020E	Water demand/ supply 2010E	Water demand/ supply 2020E
China	1,354	1,431	2,089	1,977	24%	28%
India	1,214	1,367	1,562	1,387	40%	49%
US	318	346	6,520	5,983	26%	31%
Indonesia	233	254	12,206	11,164	3%	4%
Brazil	195	209	42,129	39,383	1%	1%
Pakistan	185	226	1,205	985	95%	128%

shrinking by 17 meters a year, which it attributes to global warming and climate change. On the basis of work done by the WWF in 2005, the IPCC warned in its Working Group II report of 2007 (Chapter 10 on Asia) that the Himalayan glaciers could all but vanish within the next three decades.

The report states: "Glaciers in the Himalayas are receding faster than in any other part of the world and, if the present rate continues, the likelihood of them disappearing by the year 2035 and perhaps sooner is very high if the Earth keeps getting warmer at the current rate." The IPCC forecasts the total area of glaciers in the Himalayas is likely to shrink, from 193,051 square miles to 38,600 square miles by 2035.

However, this forecast appears to be particularly controversial. Many other specialists in the area are nowhere near as pessimistic. The China-based Institute of Tibetan Plateau Research projected (in August 2009) a 43% decrease in glacial area by 2070.

Global warming impacts are also likely to be felt (according to the IPCC) in the form of changing weather patterns. Dry continental areas, such as central Asia and the African Sahel, are likely to become even drier and hotter (in places), whereas increased rains might boost crop productivity in temperate regions.

In Australia, the shift in rainfall patterns (attributed to climate change) has meant inflows into dams have decreased by between 30% and 70%, according to the Australian Water Services Association. Brisbane came close to running out of water before rain late last year, according to the Australian Water Association.

3. Pollution

Finally pollution has further reduced the available resource. Water pollution derives from a wide variety of sources: failure to clean industrial waste, surface water run-off from agriculture, inappropriate discharge of sewage and over extraction of groundwater to depths whereby naturally occurring poisons (such as arsenic) contaminate supplies (which is a well-documented problem in India and Bangladesh). Levels of pollution are arguably worse in developing markets, where preventative legislation is not yet in place (for example, in China, where according to the World Health Organisation, 90% of rivers are polluted).

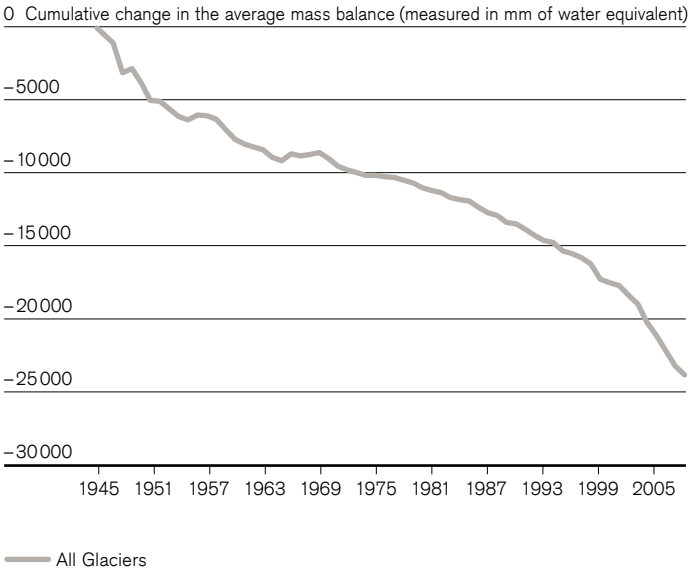
As one measure of river pollution, we can look at the Biological Oxygen Demand (BOD) of water. This is a chemical procedure for determining the rate of uptake of dissolved oxygen by the biological organisms in water – the higher the BOD reading, the worse the level of pollution. Most pristine rivers will have a BOD below 1 mg of oxygen per liter (mg O_2/l). Moderately polluted rivers may have a BOD value in the range of 2 to 8mg O_2/l. Municipal sewage that is efficiently treated by a three-stage process would have a value of about 20mg O_2/l or less. Untreated sewage varies, but averages around 600mg O_2/l in Europe.

Data from GEMStat (a division of the United Nations Environment Program) is available for comparative purposes for some countries. It typically shows that emerging markets record higher levels of water pollution (on this measure) and that the trend has been worsening (this is particularly notable in China and India).

Figure 7

Cumulative change in the average mass balance of global glaciers

Source: World Glacier Monitoring Service (www.wgms.ch): WGMS (2008a): Global Glacier Changes: facts and figures



Water prices: Beating inflation

Water prices have typically outstripped inflation for much of the past 20 years across the majority of the developed markets. This is not necessarily a sign of higher profitability for the water utilities; it is more a reflection of rising costs of production. In many emerging markets, water supplied to consumers remains heavily subsidized: in India, water is free to consumers; in China, it is very cheap. This is fostering over-extraction of water resources – a situation that we think is unlikely to be allowed to persist in the long term.

The price of water has increased significantly over recent years. Looking at the breakdown of national inflation data shows the extent to which this is the case. In the USA and the UK, water prices have outstripped headline inflation by 18% and 27%, respectively, over the past five years. The same statistics for Europe, Canada and Australia show an outperformance of 9%, 35% and 22%, respectively, in water prices over and above headline inflation in the past five years. Data from the NUS Consulting Group in its "International Report and Cost Survey" shows similar trends. The data shows that, over the past five years, municipal water rates have increased by an average of 7.6% per annum, which is 5.2% ahead of the average rate of inflation (of the thirteen countries in its sample).

However, the data also shows that there is still considerable disparity in water prices between countries. The price of a cubic meter of water in France (which is relatively water-rich) is over 50% higher than the price of a cubic meter of water in Spain (which is considered to be water-poor). Similarly, average prices in the USA are some 27% below those in Canada (which ranks as one of the two most water-rich countries in the world along with Brazil).

We believe the upward trend in water prices is set to continue for two reasons. First, costs of production are rising. The need to upgrade or build installations is rapidly unfolding at the same time as demand for higher water standards has intensified. Significant capital requirements, in conjunction with fiscal constraints limiting central government expendi-

Photo: istockphoto.com

Figure 1

US and UK water prices relative to headline inflation

Source: Bureau of Labor Statistics, Office of National Statistics, Credit Suisse research

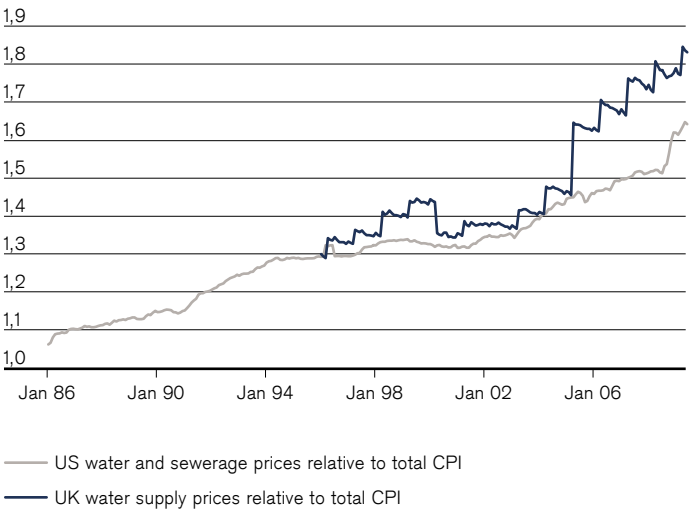
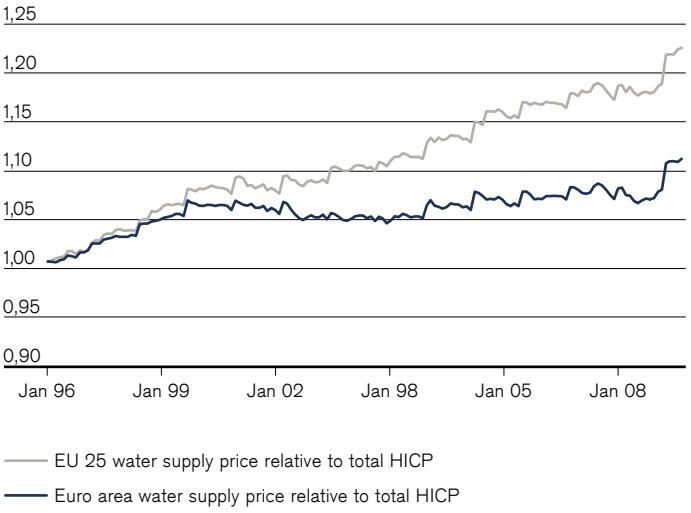


Figure 2

European water prices relative to headline inflation

Source: Eurostat, Credit Suisse research



ture, imply higher prices. The Australian Water Association, for example, predicts prices will double in Australia over the next five years to meet the rising costs of production and to fund investment, and this follows a 38% increase in average water prices over the past two years. It also follows, therefore, that rising water prices are not necessarily driving higher profitability for the water utilities. It is more the case that higher prices are, in the first instance, necessary to maintain margins. The second factor driving prices higher is to deter waste and inefficiency. In some places, this has taken the form of a tiered pricing system whereby water consumption costs more beyond a certain threshold. This enables water provision at very cheap prices to cover "basic needs," but acts as a deterrent to over-use. Tiered pricing schemes have been successfully implemented in Australia, Israel and parts of the USA.

However, while basic economics may dictate that an increasingly scarce resource should command higher prices, government subsidies are a major component of this industry. Many regions use water as a political tool and do not demand that consumers pay an economic price. This is particularly the case in many of the emerging markets: in India water is free to consumers; in China it is very cheap. Interestingly in Malaysia, the government is in the process of nationalizing water concessions in order to lower prices charged to consumers. In general, we believe that it is highly unlikely that radical changes will be introduced to water pricing mechanisms in these less-developed markets, where cheap water is entrenched in public perception. To do so would probably be at the risk igniting disruptive economic and political forces. As such, in places where water has been provided at very little or no cost for centuries, we would not expect this to change. However, this situation clearly fosters an environment of over-extraction of water resources. Take China as an example. Water prices are fixed by economic planners and, although rate hikes have intensified recently, water is still relatively cheap. As a result, farmers have little incentive to conserve water and have honeycombed water-scarce northern China with ever-deeper wells to tap a falling water table. In India, the water supply is not charged (even to farmers), which gives no incentive to conserve or optimize its use. As water scarcity generally increases over the next 10 to 20 years, it seems unlikely that either (1) significant price disparities in costs of water supply and the cost to consumers will be allowed to persist, or (2) that overuse of water will be ignored.

France and the UK perhaps set the precedent as to what we can expect in the future. Both countries can be considered as relatively mature water markets (in the UK and France, the private sector owns and operates 88% and 74% of the water network, respectively, according to infrastructure legal specialist Pinsent Masons). On the pricing front, the regulator in these markets acts to protect the interests of consumers, but also to ensure reasonable profitability for the private sector managers. The net result is an alignment of economic and consumer costs. On the volume front, government-set regulations such as water efficiency standards (gradually being rolled out in the UK) help to prevent unnecessary water waste.

In general, we expect that most OECD markets will continue to increase water prices relative to inflation in order to similarly align the economic cost of water production with costs charged to consumers. Regulations pertaining to water efficiency are also on the increase. Some are further ahead than others. Australia has regulated water use in domestic appliances for over a decade. In the USA, domestic water-efficient devices are mandatory for new buildings and regulations define the maximum water-use standards for plumbing fixtures. Europe is a laggard on this front. There are still no mandatory specifications for water efficiency in new buildings, but the European Parliament has voted (in April this year) to extend the range of products bound by efficiency standards under the Eco-design regulations (including showers, taps, windows and insulation materials). The standards, exact products and timescale for regulation have yet to be determined.

With much more limited scope for increasing water prices in many of the emerging markets the onus is on (1) tighter regulations to prevent over-use, (2) ensuring best practice in water management and (3) greater (publicly funded) investment in water supply. No wonder that in both India and China, the respective authorities have rolled out an extensive investment program in efficient irrigation techniques. And it is no wonder that, in the latter, water-related investment is up 213% in the past five years.

Figure 3

Australian water prices relative to headline inflation

Source: Australian Bureau of Statistics, Credit Suisse research

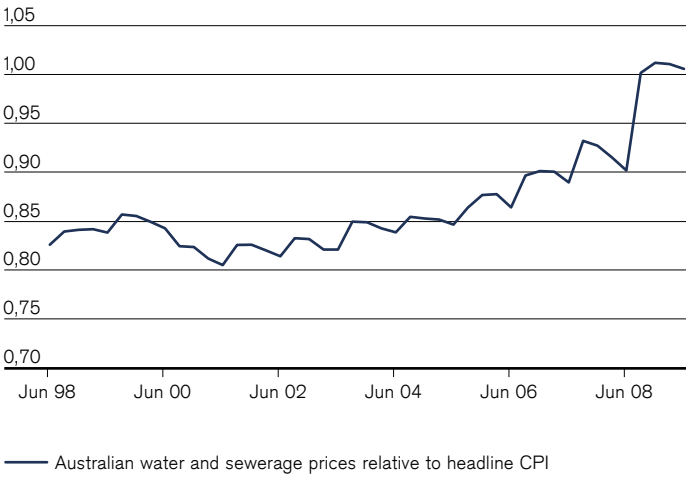


Figure 4

Canadian water prices relative to headline inflation

Source: Credit Suisse research

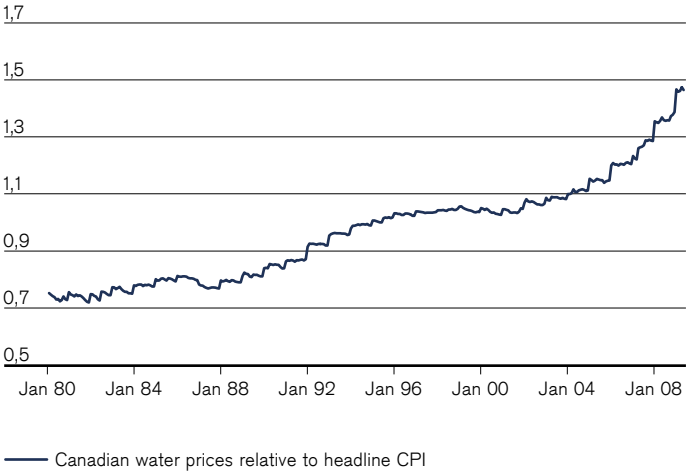


Figure 5

Water price comparison

Source: NUS Consulting Group

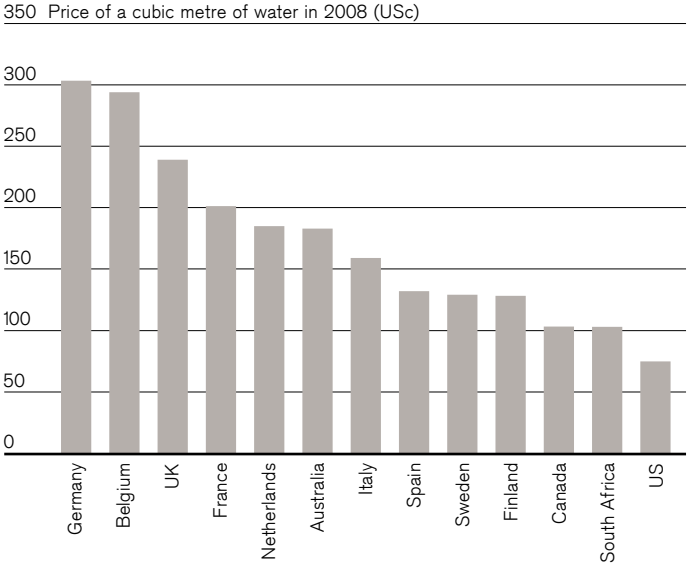


Photo: istockphoto.com

Trends in investment

To date, private sector growth in water-related investment has generally been very weak. Indeed, we find that public sector investment in key markets (such as the USA) is probably a considerable way behind "required" investment. However, in places where the problems in water supply are particularly acute (and the administration is sufficiently organized), there has been a considerable increase in water-related investment spending. China and Australia provide two such examples.

For the most part, water supply and sewage services globally are still provided by public-sector bodies. In Europe, 44% is provided by the private sector but in North America it is only 21%. In Latin America, the private sector now provides around 15% after substantial political efforts in the 1990s.

At the market level, there is as much dispersion in ownership within regions as there is between regions:

- Among the industrialized countries, only the UK, France and Spain have resolutely chosen to open up this activity to the private sector, at rates of more than 40% in both water and waste. Conversely, the Netherlands, Sweden, Switzerland and Japan have maintained 100% municipal management.
- In emerging markets, the Czech Republic, Chile and Malaysia have a delegation rate of more than 50%. We would note that, in these countries and emerging markets more generally, water-supply activities are typically more open to the private sector than are sewage services.

We expect the role of the private sector to increase

This is for two main reasons:

1. Municipal/public utilities often lack the resources to maintain their water networks.
2. Municipal/public utilities often lack the technical expertise to cope with increasing environmental standards or to manage existing water networks efficiently.

One significant caveat here is that, although the public sector may struggle to deliver increased levels of high-quality water supply, the private sector needs to be sufficiently incentivized

Figure 1

Private-sector investment in emerging markets in water, telcos, energy and transport (USD bn)

Source: World Bank PPI data, Credit Suisse research

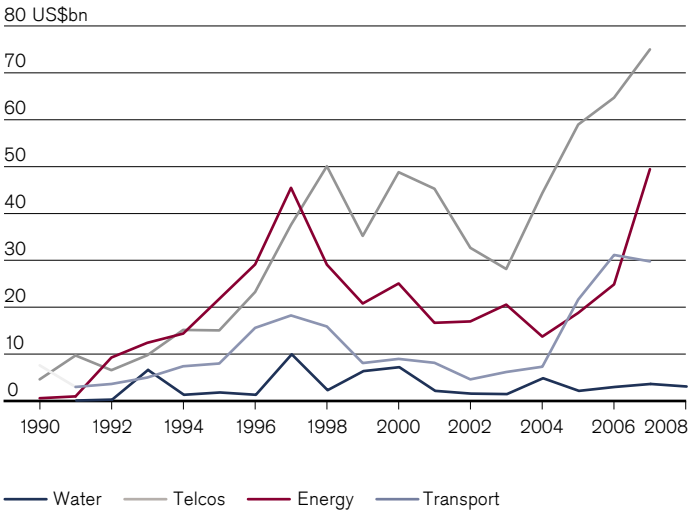


Figure 2

Private-sector projects in emerging markets: Cancelled or projects under distress and investment, 1990–2008

Source: World Bank PPI data, Credit Suisse research

	Number	% total investment
Water	60	34%
Telcos	42	4%
Energy	90	8%
Transport	62	8%

to fill the void. Greater private sector investment in water relies on strong, predictable regulation and the existence of enforceable property rights. Without this, there can be no certainty of future cash flows, which is an obvious deterrent to would-be investors. Ultimately, we would expect bottlenecks in water supply to force the authorities to establish and support the necessary legal framework.

Public/private partnerships have been popular in recent years. A private operator can sign a contract with a government agency to supply services (water delivery, waste water treatment, sewage or construction work) and a regulator sets the standard for price and quality. Subject to this safeguard, we think it makes sense for countries (or cities) to use private operators, especially where municipalities have failed.

Infrastructure legal specialist, Pinsent Masons, forecasts an increase in private participation in water and sewerage systems – from coverage of 11% of the global population in 2008, to 16% by 2015 and 19% by 2025.

Financing requirements: Mind the gap

Back in 2006, economists at the OECD projected average annual expenditure on water infrastructure and maintenance would require a three-fold increase (in real terms) over the following 20 years. This was equivalent to a real growth rate in water-related expenditure of 6.7% per annum. A lot has happened since the OECD put those estimates together. We have touched upon some of this in the above discussion, but to summarize:

1. Ground water levels have fallen quicker than anticipated.
2. Global warming projections have intensified.
3. The world went into recession and project financing dried up.

On balance, the first two factors are likely to drive higher levels of required investment in water infrastructure, and the third has probably undermined that investment, at least in the short term.

However, required investment is far from equal to actual investment. Various data sources illustrate that global growth in investment in the water industry has been lackluster, despite the worsening trend in the supply/demand balance:

1. Pinsent Masons' data on global private sector investment in water shows a cyclical trend (investment levels dipping in 2001/2002 and again in 2008), but otherwise limited evidence of "structural" growth.
2. The World Bank PPI (Private Participation in Infrastructure) dataset shows similar trends: private sector growth in water-related investment in the emerging markets has been very weak, particularly when compared to other areas of strategic economic interest.
3. Public-sector investment also displays limited growth in water investment in some of the key markets. In the USA, public-sector expenditure on water supply has averaged nominal growth of just 5.0% over the past six years. Relative to total public-sector expenditure, the proportion spent on water fell from 5.7% in June 2003 to 5.1% as of June 2009. In January 2007, the US Environmental Protection Agency (EPA) estimated USD 334.8 billion in expenditure would be needed over the next 20 years for pipe, treatment, storage, source, and other infrastructure. In real terms, we estimate an average annual shortfall of 11% in actual expenditure versus the EPA estimate of required expenditure.

A key problem in the USA is the decentralized nature of the water network: the onus is on relatively small municipalities to ensure supply rather than plans being formulated at a Federal level. This lack of a "national plan" puts pressure on large-scale project financing and leads to inefficiencies between neighboring regions.

In Japan, where the public sector still owns 100% of the water and sewage network, average annual investment has been close to JPY 2 trillion over the past seven years. According to government data, the stock of water and sewage-related assets in Japan comes to roughly JPY 120 trillion; a significant proportion of this infrastructure has already existed for 50 odd years. If we assume a replacement cycle (from now) of a further 50 years, then the public sector faces annual maintenance costs alone of JPY 2.4 trillion, even before accounting for the necessary supply-side increases.

Why has global investment in water been so weak?

We can think of four reasons:

1. **Insufficient returns.** The primary factor is that the returns across much of the water industry are perceived to be insufficient to cover risks and secure the necessary financing. From a utilities point of view, companies tend only to invest substantially in infrastructure assets if the regulation has a stable history, the regulator has immunity from direct political manipulation and it is perceived as providing solid returns.
2. **Lack of trust in the regulator.** The problem tends to be exaggerated in developing countries where regulatory history is limited and so contract fulfillment essentially relies on trust between the investor and the state. There have been various high-profile failures of private-sector contracts across the emerging markets (in Buenos Aires and Jakarta to name a couple).
3. **Technical expertise.** Lack of private sector involvement may hold back public-sector investment due to the limited technical expertise of the latter.
4. **Budgetary constraints.** Public sector investment is also limited by the usual budgetary constraints, which is likely to have dampened expenditure this year and last.

The failure rate of private sector operations in water and sewerage provision is very high.

The distress level shown in Figure 2 of 34% compares very poorly with Telcos (4%), Energy (8%) and Transport (8%). Ironically, it is water's role as a basic necessity that makes it more vulnerable to dispute, and hence breakdowns in agreements between suppliers and consumers. For example, in awarding a concession, a governing body will often seek provision to extend services in water and sewerage to the poorest region of an area, regardless of their ability to pay. Telco and electricity concessions are far less likely to include such clauses, hence reducing their inherent operational risks.

Interestingly, the volume of contracts awarded to the private sector in the water and sewerage industry has eased upward and is commensurate with the number of projects awarded to other strategic industries. However, as is implied by flat investment levels (Figure 1) and a rising number of projects (Figure 3), the average size of project has clearly declined. Ostensively, the private sector has moved away from

Figure 3

Private-sector involvement in emerging markets in water, telcos, energy and transport – number of projects by year of financial closure

Source: World Bank PPI data, Credit Suisse research

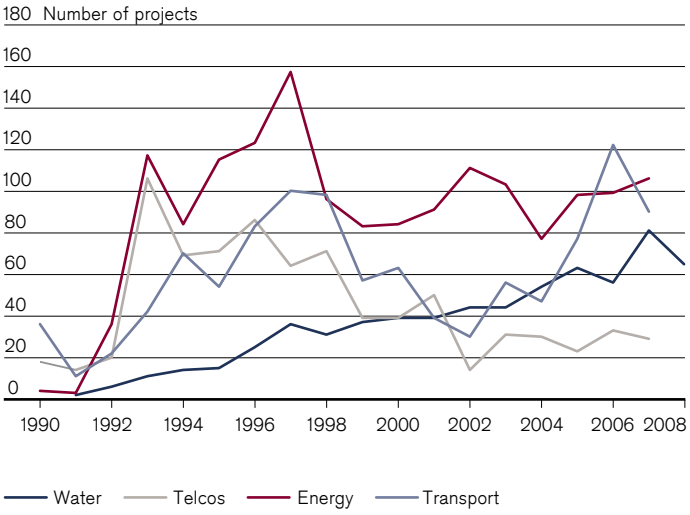


Figure 4

China: Fixed asset investment in water supply (CNY bn)

Source: National Bureau of Statistics, Credit Suisse research
* 2009 data is the YTD annualized number

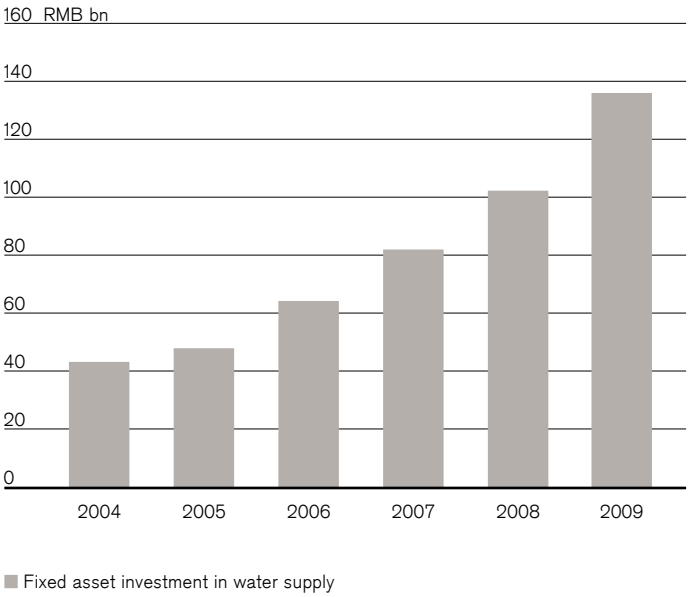


Figure 5

China: Private sector investment in energy and water supply (USD bn)

Source: World Bank PPI data

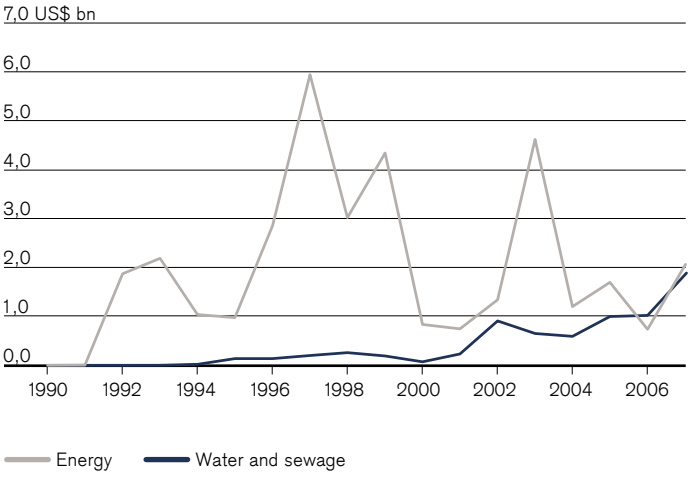
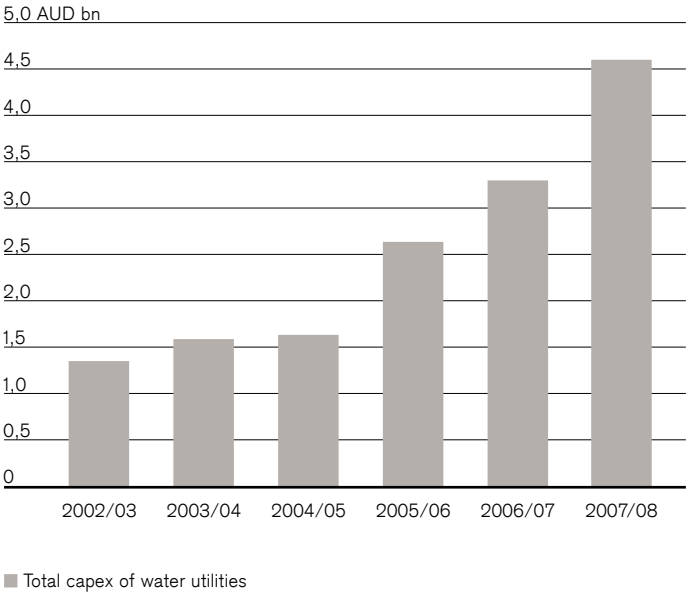


Figure 6

Australia: Total annual capital expenditure of water utilities (AUD bn)

Source: Water Services Association of Australia, Credit Suisse research



large-scale (and perhaps more complicated and contentious) projects to smaller, local projects that are easier to manage and deliver.

Areas of more acute water stress have seen greater investment

However, in regions where problems in water supply are arguably more acute (and the administration is sufficiently organized to direct and execute expenditure plans), there has been a marked increase in water-related investment spending.

China and Australia are two such examples.
In China, rising real incomes and substantial industrial growth has led to a significant increase in the demand for water – on aggregate, water demand relative to supply is running at some 24% on our estimates (which the UN classifies as medium-high stress). Water shortages are much more acute in some parts of the country than in others. According to the Beijing Water Bureau, water resources per capita in Beijing have dropped from 1000 cubic meters in 1949 to less than 230 cubic meters as of 2008 (less than an eighth of the national average). The government has clearly taken the situation very seriously, with annual fixed asset investment in the water supply more than doubling in the past three years, according to the National Bureau of Statistics. World Bank data shows that private-sector investment in China's water supply has nearly tripled over the past three years. The latest data points show that these levels of investment are commensurate with private-sector involvement in the energy supply.

In its eleventh Five Year Plan, the Chinese government has set a target of 1.35% of GDP to be invested in "environmental protection," i.e., water security, by 2010. On our projections, this is equivalent to CNY 5.049 billion in expenditure in 2010, equal to a CAGR of 14.2% between 2007 and 2010E.

In Australia, problems are concentrated in the south. According to the Murray Darling Basin Authority (MDBA), water flow into the Murray and its main tributary, the Darling, is now at a 117-year low. The MDBA has warned that there may not be sufficient water flow to meet the "basic human needs" of the 1 million population of Adelaide by as early as next year (since the city's reservoirs dried up, Adelaide has relied on the Murray for 90% of its water supply).

Total annual capital expenditure by the Australian water utilities has nearly tripled over the past three years. Driven by a government-led program, total water and sewerage capital expenditure is projected by the Construction Forecasting Council to increase a further 60% over the next nine years. Southern Australia clearly has more of a problem with its water resources than with its network; hence the construction of desalination and recycling plants is absorbing the bulk of the capital expenditure.

Conclusions

- Imbalances between water supply and demand globally are already apparent.
- Water prices are for the most part outstripping inflation as governments, regulators and service providers pass on the rising costs of water supply.
- Investment in water-related infrastructure is surprisingly weak for all the rhetoric surrounding the issue.

Photo: istockphoto.com

What next?

Investment levels may have been generally disappointing so far, but it seems clear to us that investment growth will have to pick up to alleviate worsening water shortages over the coming years. We expect much of the investment will focus on measures to increase water supply such as water recycling and desalination, as well as methods to store and regulate the supply, such as reservoirs, dams and pipelines. Three caveats accompany this forecast:

1. We expect growth in water-related investment to continue to be strong in China and Australia. We expect water-related investment growth in the Middle East and North Africa, the Mediterranean markets and Russia (where ageing infrastructure requires substantial upgrades) to pick up as the authorities have both the means (financially) and the incentive (given the scale of the problem) to respond. While water-related investment in the USA and India also looks set to grow, actual investment relative to requirements may well continue to disappoint. In the former, this reflects the problems faced by small municipalities in trying to deliver the appropriate large-scale solutions and, in the latter, it is a reflection of a relatively complicated bureaucratic system.
2. Given the inherent difficulties in the provision of water to a public that often see it as an entitlement rather than a service, it is probably less risky (from a shareholder perspective) to invest in companies focussed on "building" water infrastructure rather than those that "own and operate" the facilities. This is particularly the case in many of the emerging markets, where regulation has yet to establish a track record.
3. Similarly, the trend towards awarding smaller private-sector contracts looks likely to persist. For the most part, this may well be led by the corporates themselves as they have reacted to the relatively high failure rate of private-sector contracts in the sector and have shied away from larger (and hence, more risky) contracts. Arguably, this levels the playing field for some of the smaller, local operators in competing against the large multi-nationals that have traditionally dominated the sector.

Finally, we note that as much as we believe greater supply-side investment is on the cards, the onus to reduce demand for water is equally rising in importance. Higher consumer prices for water, supply interruptions and footing the bill for large-scale infrastructure projects all raise the incentive to improve water efficiency. More and more legislation is creeping in aimed at capping overall water demand. Much of this is aimed at the industrial sector (for instance, the Best Available Technology mandate in Europe), but domestic water users are also being targeted (for instance the USA sets maximum water-use standards for plumbing fixtures in new buildings). Various (listed) corporates provide solutions to greater water efficiency ranging from drought-resistant crops to low-flow faucets. Ultimately, as the debate and the problems escalate in this area, we expect the majority of the global population will have to consider water-efficiency measures in most aspects of everyday life.

Investing in water

The CS Water Index provides a means of investing in companies whose revenues are driven by the water theme.

Investing in water is much less about trying to buy or sell water as a commodity, but buying companies that are significantly exposed to the trends that revolve around the scarcity of water, such as more efficient forms of piping and plumbing, or technology firms that purify and process new water.

In order to provide investors with a means of investing in the range of companies whose revenues are driven by the water theme, we constructed the CS Water Index in January 2007.

This is an equally weighted index of 30 stocks that is rebalanced semi-annually. The stocks are chosen according to their relevance or exposure to the water theme and their attractiveness of the basis of the HOLT scoring model, which examines operational performance, valuation and momentum (HOLT is Credit Suisse's corporate performance and valuation advisory service).

The companies that comprise the index include beverage companies that own rights to water springs, chemical companies that decontaminate polluted water reserves, specialist seawater desalinization firms and utility companies that own, build or maintain water infrastructures. The majority of the companies in the index are based in the developed world, for example in the USA, continental Europe and the UK (Figure 1).

As Figures 2 and 3 show, the CS Water index has outperformed the MSCI World and a number of water-sector indices. Indeed, by the end of October 2009, over its total life of approximately four years, the CS Water index had significantly outperformed the broad market (recording a double-digit excess return) and also beat its benchmark, the S&P 500 Global Water Index. It has also outperformed the MSCI World in the upswing phase of the market cycle, though it has tended to underperform in downswings.

Figure 1

CS Water Index composition by country (in %)

Source: Credit Suisse

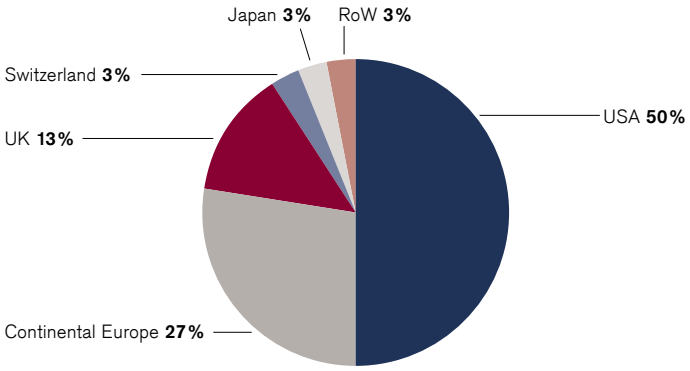


Figure 2

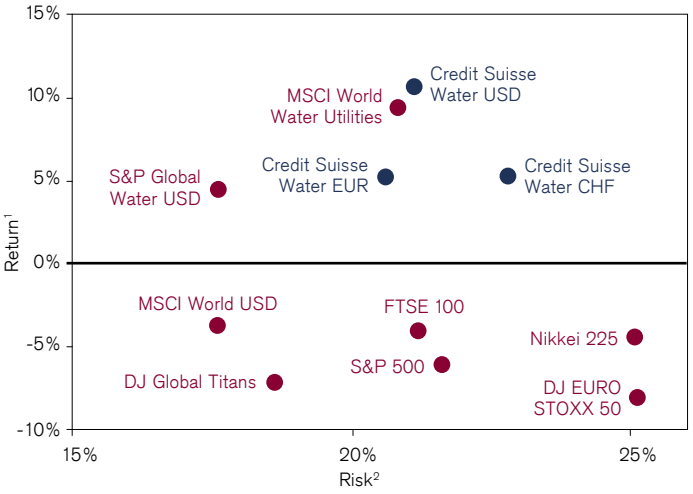
Long-term outperformance of the CS Water Index vs. MSCI World Equity

Source: Bloomberg, Credit Suisse/IDC

Figure 3

CS Water Index vs. major equity indices

Source: Bloomberg, Credit Suisse



[1]Compounded annual return from 14 January 2002 to 27 February 2009

[2]Annualized realized volatility from 14 January 2002 to 27 February 2009

General disclaimer / Important information

Imprint

Publisher
Credit Suisse Group AG
Credit Suisse Research Institute
Paradeplatz 8
CH-8070 Zurich
Switzerland

Responsible authors
Mary Curtis
Richard Kersley
Michael O'Sullivan

Editorial deadline
16 November 2009

Mat. no. 1531614 / 11/2009